COUNTRY REPORTS

THE STATE OF **ESWATINI'S** BIODIVERSITY FOR FOOD AND AGRICULTURE

This country report has been prepared by the national authorities as a contribution to the FAO publication, *The State of the World's Biodiversity for Food and Agriculture*. The report is being made available by the Food and Agriculture Organization of the United Nations (FAO) as requested by the Commission on Genetic Resources for Food and Agriculture. The information in this report has not been verified by FAO, and the content of this document is entirely the responsibility of the authors, and does not necessarily represent the views of FAO, or its Members. The designations employed and the presentation of material do not imply the expression of any opinion whatsoever on the part of FAO concerning legal or development status of any country, territory, city or area or of its authorities or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed by FAO in preference to others of a similar nature that are not mentioned.

Guidelines for the preparation of the Country Reports for *The State of the World's Biodiversity for Food and Agriculture*

Country: **Swaziland**

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Preparation of the Country Report

1. Provide a description of the process that was followed in preparing the Country Report, preferably providing the names (with affiliations and addresses) of the participants, including all stakeholders consulted.

The National report was compiled through a consultancy that was engaged with the support of FAO. The Ministry of Agriculture organized and hosted two workshops at Mphophoma Conference and Training Centre, Malkerns Research Station to solicit stakeholder inputs. The inception workshop was held on the 10th May 2017 whilst the validation workshop was held on 31st May 2017 in the same venue with a total of 43 participants representatives in attendance. The workshop official opening was graced by the Principal Secretary in the Ministry of Agriculture, Mr Bongani Masuku.

In accomplishing the assignment, the consultant worked closely with the Ministry of Agriculture through the BFA National Focal Point in the particularly with regard to organizing the workshops. The consultant undertook bilateral consultative meetings with selected stakeholder organizations and sectors of the society around the country in order source more specific data or information, and thus achieve the desired outputs. Stakeholders consulted. The relevant stakeholders consulted for this purpose included public sector organizations (departments and government parastatals) that directly oversee and/or implement biodiversity programmes as well as farmers' union representative and selected farmers, academia and civil society organizations. The aim is of such wide stakeholder consultation and participation was to ensure that the exercise was stakeholder driven and consensus reached in order to assume the status of a national document. Desk review studies on existing stakeholder reports and documents on completed biodiversity implemented activities as well as relevant legislative frameworks supporting biodiversity initiatives were also consulted. Other published and unpublished work was by researchers especially in the academic sector was also searched and according referenced.

However it is worth pointing out also that available time and other resource constraints did not match with the amount of work and effort that was required for this assignment. The fatigue due to exhaustion could have

taken its toll considering the highly demanding and involving nature of the assignment which under the limited time constraints. Otherwise, it required the engagement of a team of at-least consultants to successfully deliver the report.

Another challenge was technology in terms of available software and computer gadgets (laptops) which could not enable the report to be compiled using the Dynamic guidelines as instructed by FAO which were to be accessed after downloading Adobe Reader. Whilst the attempts to use the downloaded Adobe Reader programme in accessing the dynamic guidelines, programme caused the computers to freeze. This often resulted in regular loss of unsaved work which caused delays and frustrations.

In preparation for the inception workshop, the consultant also prepared questions which were given to sector and/or sub-sector groups for group discussion during the inception workshop as well as other groups which due to resource limitations were not invited or could not participate even when invited due to other equally important commitments. Thus the consultant made follow-up visits to stakeholder institutions such as the Swaziland Environment Authority and Swaziland Cotton Board as well and also visited the some entrepreneurs in the Manzini Central Business District to gather some information on the biodiversity derived products they sell.

A follow-up workshop was convened on 31st May 2017 to share progress and validate the finding of the consultancy with a total of 38 participants in attendance. The closing remarks for the final workshop were delivered by Mr. Gcina Dladla who was representing the office of the Executive Director of the Swaziland Environment Authority. However due to high demanding nature of the expected report in line with the FAO guidelines, it was impossible to accomplish the assignment within the given timeframe. Consequently, reconvening was necessary where even though it was again constrained by lack of financial resources to enable proper representation from sector stakeholders. The slow pace finally revealed that at-least a week long retreat for a smaller team of stakeholders would have been the best option to facilitate the compilation and finalization of the baseline report.

As a result, whilst the report might not be fully completed and have not received the best editorial in such a rush due to the above highlighted budgetary and time constraints, it however will has been an important piece of task that will surely serve the purpose. It further has also been an important piece of task and learning platform for the compiling team and the stakeholders who participated throughout the process.

Table A. List of stakeholders who participated in the workshops at **MPHOPHOMA Conference Centre, Malkerns Research Station, on 10th and 31st MAY 2017**

	NAME	ORGANIZATION	DESIGNATION	GENDER
1	FREDDY MAGAGULA	Ministry of Agriculture (MoA)– Fisheries Section	Senior Agricultural Officer	M
2	FREDDIE SIHLINGONYANE	MoA – Department of Agric. Extension (DAE)	Senior Extension Officer	M
3	ABRAHAM DLAMINI	MoA-DAE	Registrar of Seed	M
4	PHUMZILE MHLANGA	MoA – Fisheries	Fisheries Officer	F
5	HANSON B. HLOPHE	Department of Agric. Research & Specialist Services (DARSS)	Senior Research Officer	M
6	NICHOLUS MANANA	DARSS – MoA	Research Officer	M
7	QUEEN VILAKATI	MOA –Fisheries	Assistant Extension Officer	F
8	THEMBINKOSI DLAMINI	MOA –Fisheries	Fisheries Officer	M
9	BONGANI MAGAGULA	Department of Veterinary and Livestock Services (DVLS)	Range Management Officer	M
10	SIMILO MAVIMBELA	DARSS	Chief Research Officer	M
11	CALSILE MHLANGA	Swaziland Environment Authority (SEA)	Biodiversity Officer	F
12	VICTOR SIMELANE	UNISWA	Lecturer – Plant Botany and Plant Breeding	M
13	JABULANI TSABEDZE	Swaziland National Agricultural Union	Secretary General	M
14	BEGHINI STELLA	Cooperation for the Development of Emerging Countries (COSPE Swaziland)		F

15	EUNICE MAMBA	MOA – DAE	Senior Extension Officer	F
16	LINDOKUHLE VILAKATI	SNTC	Community Ciosou Off.	F
17	BONGANI MVUBU	DARSS	RO	M
18	MINKY GROENEWALD	Meteorology Dept.	TNA	F
19	MBONGENI MABUZA	DVLS	Dairy Extension Officer	M
20	THULANI KUNENE	DAE – Mushroom Promotion Unit	Mushroom Officer	M
21	LUNGILE SIKHONDZE	Swaziland Agricultural and Water Development Enterprise (SWADE)	Agribusiness Ext Officer	F
22	EMMANUEL KUNENE	Swaziland Institute of Research on Indigenous and Medicinal Plants	Research Officer	M
23	DANSILE DLAMINI	DARSS	Registry	F
24	MUSA M. MBINGO	DARSS	Documentation Officer	M
25	THEMBINKOSI GUMEDZE	DARSS	SRO	M
26	SETH MAPHALALA	Swaziland National Trust Commission NTC	Progr. Manager – Maputaland Biodiversity Hotspot	M
27	SIPHO N. MATSEBULA	SEA	Ecologist	M
28	BONGANI NKABINDZE	SEA	Biosafety	M
29	ZODWA MAMBA	FARMER	Farmer	F
30	BHEKI BULUNGA	COSPE Swaziland	Agronomist	M
31	SIPHO SHIBA	MoA – Land Use Planning and Development	Land Planning Officer	M
32	FUTHI MAZIBUKO	SWADE	Environmental Officer	F
33	BONGANI DLAMINI	Farmer	Farmer	M

34	SANDILE GUMEDZE	SNTC	Ecologist	M
35	NTOMBIKAYISE GININDZA	MOA	Senior Extension Officer	F
36	NHLANHLA HLOPHE	DARSS	RO	M
37	KWAZIKWENKOSI MKHONTA	DARSS	RO	M
38	CHRISTOPHER MTHETHWA	Seed Quality Control Services	Agricultural Officer	M
39	PHUZA MASEKO	MOA	Senior Information Officer	M
40	ZINHLE SIMELANE	DARSS	Information	F
41	EDWARD LULANE	DARSS	Research Officer	M
42	BHEKI NZIMA	DARSS	Principal-Plant Health Officer	M
43	ATALIA MSANE	DARSS		F
44	BENJAMIN MAMBA	DARSS	Seed Multiplicatio n Officer	M
45	P. J. TSELA	DARSS	Research Officer – Food Science	F
46	XOLILE ZWANE	DARSS		F
47	GCINA DLADLA	SEA	Acting Executive Director	M
48	NCOMIWE MAPHALALA	DARSS	Research Officer	F
49	SIHLE MAGAGULA	MTEA	Assistant Herbarium Curator	M
50	ZAKHE DLAMINI	SNTC	Ecologist	M
51	NOSIPHO MAZIYA	MALKERNS TOWNBOARD	Clerk	F
52	NOMTHANDAZO NKAMBULE	MALKERNS TOWNBOARD		F
53	NJABULO MKHONTA	DARSS	Plant Health Officer	M
54	**JOCHONIAH MSIBI**	**Swaziland Cotton Board**	Production Manager	

55	LOUIS KUHLASE	DAE	Agricultural Officer	M

EXECUTIVE SUMMARY

Biodiversity for Food and Agriculture is at the core of the livelihood for a majority of Swaziland's population. At least 70% of the population is engaged at some level, in agriculture. A wide diversity of production systems which involve crops, livestock, forestry and aquaculture (fisheries) within each of the biodiversity for food and agriculture sectors of Animal, Forest, Plants and Aquatic genetic resources are practiced in the country. Production objectives in the private sector on Title Deed Land (TDL) are driven by maximisation of yield per unit area and thus this sector is characterised by high investments in infrastructure and inputs. As a result, TDL accounts for the bulk of the country's exports except for beef where Swazi Nation Land (SNL) is the major contributor. High productivity on TDL has not come without cost as a number of studies have shown that it is having an impact on the country's water and other resources. Production on SNL has also come at a cost with the country's communal grazing lands manifesting irreversible signs of degradation in many areas.

Drivers of change across the country's ecosystems are well understood and documented. However, very little research has been carried on the country's associated biodiversity including how it is impacted by drivers of change. The few reports and studies available indicate that species such as small mammals, vultures and various insects are affected by anthropogenic factors hence it can be expected that the ecosystem functions they perform are also affected. There is a need to raise awareness on associated biodiversity and establish monitoring programmes in order to ensure continued productivity across sectors.

Whilst the value of ecosystem services in supporting agricultural productivity is generally recognized, there have been no systematic studies on any specific regulating and supporting ecosystem services. The country does not at present, have a programme for systematic research on ecosystem services. Similarly, very little has been done to determine what and how drivers of change are affecting the availability, diversity and knowledge of wild foods. The country's traditional knowledge largely remains undocumented. Regulating and supporting ecosystems, wild food and related traditional knowledge are marginalised in policy and in research. Prospects for responding to these gaps are provided by the National Biodiversity Strategy and Action Plan, the Climate Change Vulnerability Assessment: Biodiversity and Ecosystems.

Apart for the fisheries sector, the state of the country's genetic resources for food and agriculture are well documented and at least one Report has been submitted to the Food and Agriculture Organization. In the animal genetic resources sector, there are concerns about genetic erosion of the indigenous pig, goat and cattle gene pools with these animals being indiscriminately bred with exotic breeds. The status of fish stocks in the country is not known due to the absence of relevant data.

The extent and coverage of various forest types in the country is well known and documented however at present, the country has no specific conservation strategies/programmes for forest species. *In-situ* conservation occurs by default where a particular species occurs and is thus managed inside a protected area.
Crop relatives and landraces recorded in the country include *Sesamum, Cerototheca,Sorghum* spp., Cucurbitacea, *Vigna, Arachishypogea, Zea mays, Phaseolus, Ipomeabatatas, Manihotesculentus,*

Colocasiaesculantus, Gossypium, Physalis. The National Plant Genetic Resources Centre (NPGRC), located at Malkerns is tasked with all issues related to the conservation of plant genetic resources. At present, the collection held at the NPGRC consists of 570 accessions representing 10 species.

The major trade off in with regards to genetic resources for food and agricultures in the country is maintenance of the more resilient indigenous varieties/breeds on one hand with the need for improvement in productivity offered by improved varieties/breeds.

Because of lack of data on associated components of biodiversity across all the country's production systems, it is not possible to comment with certainty on ten-year trends. There are also no base-lines established to measure this. Where available, studies have been largely sporadic, driven by the research interests of researchers from the University of Swaziland for example. Similarly, there is no information available to comment on ten year trends in regulating and supporting ecosystems. Some work is available on provisioning ecosystem services associated with forests and the country's wetlands.

In terms of associated biodiversity, the only species that is actively managed is honey bees. Bees are managed for honey production. In 2012, the total number of bee keepers in the country was reported at 1107 with a total of 3860 hives. At least 500 of these beekeepers were smallholders.At present, Swaziland has no systematic biodiversity monitoring programme in place.Protected areas conduct monitoring activities on biodiversity that occurs within their borders.Monitoring activities in place include activities by Swaziland National TrustCommission at species level on taxa such as blue swallow, baldibis, raptors, hyenas, aardwolfs, bats, reptiles, *Encephalatoslavaefolius*, *Polystachyszuluensis*and*Kniphofiaumbrina*.The University of Swaziland also conducts some research on raptors, small mammals and insects as well as rangeland ecology. All Out Projects, also conducts habitat monitoring within Malolotja,Mlawula and Hlane protected areas using fixed point photography recording(Swaziland Environment Authority, 2005).

The Phytosanitary Unit of DARSS conducts surveillance on a range of crop pests including *Bactroceradorsalis*(Fruit fly), *Planococussolenopsis* (Cotton mealy bugs), Yellow aphids and *Chilosaccharighagu* in sugar cane, *Tutaabsoluta* in tomatoes and*Spodopterafrugiperda* (Fall armyworm) in maize. Similarly, the Veterinary Services and Livestock Services Department also conducts routine surveillance from an animal disease control perspective.

Human induced factors have had a huge impact on the country's biodiversity. As many as 89 species of vertebrates and 305 plant species are currently listed as threatened or near threatened in national Red Data Lists (Monadjem*et al.*, 2003; Dlamini&Dlamini, 2002; GOS-SEA 2013[2], GOS-SEA, 2016). Illegal collection/hunting has been a major factor for many species. Habitat modification/ destruction driven by expansion of cultivation area is another important factor. There are no established *in-situ* conservation programmes for associated biodiversity except for taxa that occur within and are thus managed by protected areas. There are also no established programmes for *ex-situ* conservation for associated biodiversity.

Records indicate that hundreds of wild species are used for food in the country. There are no systematic programmes on many of these wild foods and the associated traditional knowledge. Natural and man-made disasters, mainly recurrent droughts and wild fires have had impacts on genetic resources for food and agriculture and some components of associated biodiversity. Another important factor is Invasive alien plants with at least 80% of the country affected by at least one species. Important species include *Chromolaenaodorata* and *Lantana camara*. In aquatic ecosystems, *Onychorhynchusmykiss, Micropterussalmoides*and *Cheraxquadricarinatus* have been recorded.

The Report identifies gaps, knowledge and information gaps, capacity constraints, policy and institutional arrangements as well as priority actions for various aspects related to the conservation and sustainable use of the country's biodiversity for food and agriculture and associated biodiversity. The major constraints revolve around lean staff complements with numerous responsibilities, in some cases inadequate skills, inadequate infrastructure and equipment and inadequate budgetary allocations. Inadequate arrangements for collaboration and cooperation across stakeholder institutions in current approaches aimed at facilitating synergy is the key institutional issue identified.

Swaziland has many laws, policies, programmes and other frameworks for that support or influence the conservation and sustainable use of biodiversity for food and agriculture. There are also measures in place to enhance disaster risk mitigation and climate change adaptation and resilience. These include the Intended Nationally Determined Contribution on adaptation and mitigation to climate change. The country has also developed her second National Biodiversity Strategy and Action Plan. There are various interventions spanning across several government ministries that will, if effectively implemented contribute to achievements of targets 6,7 and 13. The country has adopted the ecosystems and landscape approach to biodiversity conservation with some initiatives having been implemented. The Strengthening the National Protected Areas Systems project currently being implemented in the country will yield valuable lessons and practical experience in this area.

One of the main gaps with regards to planned actions and future priorities to improve the conservation and sustainable use of biodiversity for food and agriculture, with specific reference to enhancing its contribution to supporting ecosystem function and the provision of ecosystem services. There is thus a need for the establishment through a legislative framework of an apex body higher than Biodiversity Programme Implementation Committee (BPIC) with a semi-autonomous status which could be accorded recognition by Government even and even reports directly to the head of Government, which will oversee the coordination and prioritization of all biodiversity-related programmes being implemented in the country.

CHAPTER 1: Introduction to the Country and to the role of biodiversity for food and agriculture

2. In a few paragraphs, provide a synthetic overview of your country, including the size, location, main physiographic and climatic features. Include a section on human population, providing disaggregated data on women and men contribution and involvement in agriculture. Briefly discuss as well the overall nature and characteristics of the economy, including the contribution of the different sectors. You may wish to draw upon the country overviews provided in the first chapters of previous and on-going Country Reports on Forest, Aquatic, Animal or Plant Genetic Resources.

General overview of the country

Location

The Kingdom of Swaziland is located in south-eastern Africa between latitudes 25°43' and 27°19' S and longitudes 30°47' and 32°08 E'. The country is landlocked, bordered by Mozambique on the east over 105 Km of her border length and by South Africa on the north, west and south over the remaining 430 km of border length. Swaziland covers an area of 17 364 km^2. The country has a highly varied landscape over a short distance with elevation ranging from 1862 metres above sea level (masl) to only 21masl where the Great Usutu enters Mozambique. Despite her small size, Swaziland is characterized by a great variation in landscape, geology, soils and climate giving rise to a wide range of biodiversity.

Physiography

Based on elevation, landforms, geology, soils and vegetation, the country is divided into four agro-ecological zones i.e. the Highveld, Middleveld, Lowveld and the Lubombo Plateau (Van Waveren & Nhlengetfwa, 1992; Remmelzvaal, 1993). The Middleveld and the Lowveld are each subdivided into two physiographic regions i.e. the Upper (Wet) Middleveld, Lower (Dry) Middleveld and the Western Lowveld, Eastern Lowveld respectively giving rise to a total of six physiographic regions. Annex I shows the physiographic map of Swaziland. Characteristics of the physiographic regions are shown in Table 1.1.

Climate

Swaziland's climate is mainly subtropical. Summers are hot and wet with about 75% of the annual rain falling between October and March. Winters are cold and mostly dry.

Physiographic zones show marked variation in climatic conditions, ranging from sub-humid and temperate in the Highveld to semi-arid and warm in the Lowveld. The highest January Mean temperatures are recorded in the Eastern Lowveld at 34°C whilst the lowest July minimum temperatures (5-10 °C) occur in the Highveld (Ministry of Tourism & Environmental Affairs 2012).

Land Tenure and Use

Swaziland has a dual land tenure system which consists of Swazi Nation Land (SNL) and Tittle Deed Land (TDL). The dominant leadership system under the Swazi Nation Land is the Traditional Authority (Chiefdom / **Umphakatsi**), the Chief is in charge of the day to day affairs community. The Chief has the ultimate authority on SNL and he allocates land to Swazi Nationals through traditional land allocation system (**Kukhonta**).

Table 1.1: Physiographic regions of Swaziland

Physio-graphic Zone	Highveld	Upper (Wet) Middleveld	Lower (Dry) Middleveld	Western Lowveld	Eastern Lowveld	Lubombo Plateau
Area (ha)	568,000	242,000	242,000	341,000	196,000	148,000
Percentage of total area	33%	14%	14%	20%	11%	8%
Altitude (masl)	900-1400	600-800	400-600	250-400	200-300	250-600
MAR*	850-1400mm	800-1000mm	650-800 mm	625-725 mm	550-625 mm	700-825 mm
Mean Annual Temp. °C	17	20.2	21	22	22	21
Jan.	20	4	25	26	27	26
July	12	15	16	28	17	17
Land form & Topography	Steep hills on steeply dissected escarpme	Mod steep hills with plateau remnants and	Rolling piedmont plains with basins and isolated	Undulating plain; 10% serious erosion	Gently undulating plain; 5%	Undulating plateau (cuesta) with steepl

	nt, transitions to plateaux; 30 % serious erosion	basins; 50 % serious erosion	hills; 20% serious erosion		serious erosion	y dissected escarpment; 5% serious erosion
Geology	Granite (dominant) with gneiss, lava	Granodiorite & granite with gneiss, shale	Gneiss (dominant) with granite/diorite	Sandstone/shale, with dolerite intrusions)	Basalt	Ignimbrite
Vegetation	Short sour grassland with forest patches	Tall grassland with scattered trees & shrubs	Broad-leaved savanna & hillside bush	Mixed broadleaved & Acacia savanna	Acacia savanna (dry)	Hillside bush and plateau savanna

MAR*-Mean Annual Rainfall Source: Sweet & Khumalo, 1994

Traditionally, SNL held under customary tenure cannot be bought, mortgaged, leased or sold and can only be acquired through **kukhonta** or by inheritance (Terry & Ogg, 2017) in which case it would be passed on to the oldest male heir. By 2000, this system accounted for about 55 % of the country's land area and supported about 80,000 homesteads estimated at 62 % of the total population (van Wavaren, 2007; Terry & Ogg, 2017). Under SNL, land and other resources are communal hence community members have open access to these. Also included under SNL is land that is leased mainly to private companies engaged in agriculture or forestry under highly capital intensive and well managed estates specialising in export commodities such as sugarcane, pineapple, citrus, beef, dairy, poultry and timber (Mabuza *et al*., 2013).

Title Deed Land (TDL) is under freehold and is owned by private individuals and companies. SNL constitutes about 60 % of the total land area whilst TDL accounts for the bulk of the remaining land area. Table 1.2 shows a breakdown of land tenure categories in Swaziland. The Swaziland Government holds title over Crown Land (Swaziland Environment Authority, 2002; Terry & Ogg, 2017; Mabuza *et al.,* 2013) which is mainly used for construction public structures, including offices and residential housing for public servants (Armstrong, 1986; Mabuza *et al.,* 2013). Annex II shows the land tenure map of Swaziland.

Table 1.2: Swaziland Land Tenure and distribution

Land tenure type	Control	Area (Km^2)	% of total land area
Swazi Nation Land	Communal under chiefs[i1]	9 480	54.6
	Non-communal under chiefs	140	0.8
	Controlled by Tibiyo[2]	500	2.9
	Controlled by Swaziland National Trust Commission	460	2.7
	Leased to companies or individuals[3]	1 120	6.5
	Controlled by the Ministry of Agriculture[4]	1 180	6.8
Title Deed Land, urban area		130	0.7
Title Deed Land, rural area		4 240	24.4
Crown land		70	0.4
Water reservoirs		40	0.2

(Modified from Swaziland Environment Authority, 2002)

The main land use categories in Swaziland are crop agriculture, animal husbandry, forestry, extraction and collection, nature protection, settlement and industry, and unused land. Some of these land use categories are complex. An example here is small-scale traditional farming which is closely associated with communal grazing. Another consideration is that there is often a primary and secondary use of the same land. Extraction and collection takes place in savannas and woodlands where animal husbandry is the primary use. Similarly, the primary use of national parks is nature protection, but recreation is an important secondary use (Swaziland Environment Authority, 2002). The main land use categories and the area under each are shown in Table 1.3 and Figure 1.

Ecosystems

Four ecosystems are recognised in Swaziland as follows:

- **Montane grasslands:** This is the second most dominant ecosystem occurring mainly in the Highveld. This ecosystem originally covered 46% of the country's land area. However its coverage has been reduced in extent by 25%. Montane grasslands are home to 72% of Swaziland's endemic flora and the country's only endemic vertebrate. A large percentage of the country's threatened flora and fauna are

[1] Includes 1010km^2 purchased from freehold land after independence
[2] Includes 420km^2 purchased from freehold after independence
[3] Includes 980km^2 purchased from freehold after independence
[4] All purchased after independence

also found within the montane grassland (Dlamini & Dlamini, 2002; Monadjem *et al*., 2003; Loffler & Loffler, 2005; GOS-SEA, 2016).

- **Savanna-woodland mosaic:** This is the most dominant ecosystem extending from the central to the lower parts of the country. It originally covered 48% of the country's land area but has been reduced by 25%. This ecosystem is further subdivided into three habitats i.e. sour bushveld, Lowveld bushveld, and the Lubombo bushveld. It is home to about half of the country's flora and fauna (GOS-SEA, 2016).
- **Forests:** The forest ecosystem is highly restricted originally covering just 5% of the country's land area. It is characterized by woody vegetation with a continuous canopy, with the dominant vegetation consisting mostly of evergreen trees. This ecosystem has been reduced by 26% as a result of unsustainable resource utilization, urbanization as well as invasion by alien plant species (GOS-SEA, 2016).
- **Aquatic systems**: The aquatic ecosystem accounts for just 6% of the total land area and is also the least well known. Swaziland's aquatic ecosystem comprises streams, rivers and wetlands. The country's aquatic ecosystems are threatened by urbanization, alien invasive plant species, erosion and unsustainable utilization patterns (GOS-SEA 2016). Annex IV shows the map of Swaziland's Ecosystems.

Table 1.3: Swaziland's main land use categories

Land use category	Code	Area (km^2)	% of total land area
Small-scale subsistence crop agriculture (rain-fed annual field cropping)	SA	2140	12.3
Large-scale commercial crop agriculture (irrigated and rain-fed field/tree cropping)	LA	1040	6.0
Extensive communal grazing	CH	8670	50.0
Ranching	RH	3320	19.1
Plantation Forestry	F	1400	8.1
Parks, Wildlife Management	P	670	3.9
Residential, Industry, Recreation	S	80	0.5
Water Reservoirs	Q	40	0.2

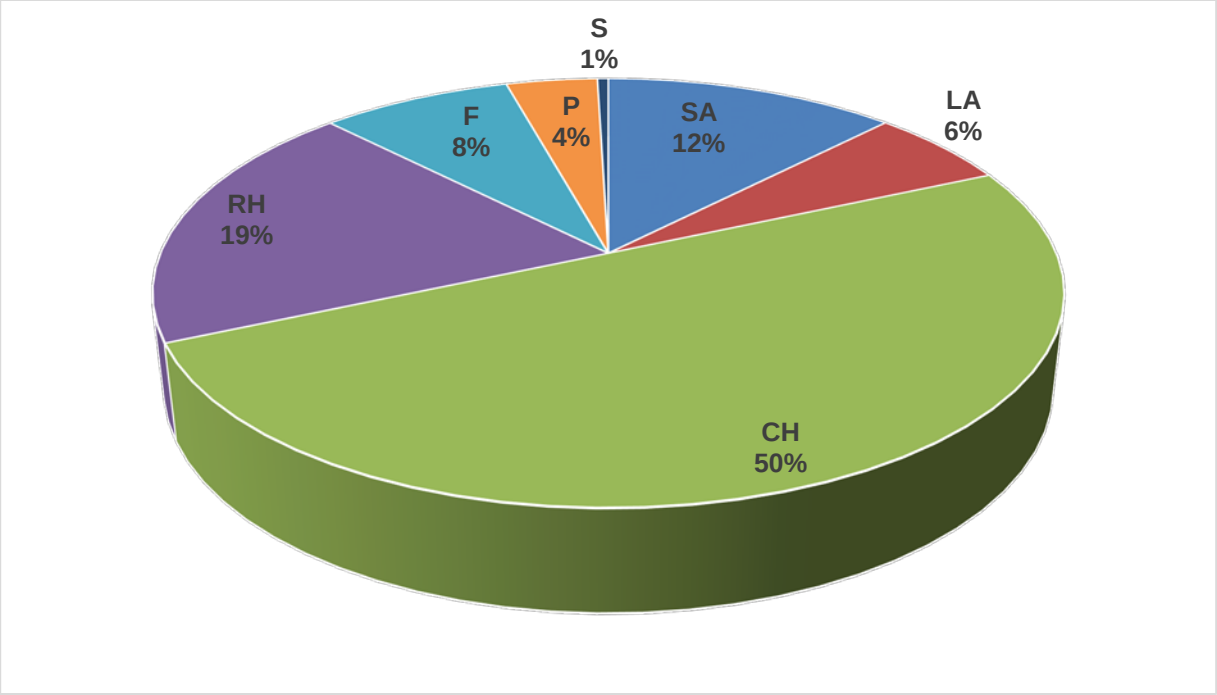


Figure 1: Main land use categories

Protected areas

Just less than 4% of the country is covered within the protected area network (GOS-SEA, 2013[1]; GOS-SEA, 2016). This is significantly lower than the internationally agreed target in the Biodiversity Strategy and its Aichi targets (Secretariat to the Convention on Biological Diversity, 2010). The current country's protected area network is composed of small and vulnerable protected areas which also have the limitation of being poorly distributed across the country's ecosystems. The current coverage of ecosystems in the protected areas network is shown in Table 1.4.

Table 1.4: Extent of coverage of the country's ecosystems in the protected areas network

Ecosystem	Grassland		Savanna		Forest		Aquatic		Total	
	km^2	%	km^2	%	km^2	%	km^2	%	km^2	%
Extent of coverage	7990	46	8327	48	8700	5	2132	1	17400	100
Area for	1920	2	4260	5	20	2	4	2	6400	4

mally protected										
Area informally protected	4	0	426	2	3	0	3	1	174	1

From GOS-SEA, 2016

Population

The housing census completed in 2007 placed the population at 1 018 449 adjusted to 1 020 102 for July of that year. The projection for 2017 was 1 145 970 with 76.3% of the population expected to be rural dwelling (CSO, 2007). The proportion of males and females is shown in Figure 2.

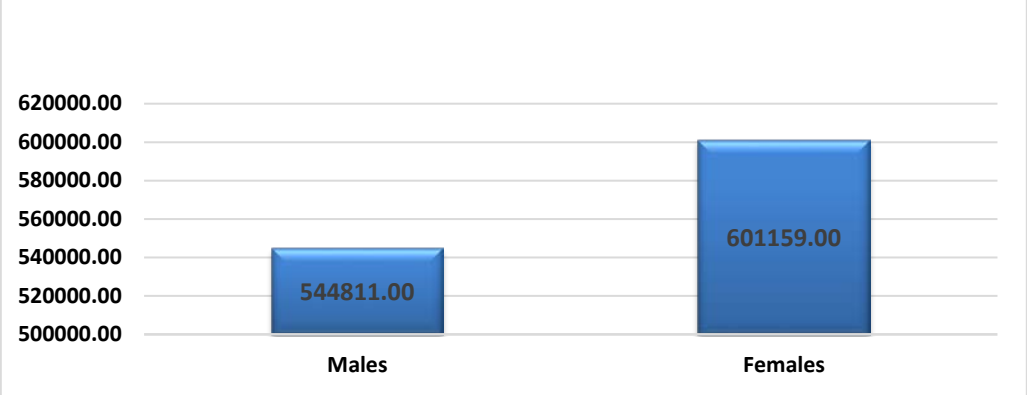


Figure 2: Proportion of males to females in the Swazi population

Agriculture and the economy

Swaziland is classified as a lower middle income country. The per capita Gross Domestic Product (GDP) was estimated at US$ 3126 in 2015 with GDP at 3.5 billion US$. Forty two percent of the population was estimated to be living below the international extreme poverty line of US$1.9 per day. The unemployment rate was estimated at 28% (World Bank, 2016). Real GDP growth by sector and projections to 2018 are shown in Table 2.5. The contribution of agriculture to the GDP is currently estimated at around 11 % of which 80 % is from commercial production on TDL whilst the predominantly subsistence SNL accounts for 10%. Livestock and forestry account for the remainder (FAO/WHO; 2005).

Table 1.5: Real GDP gross by sector projected to 2018

	201	201	201	201	201	201

	3	4	5	6	7	8
Real GDP growth at constant factor prices	4.6	2.7	1.7	-0.9	1.9	3.1
Agriculture	3.6	-4.5	7.4	-8.1	8.1	7.0
Industry	3.8	4.9	1.1	-2.1	2.2	3.1
Services	5.3	2.1	1.5	1.0	0.9	2.6

Agriculture has traditionally been the backbone of Swaziland's economy and is also a major source of employment for rural households (Thompson, 2016). In particular, smallholder agriculture is the main sector of economic activity and provides as much as 70% of the country's population with employment, housing and food (SADC, 2011; Government of the Kingdom of Swaziland, 2015). The range of crops cultivated in the country include sugarcane, citrus fruit, maize and other cereal crops, cotton, legumes, root and tuber crops etc. Forestry and livestock are also important. Agriculture's share of GDP in 2007/8 was 12.7% but dropped to 5.8% in 2016 (Global Finance Magazine, undated). Despite this, a far greater proportion of the economy is indirectly related to agriculture as a significant part of the manufacturing sector is value-added through the processing of products, such as sugar and timber (Thompson, 2016).

Role of biodiversity for food and agriculture

3. Provide a summary of the role of biodiversity for food and agriculture in improving food security and nutrition, the livelihoods of farmers, pastoralists, forest dwellers and fisher folk, ecosystem health and sustainability of production systems in your country. Specific attention should be given to associated biodiversity, ecosystem services and to wild foods. The summary should also draw attention to the *ex situ* and *in situ* conservation of biodiversity for food and agriculture, the most significant aspects of use to improve food security and nutrition in the country, major changes observed in the last 10 years and the main factors causing changes. Significant risks or dangers to the conservation and use of biodiversity for food and agriculture may also be highlighted.

Despite her small size, Swaziland is blessed with a rich flora and fauna with 2 600 species of flowering plants, approximately 121 species of mammals, 153 amphibians and reptiles, and 350 species of birds known to occur in the country (GOS-SEA, 2016). The vision of the Ministry of Agriculture is to achieve and maintain an efficient and sustainable agricultural sector that will ensure national and household food security and a sustainable growth of Swaziland's agriculture and national economy with equitable wealth distribution throughout the value chain (see www.gov.sz). This statement puts elaborately, the envisaged role of agriculture and hence the country's biodiversity for food and agriculture not only in attaining food security at household and national levels but also in stimulating economic growth and wealth distribution in the country. The people of Swaziland have a very close relationship with biodiversity on which they depend for food, agriculture as well as their rich culture and tradition which is centred on biodiversity. The main agricultural sectors in Swaziland are livestock, crops, forestry, aquaculture and fisheries.

In Swazi culture, livestock are considered a store and measure of wealth and social status (Dlamini *et al*., 2017). The main livestock products are meat, milk, eggs, draught power, manure, hides and skins (Ministry

of Agriculture & Cooperatives, 2004). The number of animals of each species recorded in the country by year is shown in Table 1.6.

Table 1.6: Number of livestock species by year

	Year		
Species	**2014**	**2015**	**2016**
Cattle	620 032	594 240	531 450
Chicken	2 546 343	2 415 138	1 594 079
Goats	441 137	443 128	501 496
Sheep	15983	14 969	16 841
Pigs	39 808	38 153	42 852

Sources: DVLS (2014; 2015 & 2016).

These animals contribute significantly to food and nutrition security, livelihoods and well-being of the country's population as they enable people to meet their needs for food, agricultural inputs, cultural ceremonies and other practices and also contribute to the country's economy. In addition, during times of need, livestock plays an important role in food security as households opt to sell livestock to maintain food security and meet other basic livelihood needs (Swazi VAC, 2004; Department of Livestock & Veterinary Services, 2004) such as school fees, medical expenses etc.

Where it is available, wild game provides a cheap source of meat and hence protein to a number of rural households. Animals that provide game meat in Swaziland include Impala, Kudus, Warthogs, various birds and some small mammals. Predators are an important constraint to production in some sectors. For example, Siyaya & Masuku (2013) report that in indigenous chickens, predators such as wild cats and birds, account for as many as 28 birds lost per farmer / year compared to an average of 4 birds per farmer per year lost due to theft.

The main crops grown by farmers in the country include cotton, sugarcane, maize, legumes as well as root and tuber crops. Some of these are important contributors to the country's economy whilst others are grown mainly for subsistence with sale of surplus thus contributing to food security as well as livelihoods. The country's informal produce and commodity markets are dominated by women selling products such maize, sorghum, groundnuts, Bambara groundnuts, cowpeas, sweet potato, Taro etc. Biodiversity for Food and Agriculture thus serves an additional role of providing livelihood opportunities for many women in the country.

Figure 3: Sweet potato and legumes sold at the Manzini Produce Market

Montane grasslands provide ecosystem goods such as food, medicinal plants and grazing lands. This ecosystem is also the watershed for most rivers which originate within the country. The forest ecosystem provides traditional medicine, timber, fuel and food. Aquatic ecosystems provide critical services such as water, flood control, food and other products (GOS-SEA, 2016).

Figure 4: Cattle grazing in the background on one of the country's montane grasslands

Similarly, the country's commercial forest plantations contribute to the economy and together with natural forests provide a range of goods to the country's population. For example, a significant proportion of the country's population depend on firewood for energy which is provided by the country's forests. Up to 75% of the country's rural population depend almost exclusively on firewood for cooking and warmth (USAID, 2007).

Forest genetic resources also play an important role in minimizing the effects of climate change and countering soil erosion through for example, regulation of flow.

Food collected from the wild provides coping mechanisms in times of food shortage as “famine foods” enter into diets. Households gather wild fruit such as *Ficus* spp. (emakhiwa), *Berchemia zeyheri* (tineyi), *Englerophytum natalense* (emanumbela), *Vangueria infausta* subsp*. infausta* (emantulwa), *Ximenia americana* (ematfundvuluka), *Sclerocarya birrea* (emaganu), *Cephalanthus natalensis* (ummfomfo), *Strychnos spinosa* (emahlala) and *Annona senegalensis* (ematelemba) to supplement the staple food thus reducing overall costs of food (Schrimpf & Feil, 2012). Other plants are collected for use as vegetables and/or relish and are thus important in contributing to the diversity of the food basket. Dlamini. & Geldenhuys (2009) report as many as two hundred and eight (208) species of wild plants are used for food and three hundred and thirty eight (338) are used for medicine. As is the case in many other countries, the more resource constrained sectors of society show a higher dependency on biodiversity for their basic needs and for income generation opportunities and livelihood (MTEA, 2014).

Aquatic ecosystems provide fish which also contribute to broadening the food base and to livelihood enhancement again, through sale of surplus catch as well as through culture enterprises.

Figure 5: Fish on Sale along the road

Production systems in the country

Production systems in the country

4. Indicate, for each of the production systems listed in Table 1 below, whether it is found in your country or not, regardless of its importance.

Production systems present in the country are shown in Table 1.

Table 1: Production systems present in Swaziland

Sector	Code	Production system names (Place pointer on the production system name for a detailed description)	Check if present in the country
Livestock	L1	Livestock grassland-based systems: Tropics	
	L2	Livestock grassland-based systems: Subtropics	✓
	L3	Livestock grassland-based systems: Temperate	
	L4	Livestock grassland-based systems: Boreal and /or highlands	
	L5	Livestock landless systems: Tropics	
	L6	Livestock landless systems: Subtropics	✓
	L7	Livestock landless systems: Temperate	
	L8	Livestock landless systems: Boreal and /or highlands	
Forest	F1	Naturally regenerated forests: Tropics	
	F2	Naturally regenerated forests: Subtropics	✓
	F3	Naturally regenerated forests: Temperate	
	F4	Naturally regenerated forests: Boreal and /or highlands	
	F5	Planted forests: Tropics	
	F6	Planted forests: Subtropics	✓
	F7	Planted forests: Temperate	
	F8	Planted forests: Boreal and /or highlands	
Aquaculture and Fisheries	A1	Self-recruiting capture fisheries: Tropics	
	A2	Self-recruiting capture fisheries: Subtropics	✓
	A3	Self-recruiting capture fisheries: Temperate	
	A4	Self-recruiting capture fisheries: Boreal and /or highlands	
	A5	Culture-based fisheries: Tropics	
	A6	Culture-based fisheries: Subtropics	
	A7	Culture-based fisheries: Temperate	
	A8	Culture-based fisheries: Boreal and /or highlands	
	A9	Fed aquaculture: Tropics	
	A10	Fed aquaculture: Subtropics	✓
	A11	Fed aquaculture: Temperate	
	A12	Fed aquaculture: Boreal and /or highlands	
	A13	Non-fed aquaculture: Tropics	
	A14	Non-fed aquaculture: Subtropics	

	A15	Non-fed aquaculture: Temperate	
	A16	Non-fed aquaculture: Boreal and /or highlands	
Crops	C1	Irrigated crops (Rice) : Tropics	
	C2	Irrigated crops (Rice) : Subtropics	
	C3	Irrigated crops (Rice) : Temperate	
	C4	Irrigated crops (Rice) : Boreal and /or highlands	
	C5	Irrigated crops (Other) : Tropics	
	C6	Irrigated crops (Other) : Subtropics	✓
	C7	Irrigated crops (Other) : Temperate	
	C8	Irrigated crops (Other) : Boreal and /or highlands	
	C9	Rained crops : Tropics	
	C10	Rained crops : Subtropics	✓
	C11	Rained crops : Temperate	
	C12	Rained crops : Boreal and /or highlands	
Mixed	M1	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	
	M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	
	M3	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Temperate	
	M4	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Boreal and /or highlands	
Others [please specify]	O1	Landless vegetables and mushrooms	

5. Provide in Table 2 a description for each production system. Countries may wish to use the following criteria, where information is available:

Description or characterization of production systems within Swaziland

L2-Livestock grassland-based systems-Subtropics: Livestock production is a major agricultural activity in Swaziland with cattle being the most widely kept animals. Other domestic animal species raised in the country are goats, sheep, pigs, poultry and equines (Ministry of Agriculture & Cooperatives, 2004; GOS-SEA, 2013[2]). The contribution of the livestock sub-sector to the agricultural sector GDP is about 4%. Beef and other livestock products contribute about 1% to total exports. The traditional SNL sector manages about 86% of cattle and 95% of small stock whilst the commercial TDL system carries the rest. Swaziland exports beef to the European Union (EU), South Africa and Mozambique. The country has historically only ever been able to meet about one third of its 3360 MT quota of boneless beef to the EU (MOAC, 2004).

The dairy sector is dominated by Jerseys and to a lesser extent Holstein-Friesian (MOAC, 2004). By December 2014, there were 582 registered Smallholder Dairy Units (SDUs) with a total of 4 668 animals (DVLS, 2014). The Swaziland Dairy Board (SDB) reported a 41.34% increase in the number of local dairy farmers from 508 in 2014 to 718 dairy farmers in 2015. The majority of these farmers are on SNL (Swaziland Dairy Board, 2016). Swaziland's total demand for milk and milk products is estimated at 50 million litres/year

in liquid milk equivalents (LME's). Local production from the dairy herd only stands at about 7.35 million litres /year. The deficit of 42.65 million litres LME's must be met from imported dairy products and contribution from the beef herd (Swaziland Dairy Board, 2017). Dairy cattle use an estimated 5% of the country's available grazing.

Swaziland's livestock grassland-based system is composed of extensive communal grazing on SNL which covers 48% of the land area and commercial ranching on TDL at 19% of the land area. In the dry season, another 2 509km^2 (about 12%) under cultivation or fallow during the summer, are also used for grazing (MTEC, 1997; MOAC, 2004) on SNL. Grazing area by sector in each agro-ecological zone is shown in Table 1.7.

Table 1.7: Grazing area by sector in each physiographic region

Agro-ecological zone	TDL grazing		SNL grazing	
	Area (km^2)	% land area	Area (km^2)	% land area
Highveld	496	8.7	3 023	53.3
Wet Middleveld	279	11.6	1 531	63.4
Dry Middleveld	580	23.9	1 279	52.8
Western Lowveld	1004	29.4	1287	37.7
Eastern Lowveld	642	32.7	439	22.4
Lubombo Plateau	328	22.1	742	50

Livestock production on SNL can be described as a low input production system with open access to post harvest residues.

Sweet & Khumalo (1994) estimate the total area of Swaziland available for summer grazing excluding crop and fallow land at 67% of the country's land area. This is predominantly used for grazing cattle and small ruminants. The livestock ownership objectives on SNL evolve around stock accumulation and maximisation of production per unit area whereas on TDL the focus is on turnover and high rates of production per head. Consequently, stocking rates tend to be high on SNL whilst economic efficiency tends to be a consideration in many TDL farms (Sweet & Khumalo, 1994).

- **Goats:** Only two major breeds of goat and their crosses exist in the country.. These are the indigenous Swazi or Nguni goat (accounting for 99% of the country's goat population) and the Boer goat an improved South African indigenous goat which accounts for 1% of the goat population (MOAC, 2004). Goats have a number of social/cultural functions including, cash income, meat and skins which are used extensively in traditional techno culture. Goats are not milked in the Swazi traditional setting (MOAC, 2004) however, the Swaziland Dairy Board has introduced dairy goat management. In 2016, 45 dairy goats were procured from Mooi River, South Africa for this purpose (Swaziland, Dairy Board, 2017).

Figure 6: Goats in a harvested field

- **Sheep:** The main breeds of sheep found in Swaziland are indigenous Nguni sheep and the Dorper. This is a South African synthetic breed developed from the Dorset Horn and Blackhead Persia. In the traditional SNL system, sheep are kept for cultural use and meat (MOAC, 2004).

Figure 7: A flock of indigenous sheep

- **Pigs:** The majority of pigs kept in the country are the indigenous type i.e. Swazi “Large Black”, “Black china” and “Spotted Swazi”. Indigenous pigs were traditionally kept for fat production but there has been a shift towards rearing pigs for meat production (MOAC, 2004).
- **Poultry:** Chicken (*Gallus domesticus*) are the most widely kept poultry species in Swaziland. Indigenous chickens are kept for home consumption purposes and constitute 79% of the national flock (MOAC, 2004). Other uses of poultry include local sales to *supplement household income as well as socio-cultural purposes (Rahmna, 2012). Traditionally, chickens were kept under free range and allowed to scavenge with minimal supplementary feeding and housing and were thus low input and in turn yielded low returns (Siyaya; 2013). Due to concerns about predators, chickens are more commonly kept under a semi-scavenging system where they are provided with housing and some supplementary food but also allowed to scavenge, within the homestead during the day. More than 90% of Swazi rural households have been reported to keep chickens with at least five birds per family (Thwala, 2012; Rahman, 2012; Siyaya & Masuku, 2013). Other poultry kept by Swazi households include turkey, ducks, geese and occasionally guinea fowl. In many homesteads, indigenous chickens are mainly reared and controlled by women and in many cases, women also have more control over the income derived from family poultry production (Rahman, 2012).

L6: Livestock landless systems (Subtropics): This production system includes feedlots for beef cattle production, piggeries, broiler- and layer production which occur both on both SNL and TDL. Beef feedlots are mainly used for production of cattle destined for slaughter by Swaziland Meat Industries (SMI) or other

abattoirs. The favoured breed for the commercial beef feedlot sector is the Simmental and its crossbreeds because of their excellent growth rates and good feed conversion efficiency (MOAC, 2004).

- **Beef fattening units (Feedlots):** As of December 2014, there were 92 registered smallholder fattening units, showing a decline from more than 110 in 2012. The main factors behind this were reported to be high costs and lack of quality feeder stock (DVLS, 2012).
- **Piggeries:** The main exotic breed is the Large White. Indigenous breeds are crossed with exotics for meat production (MOAC, 2004).
- **Broilers:** An estimated 8 million day old chicks are produced in the country. Of these, 10% are exported to neighbouring countries. Broiler production is carried out in both the SNL and TDL sectors, each accounting for 600 and 1200 jobs respectively. The majority of broiler farmers are female (Rahman, 2012). All broilers produced in the country are consumed locally to meet the demand for chicken. Commercial poultry sales have been estimated at more than 12000 tonnes and a value of E200 million (Makhubu, 2015)
- **Layers:** The layer industry is almost entirely dominated by TDL sector with two main farms as the main players.

F2: Naturally regenerated forests-Subtropics: In Swaziland, this sector consists of riverine, montane and scarp forests found along rivers and steep mountainside slopes throughout the country and in fire-protected valleys (MTEA, 2014) covering 3620km^2 of the land area. Until recently, use of indigenous forest product has been largely ignored by formal research and has also been ignored in official statistics (Dlamini, 2002). Natural forests harbour many species that are used for food. The country's natural forests also contribute to poverty reduction through products sold in the market. A significant proportion of the country's population also relies on medicines derived from forests genetic resources for healthcare. Forests also provide raw materials used for a range of products sold in the country's markets.

Figure 8: Layers at the University of Swaziland, Faculty of Agriculture

F6: Planted forests- Subtropics: This sub-sector is an important contributor to Swaziland's economy and is found in the Highveld and Upper (Wet) Middleveld. It accounts for 16-18% of the country's work force and also contributes about 26% of the country's revenue. Planted forests account for 8% of Swaziland's land area and are planted with exotic species which include pine, eucalyptus and wattle. The companies that are major players under this sub-sector are Montigny Investment and Peak Timbers. Montigny Investments owns and manages 80,000 ha of land in Swaziland which includes 50,000 ha of timber, three sawmills, two chipping operations, a chipboard plant and two villages (Bhunya & Mhlambanyatsi) and is in the process of establishing an additional 15 000 ha of commercial wattle plantations. The company has an annual turnover of E800 million. Montigny Investments sells its products to markets within Swaziland but also exports to South Africa, Namibia, Angola, Zambia, Mozambique and Japan (Thompson, 2016). Peak Timbers owns and manages 45,000 ha of planted forest.

A1 Self-recruiting capture fisheries-Subtropics: This sector consists of two main activities i.e. recreational or sport fishing and subsistence fishing by locals seeking to supplement their daily dietary requirements. Surplus may is sold (Beuil & Grima, 2014) thus contributing to household incomes. The contribution of the fishery and aquaculture sector to the national economy has remained marginal with regards to its contribution to GDP, budget revenue and employment. A survey by the Food and Agriculture Organization estimated the contribution of the fisheries and aquaculture sector to the country's GDP in 2011 at a mere 0.01% whilst fishery products accounted for 3% of food and agricultural imports (Kurien & Lopez, 2013; Beuil & Grima, 2014). Swaziland's fish imports are estimated at US$ 4 000 000. The range of fish products imported include canned fish, frozen fish and dried fish products which are used for human consumption as well as fishmeal which is used as a protein source in animal feed (Beuil & Grima, 2014). At US$ 150 000, Swaziland's fish exports are the second lowest in the Southern African Development Community (CCARDESA, 2016). Swaziland's per capita fish consumption is only 2.4 kg, much lower than the African average of 9.4 kg in 2009 (Beuil & Grima, 2014). Fish consumption accounts for 1% of the total protein intake, and 3% of the total animal protein intake (CCARDESA, 2016) in the form of fishmeal.

A10 Fed aquaculture: Subtropics: Whilst the contribution of the fishery sector to Swaziland's food security is relatively low, its potential to contribute to food security is acknowledged in national policies. The National Food Security Policy (2005) for example states "fisheries and aquaculture can play an important role in food security through production of food of a high nutritional value" (MOAC, 2005). As a result, promotion of aquaculture is included as one of the country's food security priorities, as part of the Diversification and Intensification of Food Production strategy (Beuil & Grima, 2014). Aquaculture has, to date been limited to small-scale subsistence farming in rural farm ponds stocked with tilapia fingerlings (mostly *Oreochromis mossambicus*) provided by the Ministry of Agriculture at no cost (Beuil & Grima, 2014). Two species i.e. Tilapia (*T. mossambicus* and *T. rendalli*) and catfish (*Clarias garipinus*) are exploited in aquaculture but there is potential for Common carp (*Cyprinus carpio*) and rainbow trout (*Salmo giardeneri*) to be grown in some parts of the Highveld (Beuil & Grima, 2014). The country's aquaculture fisheries produce 100 Metric tonnes (MT) of fish annually (CCARDESA, 2016). The number fish ponds in the country in 2014 was reported to be 1,000 averaging 200m^2 in size and with a capacity to produce 400 kg annually giving a potential fish culture production of 400 MT per year. Most of these were reported to be managed by women (Beuil & Grima, 2014). The Fisheries section reported 468 ponds (Fisheries Section, 2016).

C6 Irrigated crops (Other)-Subtropics: This sector is dominated by the TDL with smallholders on SNL recently entering the irrigated crop sub-sector.

- Sugarcane is Swaziland's most important cash crop. Whilst the crop has traditionally been grown in the Lowveld, recently there has been a significant growth in its cultivation in the Middleveld. Sugarcane consumes 96.6% of the country's fresh water for irrigation (MTEA, 2014). Swaziland's sugar industry accounts for 74% of Swaziland's agricultural production, 35% of the agricultural wage employment, 13% of GDP and about 25% of total merchandise exports. The country's production has grown from 4 907 866 tonnes in 2006/07 to 5 836 899 tonnes in 2015/16. This growth has been largely due to the increase in smallholder grower schemes together with productivity initiatives carried out by the sugar industry. The Swaziland Sugar Association recognizes three categories of growers In quantity, there are a total of nine (9) large scale, 29 medium scale and 450 smallholder cane growers (SSA, 2016) accounting for 77 %, 22% and 1% of production respectively (USDA Foreign Agricultural Service, 2016).
- **Citrus fruit:** Citrus, mainly grapefruit and oranges are grown under irrigation by estates in the Lowveld and to a lesser extent the Middleveld. Over the past few years there has been a decline in the land under citrus production with some estates converting to sugarcane. Table 1.8 shows production and finance statistics for the citrus sector. The main domestic buyer is Rhodes Food Group (Swazican), a food processing company whose products are sold both locally and exported.

Table 1.8: Citrus fruit production statistics

	YEAR							
	2012		**2013**		**2014**		**2015***	
Area Planted (ha)	1,308.2		1,231.6		1,183.2		1,044.2	
Production (Mt)	52,819		57,819		38,866		39,143	
Exports (Mt and value E'm)	28,647	87.4	29,863	84.0	14,371	55.1	17,042	85.2
Domestic (Mt and value E'm)	23,573	33.3	26,490	42.0	24,327	38.1	19,426	50.8

Source: Central Bank of Swaziland 2016

- **Pineapples:** Pineapples are mainly grown in the Malkerns area within the Wet Middleveld. They are mainly produced for processing by Swazican predominantly for export. National production at

present is unable to meet demand mainly due to competition for land with sugar cane which has become very popular within Malkerns and surrounding areas which are suited to pineapple production. Table 1.9 shows production of pineapples. Swazican employs 60 permanent staff and an additional 500 seasonal workers.

Table 1.9: Pineapple production statistics

	YEAR				
	2010	2011	2012	2013	2014
Area under production (ha)	850	911	1000	1088	1200
Production (Mt)	26500	29074	32000	35143	38843

Source: FAOSTAT

Figure 9: Pineapples growing in a field (left photo) and Rhodes Food Group (Swazican) processing plant at Malkerns, (right photo)

C10 Rain-fed crops (Subtropics): The traditional sector on SNL is characterised by small land holdings averaging about 1.94 ha (Terry, 1997) which are sparsely distributed and often fragmented hence farmers sometimes travel considerable distances to cultivate their land (Mabuza *et* al., 2013). Crop production on SNL has traditionally been primarily driven by the objective of meeting household needs for food with sale of any surplus usually through informal markets and less often through official commodity markets (Agra CEAS Consulting, 2008, Thompson 2015). More recently a number of initiatives have been developed to encourage commercialisation of agriculture on SNL. Crops grown include:

- **Maize:** Maize (Zea mays L.) is the staple food and the most important food crop in the country where it is produced by over 90% of smallholder farmers on SNL. It is also used as a measure of food security in the country (Dlamini *et al*., 2016). Hybrid maize accounts for more than 80% of the area planted to maize (Naysmith *et al*., 2009; Orchard *et al*., 2017). Despite this, the country has not been able to produce enough maize to meet her national demand since the 1980s. Constraints in maize production include erratic weather conditions, lack of inputs, limited use of fertilizers and

limited capacity to utilize new technologies such as herbicides (Dlamini *et al*., 2016). The HIV-AIDS pandemic is also having a significant impact on food production with as many as 38.5% of rural households having reduced their area under cultivation, 42% having experienced a change in cropping patterns and 47% a decline in crop yield. Another 31% of households have had to divert family labour to take care of the sick while 39% have experienced a loss of off-farm income (FAO/WFP, 2007; Mabuza *et al*., 2013). The area planted to maize by ecological zone is shown in Table 1.10.

Table 1.10: Area planted to maize by agro-ecological zone

Agro-ecological zone	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**
Highveld	150 062	176 662	136 677	145 508	224 243	236 266
Middleveld	255 389	311 163	255 273	288 091	326 615	324 408
Lowveld	111 690	135 583	104 416	104 934	235 258	228 852
Lubombo Plateau	619 93	793 36	669 98	772 27	863 38	863 38
Swaziland	583 33	703 34	566 06	612 66	866 75	877 16

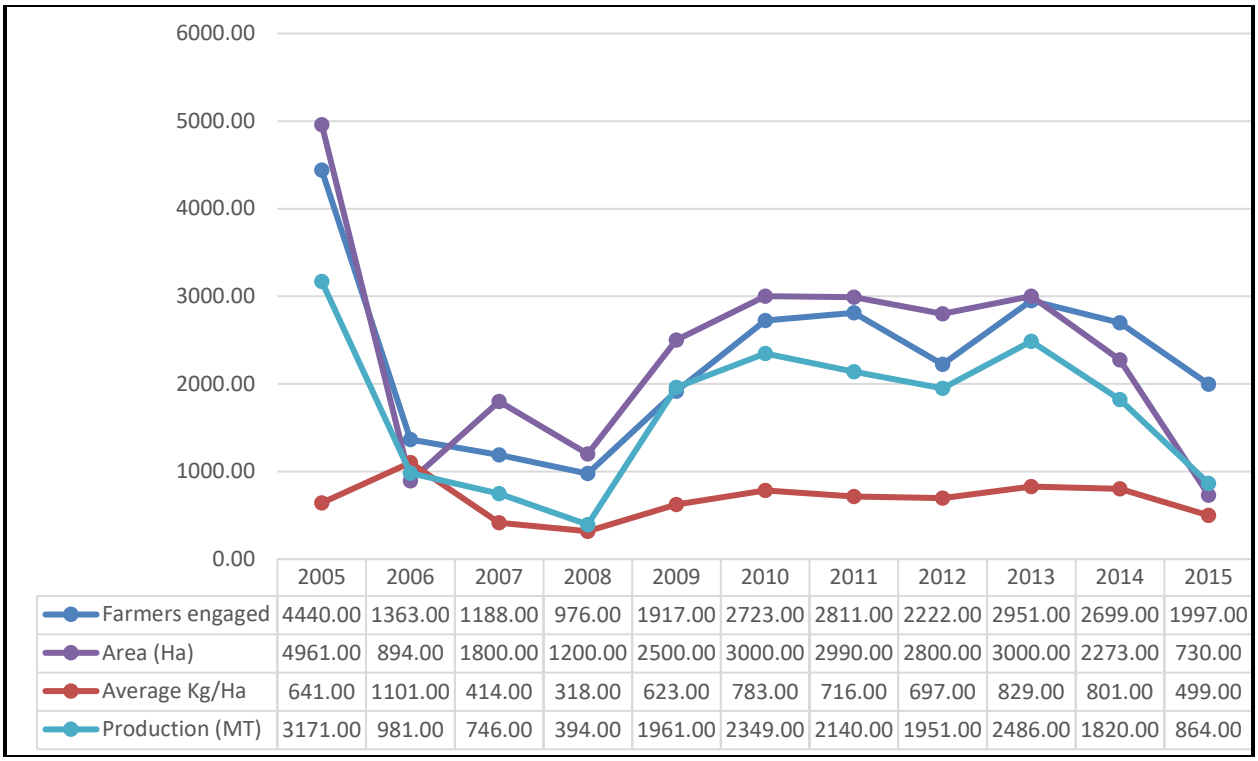
	4	4	4	0	4	4

Source: FAO/WFP (2015)

- **Cotton:** Cotton has traditionally been the most important cash crop in the smallholder sector. It is cultivated in the drier parts of the country i.e. the Lowveld and Dry Middleveld. The number of farmers engaged has declined from 4440 in 2005 to just less than 2000 in 2015. This has been accompanied by a drastic reduction in the area under cotton from 4961ha to just 730ha over the same period. Major challenges that have been reported in cotton production include drought, sap sucking pests including Mealy Bugs and Aphids (Swaziland Cotton Board 2016[1&2], Central Bank of Swaziland, 2016). Another factor that has resulted in a drop in the number of farmers engaged in cotton production and thus the area is the lack of suitable varieties that can withstand the increasingly drier and longer droughts. In 2014/15, Alba QM 301 accounted for 99.1% of the plantings with Delta Opal accounting for the balance. The previous year, Delta Opal accounted for 32% of the area cultivated but the variety is no longer available as conventional seed- only the GM variety is listed in South Africa's Varietal List (Department of Agriculture, Forests and Fisheries, 2015).

The country's cotton supports the country's textile industry which is a contributor to the country's Forex earnings.

Other crops grown include legumes such as Bambara groundnuts, groundnuts, beans, and cowpeas; tobacco as well as root vegetables such as sweet potato and cassava. Most of these are grown for subsistence farming with some local sales mainly through informal channels. Swaziland exported 10 MT of sweet potato for re-export top Botswana in September 2015 (Western Cape Department of Agriculture, 2015).



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Farmers engaged	4440.00	1363.00	1188.00	976.00	1917.00	2723.00	2811.00	2222.00	2951.00	2699.00	1997.00
Area (Ha)	4961.00	894.00	1800.00	1200.00	2500.00	3000.00	2990.00	2800.00	3000.00	2273.00	730.00
Average Kg/Ha	641.00	1101.00	414.00	318.00	623.00	783.00	716.00	697.00	829.00	801.00	499.00
Production (MT)	3171.00	981.00	746.00	394.00	1961.00	2349.00	2140.00	1951.00	2486.00	1820.00	864.00

Figure 10: Cotton production statistics

Based on data from Swaziland Cotton Board

Other- Mushroom Landless System (Organic)

Mushroom cultivation was introduced into Swaziland through the Mushroom Development programme implemented by the Swaziland government in collaboration with the United Nations Development Programme (UNDP) in 2001 (Mabuza *et al*., 2012). The production of mushrooms in the Kingdom spans over a decade with emphasis on the *Pleurotus ostreatus* species (oyster mushrooms). The present total production area is about 1 120m^2. Oyster mushrooms are popular in Swaziland due to their excellent flavor and ease of cultivation. Other species like *Agricus bisporus* and Shittake are imported from neighboring states like South Africa. Medicinal mushrooms that have been identified in the country like *Ganoderma lucidum* presently grow in the wild. The most common substrate used in Swaziland is grass straw mixed with wheat bran in a 9:1 ratio. An alternative is maize straw, maize cobs and wheat bran in a 45:45:10 ratio (Kunene, 2010). Mushroom production statistics over the past 8 years are shown in Tabe 1.11.

Table 1.11: Mushroom production in the last 8 years

Year	Number of	Yield (kg)

	Farmers	
2009	43	1 280
2010	324	2 600
2011	312	2 595
2012	334	4 536
2013	42	1 180
2014	20	1 992
2015	52	2 200
2016	55	3 950

Source: Kunene, 2016

Figure 11: Mushrooms growing in one of the mushroom houses, University of Swaziland, Faculty of Agriculture

6. Provide a map of production systems in your country, marking the places and regions mentioned in the Country Report

7. For each production system found in your country (refer to Table 1), indicate in Table 3 the area under production (km^2, hectares, acres, other). If not applicable, indicate the estimated production quantity (major products aggregated) using the appropriate unit or measure (tonne, head, inventory, cubic metre, etc.) for the production system. If available, indicate the contribution of the production

system to the agricultural sector economy in the country (%). Please use the most recent data available and indicate the year of reference for the data or estimates. Specify NK if not known or NA if not applicable

Table 3. Area under production, production quantity and contribution to the agricultural sector economy of production systems in the country.

Production systems	Area		Production - quantity		Contribution to the agricultural sector	Reference year
	Val	Unit	Val	Unit (Head)	%	Year
Livestock: Grassland	1199	km²	531 450		The livestock sector combined contributes 4% to	SEA (2002) SEA-GOS (2012)
Livestock landless	NK					
Crops irrigated	2140	km²				SEA (2002)
	5992	ha	5 836 553	Tonnes	13%	SSA (2016)
Crops rain-fed (Maize)	6768	ha	69237	Tonn		CSO (2003)
Cotton	**730**	ha	864	Tonn	2.5%	Swaziland Cotton Board (2016)

8. Comment on the effects on biodiversity for food and agriculture of production destined for exportation versus production for local and/or national consumption. Where information is available, indicate for each production system the proportion of production that is destined for export, the major commodities involved, the impact on the methods of production (e.g. adoption of specific production practices to meet export needs) and the implications for biodiversity.

The country's major export products include sugar (from sugarcane), citrus fruits, beef and live animals. Others are textiles and soft drink concentrates. Livestock production on SNL is primarily geared towards subsistence but also accounts for the bulk of the country's beef exports. The main driver of change in the communal sector is overgrazing. At 2.6 ha/ per livestock units (LU), the stocking rate on SNL is among the highest in Africa. The country's communal rangelands are showing signs of increasing deterioration with evidence of severe erosion in many areas (MOAC, 2004). Swaziland's rangeland ecosystem covers about 67% of the total land mass, with savannas and grasslands, representing 48 and 46%, respectively (Beyene

& Mlambo, 2012). Although some variation occurs, range management on TDL is generally more attentive to stocking rates and other environmental concerns as the economic optimum is a key consideration in this sector (Sweet & Khumalo, 1994).

As previously stated, production on TDL is intensive and accounts for the bulk of the country's high value production and exports. This sector is characterized by high inputs including chemical fertilizers and pesticides. About 630 tons of herbicides, mainly divron, atrazine and 2-4-D are applied annually for control of weeds in sugarcane. Fertilizer is applied at a rate of 600 kg/ha (Mhlanga *et al.,* 2006). As a result, this sector places pressure on the environment due to high water consumption as well the load of pollutants which are having impacts on water resources. The State of the Environment Report notes that the quality of surface water in the country is showing signs of deterioration due to pollution resulting from commercialized agriculture and industrial activity. Agricultural activities that are implicated include irrigation, abattoirs and others (GOS-SEA, 2013[2]).

A study by Mhlanga *et al.,* (2006) carried out on the Mbuluzi River up- and down- stream of the Simunye/Mhlume sugarcane estate showed that return flows have a noticeable impact on river water quality. The study analysed ten parameters i.e. total dissolved solids (TDS), suspended solids, sodium (Na) calcium (Ca), magnesium (Mg), Chemical Oxygen Demand (COD), potassium (K), electrical conductivity (Ec), sodium adsorption ratio, and pH. The results indicated elevated TDS, Na, and Mg levels in the drainage streams compared to the control sites upstream of the Mbuluzi River. The impacts of the deteriorating water quality on aquatic biodiversity have not been investigated.

Another study showed that sugar farming in the country impacts the water quality in the downstream stretches of the Mbuluzi River through increased levels of conductivity, phosphate, phosphorous, nitrate and nitrite although analysis of water samples collected further downstream also showed that the river has some capacity for self-purification leading to more acceptable water quality in the reaches. The study further pointed out that increasing levels of pollution may challenge this self-purifying capacity (Gustafsson & Johansson, 2006).

9. What have been the most important drivers affecting the extent and distribution of associated biodiversity in the last 10 years in your country? In describing the drivers you may wish to indicate the production systems where associated biodiversity is most affected and identify drivers that are common to the various components of associated biodiversity listed. Indicate where possible the indicators used to measure changes, along with the sources of information.

The distribution of Swaziland's biodiversity has to a large extent been shaped by the prevalent physiography and other conditions. The country's biodiversity is under pressure due to a number of factors. For example, many species of large mammals that once roamed the grasslands and savannas are now generally extinct or are now restricted to protected areas where they only occur in small numbers (GOS-SEA 2013[2], Monadjem *et al.*, 2003; Dlamini & Dlamini, 2002). Swaziland's second State of the Environment Report states demands placed upon biodiversity by a growing population and the increasing need for land for agriculture and settlements as the main driving force behind change in the country's biodiversity. Other factors identified include a changing climate, invasive alien species (IAS) that have invaded many of the country's habitats, increasingly frequent and intense wildfires, excessive extractions for a variety of cultural and medicinal needs and increasing regional trade as key factors (GOS-SEA, 2016).

The main drivers of change as reported in the country's State of Environment Report are shown in Table 2.1.

Table 2.1: Main drivers of change affecting Swaziland's ecosystems

Factor	Grassland	Savanna	Forest	Aquatic
Resource harvesting	✓	✓	✓	✓
Afforestation (land conversion: exotic plantations)	✓			
Rain fed cropping (land conversion)	✓			
Sugar cane cropping (land conversion)		✓		
Urbanisation (land conversion)	✓	✓	✓	
Land degradation by livestock grazing & trampling	✓			✓
Soil Erosion	✓			✓
Alien invasive species	✓	✓	✓	✓
Bush encroachment		✓		
Pollution				✓

Source: GOS-SEA 2013[2]

To date there have been limited research studies on associated biodiversity in Swaziland. There have been a few studies and reports focussed on particular taxa that can be considered indicators of ecosystem health. These include:

- Blue swallows (*Hirundo atrocaerulea*) are threatened by afforestation, urban expansion which has expanded into their breeding grounds around Mbabane. Agricultural intensification is thought to have destroyed nesting sites around Malolotja. Other important threats include inappropriate farming methods which lead to soil erosion (Monadjem et al. 2003) and drainage of wetlands for cultivation. It has been

reported that the range of Blue swallows in South Africa and Swaziland has contracted by 74% from 1890 to 2005 (Evans & Barnes, 2015).

- Monadjem & Garcelon (2005) showed that agriculture impacts on nesting of threatened vulture species i.e. African White-backed, White-headed and Lappet-faced vultures in low-lying savannas of Swaziland. The study found that nests of White-headed Vultures and Lappet-faced Vultures were exclusively located in conservation areas indicating sensitivity to anthropogenic activity. Nesting was reported to be highest in conservation areas with some conservation areas exceeding nesting densities of 260nests / 100km^2, lower on protected cattle ranches and negligible on government ranches.
- Mahlaba (2007) showed that grazing pressure by ungulates rendered habitat unsuitable for small mammals due to removal of cover as well as increased colonization by IAS. The study also showed that this effect is further exacerbated by diminishing and unpredictable rains.
- The Corncrake (*Crex crex*) is a migratory bird which uses Swaziland as one of the core wintering areas between November and March migrating back to their breeding grounds in Eurasia between March-April. Swaziland is thus recognized internationally as an important area for the conservation of the Corncrake as well as other migratory species whose conservation depends on international cooperation. Swaziland's grasslands are highly vulnerable to climate change and frequent fires whilst other suitable habitat for the Corncrake is threatened by agricultural expansion (Dlamini, 2014).
- The themarabou stork (*Leptoptilos crumeniferus*) is a widespread scavenging bird (Monadjem *et al.,* 2012). It is widely distributed in savanna habitats throughout sub-Saharan Africa but has a limited number breeding sites one of which occurs in Swaziland. The study showed that the size of the population of this bird is increasing in Swaziland (Monadjem, 2012). Marabous select nesting sites in relatively low-crowned *Acacia tortilis* and *A. nilotica* trees*,* which are situated well away from rivers or standing water (Monadjem, 2005).
- Magagula (2013) investigated the impact of insect growth regulators on non-target species in some of the country's estates with particular emphasis on *Coccinellidae* which includes important predators of citrus pests. The study reported lower *Coccinellidae* density in the natural veld that was ascribed to absence of the host plant and prey species in natural vegetation. The study also reported much higher population densities of beneficial insects in non-insect growth regulator treated orchards and orchards under an integrated pest management programme.
- Magagula & Nzima (2015) investigated the diversity of carabid beetles and ants within a variety of habitat mosaics in Big (Lowveld) and the Malkerns (Middleveld). The habitats investigated include grassland fallow, grassland/ eucalyptus border, maize plot (Malkerns), cotton plot (BigBend). Among others, the study reported that carabid beetle populations were affected by land use features.

The range of services provided by the taxa involved in these studies include nutrient recycling as well as disease control, pest and disease control, pollination and seed dispersal. Whilst there is not enough information to conclude on trends over the past few years, these studies are important in a number of ways. First, they provide clear indications that anthropogenic factors are having impacts on the country's associated biodiversity and thus the goods and services that are key to sound production systems. Second, they provide some guidance on taxa that can be used as indicators for monitoring ecosystem health going forward.

Effects of drivers of change on associated biodiversity

10. Where associated biodiversity is believed to be affected by climate change, please provide additional information on the nature, severity and frequency of the climate threat and the production systems impacted.

The country is prone to extreme weather conditions such as droughts and floods. The *El Nino* effect resulted in a severe drought which compromised availability of water for irrigation thus impacting the sugar industry. This was further compounded by extreme temperature variations experienced the previous year (SSA, 2016). SSA (2016) also notes that some rivers ran dry and dam levels remained low throughout most of the year. It can thus be expected that at least some components of associated biodiversity have been impacted by climate change but there is no specific information on impacts of climate change on associated biodiversity in the country. Manyatsi (2010) predicts that climate change will have a significant effect on agriculture in Swaziland with temperatures predicted to increase by as much as 2.5°C and precipitation to decrease by as much as 100mm by 2050. The impact of this are likely to include low maize yields that will leave many households more vulnerable. The Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN) ascribes this to inadequate capacity to adapt to the negative impacts of external shocks by the majority of rural households, weak institutional arrangements, and, interventions that are not carefully matched to needs (FANRPAN, 2011). The Vulnerability and Adaptation Assessment for Biodiversity and Ecosystems Report (MTEA, 2014) indicates that the country's biodiversity and ecosystems will be impacted, to various extents by climate change. Some of the changes that can be expected include:

- Increase in the range of sour bushveld replacing some of the country's grassland biome,
- Possible incursions of the forest ecosystem,
- Aquatic ecosystems in the western part of the country are expected to be affected through reduced water quality in remnant pools, reduction in floodplain egg and seed banks, the loss of permanent aquatic refugia for fully aquatic species and water birds, altered freshwater food webs, and drying out of wetlands,
- Some of the country's threatened tree species in the Lubombo bushveld are expected to be extinct during the 2050s. These include *Celtis midbraedii*, *Euphorbia keithii*, *Excoecaria madagascariensis*, and *Gardenia thunbergia*. These trees are used for medicine, carving and/or medicine (MTEA, 2014).

11. For each production system present in your country as indicated in Table 1, fill in the code and name of each production system in Table 4 (repeat Table for each production system). For each production system indicate which drivers have been influencing biodiversity for food and agriculture, disaggregated by sector, during the past 10 years (description of drivers can be found in Annex 3). Drivers may have a strongly positive (2), positive (1), negative (-1), and strongly negative effect (-2), or no effect at all (0) on biodiversity for food and agriculture. If the effect of the driver is unknown or not applicable, please indicate not known (NK) or not applicable (NA).

Drivers of change in the livestock sector: Grazing under both communal and ranching constitutes the major land use category in Swaziland. Maintenance of the country's rangelands and the biodiversity they support is thus key to sustainability of livelihoods for a very significant proportion of the country's population. The major drivers of rangeland degradation in Swaziland are demographic and include the continuous growth of both human and livestock populations, decreased available grazing land due to expansion of crop agriculture, private ranches and industries and other developments (MOAC, 2004; Tefera *et al*., 2007; Tefera & Mlambo, 2012). A recent paper has demonstrated that loss of wild native mammals from southern Africa's grasslands, including Swaziland and their replacement by domestic livestock has impacted on the diversity of insects in those grasslands (Pryke *et* al., 2016). Diversity of dung beetles, butterflies and grasshoppers was compared in ecological networks across a landscape mosaic of timber plantations, of three types i.e. where large herbivores had been replaced by domestic animals, where large herbivores had been maintained and finally in Protected Areas. The results showed that insect diversity was similar for the last two sites and differed significantly from sites where mega-herbivores had been replaced with domestic livestock. The results indicated that sites that are under exclusive grazing by domestic livestock may have lost specialist

insect species due to the lack of habitats created by wild grazers. The paper advocates the maintenance or introduction of large native mammals or mixed grazing in ecological networks or similar conservation areas in production landscapes to simulate the ecological conditions and natural heterogeneity in nearby Protected Areas.

The livestock sector relies on the use of dipping chemicals to control ticks, fleas and other ecto-parasites. Whilst the tick control programme appears to have had positive impacts on control of diseases associated with these parasites (Callow, 2010), they can be expected to have impacts on associated biodiversity and aquatic biodiversity. Introduction of exotic breeds and indiscriminate breeding with the indigenous Nguni has been cited as a concern in the national herd. This is also true for indigenous goats. Another consideration here is possible loss of traditional knowledge related to control of breeding which has resulted in early onset breeding leading to impacts on the quality of the national flock through low birth weight, poor kid survival and the perpetuation of inferior genotypes (Lebbie & Mastapha, 1985).

Drought is another important driver in this sector. Swazi Vac (2016) reports that between May 2015 and May 2016 the country lost 67,120 heads (11% of the national herd) due to the drought. Other important drivers are bush encroachment and infestation by alien invasive species.

Positive drivers of change relate to policies and other interventions that have been put in place in the country. These include the Livestock Development Policy **(**LDP). The LDP (1995) recognizes the role of agriculture in general in Swaziland's socio-economic development and of livestock in particular to Swazi culture and tradition. The policy notes a number of challenges related to livestock production including poor condition of animals despite apparent increase in numbers, lack of market opportunities as well as degradation of the country's range lands. This policy, together with concerted government efforts to stimulate commercialisation of the smallholder agriculture sector on SNL has contributed to growth in the smallholder sector.

Table 4a: Effect of drivers on sector biodiversity within the grassland-based livestock production systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PG	FG	An	Aq
L2: Livestock grassland-based systems: Subtropics	Changes in land and water use and management	-1	-2	**-2**	-2
	Pollution and external inputs	NK	-1	**-1**	-1
	Over-exploitation and overharvesting	-1	-1	**-2**	NK
	Climate change	NK	NK	**-2**	-1
	Natural disasters (drought)	NK	NK	**-2**	-1
	Pests, diseases, Invasive Alien Species	-1	-1	**-2**	NK
	Markets, trade and the private sector	NK	NK	**-2**	NK

	Policies (commercialization of production on SNL)	NK	NK	**-2**	NK
	Population growth and urbanization	-1	-2	**-2**	NK
	Changing economic, socio-political, and cultural factors	NK	NK	**-2**	NK
	Advancements and innovations in science and technology	NK	NK	**2**	NK
	Other [*please specify*]:				

Table 4b: Effect of drivers on sector biodiversity within the landless livestock production systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PG	FG	An	Aq
L6: Livestock landless systems: Subtropics	Changes in land and water use and management	0	0	-1	-1
	Pollution and external inputs	NK	NK	+1	-1
	Over-exploitation and overharvesting	0	0	0	0
	Climate change	NK	NK	NK	-1
	Natural disasters (drought)	NK	NK	-1	NK
	Pests, diseases, Invasive Alien Species	0	0	NK	NK
	Markets, trade and the private sector	NK	NK	+1	NK
	Policies (commercialization of production on SNL)	0	0	+1	NK
	Population growth and urbanization	NK	NK	+1	NK
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	-2	NK
	Other [*please specify*]:				

At present, the bulk of feed used originates outside the country. It can be expected that at present it has had minimal to no effect on the crop sector in terms of land use change.

Drivers of change in the Forest sector: Increasing demands for land for human settlements, roads and agriculture were reported to be the main drivers of change in Swaziland's State of Forest Genetic Resources (MTEA, undated). Estimates of annual forest loss range from 1.9% annually between the years 1968 and 1978 (FAO, 1980); 18,000 ha of indigenous forest for the 15-year period between 1985 and 2000 (DANCED 2000) whilst the forest resource assessment (FRA) report reported that the country is gaining forest cover (FAO, 2014). Dlamini (2017) observed that these studies all had the limitation of relying on upward linear extrapolations based on the 1990 and 2000 forest resource assessments, which also differed in techniques used to estimate forest cover. Based on Landsat Imagery analysis, (Dlamini, 2017) reports loss of 46,620 ha of forest and woodland between 1990 and 2015 implying an average deforestation rate of 1704 ha per annum over the period. This was comparable to the Global Forest Change dataset which indicates a mean deforestation rate 1563 ha per annum when excluding forest regrowth over the same period. Acacia woodlands, open mixed woodlands, dense and open bushlands were found to have been particularly under pressure compared to other forest types. Ngwenya and Hassan (2005) have also previously reported significant reductions in timber stock across most of the forests and woodlands in the country with the exception of wattle and to a lesser extent, open montane forests and open moist mixed woodlands. The main factor identified here was wood extractions rates which exceed regeneration rates culminating in an average annual depletion of 0.3 m^3/ha or 71,100 t of carbon. An important factor related to firewood extraction in naturally regenerated forests relates to changing economic, socio-political, and cultural factors. In particular, this relates to increasing poverty, lack of employment and alternative income generating opportunities combined with loss of respect for traditional practices. This has resulted in increased pressure on naturally regenerating forest resources as scores of households fall on these resources to extract firewood for sale and carving wood. Where people have traditionally relied on axes and hand held saws, chain saws appear to be increasingly popular leading to a substantial increase in the level of extraction.

Another important driver in forest production systems is the spread of invasive alien species. 80% of the country is infested with at-least one invasive species. The most important woody invasive alien species recorded in the country are *Lantana camara*, *Chromoleana odorata Acacia mearnsii*, *Solanum mauritianum*, *Psidium guajava*, *Caselpinia decapetata* (GOS-SEA, 2013[2]),

The main sectors that have impacted the country's forests are the irrigated crop sector with land conversion to sugar cane driven by newly developed irrigation schemes (Dlamini, 2017).

Biodiversity associated with these forests will also have been impacted by the loss of habitat putting it at risk. It has been reported for example the *Screrocarya birrea* is under threat as a result of deforestation (Swaziland Indigenous Products, undated). The Forest Resources Assessment report indicated that *S. birrea* in plantations was threatened by a defoliator, yet to be identified (FAO, 2014).

Table 4c: Effect of drivers on sector biodiversity within naturally regenerated forest systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)

	(Place pointer on the driver name for a detailed description)	PG	FG	An	Ag
F2 Naturally regenerated forests: Subtropics	Changes in land and water use and management	NK	-2	-2	-1
	Pollution and external inputs	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	-2	-2	NK
	Climate change	NK	-1	-1	NK
	Natural disasters	NK	-2	-1	NK
	Pests, diseases, Invasive Alien Species	NK	-2	-2	NK
	Markets, trade and the private sector	NK	-1	-1	-1
	Policies	-1	1	-2	NK
	Population growth and urbanization	-1	-2	-1	-1
	Changing economic, socio-political, and cultural factors	1	-2	--2	NK
	Advancements and innovations in science and technology		-2		
	Other [*please specify*]:				

Drivers of change in the aquaculture and fisheries sector: Among the main factors impacting on the country's aquatic ecosystems and thus aquatic genetic resources is drainage of wetlands for crop cultivation. The Swaziland National Trust Commission for example, has reported that irrigation schemes involving citrus fruit, pineapples, rice, tobacco, cotton and sugarcane have led to the disappearance of a number of swampy areas adjacent to some rivers in the middleveld and the lowveld (GOS-2013[1]). Another way in which crop agriculture has impacted on aquatic genetic resources is through reduction of flows as a result of abstraction of water for irrigation. Jury *et al.,* (2007) suggests that both the Mbuluzi and the Mlawula Rivers have suffered reduced flow since the irrigation of the sugarcane fields begun in the 1970s and droughts more recently. Other impacts include pollution by agrochemicals such as dipping chemicals, herbicides, chemical fertilizers etc. As explained previously, some of the country's aquatic resources have been impacted by Alien invasive species including *Onychorhynchus mykiss*, *Micropterus salmoides* and *Cherax quadricarinatus*. The recurring drought has also been reported to be leading to significantly reduced water flows thus impacting the country's genetic resources.

Table 4d: Effect of drivers on sector biodiversity within the self-recruiting capture fisheries systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)

	(Place pointer on the driver name for a detailed description)	PG	FG	An	Aq
A2 Self-recruiting capture fisheries: Subtropics	Changes in land and water use and management	NK	NK	NK	-2
	Pollution and external inputs	NK	NK	NK	-1
	Over-exploitation and overharvesting	NK	NK	NK	-1
	Climate change	NK	NK	NK	-1
	Natural disasters (drought)	NK	NK	NK	-1
	Pests, diseases, Invasive Alien Species	NK	NK	NK	-1
	Markets, trade and the private sector	NK	NK	NK	0
	Policies	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	-1
	Changing economic, socio-political, and cultural factors	NK	NK	NK	-1
	Advancements and innovations in science and technology	NK	NK	NK	-1
	Other [*please specify*]:				

Table 4e: Effect of drivers on sector biodiversity within the culture-based fisheries systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PG	FG	An	Aq
A6 Culture-based fisheries: Subtropics	Changes in land and water use and management	NK	NK	NK	-2
	Pollution and external inputs	NK	NK	NK	-1
	Over-exploitation and overharvesting	0	0	0	-1
	Climate change	NK	NK	NK	-1
	Natural disasters (drought)	NK	NK	NK	-2
	Pests, diseases, Invasive Alien Species	0	0	0	-1
	Markets, trade and the private sector	0	0	0	-1
	Policies	0	0	0	0

	Population growth and urbanization	NA	NA	NA	-1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	1
	Advancements and innovations in science and technology	NA	NA	NA	NK
	Other [*please specify*]:				

Drivers of change in the Crop Sector: Like other sectors, a growing population and need for socio-economic development has made it necessary to have more land allocated to crop cultivation. Land use conversion from, for example, forest to sugar cane cultivation has been one of the main factors in the past decade. Extreme weather conditions, mainly in the form of unpredictable rains with long dry spells are another factor. In cotton for example, lack of climate smart varieties has impacted negatively on both the number of farmers and the area under cotton cultivation. This has forced the Swaziland Cotton Board to explore genetically modified cotton as an option. Confined Field Trials are currently being conducted in Malkerns and Big Bend.

Figure 12: GM cotton field trials at Malkerns and Big Bend

Developments in the crop sector are also affected by policy and government programmes. These include for example, the Food Security Policy. Others include programmes such as the Swaziland Agricultural Development Project (SADP). The objective of SADP is to develop improved smallholder production and

marketing systems which lead to sustainable food security and an improved quality of life for rural households in Swaziland. Such programmes are contributing towards stimulating production especially in the smallholder sector. Government programmes aimed at rationalizing use of water and increasing access to smallholders have been a key driver behind increasing the number of small holder farmers involved in sugarcane farming.

The crop sector is also having impacts on other sectors. For example, wildfires observed in the Lowveld the grassland ecosystem and the Lebombo and sour bushveld have been ascribed to sugarcane harvesting fires (MTEA, 2014).

Table 4f: Effect of drivers on sector biodiversity within the Irrigated crops: Sugar cane systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	**Drivers**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PG	FG	An	Ag
Irrigated crops: Sugar cane (Subtropics)	Changes in land and water use and management	-2	-2	-2	-2
	Pollution and external inputs	-2	NK	-1	-2
	Over-exploitation and overharvesting	0	0	0	0
	Climate change	-2	NK	NK	-1
	Natural disasters	-1	NK	NK	-1
	Pests, diseases, Invasive Alien Species	-2	NK	NK	NK
	Markets, trade and the private sector	-1	NK	NK	NK
	Policies	1	-2	-2	-2
	Population growth and urbanization	-2	NK	NK	NK
	Changing economic, socio-political, and cultural factors	-2	NK	NK	NK
	Advancements and innovations in science and technology	1	NK	NK	NK
	Wildfires	-1	-1	NK	0

Table 4g: Effect of drivers on sector biodiversity within the Rain-fed crops: Subtropics systems by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources

Production systems	Drivers	Effect of drivers on sector biodiversity for food and agriculture (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PG	FG	An	Ag
C10 Rain-fed crops : Subtropics	Changes in land and water use and management	-2	-2	-1	-1
	Pollution and external inputs	-2	NK	-1	-1
	Over-exploitation and overharvesting	-2	NA	NA	NA
	Climate change	-2	NK	NK	NK
	Natural disasters (drought)	-1	NK	NK	NK
	Pests, diseases, Invasive Alien Species	-2	NK	NK	NK
	Markets, trade and the private sector	-1	NK	NK	NK
	Policies	1	NK	NK	NK
	Population growth and urbanization	-2	NK	-1	NK
	Changing economic, socio-political, and cultural factors	-2	NK	NK	NK
	Advancements and innovations in science and technology	1	NK	NK	NK
	Other [*please specify*]:				

Effects of drivers of change on associated biodiversity

12. What have been the main drivers affecting regulating and supporting ecosystem services in the country during the last 10 years? Describe, for each production system, the major driver(s) affecting ecosystem services and indicate the effect on ecosystem services as being strongly positive (2), positive (1), negative (-), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA) in Table 5 (repeat table for each production system). Place pointer on the ecosystem service name for a detailed description.

Swaziland does not at present, have a programme for systematic research on ecosystem services. Whilst the value of ecosystem services in supporting agricultural productivity is generally recognized, there have been no systematic studies on any specific ecosystem service. The dearth of information on ecosystem services in Swaziland has also been pointed out by Shackleton *et al.,* (2008). Despite this some insights can be gained from Red data lists and similar publications.

Table 5a. Major drivers and their effect on ecosystem services in Livestock sector-based production systems.

Production System (Code or Name)	**Drivers**	**Effect of drivers on ecosystem services** Please score 2, 1, 0,-1, -2, NK, NA as previously ex					
		Polli nati on	and dise ase regu latio	icati on and was te	ural haz ard regu latio	Nutr ient cycli ng	form atio n and
Grassland-based livestock	Changes in land and water use and management	**0**	**-1**	**-2**	**-2**	**-2**	**-2**
	Pollution and external inputs	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Over-exploitation and overharvesting	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Climate change	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Natural disasters	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Pests, diseases, alien invasive species	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Markets, trade and the private sector	**0**	**-2**	**-2**	**-2**	**-2**	**-2**
	Policies	**0**	**-2**	**-2**	**-2**	**-2**	**-2**
	Population growth and urbanization	**0**	**-2**	**-2**	**-2**	**-2**	**-2**
	Changing economic, socio-political, and cultural factors	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Advancements and innovations in science and technology	**1**	**1**	**1**	**1**	**1**	**1**

Table 5b. Major drivers and their effect on ecosystem services in Forest sector-based production systems.

Production System	Drivers	Effect of drivers on ecosystem Please score 2, 1, 0,-1, -2, NK, NA as pre				
		Pollination	Pest and disease regulation	Purification and waste	Natural hazard regulation	Nutrient cycling
FORESTS	Changes in land and water use and management	-1	-1	**-1**	**-1**	**-1**
	Pollution and external inputs	**-1**	**-1**	**-1**	**-2**	**-2**
	Over-exploitation and overharvesting	**-2**	**-1**	**-2**	**-2**	**-2**
	Climate change	**-1**	**-1**	**-2**	**-2**	**-2**
	Natural disasters	**-2**	**-1**	**-2**	**-2**	**-2**
	Pests, diseases, alien invasive species	**-1**	**NK**	**-1**	**NK**	**-1**
	Markets, trade and the private sector	**-1**	**-1**	**-1**	**-1**	**-1**
	Policies	**0**	**1**	**1**	**2**	**1**
	Population growth and urbanization	**-2**	**-1**	**-2**	**-1**	**-2**
	Changing economic, socio-political, and cultural factors	**1**	**1**	**-1**	**1**	**1**
	Advancements and innovations in science and technology	**1**	**1**	**1**	**NK**	**2**
	Afforestation	NK	NK	NK	NK	NK

	Land use conversion	NK	NK	NK	-1	NK
	Wildfires	NK	NK	NK	NK	NK

Table 5c. Major drivers and their effect on ecosystem services aquatic sector-based production systems.

Production System	Drivers	Effect of drivers on ecosystem Please score 2, 1, 0,-1, -2, NK, NA as pre				
		Pollination	Pest and disease regulation	Purification and waste	Natural hazard regulation	Nutrient cycling
Aquaculture	Changes in land and water use and management	NA	NK	NK	NA	0
	Pollution and external inputs	NA	1	1	NK	NK
	Over-exploitation and overharvesting	NA	NA	NA	NA	NA
	Climate change	NA	NA	NA	NK	NA
	Natural disasters	NA	NA	NA	NA	NA
	Pests, diseases, alien invasive species	NA	NK	NK	NK	NA
	Markets, trade and the private sector	NA	2	NA	NA	NA
	Policies	NA	2	1	NK	NA
	Population growth and urbanization	NA	1	NK	NK	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA

	Advancements and innovations in science and technology	NA	NK	NK	NA	NK

Table 5d. Major drivers and their effect on ecosystem services Plants (crop) sector-based production systems.

Production System	Drivers	Effect of drivers on ecosystem servic Please score 2, 1, 0,-1, -2, NK, NA as previously					
		Polli nati on	Pest and dise ase regu latio	icati on and was te	Nat ural haz ard regu latio	Nutr ient cycli ng	rorm atio n
CROPS	Changes in land and water use and management	-1	-1	**-1**	**-1**	**-1**	**-2**
	Pollution and external inputs	**-2**	**-1**	**-1**	**-2**	**-2**	**-2**
	Over-exploitation and overharvesting	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Climate change	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Natural disasters	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Pests, diseases, alien invasive species	**-2**	**NK**	**-1**	**NK**	**-1**	**0**
	Markets, trade and the private sector	**1**	**-1**	**-1**	**-1**	**-1**	**-2**
	Policies	**2**	**1**	**1**	**2**	**1**	**1**
	Population growth and urbanization	**-2**	**-1**	**-2**	**-1**	**-2**	**-2**
	Changing economic, socio-political, and cultural factors	**2**	**1**	**-1**	**1**	**1**	**1**

	Advancements and innovations in science and technology	**1**	**1**	**1**	**NK**	**2**	**1**

13. Briefly describe the main driver(s) affecting ecosystem services in each production system, as identified in Table 5. Include where possible a description of the components of associated biodiversity that are affected, the indicators used to measure change, and the source of information.

The above summary of the effect of drivers on the ecosystem services is based on consensus of discussions of stakeholders who participated in the inception workshop. For each Production system stakeholders who are experts in each sector met in smaller groups and discussed in order to reach a consensus on the effect of each of the drivers on the various ecosystem services.

Generally, the most of the drivers negatively affected ecosystem services under the different production systems save for the Aquatic sector production systems which were not influenced by most of the drivers, and hence not applicable in affecting ecosystem services under review.. Otherwise, all the production sectors under the livestock sector, forest and plant genetic resources sector were mostly negatively affected. Over-exploitation and overharvesting, climate change in the form of increased prevalence of drought due to erratic rainfall combined with extremely high temperatures, natural hazard regulation as well as population growth and urbanization came out as the main drivers that affect ecosystem services. These drivers negatively affect almost all the ecosystem services, On the other hand, advancements and innovation in science and technology were said to positively affect (enhance) most of the ecosystem services except natural hazard regulation and the production of oxygen or gas regulation.

Effects of drivers of change on wild foods

14. What were the main drivers affecting the availability, knowledge and diversity of wild foods during the last ten years in the country? In Table 6, indicate the major drivers affecting availability, knowledge and diversity of wild foods, and if the effects are strongly positive (2), positive (1), negative (-1), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA).

Table 6: Drivers affecting availability, knowledge and diversity of wild foods

Drivers	**Effect of drivers** (2, 1, 0,-1, -2, NK, NA)		
(Place pointer on the driver name for a detailed description)	Availability	Knowledge	Diversity
Changes in land and water use and management	-2	-2	-2
Pollution and external inputs	-1	-1	-1
Over-exploitation and overharvesting	-1	-1	-1
Climate change	-2	-2	-2

Natural disasters	NK	NK	NK
Pests, diseases, Invasive Alien Species	-1	-1	-1
Markets, trade and the private sector	-1	1	-1
Policies	1	1	1
Population growth and urbanization	-1	-2	-1
Changing economic, socio-political, and cultural factors	1	0	1
Advancements and innovations in science and technology	1	1	1
Other [*please specify*]:			

15. Briefly describe the main drivers affecting the availability, diversity and knowledge of wild foods in your country, as identified in Table 6. Include where possible indicators used to measure change, along with the source of information.

It is not clear to what extent the overall availability and diversity of wild food plants are threatened. It can be expected that drivers of change in biodiversity overall will also impact some wild foods. These include:

- **Changes in land (and water) use and management**: This has been cited as a key driver of change across most of the country's ecosystems that provide habitats for wild species used for food. Whilst not much information is available on this, indications are that this has resulted in a decline of some wild species used for food. This decline can be expected to have been accompanied by loss of the knowledge associated with their use and management.
- **Over-exploitation and overharvesting:** This driver has particularly impacted negatively on wild game animals and possibly some plant species which have either become near threatened or even extinct in the wild due to unsustainable use practices. Loss of those species implies reduction of the diversity of wild foods.
- **Climate change:** Climate change in the form of increased prevalence of drought due to erratic rainfall combined with extremely high temperatures has resulted in reduced diversity of wild foods. For example, wild mushrooms which used to be produced or emerge from mounds a few days after heavy thunderstorm or rain has become a rare occurrence due to reduced prevalence of rain during the summer season. Similarly a number of edible insect species such as termites that have also diminished with the increase of Elnino weather events or drought. Again wild fruit species and vegetables fail to germinate and reproduce due to drought and/or late inception of rains. Similarly, as a result of the drought, wild game animals which are also a major source of food as well as income for rural folks have not been spared by the effect of climate change in the form of drought which affect the emergence and growth of abundant grass and plant species to feed on throughout the year. Consequently a number of wild food including game animals have die as a result and/or not been able to produce off-springs due to shortage of food,
- **Pests, diseases, and invasive alien species:** Invasive Alien Species have affected most ecosystems in the country. Some of them, for example, *Chromolaena odorata* have allelopathic effects and as such may affect the distribution of wild foods in the country. No studies have been

carried out to assess the impacts of IAS on distribution of wild foods. The Forest Resources Assessment reported presence of a defoliator affecting *S. birrea* (FAO, 2015).

- **Policies:** Wild foods have not been addressed directly in policy. In many cases, biodiversity is mentioned in general terms. Whilst some reports mention wild foods as playing a role as part of the coping mechanisms to shocks and stresses, wild foods are not mentioned in any of the country's Disaster Risk documents. This is a missed opportunity to raise the profile of wild foods and possibly enhance their recognition in the research agenda.
- **Changing economic, socio-political, and cultural factors:** Changing economic, socio-political and cultural factors have resulted in erosion of the country's traditional knowledge management systems. For example, Malaza, (2003) identifies pressure on women's time that is forcing them to become increasingly dependent on wage labour as a main factor that is contributing to abandonment of traditional coarse grain staples and indigenous vegetables in favour of refined wheat products and exotic vegetable varieties (Howard, 2003). Again, with abandonment of these foods, traditional knowledge is also eroded.
- **Advancements and innovations in science and technology:** Advancements in innovations and technology have affected the way that foods are prepared in households. Many of the traditional food preparation methods such as grinding on stones, cracking of maize kernels "**kukhobola''** have been replaced by hammer mills. The same can be said for methods of preparation of some wild foods.
- A positive driver has been Swaziland Indigenous Products (SIP), a member-owned natural seed oil enterprise that operates in the Lowveld. SIP buys Marula seed from 2400 women and also supports sustainable cultivation and collection of wild Marula, *Trichilia*, and *Ximenia* seeds. Since it was established in 2004, SIP has paid out ZAR 3.7 million (US$ 420,000) to rural Swazi women resulting in improved well-being and empowerment (United Nations Development Programme. (2013).

16. Which drivers have had the most significant effect on the maintenance and use of traditional knowledge relating to biodiversity for food and agriculture?

Agriculture has been challenged by two main drivers i.e. Advancements and innovations in science and technology as well as changing economic, socio-political, and cultural factors. Social development has resulted to the loss of many cultural practices which facilitated transfer of knowledge between generations. Examples are story telling by the elderly in the evenings, sessions between older boys and older males (**esangweni)** and other practices which provided family elders to interact with younger members. A growing lack of respect for traditional practices manifesting itself in indiscriminate cutting of trees including those that are traditionally protected such as fruit trees and trees used for ceremonial practices is another factor (GOS-SEA 2013[1]).

In terms of advancements and innovations in science and technology, indications are that some traditional practices related to sustainable use of biodiversity have been marginalised. This is despite that there are no affordable and appropriate substitutes in some cases. Attitudes and perceptions about traditional knowledge were also found to be important (Dube & Musi, 2002). Hlanze *et al.,* (2005) also identified HIV/AIDS as an important driver in loss of traditional knowledge in Swaziland due to the death of elderly people who are the custodians of traditional knowledge.

Effects of drivers of change on traditional knowledge, gender and rural livelihoods

In answering questions 16 to 18, describe the major drivers that have had an impact in the last 10 years and include where possible indicators used to measure change, and sources of information.

17. Which drivers have had the most significant effect on the involvement of women in the maintenance and use of biodiversity for food and agriculture?

Women have traditionally played a role in maintenance and use of biodiversity for food agriculture. Sachs & Roach (1981) for example note the important role and the predominance of women in all homestead agricultural activities. This role has become increasingly important with the increase in the number of women-headed households in the country. Among the most significant changes in the context of participation of women in maintenance of biodiversity for food and agriculture in Swaziland are changing economic, socio-political, and cultural factors. In particular, men and the youth migrating to urban areas in search of employment. The HIV/AIDS pandemic is yet another important driver in this regard. On the one hand, many women have lost their husbands due to the pandemic. This has contributed to women taking a lead in decision-making regarding agricultural enterprises in their households. On the other hand, with so many people affected in the country, women are the primary care givers this limits time that is available for agriculture.

Another factor is markets, trade and the private sector. Opportunities have opened for small holder farmers to market in areas where they have previously been marginalized. For example, cattle production has traditionally been dominated by men but indications are that with support for feedlots, women have been empowered to participate in this sector.

Policy drivers include development of the National Gender Policy and related initiatives**.** This Policy recognizes the inequality between women and men that characterizes the Swazi society and thus seeks to promote fair and equitable distribution of economic and political resources and the full participation of all at community and policy level regardless of gender. Noting the close relationship between environmental degradation and poverty as well as the high dependence of women in particular on the environment to meet basic needs, it stresses the importance of mainstreaming gender into all government policies that have a bearing on issues of access, control, benefits as well as management of the natural resources (Kingdom of Swaziland, 2010). Another initiative is the Women Farmer of the Year Competition coordinated by the Ministry of Agriculture which encourages women to not only build up their farming skills but also promote their leadership skills and home management.

18. Which drivers have had the most significant effect on the role of biodiversity for food and agriculture in improving food security and sustainability?

The majority of Swaziland's population is dependent on agriculture for food and livelihood. The majority of these people are in the less developed predominantly subsistence-based sector on SNL. This reality, underpins the role of biodiversity for food and agriculture in improving food security and sustainability in the country. This also means any drivers that impact on biodiversity for food and agriculture especially on SNL have huge implications on food security and sustainability in the country. From the previous discussions, the most important drivers in this regard are persistent and increasingly longer and drier droughts (possibly lined to climate change) and a struggling economy. A growing population translating into increasing requirement for land for resettlement and other development infrastructure is another factor. Changing economic, socio-political, and cultural factors such as HIV/AIDS have also been important.

Against this background, the Swaziland Government has developed and adopted a number of policies and programmes to stimulate growth and transformation of agriculture on SNL. These policies and programmes are having an impact on enhancing the role of biodiversity for food and agriculture in food security and sustainability. These include the Comprehensive Agriculture Sector Policy, The National Food Security Policy, the Swaziland Agricultural Development Project (SADP) among others.

19. Referring to the information provided in this Chapter, identify countermeasures planned or in place to reduce adverse consequences of drivers on a) associated biodiversity, b) ecosystem services and c) wild foods. Provide any expected outcomes, lessons learned and best practices.

Swaziland has adopted the ecosystem approach to biodiversity conservation. She is Party to the Convention on Biological Diversity and as a measure for responding to and addressing biodiversity loss, she has developed the second National Biodiversity Strategy and Action Plan (NBSAP 2). In line with the BSP and its Aichi Targets, Target 11 in NBSAP 2 States **"***By 2022, at least 20 per cent of Swaziland's land area, especially areas of particular importance for biodiversity and ecosystem services, protected landscapes and multiple resource use areas are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas".* Swaziland has recently initiated a project entitled "Strengthening the National Protected Areas Systems" (SNPAS) which is aimed at developing, expanding and effectively managing the capacities of Swaziland's PAN to adequately protect the biodiversity. SNPAS is based on a landscapes approach towards sustainable development involving integrated land and natural resource management. It is anticipated that this will transform the current Protected Areas patchwork into a network and will also enhance the livelihoods of the country's vulnerable communities particularly those adjacent to the protected areas (KOS/UNDP/GEF, undated).

As one of the measures to minimise the risks and the impacts of natural and human made disasters on the country's population, Swaziland has established the Disaster Management Agency (DMA) and also developed strategies and plans for disaster risk reduction. There are also plans for enhancing preparedness at community level through a number of initiatives planned by the Office of the Deputy Prime Minister which houses the DMA including awareness raising on disasters and disaster preparedness, training on water harvesting and water harvesting technology, training on smart climate-smart agriculture etc. It is important that as these planned programmes are rolled out, lessons are documented to inform future planning.

Swaziland has also conducted a number of Climate Change Vulnerability Assessments including the Biodiversity and Ecosystems Assessment (MTEA, 2014). This Assessment proposes nine strategic actions for adaptation, among them:

- Expansion of protected areas and enhancing connectivity in line with Aichi Target 10 on the Biodiversity Strategic Plan,
- Ecosystem restoration
- Watershed connectivity restoration and protection of riparian buffers
- Ex-situ conservation,
- Invasive species management
- Land use planning
- National energy policy
- Funding, and,
- Research and monitoring

Subject to effective implementation, these planned countermeasures will go some way towards arresting and possibly reversing loss of biodiversity.

CHAPTER 3: The state and trends of biodiversity for food and agriculture

20. Overall state, trends and state of conservation of diversity of forest, aquatic, animal or plant genetic resources

State of animal genetic resources: 820 species of vertebrates have been recorded in the country. The country's livestock sector is based on just 5 species with a limited number of breeds as previously explained. Estimates of the purebred Nguni cattle population and trends in the traditional system have not been determined (MOAC, 2004). There are strong indications to suggest that pure-bred Nguni populations are decreasing due to indiscriminate crossbreeding with exotic breeds, mainly Brahman, in the country.

Figure 13: Some breeds of exotic breeds of bulls in the country

Current initiatives in place include:

- **The Government Bull Loan Scheme:** Government has a scheme for loaning competent farmers improved bulls of different breeds (Nguni, Brahman, Simmental, Drakensberger) as a means of improving the genetic merit of the national herd. Farmers have tended to favour Brahmans. The Bull Loan Scheme was developed under Government's Livestock Development Policy of 1995 as part of Government's efforts to improve the national beef herd. Bulls are available on loan to both TDL and SNL farmers at E1000 and E500 respectively for a period of up to three years. After three years the farmer is issued a different bull to avoid inbreeding. The scheme is available to individual farmers engaged in rearing beef cattle or operating in a recognised group ranching system (Nkambule, 2014).
- Frequent dry spells in the country force farmers in the traditional farming system to restock their herd with lack of indigenous cattle for sale in the market, they are compelled to rebuild their herds using the more readily available exotic breeds from the commercial system leading to further contamination of the Nguni population.
- In the commercial sector, the pressure to improve on conformation and size of their animals through crossbreeding with large exotic breeds has resulted in displacement of the Nguni breed by cross breeds and exotic breeds (MOAC, 2004).

State of aquatic genetic resources: Just over fifty species of fish have been recorded in the country. These include *Barbus trimaculatus, Clarias gariepinus, Oreochromis mossambicus, O. macrochir, Serranochromis robustus, Tilapia rendalli, T. sparrmanii, and Schilbe intermedius* all recorded in the Sand River Dam (Ferreira & Avenant- Oldewage; 2013). The status of fish stocks in Swaziland is not known due to the absence of relevant data (Beuil & Grima, 2014).

State of Forest Genetic Resources:

The country's Forest types, area of coverage and main species that occur are shown in Table 3.1.

Table 3.1: Major forest types and species represented

Major Forest types	Area covered	Main Tree species
Riparian Forest	2344 ha	*Acacia xanthophloea, A. ataxacantha, Breonadia salicina, Celtis Africana, Bridelia micrantha, Combretum erythrophyllum, Deinbollia oblongifolia, Faidherbia albida, Trichillia emetic, Syzygium cordatum, S. guinesse, Rhus chirindensis, Vernonia myriantha, Ziziphus mucronata.*
Moister Savanna h	112720 ha	*A.grandicornuta, A. davyi, A. karroo, A. xanthophloea, Pavetta edentula, Pterocarpus angolensis, Sclerocarya birrea. Vangueria infausta,*
Acacia Savanna h	150590 ha	*A. davyi, A. grandicornuta, A. karroo, A. xanthophloea, P. angolensis, Pavetta edentula, S. birrea, V. infausta,*
Dryer Acacia Savanna h	34024 ha	*A. tortillis* var. *woodii, A. swazica C. apiculatum, Barchemia zeyheri, C. imberbe, C. hereroense, C. zeyheri Euphorbia ingens, E. confinalis*
Bushveld	151890 ha	*A. burkei, A. caffra, A. gerrardii, Afzelia quanzensis. Androstachys johnonii, C. zeyheri, Dodonaea angustifolia, D. rotundifolia , Cussonia natelensis, C. paniculata, C. spicata, E. ingens E. grandidens , Spirostachys africana, Terminalia sericea*
Plantatio ns	135000 ha	*A. mearnsii, Eucalyptus grandis, E. saligna, Pinus patula, Pinus elliotti,*
Montane and Afromont ane Forest	11920 ha	*Brachylaena transvuaalensis, C. Kraussii, Cassipourea malosana Englerophytum magalismontanum, Eugenia natalitia, Halleria lucida. Ilex mitis, Pittosporum viridiflorum, Pordocarpus latifolius, Prunus Africana, Rothmania capensis*

At present, the country has no specific conservation strategies/programmes for forest species. *In-situ* conservation occurs by default where a particular species occurs and is thus managed inside a protected area. Whilst they were mostly initially set up for conservation of animals, most protected areas make an effort to actively monitor threatened forest species that occur within their boundaries (MTEA, undated).

State of Plant Genetic Resources: A total of 3441 species of plants in 1124 genera and 244 families are known to occur in the country (Braun *et al*., 2004). Crop relatives and landraces recorded in the country include *Sesamum, Cerototheca, Sorghum* spp., Cucurbitacea, *Vigna, Arachis hypogea, Zea mays, Phaseolus, Ipomea batatas, Manihot esculentus, Colocasia esculantus, Gossypium, Physalis*. Maize is increasingly grown from hybrid seed although some farmers continue to grow open pollinated varieties. The number of varieties of each crop contained in the Swaziland seed register is shown in Table 3.2. Diversity of some crops is shown in Figure 14.

Table 3.2: Number of registered varieties per crop

Crop type	Crop	Number of recommended varieties
Cereals	Maize (Hybrids)	35
	Maize (open pollinated varieties)	14
	Sorghum	4
Legumes	Beans	17
	Groundnuts	7
	Soybeans	6
	Cowpea	4
Root crops	Sweet potatoes	9
Fibre	Cotton	4

Figure 14: Left -Diversity of selected cowpea varieties/landraces Right: An open pollinated variety of maize

Landraces of crops such as Bambara groundnut, cowpea etc. are maintained by farmers. Royal residences maintain some of the country's landraces of sorghum (Dlamini & Lupupa, 1997).

The current collection held at the NPGRC is shown in Table 3.3.

Table 3.3: Collection of germplasm held at the NPGRC

Crop /	SiSwati Name	Scientific	Number of

		Name	accessions held
Maize	Ummbila	*Zea mays*	170
Sorghum	Emabele	*Sorghum bicolor*	80
Cowpea	Tinhlumaya	*Vigna unguiculata*	60
Beans	Emabhontjisi	*Phaseolus vulgaris*	55
Groundnuts	Emantongomane	Arachis *hypogea*	66
Jugo Beans	Tindlubu	*V. subterrenea*	40
Mungbeans	Mungomeni	*V. mungo*	16
Curcubits	Ematsanga, Emajoti	*Curcubita spp.*	53
Amaranth	Imbuya	*Amaranthus hybrida*	20
Corchorus	Ligusha	*Corchorus spp.*	10
		Total	**570**

Common features: All four sectors are heavily dependent on a small number of species despite the large number of species that occur in the country. One of the main features that all sectors have in common is the challenge of maintaining biodiversity along with enhanced production which is often achieved through adoption of exotic breeds/varieties even crop species. Whilst contributing to improvements in productivity, exotic breeds/varieties are impacting on the country's biodiversity as discussed previously.

Differences between sectors: One of the main differences is with respect to management of sector information. Of the four sectors, the livestock sector, and even then only with cattle has made strides in developing information management systems related to biodiversity for food and agriculture. An example here is the Swaziland Livestock Information and Traceability System (SLITS). Another difference is with respect to coordination of activities. The Plant genetic resources sector is the only one that has an established multi-stakeholder coordinating committee i.e. the National Plant Genetic Resources Committee (NPGRCom). Functioning of this committee however, is limited by lack of funding.

Synergies between sectors: The Ministry of Agriculture is responsible for three of the sectors i.e. Animal Genetic Resources, Aquatic Genetic Resources and Plant Genetic Resources. The Forestry sector now falls within the Ministry of Environmental Affairs (MTEA). The country does not have a mechanism to coordinate genetic resources related issues. Swaziland Environment Authority (SEA), a parastatal under MTEC is the lead institution responsible for biodiversity in Swaziland. SEA established the Biodiversity Programme Implementation Committee (BPIC), a multidisciplinary and inter-sectoral committee established. Its main function is to coordinate the implementation of all national biodiversity programmes in the country. This offers some opportunity for enhancing synergies across sectors. BIPC is however challenged by imitations of funding.

State and trends of associated biodiversity and ecosystem services

21. Have any changes been detected in your country for the different production systems over the last 10 years in components of associated biodiversity? If so, indicate if trends are strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 7. If no information is available, indicate not known (NK). If not applicable, (NA).

Table 7. Trends in the state of components of associated biodiversity within production systems.

Production systems	**Trends in last 10 years (2,1,0,-1,-2, NK, NA)** (Place pointer on the component of associated diversity name for a description)			
	Micro-organisms	Invertebrates	Vertebrates	Plants
Livestock grassland-	NK	-1	-2	-1
Livestock landless	0	0	0	0
Naturally regenerated	NK	-1	-1	-2
Planted forests: Subtropics	NK	NK	NK	-2
Self-recruiting capture	NK	NK	-2	NK
Fed aquaculture:	NK	0	0	0
Irrigated crops (Sugar cane):	NK	-1	-2	-2
Rain-fed crops: Subtropics	NK	-1	-1	-1

Due to current lack of information to conclude on ten year trends the state of components of associated biodiversity within production systems in the country. Thus the table is indicatively based on the limited information available.

22. Briefly describe the changes or trends in diversity recorded in Table 7. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.

There is not enough information available to draw firm conclusions on this.

23. Have any changes been detected in your country for the different production systems over the last 10 years in regulating and supporting ecosystem services? If so, indicate if trends are strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 8. If no information is available, indicate not known (NK). If not applicable, (NA).

Table 8. Trends in the state of regulating and supporting ecosystem services within production systems.

There is no information available on this as there are no records of studies on ecosystem services in the country.

Production systems	**Trends in last 10 years (2,1,0,-1,-2, NK, NA)** (Place pointer on the ecosystem service name

	for a description)								
	Pollination	Pest and disease regulation	Water purification and waste	Natural hazard regulation	Nutrient cycling	Soil formation and protection	Water cycling	Habitat provisioning	Production of oxygen/ Gas regulation
Livestock grassland-based system	NK	NK	NK	NK	NK	NK	NK	NK	NK
Livestock landless systems: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Naturally regenerated forests: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Planted forests: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Self-recruiting capture fisheries: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Fed aquaculture: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Irrigated crops (Sugar cane; Maize) : Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK
Rain-fed crops: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK

24. Briefly describe the changes or trends in diversity recorded in Table 8. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.

There has been very little if any work done on regulating ecosystem services in Swaziland. More work has been done on provision services. Examples here include work by (Dlamini & Geldenhuys, 2009) on Non-Timber Forest Products (NTFPs) which showed that medicinal use followed by firewood were the most predominant NTFP categories in Swaziland.

Provision services associated with Swaziland's wetlands include fishing, habitat provision, provision of fruit and provision of raw materials for hand craft and they also provide recreational services (Masarirambi *et al*., 2010). Again, the studies are not adequate to draw conclusions on ten year trends.

25. Is there evidence that changes in biodiversity for food and agriculture have impacted ecosystem services in your country? Indicate if strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 9 and provide a description of specific situations and documentation where available.

Table 9. Impact of changes in biodiversity for food and agriculture on ecosystem services.

Production systems Code&Name	**Changes**	**Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA)								
		Pollination	and disease regulation and waste	al hazard regul	Nutrient cycling	formation and prote	Water cyclin	Plant provisioni	of oxygen/ Gas regulat
	Changes in animal genetic resources	**NK**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**
	Changes in crop genetic resources	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
	Changes in forest genetic									

	resources									
	Changes in aquatic genetic resources	**0**	**2**	**0**	**0**	**1**	**0**	**1**	**1**	**0**
	Changes in micro-organism genetic resources (associated biodiversity)	**-1**	**-1**	**-1**	**1**	**-1**	**-1**	**-1**	**-1**	**-1**
	Changes in invertebrates genetic resources (associated biodi									

	versity)									
	Changes in vertebrates genetic resources (associated biodiversity)									
	Changes in plants genetic resources (associated biodiversity)	**-2**	**-1**	**-1**	**-2**	**-1**	**-1**	**-1**	**-2**	**-1**

26. Briefly describe the impacts on ecosystem services recorded in Table 9. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.

Whilst there is plenty of information that shows how different production systems are impacting on each other e.g. clearing of natural forests for crop land as discussed earlier in this report, there have been no studies on how these effects translate into impacts on regulating ecosystem services hence no conclusions could be drawn.

However, the summary on impacts of changes in biodiversity for food and agriculture on ecosystem services indicated in Table 9 is based on consensus of discussions of sector stakeholder groups during the inception workshop.

Generally during the period under review, the impact of changes in animal genetic resources which saw tens of thousands of livestock being lost have a positive impact on ecosystem services. This implies that animal genetic resources themselves negatively affect ecosystem services. Whilst changes in micro-organisms, forests and plant genetic resources have negative impact on ecosystem services. This indicate that these genetic resources are very crucial for ecosystem balance and service provisioning. Aquatic genetic resources on the other hand have a little positive or no effect on most ecosystem services.

27. List any associated biodiversity species or sub-species (if information is available) that are in some way actively managed in your country to help provide regulating or supporting ecosystem services in Table 10. Indicate in which production systems they occur and indicate if diversity information is available. Provide any available sources of information.

Bees are managed purely for production of honey. Indigenous honey bees i.e. *Apis mellifera* subsp. *adansoni* and *A. mellifera* subsp. *scutallata* in natural forests, eucalyptus forests, citrus plantations and field crops are used for honey production under natural conditions (Ndlangamandla, 2014). In 2012, the total number of bee keepers in the country was reported at 1107 with a total of 3860 hives. At least 500 of these beekeepers were small holders with less than 10 hives each. Bee keeping is associated with various species including *Eucalyptus,* Wattle and Pine in the Highveld, Natural Forest and Citrus in the Middleveld, Natural forest and citrus in the Lowveld and Natural Forest (*Acacia* and *Aloe*) in the Lubombo. Local honey production accounted for 105 tonnes of the total national consumption of 126 tonnes annually (Ndlangamandla, 2011).

At least one (out of an initial seven) vulture restaurant is maintained to add to the carrion available to vultures such as the African White-backed vulture (AWBV) and to also facilitate availability of food in space and time. Swaziland's population of AWBVs is of particular significance as it is the densest nesting population of the species in the world (Kane *et al*., 2014).

Borders of natural grass species are maintained in crop fields especially in high rainfall areas i.e. highveld and middleveld. These species include *Eragrostis* spp., *Hyperenia hirta, Pennisetum purperium, Thermeda triandra* among others. These provide multipurpose services among them livestock feeding, grass for handicraft such nests for laying hens and mats, thatching grass as well as serving in regulation of flooding and erosion.

Table 10. Associated biodiversity species that are in some way actively managed in your country to help provide regulating or supporting ecosystem services.

Ecosystem service provided (Place pointer on the ecosystem service name for a	**Actively managed species (name) and sub-species (where**	**Production systems (code or**	**Availability of diversity**	**Source of information**
Pollination	*Apis mellifera* subsp. *adansoni* and *A. mellifera* subsp. *scutallata*	Naturally regenerating forests; Plantation Forests	N	Ndlangamandla, 2014 Ndlangamandl
Pest and disease regulation	African white-backed vultures	Savannah ecosystem		*Kane et al.,*
Water purification and waste treatment				
Natural hazard regulation				
Nutrient cycling				

Soil formation and protection				
Water cycling				
Habitat provisioning				
Production of oxygen/ Gas regulation				
Other [*please specify*]				

28. Does your country have monitoring activities related to associated biodiversity? If yes, describe these. Where possible provide information on the components of associated biodiversity that are monitored and on the geographical coverage of the monitoring system (local, regional, national, global). Include references to the sources of information, if possible.

The country has no systematic biodiversity monitoring programme in place. Swaziland's First State of Forest Genetic Resources (SoFGR) reported that assessment of threatened forest species in the country is only done when updating the country's Plant Red Data List at 10-15 year intervals. Protected areas conduct monitoring activities on biodiversity that occurs within their borders. The University of Swaziland also conducts some research on raptors, small mammals and insects as well as rangeland ecology. This is driven by researcher interests and areas of expertise especially in response to emerging issues of national interest. Swaziland's Fourth Report to the Secretariat on Biological Diversity makes a similar observation (Swaziland Environment Authority, 2009). All Out Projects, a private company conducts habitat monitoring within Malolotja, Mlawula and Hlane protected areas using fixed point photography recording ((Swaziland Environment Authority, 2005). Swaziland National Trust Commission conducts species level monitoring on taxa such as blue swallow, bald ibis, raptors, hyenas, aardwolfs, bats, reptiles, *Encephalatos lavaefolius*, *Polystachys zuluensis* and *Kniphofia umbrina* (Swaziland Environment Authority, 2005).

Surveillance is carried out on crop pests by the Phytosanitary Unit of DARSS on a range of pests e.g. *Bactrocera dorsalis* (Fruit fly), *Planococus solenopsis* (Cotton mealy bugs),
Yellow aphids and *Chilo sacchariphagu* in sugar cane, *Tuta absoluta* in tomatoes and *Spodoptera frugiperda* (Fall armyworm) in maize. There is also lot of interest in *Striga hermonthica* and *S. asiatica* (Witch weed) in maize. The Veterinary Services and Livestock Services Department also conducts routine surveillance from an animal disease control perspective.

Species of associated biodiversity at risk of loss

In this section the objective is to identify species of associated biodiversity within the country that are at significant risk of loss, degradation or extinction.

29. List in Table 11 any components of associated biodiversity for which there is evidence of a significant threat of extinction or of the loss of a number of important populations in your country. Specify the degree of the threat according to the classification in use in your country or following the IUCN Red List Categories and Criteria. Include a description of the threat and list references or sources of information if available.

Human-induced factors have had a huge impact on the country's biodiversity. As many as 89 species of vertebrates and 305 plant species are currently listed as threatened or near threatened in national Red Data Lists (Monadjem *et al.*, 2003; Dlamini & Dlamini, 2002; GOS-SEA 2013[2], GOS-SEA, 2016).

Table 11. Main threats to associated biodiversity identified as at risk

Associated biodiversity species	**Degree of threat**	**Main threat**	**References or sources of information if available**
Adenium swazicum Stapf	Endangered	Illegal trade from the wild	SNTC database
Aloe albida (Stapf) Reynolds	Endangered	Near endemic	Golding, 2002
Aloe chortolirioides A.Berger var. chortolirioides	Endangered	Rare species occurring in only one other locality	Golding, 2002
Aloe dewetii Reynolds	Endangered	High population density,	Golding, 2002
Aloe ecklonis Salm-Dyck	Vulnerable	??	Golding, 2002
Aloe kniphofioides Baker	Vulnerable	Collection, harvesting, grazing, fire and	Golding, 2002
Aloe minima Baker	Vulnerable	Rare in Swaziland	Golding, 2002
Asclepias eminens (Harv.) Schltr.	Vulnerable	Threats, grazing, soil erosion, fire	Golding, 2002 SNTC database
Aster pseudobakeranus W.Lippert	Vulnerable	Restricted distribution	Golding, 2002
Brachystelma coddii	Endangered	??	Golding, 2002
Celtis mildbraedii	Critically Endangered	Indiscriminate harvesting	Loffler & Loffler, 2005
C. gomphophylla	Endangered		Loffler & Loffler, 2005
Ceropegia cimiciodora Oberm.	Endangered		SNTC database
Crassula vaginata Eckl. & Zeyh. ssp. minuta	Critically Endangered	Urban expansion,	Golding, 2002
Cheirostylis gymnochiloides (Ridl.)	Critically Endangered	Extremely rare, Mining	Golding, 2002
Cyrtanthus nutans R.A.Dyer	Endangered	Damming	Golding, 2002
Dianthus mooiensis F.N.Williams ssp. kirkii (Burtt Davy) S.S.Hooper	Vulnerable	Collection	Golding, 2002
Dierama elatum N.E.Br.	Extinct	Urban expansion	Golding, 2002
Disa intermedia H.P.Linder	Endangered	Habitat degradation	Golding, 2002
Duvernoia aconitiflora A.Meeuse	Endangered	Population expansion	Golding, 2002

Encephalartos aplanatus	Endangered	Illegal collection	Loffler & Loffler, 2005
E. heenanii	Critically Endangered	Illegal collection	Loffler & Loffler, 2005
E. laevifolius	Critically Endangered	Illegal collection	Loffler & Loffler, 2005
E. lebomboensis	Endangered	Illegal collection	Loffler & Loffler, 2005
E. senticosus	Critically Endangered	Illegal collection	Loffler & Loffler, 2005
E. umbeluziensis	Critically Endangered	Illegal collection	Loffler & Loffler, 2005
Euphorbia keithii	Critically Endangered	Agriculture, urban expansion, habitat degradation	Golding, 2002 Loffler & Loffler, 2005
Encephalartos paucidentatus	Vulnerable	Illegal collection	Golding, 2002
Excoecaria madagascariensis	Critically Endangered	Forest clearing, IAS	Schmelzer *et al*., 2008
Ficus polita subsp. polita	Vulnerable	??	Golding, 2002
Ficus sansibarica Warb. ssp. sansibarica	Critically Endangered	??	Golding, 2002
Encephalartos lebomboensis I.Verd.	Endangered	Harvesting, collection	Golding, 2002
Encephalartos senticosus	Vulnerable	Illegal coollection	Golding, 2002
Erica swaziensis E.G.H.Oliv.	Endangered	Endemic restricted to wetlands	Golding, 2002
Gardenia thunbergia	Critically Endangered	Deforestation	Golding, 2002 Loffler & Loffler, 2005
Gladiolus brachyphyllus F.Bolus	Vulnerable	Urban expansion	Golding, 2002
Heywoodia lucens Sim	Endangered		Golding, 2002
Haemanthus pauculifolius Snijman & A.E. van Wyk	Vulnerable	Damming, grazing	Golding, 2002
Kniphofia umbrina Codd	Critically Endangered	Habitat degradation	Golding, 2002
Lannea antiscorbutica	Endangered	Near endemic	Golding, 2002
Ocotea kenyensis	Critically Endangered	Habitat degradation, afforestation	Golding, 2002
Oxyanthus pyriformis subsp. pyriformis	Endangered	Near endemic	Golding, 2002 Loffler & Loffler, 2005
Protea comptonii	Endangered	Near endemic	Golding, 2002

P. parvula Beard	Vulnerable		Golding, 2002
Prunus africana	Endangered	Harvested for medicinal use	Golding, 2002
Sebecio austromontanus	Data deficient		Golding, 2002
Siphonochilus aethiopicus (Schweinf.) B.L.Burtt	Endangered	Heavy exploitation	Golding, 2002
Streptocarpus davyi S.Moore	Vulnerable	Habitat destruction, urban expansion	Golding, 2002
Syncolostemon stalmansii (A.J.Paton & K.Balkwill) D.F.Otieno	Vulnerable	Dam Construction	http://www.nationalredlist.org/files/2012/08/Swaziland-Plant-Red-Data-List-2002.pdf
Warburgia salutaris	Critically Endangered	Collection	Golding, 2002
AMPHIBIANS			
Pyxicephalus adspersus (Giant Bull frog)	Regionally extinct	Habitat loss and habitat fragmentation	Monadjem *et al.,* 2003
Hyperolius semidiscus (Yellow-strped reed frog)	Near Threatened		Monadjem *et al.,* 2003
REPTILES			
Crocodylus niloticus (Nile crocodile/ [illegible])	Vulnerable	Habitat loss/ degradation	Monadjem *et al.,* 2003
Python natalensis (Southern African Python/ Inhlatfu)	Vulnerable	Killing for fat, skin and other parts used for traditional	Monadjem *et al.,* 2003
Birds			
Anthropoides paradesia (Blue crane)	Regionally extinct	Loss of habitat	
Aquila rapax (Tawny Eagle/ **Lusweti**)	Endangered	Habitat destruction, nest disturbance	Monadjem *et al.,* 2003
Aquila verreauxii	Vulnerable	Loss of preferred food source (hyraxes)	Monadjem *et al.,* 2003
Ardeotis kori (Kori bustard)	Regionally extinct	Hunting, loss of habitat	Monadjem *et al.,* 2003
Balearica regulorum (Grey Crowned Crane)	Endangered/ regionally extinct	Loss of habitat, possibly hunting	Monadjem *et al.,* 2003
Bucorvus leadbeateri (Southern Ground Hornbill)	Endangered	Loss of savanna habitat	Monadjem *et al.,* 2003

Bugeranus caranculus (Wattled crane)	Regionally extinct	Drainage of marshlands to agriculture	Monadjem *et al.,* 2003
Buphagus africanus (Yellow-billed oxpecker/ **Malaza**)	Regionally extinct	Initially rinderpest outbreak at turn of century, more recently dipping chemicals	Monadjem *et al.,* 2003
Ciconia nigra (Marabou stork / Umcalandlovu)	Vulnerable	Habitat destruction	Monadjem *et al.,* 2003
Circus ranivorus	Vulnerable	Habitat and nest-site loss	Monadjem *et al.,* 2003
Ephippiorhynchus senegalensis (Saddle-billed stork)	Endangered	Hunting, land use conversion,	Monadjem *et al.,* 2003
Eulophia chlorantha Schltr.	Endangered	Habitat destruction, hunting	Monadjem *et al.,* 2003
Eupodotis cafra	Vulnerable		
Geronticus calvus (Boldl Ibis)	Vulnerable		Monadjem *et al.,* 2003
Glaucidium capense (Barred owl / **Sikhova)**	Vulnerable	Habitat destruction and loss	Monadjem *et al.,* 2003
Gorsachius leuconotus (White-backed night heron)	Vulnerable	Habitat destruction	Monadjem *et al.,* 2003
Gyps coprothres (Cape Vulture **/ Lingce**)	Regionally extinct	Land use conversion from grazing to sugar cane	Monadjem *et al.,* 2003
Hieraaetus fasciatus (Africa Hawk eagle/ Lusweti)	Endangered	Habitat fragmentation	Monadjem *et al.,* 2003
Hirundo atrocaerulea (Blue swallow/ **Inkonjane)**	Critically Endangered	Habitat loss, afforestation	Monadjem *et al.,* 2003
Leptoptilos crumeniferus	Vulnerable		
Lioptilus nigricapillus (Bush Blackcap)	Vulnerable		Monadjem *et al.,* 2003
Manis teminckii (Pangolin / **Imfinyezi)**	Endangered	Hunting for medicinal use, habitat destruction	Monadjem *et al.,* 2003
Melanospermum italae Hilliard	Endangered		
Melanospermum swazicum Hilliard	Endangered	Habitat degradation & loss	Monadjem *et al.,* 2003
Neotis denhami (Stanley's budstard)	Endangered	Degradation and loss of grassland habitat	Monadjem *et al.,* 2003

Podica senegalensis (Africa Finfoot)	Vulnerable	Destruction of riparian vegetation	Monadjem *et al.,* 2003
Polemaetus belicosus	Vulnerable	Land use conversion (habitat loss), nest site disturbance	Monadjem *et al.,* 2003
Protea parvula Beard	Vulnerable		
Prunus africana (Hook.f.) Kalkman	Endangered		
Sagittarius serpentarius (Secretary bird/ **Dvoye**)	Endangered	Land use conversion, fire, overgrazing	Monadjem *et al.,* 2003
Sarothrura affinis (Striped flufftail)	Endangered	Fragmented distribution, wetland drainage	Monadjem *et al.,* 2003
Scotopelia peli (Pel.s Fishing Owl)	Regionally extinct	Natural disaster (cyclone domoina which eradicated suitable habitat)	Monadjem *et al.,* 2003
Smithornis capensis	Vulnerable	Habitat destruction & loss	Monadjem *et al.,* 2003
Stephanoaetus coronatus	Vulnerable	Loss of habitat, overexploitation of forests	Monadjem *et al.,* 2003
Streptocarpus wilmsii Engl.	Vulnerable		
Syncolostemon comptonii Codd	Critically Endangered		
Terathopius ecaudatus (Bateleur / I**ngculungculu**)	Endangered	Habitat destruction, nest disturbance, prey reduction	Monadjem *et al.,* 2003
Torgos tracheliotus (Lappet-faced vulture / **Lingce)**	Endangered	Habitat destruction, reduction of food supply, poisoning	Monadjem *et al.,* 2003
Trigonoceps occipitalis (White headed vulture / **Lingce)**	Endangered	Habitat destruction, reduction of food supply	Monadjem *et al.,* 2003
Turdus gurneyi	Vulnerable		Monadjem *et al.,* 2003
Turnix hottentotta (Black-rumped buttonquail)	Endangered	Agriculture/ afforestation	Monadjem *et al.,* 2003
Tyto capensis (Grass owl /**Sikhova)**	Endangered	Habitat loss, drainage of wetlands,	Monadjem *et al.,* 2003

		agriculture, overgrazing	
Zoothera gurneyi (Orange thrush)	Vulnerable	Mining	Monadjem *et al.,* 2003
FISH			
Amphilus natalensis **(Natal mountain catfish)**	Vulnerable	Alien fish species (trout)	Monadjem *et al.,* 2003
Barbus crocodilensis **(Southern rosefin barb)**	Vulnerable	Unknown	Monadjem *et al.,* 2003
Barbus cf. neefi (Sidesport Barb)	Critically endangered	Intense agriculture, water abstraction	Monadjem *et al.,* 2003
Barbus previpinnis (Shortfin Barb)	Endangered	Afforestation, IAS (*Oncorhynchus mykiss)*	Monadjem *et al.,* 2003
Chetea brevis	Critically endangered	Pollution, water abstraction	Critically endangered
Chiloglanis bifurcus (Incomati Rock catlet)	Critically endangered	Alien fish (predators), restricted	Monadjem *et al.,* 2003
MAMMALS			
Acinonyx jubatus (Cheetah/ **Lihlosi)**	Regionally extinct	Lack of habitat	Monadjem *et al.,* 2003
Cercopithecus mitis (Samango monkey/ **Inzimango)**	Endangered	Habitat destruction	Monadjem *et al.,* 2003
Ceratotharium simum (White Rhinoceros)	Vulnerable	Poaching	Monadjem *et al.,* 2003
Crocuta crocuta (Spotted hyena/ Imphisi)	Vulnerable	Persecution (Poisoning / killing for attacks	Monadjem *et al.,* 2003
Dasymys incomtus	Vulnerable	Loss of habitat trough draining of wetlands	Monadjem *et al.,* 2003
Diceros biornis (Black rhinoceros/ Bhejane)	Endangered	Poaching	Monadjem *et al.,* 2003
Hippopotamus amphibious (Hippopotamus / **Imvubu)**	Vulnerable	Persecution by people (for destruction of crops),	Monadjem *et al.,* 2003
Lycaon pictus (African wild dog / **Budzatja**)	Regionally extinct	Hunting	Monadjem *et al.,* 2003
Manis temminckii (Pangolin/ **Imfinyezi)**	Endangered	Overhunting for medicinal use and habitat	Monadjem *et al.,* 2003
Mellivora capensis	Vulnerable	Demand for skins	Monadjem *et al.,* 2003
Ourebi ourebi (Oribi / **Liwula**)	Vulnerable	Hunting with dogs	Monadjem *et al.,* 2003

Conservation of associated biodiversity

This section collects information on the state of conservation of components of associated biodiversity providing ecosystem services within production systems in your country.

30. Does your country currently have any *ex situ* conservation or management activities or programmes for associated biodiversity for food and agriculture? These may include, for example, culture collections, collections of pollinators, etc. If so, list these in Table 12.

The country has no specific *ex situ* conservation or management activities or programmes for associated biodiversity. Researchers mainly within the University of Swaziland collect specimens of insects for research purposes but the country has no established culture collections or similar initiatives. The General Entomology Service under the Department of Agricultural Research and Specialist Services (DARSS) has an interest in cataloguing major insect pests with a view to establishing the national insect collection.

Table 12. *Ex situ* conservation or management activities or programmes for associated biodiversity for food and agriculture.

Component	Organisms, species and sub- species (where available)	Size of col-	Conservation	Objective(s)	Characterization and evaluation
NONE	N/A	N/A	N/A	N/A	N/A

31. Does your country currently have any *in situ* conservation and management activities or programmes in your country that support the maintenance of associated biodiversity? If so provide any available information on organisms and species managed or conserved, site name and location, production system(s) involved, conservation objective and specific actions that secure associated biodiversity or ecosystem services (if any).

Table 13. *In situ* conservation or management activities or programmes for associated biodiversity for food and agriculture.

Components of associated biodiversity	Organisms, species and sub-species (where	Site name	Production system(s) involved	Conservation objectiv-	Specific actions that secure associated biodivers-
NONE	N/A	N/A	N/A	N/A	N/A

There are no known i*n situ* conservation or management activities or programmes for associated biodiversity for food and agriculture in the country. Swaziland's Fourth National Report to the CBD identifies lack of *refugia* for *in-situ* conservation apart from plants conserved in areas managed by SNTC (Swaziland Environment Authority, 2009).

32. What activities are undertaken in your country to maintain traditional knowledge of associated biodiversity? Has traditional knowledge of associated biodiversity been used to inform conservation and use decisions in your country? Please share best practices and lessons learned.

Traditional systems of conserving biodiversity are acknowledged for example, in reports to the Convention on Biological Diversity but these remain largely undocumented and concerns have been raised that they are currently being eroded (GOS-SEA, 2009). Traditional knowledge has not been used in decision-making nor has it been mainstreamed into biodiversity management practice.

33. Provide any available information on gender dimensions with respect to the maintenance of and knowledge about associated biodiversity. These may include differences in the roles and insights of women and men with respect to maintaining particular resources, monitoring their state, overseeing their management at different stages of production or ecosystem management.

Although there is no specific data available to support this, it is possible that age may be a more important consideration in Swaziland. Older people, especially those who have grown up in and remained in rural areas where they interact more intimately with biodiversity, are generally more knowledgeable about resources that are important to them including changes that are taking place within their communities. Another important aspect is with regards to the primary occupation. For example, those who have spent longer looking after livestock have more opportunity to interact more closely with biodiversity as they follow the animals. Similarly traditional medicine practitioners of both sexes have more knowledge about trends the state of the resources and changes that have taken place with time.

State and trends of wild resources used for food

34. **Provide in Table 14 a list of wild food species known to be harvested, hunted, captured or gathered for food in your country, and that are not already included in a completed or ongoing Country Report on Forest, Aquatic, Animal or Plant Genetic Resources. Indicate in or around which production system the species is present and harvested, and the change in state of the species over the last 10 years (strongly increasing (2), increasing (1), stable (0), decreasing (-1), or strongly decreasing (-2), or not known (NK)). Indicate where differences within species have been identified and characterized.**

Table 14. Wild species used for food in the country.

Species (local name)	**Species (scientific name)**	**Production systems or other environments in which present and harvested**	**Change in state (2,1, 0,-1,-2,**	**Differences within species identi**	**Source of information *Wild food resources at risk*** In this section the objective is to identify
Emadolofiya/ umtiligi	*Opuntia ficus-indica*	Bushveld, thicket, grassland, erosion	+2 (Declared a	N	Loffler & Loffler, 2005
Emayiwane	*Hoslundia opposite*	L2	NK		Ogle & Givett, 1985[2]
Ingotjwa / linhati	*Sarcostemma viminale*	L2	NK	N	Ogle & Givett, 1985[2]
Inhlangushane	*Rhus gueinzii*	Bushveld, thicket, and riverine vegetation	NK		Loffler & Loffler, 2005
Inhlangushane	*Rhus pyroides*	Grassland, wooded grassland, forest margins,	NK		Loffler & Loffler, 2005
Inhlangushane	*Rhus transvaalensis*	Open bushveld, wooded grassland, grassland, forest margins, and	NK		Loffler & Loffler, 2005
Inkhokhokho	*Ficus petersii*	Woodland, bushveld, riverine	NK		Loffler & Loffler, 2005
Lishelushelu	*Aloe cooperi*				Ogle & Givett, 1985[2]
Mncwambi, Siformamasi,	*Manilkara concolor*	Bushveld, thicket, and low-lying riverine bush	NK		Loffler & Loffler, 2005
Umbadanga/ umTabh	*Flacourtia indica*	Bushveld, woodland, and riverine	NK		Loffler & Loffler, 2005
Umbinda	*Halleria lucida*	Evergreen forest, grassland, rocky slopes, stream banks,	NK		Loffler & Loffler, 2005
Umchafutanelomhlophe	*Diospyros lycioides Desf. subsp.*	Grassland, riverine vegetation, rocky	NK		Loffler & Loffler, 2005

Umchafutane lomnya	Diospyros lycioides Desf.	Grassy hillsides and wooded	NK		Loffler & Loffler, 2005
UmFomfo	*Cephalanthus natalensis*	Bushveld, grassland, along forest margins, and	NK		Loffler & Loffler, 2005
UmGanu	*Sclerocarya birrea*	Bushveld, woodland,	NK	N	Loffler & Loffler, 2005
UmGungumence	*Rubus pinnatus*	rocky outcrops in grassland, forest margins,	+2 (declared wee		Loffler & Loffler, 2005
UmGwenya/ Umgonyogony	*Harpephyllum caffrum*	Evergreen forest, riverine vegetation,	NK		Loffler & Loffler, 2005
UmHlala	*Strychnos spinosa*	Bushveld, forest, and	NK		Loffler & Loffler, 2005
UmHlala-mahululu/	*Antidesma venosum*	Bushveld, riverine vegetation, wooded	NK		Loffler & Loffler, 2005
UmKhiwa	*Ficus sur*	Woodland, forest, wooded	NK		Loffler & Loffler, 2005
UmKhiwane / iNkhokhokho	*Ficus ingens*	Rocky outcrops in grassland, wooded	NK		Loffler & Loffler, 2005
UmKhiwubovanaumK	*Ficus sycomorus L.*	Riparian vegetation, woodland,	Nk		Loffler & Loffler, 2005
UmKhuhlu	*Trichilia emetica subsp.*	Riparian forest, bushveld,	NK		Loffler & Loffler, 2005
UnKhuna	*Parinari capensis* subsp.	High and medium-altitude	NK		Loffler & Loffler, 2005
Umkhuna/ MaBulw	*Parinari curatellifolia*	Moist bushveld and grassland at	NK		Loffler & Loffler, 2005
Umklele	*Ehretia amoenia*	L2; F2	NK	N	
UmKhwakhwa	*Strychnos madagascariensis*	Bushveld, woodland, dry rocky areas, and low-lying	NK		Loffler & Loffler, 2005

UmNcozi	*Syzigium cordatum*	Along mountain streams and rivers, riparian	NK	N	Loffler & Loffler, 2005 Manyatsi *et al.,* 2010
UmNeyi	*Berchemia zeyheri*	Bushveld, woodland, dry thicket, and riverine vegetation.	NK		Loffler & Loffler, 2005
UmNtokolovu/ umGan	*Lannea discolor*	Bushveld and woodland. Often on	NK	N	Loffler & Loffler, 2005
UmNumbela	*Engleroph ytum natalense*	Understorey of evergreen forest and forested ravines,	NK		Loffler & Loffler, 2005
UmNtulwa	*Vangueria infausta subsp. infausta*	Bushveld, wooded grassland, woodland, rocky	NK		Loffler & Loffler, 2005
Umntulwa	*Vangueria madagascariensis*	Woodland, bushveld, wooded			Loffler & Loffler, 2005
Umphafa/ umLahlabantfu	*Ziziphus mucronata*	Bushveld, thicket, woodland, wooded grassland, riverine	NK	N	Loffler & Loffler, 2005
Umphatsankhosi	*Canthium mundianum*	Rocky hillsides in woodland, grassland, and bushveld,	NK		Loffler & Loffler, 2005
UmTelemba/ Pofugwane	*Annona senegalensis*	Bushveld, wooded grassland, riverine vegetation,		N	Loffler & Loffler, 2005
UmThunduluka	*Ximenia americana*	Bushveld, woodland, and dry	NK		Loffler & Loffler, 2005
Umtitane	*Uvaria caffra*	In and along margins of Lebombo forest and			Loffler & Loffler, 2005

Umvutfwamini wemahlatsi/ sangon	*Canthium ciliatum*	Forest, rocky outcrops in grassland, wooded grassland,	NK		Loffler & Loffler, 2005
Umvutfwamini	*Canthium inerme*	Understorey of forest, rocky outcrops in grassland,	NK		Loffler & Loffler, 2005
Mncwambi, Sifomamasi,	*Manilkara concolor*	L2, F2, A2*			Ogle & Grivetti, 19852 Loffler &
INDINGENOUS VEGETABLES					
Bubati / Lubatsi	*Laportea pedumentaria*				Ogle & Grivetti, 1985[2]
Umdzayi	*Asclepias buchwaldii*			N	Ogle & Grivetti, 1985[2]
Umdzebedzebe	*Zantedeschia sp.*				Ogle & Grivetti, 1985[2]
Chuchuza	*Bidens pilosa*	Rain-fed crops, in fields			Ogle & Grivetti, 1985[2]
Emahala	*Aloe saponaria*			N	
Fohlofohlo	*Gweria villosa*			N	
Imbikilicane	*Chenopodium album*				Ogle & Grivetti, 1985[2]
Imbuya	*Amaranthus spp.*	Rain-fed crops, in fields			Ogle & Grivetti, 1985[2]
Imbuya batfwa	*Amaranthus spinosus*				Ogle & Grivetti, 1985[2]
Ingabe / lihabe	*Sonchus oleraceus*	Rain-fed crops, in fields			Ogle & Grivetti, 1985[2]
Inkakha	*Momordica involucrata*				Ogle & Grivetti, 1985[2]
Inshubaba	*Momordica foetida*	Rain-fed crops, in fields			Ogle & Grivetti, 1985[2]
Ligusha	*Corchorus spp.*	Rain-fed crops, in fields			Ogle & Grivetti, 1985[2]
Liklolo / Lambonjane)	*Gweria caffra*				Ogle & Grivetti, 1985[2]
Lunyawolwenkhaldu	*Hibiscus trionium*				Ogle & Grivetti, 1985[2]

Sankuntjane	*Ophioglossum*				Ogle & Grivetti, 1985[2]
Sibhaze	*Peucedanum*	/			Ogle & Grivetti, 1985[2]
Sikhwa					
Selele	*Portulaca olearcea*				Ogle & Grivetti, 1985[2]
Umdzandzabuko	*Ipomoea* sp. prob.				Ogle & Grivetti, 1985[2]
Umshunko	*Riocreuxia* sp.				Ogle & Grivetti, 1985[2]
Umsiphane	*Gweria bicolor*				Ogle & Grivetti, 1985[2]
Umsobo	*Solatium nigrum/*				Ogle & Grivetti, 1985[2]
Zombodze mandun	*Pouzolzia parasitica*				Ogle & Grivetti, 1985[2]
BUSHMEAT SPECIES					
Budzayikatame/ingulube	*Phacochoerus africanus*	Moist and dry African savannah grasslands,			Swanepoel et al., 2016.
Lishongololo / Greater	*Tragelaphus*	Mixed scrub woodland			Parrini & Child, *2016*
Impala/ Common Impala	*Aepyceros melampus melampus*				
Inyatsi / **African Buffalo**	*Syncerus caffer*				
Ligcina/ Steenbok	*Raphicerus campestris*	Drier grasslands, shrublands			Palmer *et al.,* 2016
Liloni / Blesbok	*Damaliscus pygargus phillipsi*	Short grasslands			Dalton *et al*. 2007
Southern Ground	Bucorvus leadbeateri	Forests			Trail, 2007
INSECTS					
Emanyamanane (***Gonimbrasia***					
Tinhlwa (Edible ants)					

Grassh oppers (Emadzi ya, Emabon					

Wild food resources at risk

In this section the objective is to identify uncultivated and wild species used for food within the country that are at significant risk of loss.

35. **List in Table 15 any wild food species for which there is evidence of a significant threat of extinction or of the loss of a number of important populations in your country. Specify the degree of threat according to the classification in use in your country or following the IUCN Red List Categories and Criteria. Include a description of the threat and list references or sources of information if available.**

Table 15. Main threats to wild food species identified as at risk.

Wild food sp ec ie	**Degree of threat**	**Main threat**	**References or sources of information if available**
Sclerocarya birrea	The species is widely distributed in the country but some populations may be of concern.	Land use change (conversion of forests to sugarcane cultivation), Unidentified	SIP (undated) State of Forest Resources Report
Wild mushroom	NK	Drought, Climate change, IAPs	
Aloe saponaria (Emahala)	NK	With increasingly longer droughts, some communities are concerned about unsustainable harvesting practices threatening regeneration of	
Edible insects (Grasshoppers, Termites, worms		Climate change, Indiscriminate use of chemicals sprays	
Mammal species/ Game		Over exploitation (hunting) Loss of habitat Habitat degradation	Monadjem *et al*., 2003

Conservation of wild resources used for food

Provide information, where available, as to how the loss of wild food species affects the livelihoods of those that depend on them and on the general impact of their loss on food security and nutrition. Include references to the sources of information, if possible.

Wild foods, when and where available offer a cheap source of food and nutrition for rural communities more especially the poorer sectors of society. The contribution of wild fruits to the diet and nutrition is difficult to quantify as most fruit are eaten as a snack and are consumed way from the homestead e.g. when working or walking in the bushveld. Wild fruits, when and where available serve as a snack food for children across the country's ecological zones and as such contribute to the health and well-being of children. Loss of these wild foods may thus pause a risk to the nutrition of children. Edible leafy plants not only play the role of adding variety to the diet as well as supplying essential nutrients which may be otherwise lacking when usual food sources are in low supply they also contribute to a wider food base. Another consideration is that in the Lowveld which is drier and with a longer dry season, wild foods take on an additional significance in the food and nutrition security (Ogle & Glivetti, 1985). Some role of wild food in the Swazi diet include:

- Wild and weedy vegetables are often the main (and only) accompaniment to maize meal porridge (sishibo/ relish)
- Proving much needed vitamin c in winter months when little or nothing else is available.

They also offer opportunities for income generation through for example beer production, jam making (in the case of Marula) and sale of vegetables and fruit. Similarly, wild game is a source of protein.

Conservation of wild resources used for food

36. **Are any *ex situ* conservation or management activities or programmes established in your country for wild food species? These may include, for example, culture collections, collections of insects, fungi, etc. If so, list these in Table 16.**

There are no known collections of wild food species in the country apart from small collections held by individuals.

Table 16. *Ex situ* conservation or management activities or programmes for wild food species.

Wild food species conse	**Size of collection (number of accessions and quantities)**	**Conserv ation**	**Objective(s)**	**Characterization and evaluation status**
Amaranthus hybrida	20	Cold storage at -18 ^{0}C	Promote conservation and utilization	Not yet
Corchorus	10	Cold storage at -	Promote conservation and	Not yet

37. **Are any *in situ* conservation and management activities or programmes established in your country that supports maintenance of wild food species? If so list these in Table 17 provide the following information for each activity or program: site name and location, production system(s) involved, conservation objective and specific actions that secure wild food species (if any).**

The National Plant Genetic Resources Centre of the DARSS established an *in situ* field genebank for at the Lowveld Experimental Station in order to maintain wild species collections . Species in the field genebank include *Aloe saponaria* which was being over-harvested people from surrounding communities for income generation. Other species were found to occur within the area which was eventually fenced off to protect the diversity of species that occur in the area.*Agave sisalana* was rescued from an inundated area which is now occupied by the Lubovane dam, the second largest reservoir in Swaziland, following the initiation of the irrigated farming project which was mainly aimed to enhance the livelihoods of rural communities through irrigated farming, mainly sugarcane.

Table 17. *In situ* conservation or management activities or programmes for wild food species.

Wild food species conserved	**Site name and location**	**Size and enviro**	**Conserv ation objectiv**	**Actions taken**
Ximenia caffra L. var. *microphylla*	Lowveld Experiment Station/	Within the Govern		
Ximenia caffra var. *caffra*	Lowveld Experiment			
Sclerocarya birrea	Lowveld Experiment Station/	10 trees *In situ* field		
Aloe saponaria	Lowveld Experiment Station/	Thousa nds of plants *In situ*	Protectio n from over harvestin	
Aloe	Lowveld Experiment Station/	15 plants *In situ* field		
Agave sisalana	Lowveld Experiment Station/	5 plants *In situ* field	Rescued from inundate d area	

38 What activities are undertaken in your country to maintain traditional knowledge of wild food species (indicate if the extent to which these have already been described in sector reports)? How can traditional knowledge of wild food species be accessed and used to inform conservation and use decisions?

Reports on the implementation the CBD also note lack of programmes and national targets on t traditional knowledge (Swaziland Environment Authority; 2005; 2009).

The annual Agricultural shows have contributed towards awareness raising and maintenance of traditional knowledge of wild foods such as *Plectranthus esculentus* L. (Livingstone potato /"**umhlata**") and about the

importance of these foods to food and nutrition security as well as health. The challenge however for some of the plant species used as wild food and displayed in agricultural shows is that the use is not directly aimed at promoting conservation and sustainable use as well as the maintenance of traditional knowledge of wild foods but is instead threatening its future availability and use if continuously harvested unsustainably from the wild. The harvesting method (digging of roots in order to harvest the tubers) and time of harvesting during times of high moisture stress and extremely dry winter season both pose a major survival threat to the wild foods. Thus further research is required in order to promote the domestication and cultivation of plants used as wild foods as well as for medicinal purposes through backyard gardening or cultivation. This would hopefully promote sharing of traditional knowledge in order for communities to be encouraged to conserve and sustainably utilize wild foods.
The Swaziland Institute for Research in Traditional Medicine, Medicinal and Indigenous Food Plants (SIRMIP) within the University of Swaziland also conducts research on wild food plants.

The DARSS (Food Science and Technology and Horticulture Sections) has initiated some research to determine the nutritional content of some wild fruits species including *Sclerocarya birrea*, and *Ximenia caffra* and also establish the best propagation methods for the wild species in order to promote their propagation, use and conservation by communities in the country. Seed as well as vegetative (airlayering) propagation are both being investigated.

39. Provide any available information on gender dimensions with respect to the maintenance of and knowledge about wild food species. These may include differences in the roles and insights of women and men with respect to harvesting particular resources, monitoring their state, overseeing their ecosystem management.

In Swaziland, it is generally acknowledged that women and children are the main group responsible for collection of weedy vegetables. Men and older boys were traditionally responsible for hunting. Herd boys are knowledgeable about a broad range of species including birds, small mammals, fruit and others that they come into contact with and use when they are out looking after livestock. Young children may engage with catching insects such as termites and grasshoppers, again for use as snacks. People of all ages collect and eat fruit as they come into contact with them whilst walking or doing other activities.

Natural or human-made disasters and biodiversity for food and agriculture

This section collects information on natural or human-made disasters and their impact on and response from biodiversity for food and agriculture as a whole.

40. **Has your country experienced any natural or human-made disaster(s) that has had a significant effect on biodiversity for food and agriculture and/or on ecosystem services in the past 10 years? List in Table 18 those for which any information exists on their effect on biodiversity for food and agriculture and/or ecosystem services. Indicate the effect on different components or services as significant increase (2), increase (1), no change (0), some loss (-1), significant loss (-2), or not known (NK).**

The country has experienced a number of severe disasters in the last decade. These include five droughts experienced in 2007, 2008, 2009, 2010, 2011 and 2015. Other disasters include wildfires. In 2007, Swaziland experienced extensive fires which affected 7% of the land area leading to declaration of a natural disaster. The fire resulted in losses in plantation and natural timber with associated reduction in the forest industry productivity and employment. More than 20,000ha of pine and eucalypt plantation were affected with an estimated loss of US$45 million. Recent droughts have led to significant losses of livestock among

other impacts. Swazi Vac (2016) reports that between May 2015 and May 2016 the country lost 67,120 heads (11% of the national herd) due to the drought.

The Fisheries Department has reported that drought has led to the loss of a number of ponds established for aquaculture.

Table 18. Natural or human-made disasters that has had a significant effect on biodiversity for food and agriculture in the past 10 years in the country.

Disaster description	**Production system(s) affected (code or name)**	**Effect on overall biodiversity for food and agriculture (2, 1, 0, -1, -2, NK)**	**Effect on ecosystem services (2, 1, 0, -1, -2, NK)**
Wild fires	Livestock grassland-based systems: Subtropics	-1	-1
Wild fires	Planted forests: Subtropics	-2	NK
Drought	Livestock grassland-based systems: Subtropics	-2	NK
Drought	Fed aquaculture: Subtropics	-1	NK

41. B**riefly summarize any available information, including the year of the disaster, a description of the effects of the disaster on the different components of biodiversity for food and agriculture and/or on the effects on ecosystem services, and references to the supporting documentation.**

Analysis of the impacts of the recorded disasters on associated biodiversity and ecosystem services has not been done.

42. **Provide any available evidence from your country that changes in biodiversity for food and agriculture caused by natural or human-made disasters have had an effect on livelihoods, food security and nutrition.**

The 2007 fires resulted in closure of Sappi Usuthu Pulp Mill and downscaling of operations by Peak Timbers leading to loss of 728 direct and 4,368 indirect jobs. 169 homesteads were destroyed. Two people died and more than a dozen were injured with a total of 938 people affected in some way. The recurrent droughts make a significant proportion of the country's population vulnerable to hunger (Dlamini, 2007).

Table *3*.4: Natural disasters in Swaziland over the past decade

Year	Disaster	Number of people affected
2007	Drought	410 000
2008		287 634
2009		256 283
2010		170 000
2011		88 511
2010	Strong winds	1 000
2011		200
2008	Floods	272 000
2011	Lightning	200 families

Based on Manyatsi & Mhazo, 2014,

43. **Provide any available evidence that the enhanced use of biodiversity for food and agriculture has contributed to improving livelihoods, food security and nutrition in the context of a natural or human-made disasters. Describe and provide source of information.**

It has been reported that poorer households within the Lowveld where severe droughts are common have been reported to gain only 15% of their food requirement from their own production. Supplementing their food intake with wild foods is one of the coping strategies used by such households to meet their food intake needs (FAO/WFP, 2005; FAO/WFP 2015). More research is needed to quantify this aspect.

Invasive alien species and biodiversity for food and agriculture

44. **Are there invasive alien species identified in your country that have had a significant effect on biodiversity for food and agriculture in the past 10 years? List in Table 19 those for which any information exists on their effect on biodiversity for food and agriculture and/or ecosystem services. Indicate the effect on different components or services as strong increase (2), increase (1), no effect (0), some loss (-1), significant loss (-2), or not known (NK).**

Table 19. Invasive alien species that have had a significant effect on biodiversity for food and agriculture in the past 10 years.

Invasive alien species (scientific	Production system(s) affected (code or name)	Effect on components of biodiversity for food and	Effect on ecosystem services
Acacia mearnsii	Natural Forests Plantation Forests Grassland based	-1	NK
Ceasalpinia decapetata	Natural Forests Grassland based	-1	NK
Cereus jamacaru	Natural Forests Grassland based	-1	NK

Chromoleana odorata	Natural Forests Plantation Forests Grassland based livestock Aquatic ecosystems	-2 (Identified as a major threat to *Croton*	NK
Eucalyptus spp.	Natural Forests Plantation Forests Grassland based livestock	-1	-1 (water availability)
Jacaranda mimosifolia	Natural Forests Grassland based livestock	-1	NK
Lantana camara	Natural Forests Plantation Forests Grassland based livestock Aquatic ecosystems	-2 (Identified as a major threat to *Croton*	NK
Melia azedarach	Natural Forests Plantation Forests Grassland based livestock Aquatic ecosystems	-2 (dentified as a major threat to *Excoecaria madagasca*	NK
Opuntia spp.	Natural Forests Grassland based	-1	NK
Pinus spp.	Natural Forests Plantation Forests Grassland based livestock	-1	NK
Senna didymobotrya	Natural Forests Grassland based livestock	-1	NK
Sesbania punicea	Natural Forests Grassland based livestock	-1	NK
Solanum mauritanium	Forest mainly in the highveld	-1	NK
Pathenium	Grassland based livestock	-1	NK
Populus alba	Aquatic ecosystems	-1	NK
Psidium guajava	Natural Forests Grassland based livestock	-1	NK
Rubus spp.	Natural Forests Plantation Forests Grassland based	-1	NK
Solanum mauritianum	Natural Forests Plantation Forests Cultivated fields Aquatic ecosystems	-1	NK
Onychorhynch us mykiss	Fisheries	-1	NK

Micropterus salmoides	Fisheries	-1	NK
Cherax quadricarinatus	Fisheries	-1	NK

45. Briefly summarize any available information related to the invasive alien species listed in Table 19, including a description of the effects of the invasive alien species on the different components of biodiversity for food and agriculture and/or on the effects on ecosystem services, and references to the supporting documentation.

80% of the country's land area has been infested with at least one alien invasive species. Figure 15 shows the extent of infestation over the country's land surface.

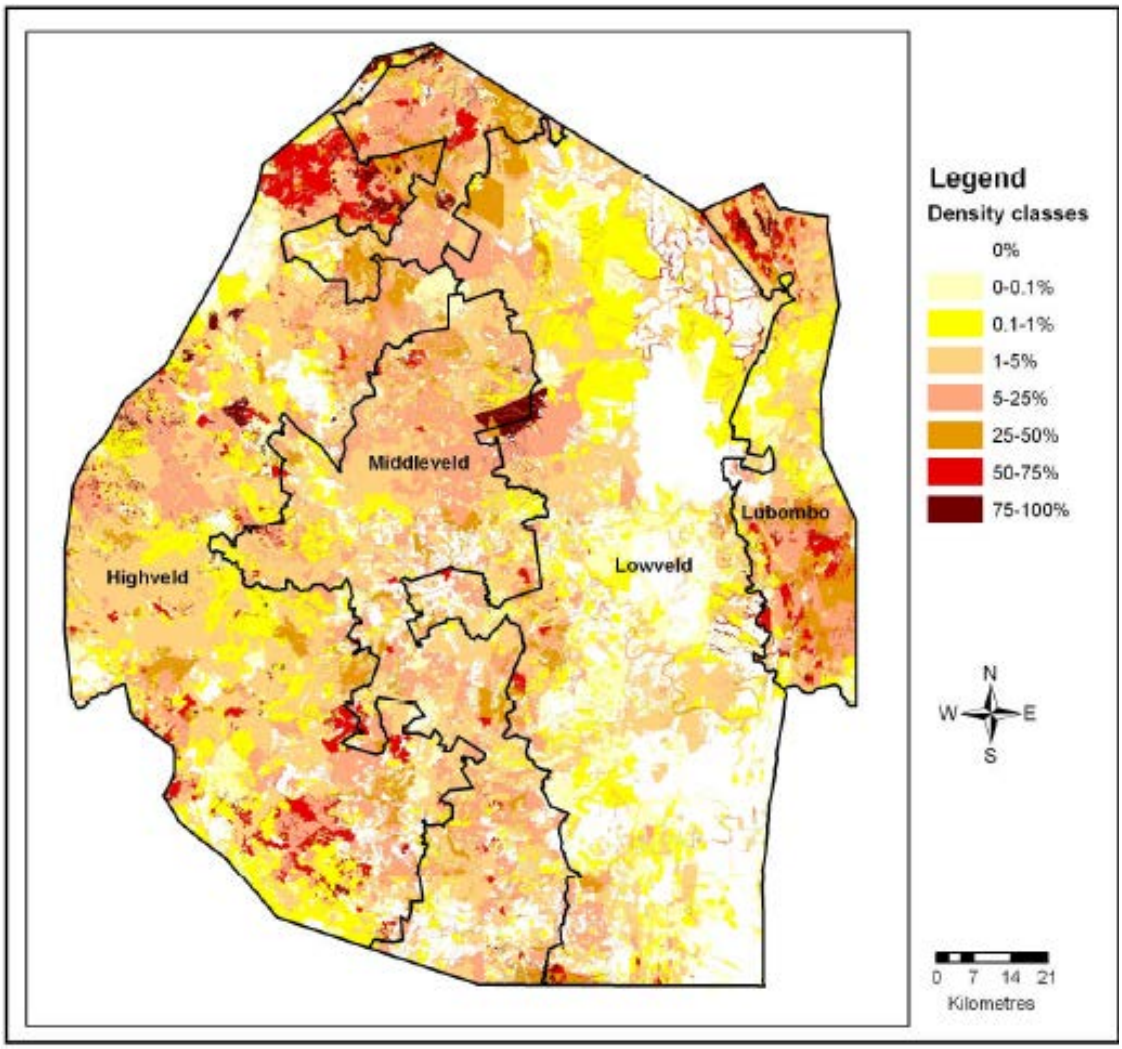


Figure 15: Extent of infestation by Alien invasive species in Swaziland

Source (GOS-2013[1]).

The Government of Swaziland declared Alien Invasive Plants a national disaster in 2005. The Second SOER identified the following as impacts of IAS in the country:

- Interference with run-off,
- Reduction of water availability due to high water uptake, and,
- Reduction of biodiversity.

One of the main ecosystem services reported to be impacted by IAS in the country is water availability. The SOER reports that water consuming IAS, mainly Wattle (*Acacia mearnsii*), *Chromalaena*, *Eucalyptus* spp. and *Lantana* are spreading in catchments such as the Mbuluzi & Nkomati resulting in the reduction of water resources available for irrigation (GOS-2013[2]). The Government of Swaziland declared Alien Invasive Plants, in particular *C. odorata and L. camara* a national disaster in 2005. The SOER identifies the following as impacts of IAS in the country:

- Interference with run-off: IAS such as black wattle (*Acacia mearnsii*), eucalyptus (*Eucalyptus grandis*) and others have invaded waterways and drainage lines and are thus impacting on the country's aquatic biodiversity.
- Reduction of water availability due to high water uptake: A study on water utilisation in the Komati and Mbuluzi river basins reveals that 6% and 6.4% of the Komati and Mbuluzi river catchments respectively are infested by IAS. The study also showed that 6.3 and 10.6 % respectively of the two catchments is used by IAS.
- Reduction of biodiversity due to out-competition: IAS such *C. odorata* have been reported to be out-competing local species and changing the ecosystems and habitats such to the extent that indigenous species can no longer survive (GOS-2013[2]).
- Information on the impacts on specific production systems and even specific ecosystem services is not available. The costs of clearing IAS in the country have been estimated at E665 million (GOS-2013[2]) i.e. US$ 55 Million.

46. Has biodiversity for food and agriculture contributed to managing the spread and proliferation or controlling established invasive alien species in your country? If yes, provide information on the invasive alien species involved, the components of biodiversity for food and agriculture and any indication on how the components of biodiversity contributed to managing the spread and proliferation or controlling established invasive alien species in your country. Provide references to the supporting documentation.

Following declaration of AIS as a natural disaster, the Government of Swaziland, engaged contactors to clear Alien Invasive Plants. Between 2006 and 2009 contractors cleared about 15000 ha of infested land. This was followed by three follow-up controls on cleared sites. In 2008/2009 the project was restructured to include public awareness creation, surveying and mapping of the intensity and distribution of selected Invasive Alien Plant Species (IAPs), field combating operation, Development of the National Strategy for control and management of IAPs, and review of a draft Forest Bill (2002) to include the control and management and IAPS (GOS-2013[2]). More can be done to encourage farmers and communities to control these weeds around homesteads and communal grazing lands.

Similarities, differences and interactions

47. Comment on those aspects with respect to the state, trends and conservation of associated biodiversity or wild food biodiversity in relation to the state, trends and conservation

of sector genetic resources. It would be helpful to provide your observations under the following headings:

a. main similarities between associated biodiversity, wild food diversity and the different sectors;

In common, research in most sectors focusses on control of associated biodiversity that is detrimental to production systems. In the livestock sector, Ecto-parasites are controlled through a system of dip tanks located on both private land and SNL. As of 31 December, 2014, there were 627 plunge dip tanks and 151 spray dips that were reported to be operational in the country (Department of Livestock & Veterinary Services, 2014). The dip tanks are used for both treatment for ecto-parasites as well inspection for communicable diseases such as Foot & Mouth Disease (Department of Veterinary and Livestock Services, 2014). This programme has been largely successful in control of tick-borne diseases but may be having impacts on associated components of biodiversity. For example, it has been suggested that dipping chemicals are a major threat to the survival of the Yellow-billed ox-pecker in Swaziland (Mondjem *et al,* 2003). Similarly, a study aimed at investigating dip-tank effects on woody vegetation cover and encroachment found that large areas around dip tanks are under heavy bush encroachment in communal savannah areas of Swaziland across various soil types (Beyene, 2013).

In the crop sector across both production systems, there is significant investment in research and documentation of pests and diseases as well as control strategies. This research is conducted by DARSS for most crops whilst the Swaziland Sugar Association also conducts similar research for sugar cane. Other components of associated biodiversity, including beneficial insects and microorganisms are largely ignored, save for sporadic studies by the University of Swaziland and other stakeholders.

b. Major differences between associated biodiversity, wild food diversity and the different sectors;

Both use of wild food diversity and genetic resources for food and agriculture are relatively well documented. Components of associated biodiversity on the other hand are poorly understood and very little has been done towards their documentation in the country. The interactions between genetic resources for food and agriculture across all sectors and components of associated biodiversity have been largely ignored in research. The same can be said for interactions between wild food species and components of associated biodiversity. This means that impacts on of use of biodiversity for food and agriculture on associated biodiversity cannot be monitored and may in future pause challenges for sustainability of production systems.

c. Synergies or trade-offs between associated biodiversity, wild food diversity and the different sectors.

The major trade-off is with regards to enhanced productivity against long term-resilience of production systems. Indigenous breeds and varieties offer opportunities for resilience especially in the light of increasingly difficult environmental conditions such as more frequent, drier and longer droughts. This however often conflicts with the need at individual level and the national goal of enhanced productivity as a driver to economic development. In the livestock sector, the trade-off is with respect to compromising the purity of indigenous breeds of animals versus increasing productivity through introduction of exotic breeds. In the crop sector, the trade-off is with respect to traditional varieties which are adapted to local conditions and have a wider genetic base but often lower productivity against adoption of improved varieties which with optimum levels of inputs and water offer improved yields etc.

Gaps and priorities

48. With respect to the state, trends and conservation of associated biodiversity and ecosystem services:

a. What are the major gaps in information and knowledge?

Indications are that associated biodiversity and ecosystem services are not adequately understood across all production sectors. Major gaps include:

- Documentation of beneficial associated biodiversity for all production systems in the country,
- Monitoring trends in the state of components of associated biodiversity across all sectors,
- Systematic studies on ecosystem services supporting functioning of each production system in the country,
- Monitoring trends in functioning of ecosystem, services across all production systems,
- Identification of priorities for management.

b. What are the main capacity or resources limitations?

- Limited human resource pool across most stakeholder institutions,
- Inadequate infrastructural capacity for research and monitoring e.g. The Fisheries Section currently lacks a boat for use in monitoring activities.
- Inadequate budgetary allocation.

c. What are the main policy and institutional constraints?

National policy and other documents are silent on associated biodiversity whilst ecosystem services are mentioned in generic terms. There is a need to elaborate appropriate policy statements to ensure mainstreaming of associated biodiversity and ecosystem services in the national agenda.

d. What actions are required and what would be the priorities?

49. **. With respect to the state, trends and conservation of wild resources used for food:**

a. What are the major gaps in information and knowledge?

The fisheries sector is the most poorly understood of all the production systems. Efforts aimed at understanding the status of genetic resources and impacts of AIS need to be enhanced. The status of the country's fish stocks is not adequately understood whilst some birds associated with the country's aquatic ecosystems are reported to be of conservation concern. There is an urgent need for knowledge to be generated on the country's fish stocks and other components associated with the country's aquatic ecosystems including the effects of exotic ecosystems.

Non-cultivated food species are associated with traditional crops under the rain-fed production system. The exception is with respect to the cotton sector as vegetables are not collected because of heavy use of pesticides. Use of chemicals such as herbicides in commercial irrigated crops makes is difficult or even impossible to harvest vegetables. The major gap is with regards to characterization of diversity and widening the *ex-situ* collection held at the National Plant Genetic Resources Centre. An additional dimension is the need to explore opportunities for integrating traditional knowledge into decision-making and practice.

Wild fruit species are more commonly associated with natural regenerating forests across the country's forest landscape depending on species biology and prevalent environmental conditions. Most of these are

reported as being of least concern in the Tree Atlas (Loffler & Loffler, 2005). Many of the country's plant species reported to be of conservation concern are associated with the forest sector and are mainly used as traditional medicines. Interactions between species have not been studied. It is not clear what impacts loss of medicinal plants will have on other forest genetic resources in the long term. The major gap in this regard is generation of knowledge on:

- Quantification and valuation of the contribution of wild foods to food security and nutrition,
- Species interactions with other components of biodiversity, and
- Characterization and assessment of intra-and inter species diversity.
- Seed propagation studies for priority fruit species.

b. What are the main capacity or resources limitations?

- Inadequate capacity to support establishment of a documentation system for forest reproductive material.
- Inadequate human and infrastructural capacity to support proper functioning of the National Tree Seed Centre.
- Budgetary constraints preventing establishment of the National Botanical Garden.
- Inadequate human capacity to support molecular characterization of the country's genetic resources across all sectors.
- Inadequate capacity (Humans and infrastructure) to support regular monitoring programmes across most sectors.

c. What are the main policy and institutional constraints?

The main constraint is the largely fragmented institutional arrangements with multiple policies, sometimes with conflicting mandates. This results in poor coordination and sometimes duplication of effort against a background of limited resources.

d. What actions are required and what would be the priorities?

- Allocation of adequate budget to support monitoring activities,
- Establishing closer collaboration arrangements with relevant stakeholder institutions,
- Establishment of a national research agenda setting platform informed by e.g. the NBSAP and national policy documents,
- Establishment of a national platform for sharing research results and sharing lessons and best practice.

50. **With respect to the impact and response to natural or human-made disasters and biodiversity for food and agriculture**:

a. What are the major gaps in information and knowledge?

The lead agency with regards to disaster response is the Deputy Prime Minister's Office. Swaziland has developed a National Disaster Risk Management Policy (GOS, 2011). The National Disaster Risk Management Policy (NDRMP) identifies a number of gaps in knowledge. These are:

- Generation of knowledge and documentation of coping mechanisms with a view to strengthening them.
- Assessment of trends in these coping mechanisms.
- Assessment of the ability/capacity of people, organisations and systems to face and manage adverse conditions using available resources.

In addition to these, it is important to Quantify and valuate the contribution of wild foods in coping with shocks and stresses with a view to informing policy and decision making.

As previously discussed in this Report, wild foods and other components of biodiversity play a role as a component of coping and resilience mechanisms to natural disasters in the country. The main gap, with respect to biodiversity for food and agriculture is to systematically assess the role of wild foods and other components of biodiversity in building resilience to natural and human-made disasters.

b. What are the main capacity or resources limitations?

The capacity gaps include

- Inadequate human resources with many stakeholder institutions having the minimum staff complement leading to personnel being burdened with multiple responsibilities,
- Inadequate infrastructure for the level of research required to make a meaningful contribution to the understanding of the issues. This includes, equipment, laboratory facilities, field equipment and transport.
- Budgetary limitations.

c. What are the main policy and institutional constraints?

The country has developed a number of documents related to Disaster Risk Mitigation. The major limitation of these instruments is that they do not give adequate coverage of wild foods as coping mechanism despite evidence that they are an important component.

d. What actions are required and what would be the priorities?

There is need to highlight the role of wild foods in disaster risk reduction at policy level. A second priority is to enhance collaboration and cooperation between the National Disaster Agency and key institutions involved with biodiversity used as food from the wild. Other priorities include

- Allocation of adequate human resources in key institutions,
- Adequate budgetary allocation to support knowledge generation and monitoring.

51. **With respect to the impact of invasive alien species on biodiversity for food and agriculture:**

a. **What are the major gaps in information and knowledge?**

Although there has been some effort in raising public awareness on invasive alien species, indications are that this has not been adequate to stimulate the necessary action at individual and community level that will ensure sustainable success. For example, despite the awareness creation effort, plants listed as weeds continue to be allowed to grow as part hedges and weeds within homesteads and communities.

Another gap is with regards to control methods. There is a need to learn from lessons in the international arena with a view to developing multi-pronged control methods e.g. opportunities for biological control in addition to mechanical and control methods.

With regards to aquatic invasive species, the main gap is on understanding the impacts these exotic species are having on other species and the provisioning of ecosystem services.

In both cases, there is need to evaluate the costs associated with loss of biodiversity and ecosystem services as a result of IAS to inform decision making, Whilst it generally acknowledged that the cost of eradicating IAS is considerable, it is also true that the costs of non-action are higher.

b. **What are the main capacity or resources limitations**

Initiatives aimed at eradicating Invasive Plant Species are led by the Department of Forestry which is under-resourced considering their mandate. Another capacity constraint relates to the financial cost of eradicating invasive alien plants. The SOER report states that Government suspended the AIS clearing programme because of budgetary constraints (GOS-SEA-2013[2]).

c. **What are the main policy and institutional constraints?**

There is need to enhance policy links between prevention of IAS, early detection and management of established infestations. This would also entail enhancing linkages between the Departments of Forestry, Fisheries Section, other institutions mandated with protection of plants and animals and development of a comprehensive biosecurity policy and legislation which are currently lacking in Swaziland.

d. **What actions are required and what would be the priorities?**

- Establishment of a biosecurity steering committee to review current policy and regulatory gaps,
- Establishment of an interim arrangement to enhance prevention and early detection
- Enhancing public and community awareness,
- Valuation of costs of no action on ecosystem services at community level, and,
- Establishing and supporting community driven eradication interventions.

The use of management practices or actions that favour or involve the use of biodiversity for food and agriculture

This section looks for information on the extent to which biodiversity maintaining management practices and diversity based practices are in use in your country.

52. For each of the production systems present in your country indicate in Table 20 the extent of use of management practices that are considered to favour the maintenance and use of biodiversity for food and agriculture.

In the table indicate the percent of total production area or quantity under the practice (where known), changes that have occurred over the last 10 years in the production area or quantity under the practice (significant increase (2), some increase (1), no change (0), some decrease (-1), significant decrease (-2), not known (NK), not applicable (NA)), and any identified change in biodiversity for food and agriculture associated with the practice (strongly increasing (2) increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK), not applicable (NA)).

Table 20. Management practices that are considered to favour the maintenance and use of biodiversity for food and agriculture.

Production systems	**Management practices** (Place pointer on the management practice name for a description)	**Percent of production are**	**Change in production are**	**Effect on biodiversity**
Rain-fed crops	Integrated Plant Nutrient Management	Majority of home	**NK**	1
Rain-fed crops	Conservation agriculture	Currently	**NK**	NK
Rain-fed crops	Water management practices, water harvesting	Limited??	NK	NK
Rain-fed crops Grassland-based livestock	Home gardens	Majority of home	**NK**	2
Protected areas	Areas designated by virtue of production features and approaches	3.9 % of the count	0	2
Grassland-based livestock (Communal / TDL)	Areas designated by virtue of production features and approaches	2.7% of the country	0	2

Where evidence exists of an effect of any of these practices on biodiversity for food and agriculture, provide a brief summary of the effect, the components of biodiversity for food and agriculture affected, and available indicators. Include any available references or reports.

Based on the definitions provided in the guidelines for preparation of country Reports, the following management practices that favour use of biodiversity for food and agriculture are practiced in Swaziland.

Integrated Plant Nutrient Management: In Swaziland, Integrated Plant Nutrient Management (IPNM) takes the form of predominant use of kraal manure and other animal waste including poultry as fertiliser in fields and gardens. Almost all smallholder farmers who keep animals on SNL use kraal manure in their fields. Even those who have no animals are able to access kraal manure from neighbours and relatives in the community. In a survey involving 120 smallholder farmers and 54 largescale farming operations, it was reported that 100% of smallholder farmers apply animal waste as fertiliser in their fields compared to 72% of largescale operators. 38.6% of largescale operators reported that they sell animal waste to other farmers to use in their fields whilst no smallholder farmers sold animal waste. 23% of smallholder farmers gave animal waste to neighbours for free whilst 17.3% largescale farming operations gave animal waste away for free (Mijinyawa & Dlamini, 2006).

Conservation agriculture: Conservation agriculture (CA) was introduced into Swaziland by the Ministry of Agriculture (MOA) with support from FAO and the Cooperation of the Development of Emerging Countries (COSPE) in 2002. It was piloted in two sites i.e. Shewula community in the north-east of the country and Kambhoke community in the south. In 2006, CA was rolled out to cover the whole country. Participating farmers were supplied with the CA equipment and inputs. Advocates for CA in the country include the Ministry of Agriculture, the private sector and civil society. Through Swaziland Agricultural Development Project, 2118 farmers have been trained in sustainable agriculture, with 1141 (54%) of those trained being females. 1200 of the farmers trained prepared 288 ha using CA techniques through the assistance of International Relief & Development (IRD). The farmers produced maize, sorghum and cowpeas (Manyatsi, & Mhazo, 2014).

Constraints identified in adopting and upscaling CA in the country include:

- Lack of a local infrastructure to support the manufacture and repair of CA equipment with heavy reliance on international suppliers.
- Land tenure issues (insecure land rights under SNL tenure) making it impossible for farmers to use it as collateral
- Open access system in place in after harvesting leaves soil without cover whilst CA requires permanent soil cover
- Insufficient biomass and cover throughout the year permanent soil cover and integration of livestock into CA (Manyatsi & Mhazo, 2014).

Water management practices, water harvesting: Vilane & Mwendera (2011) carried out a survey aimed at determining the extent of rainwater harvesting and the technologies used by households in the country between September and January, in 2007. The sample population included rural households that practiced rainwater harvesting in the four ecological zones of Swaziland, i.e. highveld, middleveld, lowveld and Lubombo Plateau. Because it was known that more households carry out rainwater harvesting in Lubombo than elsewhere in the country, the study used purposive sampling whereby out of thirty (30) sampling sites selected, 12 were in the lowveld, and six from each of the remaining ecological zones. Out of the final

sample of 714 households that were eventually used, it was found that 99.6% of the 714 households studied harvested water using roof catchments to aboveground reservoir technologies. 0.1% households sampled harvested water using roof catchments to underground reservoir technologies, whilst 0.3% used vegetated ground. Roof catchments ranged in size from 20 m^2- 100$m^{2.}$. It is not clear what proportion of households practice rainwater harvesting in Swaziland. Zwane (2004) has previously reported that rainwater harvesting in Swaziland can be observed at a small scale in a relatively few households. Even where it used, it appears that rainwater harvesting is used more for potable water thus it is difficult to draw conclusion about contribution of the practice to sustainable use of biodiversity.

The potential yield per catchment area based on catchment sizes of 20m^2 and 50m^2 and recorded Mean Annual Rainfall per agro-ecological zone as determined in a subsequent study by Vilane *et al.* (2010) are shown in Table 4.1. This shows that there is potential for use of rainwater harvesting for some applications in agriculture.

Table 4.1: Potential Yield by Catchment Area

Agro-ecological Zone	Mean Annual Rainfall (mm)	Potential Yield Per Catchment Area (Litres)	
		20 m^2	**50 m^2**
Highveld	1068	17088	42720
Upper Middleveld	816	13055	32638
Lower Middleveld	1022	16352	40879
Western Lowveld	773	12289	30723
Eastern Lowveld	671	10739	26846
Lubombo Plateau	912	14582	36456

Home gardens: In Swaziland, the majority of households on SNL are engaged in a range of productive activities involving various livestock and crop species in addition to off land activities that combine poultry, livestock, fruit, crops, home gardens etc. As an example, one of the households visited during preparation of this report in engaged in rearing of cattle, goats and indigenous chickens, a small piggery and also grows maize, cucurbits and tobacco which is dried and sold on the farm. The range of agricultural activities in this homesteads is shown in Figure 16.

Areas designated by virtue of production features and approaches: Swaziland uses protected areas as the major vehicle for biodiversity conservation taking into account the country's ecosystems and landscapes. Six National Protected Areas were established initially for conservation of animals. The six National PAs include Malolotja, Mlawula and Mantenga managed by the Swaziland National Trust Commission (SNTC) and Mlilwane, Hlane and Mkhaya managed by Big Game Parks (BGP). Mlilwane and Mantenga adjoin each other (together making up 5,300 ha) as do Hlane and Mlawula together making up 37,888 ha. The six protected areas together comprise 69,530 ha i.e. 3.9% of the country, however, only 50,118 ha of these national PAs have been gazetted.

There are also a number of Informal PAs in Swaziland which qualify as PAs in that they are conserved through "other effective means" though they are not gazetted under the SNTC, Game or Flora Protection acts. These include IYSIS at just over 20,000 ha, the Big Bend Conservancy, Jozini Big 6, Mhlosinga and

Mbuluzi ranging from just over 13,000 ha to just over 2,300 ha respectively. Most of the other Informal PAs are under 1,500 ha in size, but together these areas make up at least 46,977 ha i.e. 2.7% of the country (KOS/UNDP undated). The Protected areas estate is shown in Table 5.2 and Figure 17. Conservancies such as Shewula Trust also contribute to conservation of biodiversity.

Figure 16: Components of typically diverse farming activities in a single Swazi homestead

Table 5.2: Swaziland's Protected Area Estate

UNDER MANAGEMENT OF SNTC		UNDER MANAGEMENT OF BIG GAME PARKS		NOT GAZETTED	
NAME	**AREA (HA)**	**NAME**	**Area (HA)**	**NAME**	**AREA (HA)**
Malolotja Nature Reserve	16,292 ha	Hlane Royal National Park	17 000 ha	Hawane Nature Reserve	100
Mantenga Nature Reserve	200	Mkhaya Game Reserve (PVT)	10,050 ha	Mbuluzi Game Reserve (PVT)	2400
Mlawula Nature Reserve	17 400	Mlilwane Wildlife Sanctuary	4 700	Mhlosinga Nature Reserve (PVT)	400
				Muti Muti	200
				Nisela Safaris (PVT)	1

		5 0 0
	Ovendale Nature Reserve (PVT)	2 0 0
	Phophonyane Falls Nature Reserve	6 0 0
	Shewula Community Nature Reserve	3 2 0 0
	Shonalanga Private Reserve	1 0 0
	Sibetsamoya (PVT)	4 0 0
	Simunye Nature Reserve (PVT)	1 9 0 0

The Strengthening the National Protected Areas System of Swaziland (SNPAS) Project has as its main objective “to effectively expand, manage and develop Swaziland’s protected area network in order to adequately protect the biodiversity and landscapes of the country” (Kingdom of Swaziland, undated). It is envisaged that this project will significantly enhance the country’s protected area estate.

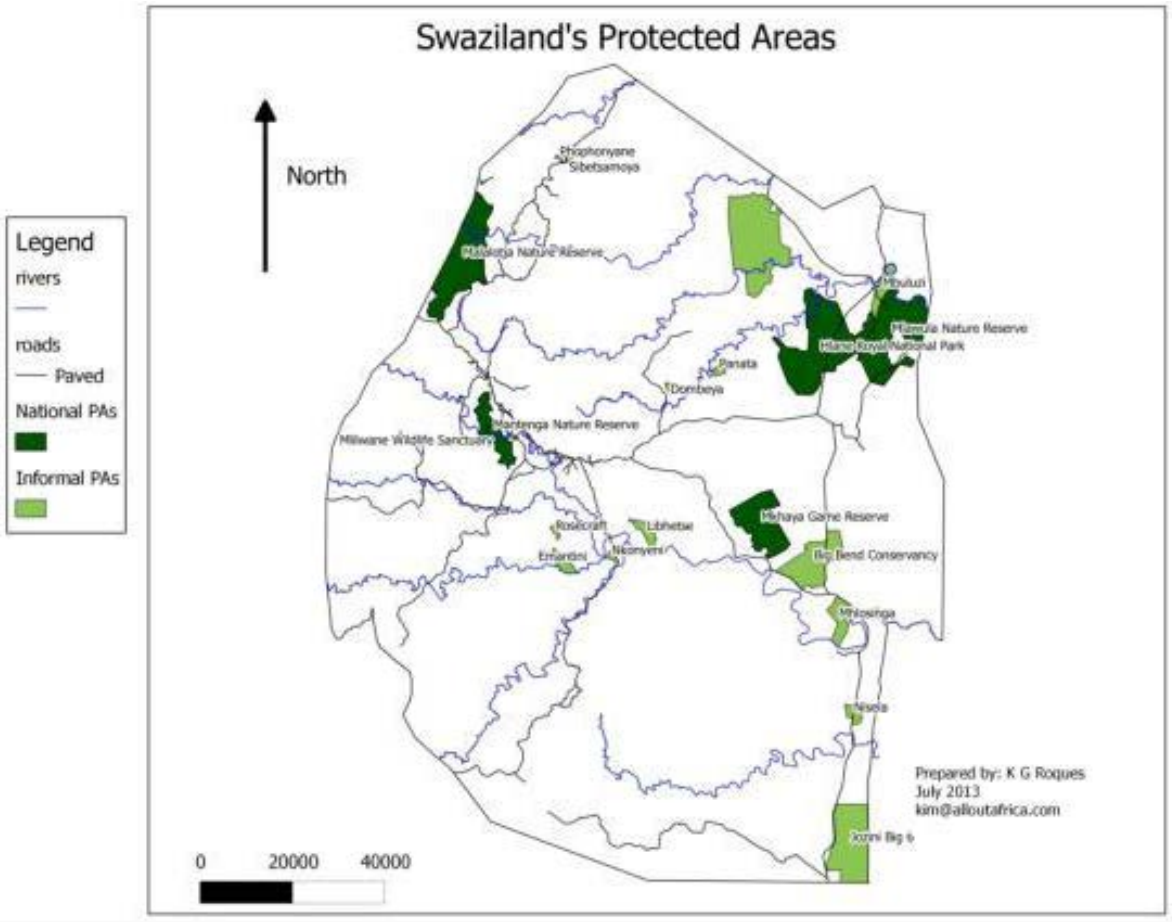


Figure 17: Swaziland protected area estate

53. For each of the production systems present in your country indicate in Table 21 the extent of use of diversity based practices that involve the use of biodiversity for food and agriculture.

In each table indicate the percent of total production area or quantity under the practice (where known), changes in the production area or quantity under the practice that have occurred over the last 10 years (strongly increasing (2), increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK)) and any identified change in biodiversity for food and agriculture associated with the diversity based practice (strongly increasing (2) increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK)).

Table 21. Diversity based practices that involve the enhanced use of biodiversity for food and agriculture.

Production systems	Diversity based practices (Place pointer on the diversity based practice name for a description)	Percent of production area	Change in production area	Effect on biodiversity
Grassland-based livestock/ Rain-fed crops	Land restoration/ reclamation	Communities	NK	NK

Briefly summarize the information that exists on the effect of the diversity based practice on different components of biodiversity for food and agriculture. Indicate where practices used in a production system are affecting biodiversity for food and agriculture in another production system. Include any available references or reports to support the evaluation given above.

There is no information available on this aspect.

54. List and briefly describe any specific programmes or projects that have been undertaken in the country to support any of the practices listed in Table 20 and Table 21. Provide information where available on what types of activities were supported, areas and numbers of farmers, pastoralists, forest dwellers and fisherfolk involved, state and outcome with respect to components of biodiversity for food and agriculture.

World Vision, working with Swaziland Water and Development Enterprise (SWADE) has been supporting communities in the Lowveld, mainly Sithobela area to reclaim dongas and establish agriculture projects through the Working for Food Programme. Other communities were supported by Conserve Swaziland, a Non-Governmental Organization.

The Ministry of Tinkhundla Administration and Development has plans to train up to 100 communities on water harvesting technologies. The Ministry of Agriculture also has a programme of training farmers on Climate Smart Agriculture.

Sustainable use of biodiversity for food and agriculture

Sustainable use of biodiversity for food and agriculture ensures its utilization in ways that do not compromise its continuing availability and its use by future generations. Sector reports will provide information on sustainable use of the different sector genetic resources. Here the focus is therefore on associated biodiversity and on wild foods.

55. What are the major practices in your country that negatively impact associated biodiversity and/or wild foods? Answers can be provided in Table 22 where examples of general types of practices are listed.

Table 22. Major practices that negatively impact associated biodiversity and/or wild foods in the country.

Types of practices	Major practice	Description	Reference
Over abstraction of water e.g. for irrigation and other uses	Yes	Some of the country's rivers have been reduced significantly in size due to abstraction droughts more recently	Jury *et al.*, 2007).
Heavy use of agrochemicals	Yes	Aquatic ecosystems are affected by polluted drainage water. A four-fold increase in nitrate downstream of the sugar estates in the Mbuluzi river,	JTK Associates, 2003) Gustafson &
Over-use of chemical control mechanisms (e.g.	Yes	It has been suggested that the yellow-billed ox-pecker in Swaziland has been affected by dipping chemicals	Monadjem *et al.*, 2003
Improper use of fire	Yes	Almost every year, uncontrolled fires ravage the country's grasslands, forests and other	Dlamini, 2007 Manyatsi &
Practices leading to soil and water degradation	Yes	A significant proportion of the country is vulnerable to erosion. This is further exacerbated by heavy grazing resulting from a high animal population beyond	
Over-stocking, over-grazing and use of same tracks to dip-tanks and grazing lands on SNL	Yes	Livestock is driven along the same paths and routes to grazing lands and dip tanks leading to soil erosion. Stocking rates on SNL are generally higher than carrying capacity	Sweet & Khumalo, 1994
Uncontrolled forest clearing	Yes	Land use change, mainly conversion of forest to crop land is one of the main drivers of biodiversity loss in the country	GOS-SEA (2013[2])
Fishing in protected areas	?	In Swaziland the problem appears to be more of use nets despite this being illegal in the	
Overharvesting		This appears to be more of a concern with plants destined for medicinal use and sale. In some food plants, especially where the desired is underground, the problems appears to be related	
Other [*please specify*]:			

Please comment on the reasons why the practices are in use and discuss if trade-offs are involved.

Sugarcane is Swaziland's most important crop in terms of Forex earnings and employment. Assurance of a market and preferential trade under for example African, Caribbean and Pacific (ACP) countries and the EU. Sugarcane alone accounts for more than 96 % of the country's water in irrigation. Because it has been identified by Government as a major vehicle for stimulating growth and development of the smallholder

sector, a number of irrigation-based initiatives as discussed elsewhere in this report have led to significant land use change to irrigated sugarcane.

There are a wide range of factors that have contributed to improper use of fire. These include the need to clear weeds in cultivated fields, harvesting of honey, management of grazing resources to stimulate new growth etc. Significantly drier and longer winters have contributed to the wildfires that have become commonplace.

56. Briefly describe any actions and counter measures taken to limit unsustainable use and/or support sustainable use of associated biodiversity and/or wild foods.

There is a wide range of legislation that seeks to limit unsustainable use of biodiversity in the country. This includes:

- **The Forests Preservation Act, 1910 (Act 14/1910):** It provides for the preservation of trees and forests growing on Government land as well as on Swazi Nation Land (SNL). The Act prohibits cutting, damaging, removal, sale and purchase of indigenous timber without the permission of the Minster or other designated authority. It also prohibits cultivation and other developments within 30yards of indigenous forests and setting or spreading fire on land on which indigenous timber forest is growing on both SNL and Government Land.
- **The Wild Birds Protection Act, 1914:** It seeks to ensure protection of wild birds by prohibiting sale and exportation of the plumage and skins of wild birds without a permit from the Ministry of Agriculture. A permit is also required for capture and sale, export or exposure for sale and export as well as confinement of wild bird
- **The Protection of Fresh Water Fish Act, 1937: This Act** seeks to provide for the protection of fresh water fish. It empowers the Minister to pronounce closed seasons during which fishing, capture etc. will be prohibited in particular districts and/or areas of water. The Act also prohibits use of nets of any material for fishing or capture of fish as well as the use of explosives to destroy fish.
- **The National Trust Commission Act, 1972:** This Act established the Swaziland National Trust Commission (SNTC) as a body corporate and detailed the procedures for its operations. The SNTC was established with the objective of preserving both the cultural heritage and conserving the natural heritage of the Kingdom of Swaziland. The Act empowers the Minister, upon recommendation of the SNTC to proclaim protected areas which may be national parks with the purpose of promoting and conserving indigenous animal and plant life and eliminating non-indigenous animal and plant life within the area of a park or reserve.
- **The Grass Fires Act, 1995:** The Act is aimed at controlling grass fires in the country by prohibiting property owners and occupiers from burning grass at intervals shorter than 24 months.
- **The Flora Protection Act 2000:** The 2000 Act repealed and replaced its predecessor i.e. the Flora Protection Act (Act No. 45 of 1952) with the intention of providing for more effective protection of indigenous flora and related issues. The Act prohibits picking, plucking, gathering, cutting, uprooting, causing injury, breaking, destroying or processing of any part of protected flora, including seeds except where a permit has been granted by the Minister.
- Other relevant instruments include the Game Control Act 1947, the Game Amendment Act 1953 and the Private Forests Act 1951.

Whilst these instruments are in place, a challenge still remains with regards to enforcement. Another limitation is that most of this legislation is outdated and is heavily reliant on punitive measures.

Another countermeasure is awareness raising initiatives aimed at enhancing the public's understanding of sustainable use. These include SNTC's National Environmental Education Programme, campaigns by Stakeholder institutions on Media, the National Trade Fair and other vehicles.

57. Provide in Table 23 any information available that lack of biodiversity for food and agriculture is limiting food security and nutrition, and/or rural livelihoods in the different production systems in your country. Indicate the production systems affected together with any information on the extent of problem (significant lack (2), some lack (1)), describe the effects on livelihood, food security and nutrition, and the components of biodiversity for food and agriculture that are limited.

Table 23. Effect of the lack of biodiversity for food and agriculture on production, food security and nutrition and livelihood.

Production system	Biodiversity component	Extent of pro	Effect on food secur	Effect on livelihood	Reference
Rain-fed crops (cotton)	Variety diversity (Climate smart). Industry currently based on a single variety in the country	2	Cotton has been the only cash crop that allowed house holds in the	Loss of interest in cotton production impacting downstream sectors (textile and	Swaziland Cotton Board

The contribution of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification

This section looks for information on the direct contributions of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification. It is concerned specifically with the combined use of genetic resources coming from different sectors, the use of all types of associated biodiversity, the use of wild foods and, where information exists, other important wild products.

Note the ways in which biodiversity for food and agriculture contributes to food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification are often linked. Answers to the requests for information below may therefore be combined.

58. Where available, provide information that increasing the amount of biodiversity for food and agriculture, including associated biodiversity, in production systems in your country have improved the following:

a) productivity;
b) food security and nutrition;
c) rural livelihoods;
d) ecosystem services;
e) sustainability;
f) resilience;
g) sustainable intensification.

What specific actions have you undertake to strengthen the contribution of biodiversity for food and agriculture to improving these outcomes? For each of these aspects, briefly describe the nature and scale of the actions implemented, the production systems involved, and the outcomes, results obtained or lessons learned from these actions.

Through support and promotion of the broiler industry, the country has been able to produce enough chickens to meet her national need. On SNL, the broiler sector is dominated by women hence this has contributed to improving the status of women and is also contributing to food security and nutrition and rural livelihoods. Efforts by Ministry of Agriculture and SWADE of promoting indigenous chickens has also stimulated a lot of interests in this sector, also dominated by women contributing to some of these goals.

The Swaziland Agricultural Development Project has been able to engage 20 000 farmers through a range of interventions ranging from vegetable gardening to transforming subsistence farming into commercial enterprise thus contributing to the above objectives.

Promotion of beef feedlot ting by SWADE has also enabled women to participate in the beef sector which has historically been dominated by men.

Where available provide information on the components of biodiversity for food and agriculture involved, the stakeholders involved and the gender aspects of these actions. Note that information on policies, legislation or regulations should be reported in Chapter 5 and your response here should be concerned with interventions at production system level.

59. Do you have information on the proportion of the population in your country that uses wild food on a regular basis for food and nutrition? If available, include information such as the proportion of the diet that is collected from the wild in normal time and in times of scarcity, drought, natural and human-made disaster, and the degree to which wild foods are used (for subsistence, supplementing, nutrition, other).

Provide explanations and additional information as regards the gender differences in the patterns of use, management and consumption of wild food, including data disaggregated by sex.

A detailed analysis conducted by Ogle & Grivetti (1985) involving a sample of 221 adults and 141 children revealed that as many as 220 plant species representing 59 families are used by Swazi people for food. All 351 subjects were found to use some wild plants for food. The analysis also showed that among the wild plants used for food, some can be considered central to the Swazi diet being consumed by the majority of

people in the country. Three species i.e. *Amaranthus, Bidens* and *Corchorus,* were used frequently by two thirds of the study population and, 20 leafy species were found to be frequently used by at least 50% of adults in at least one ecological zone. Analysis of 133 main meals among 43 subjects showed that wild species accounted for 39% of the dietary intake.

The adoption of ecosystem approaches

60. Describe in Table 24 the extent to which you consider that ecosystem approaches have been adopted for the different production systems in your country (widely adopted (2), partially adopted (1), not adopted (0), not applicable (NA)) and indicate whether ecosystem approaches are considered of major importance (2), some importance (1), no importance (0), not applicable (NA). You may also want to describe landscape approaches that have been adopted in your country.

Swaziland's First NBSAP advocated an ecosystem based approach to biodiversity management. Despite this, there are no actual, interventions that have been taken using this approach in the country. The SNPAS project is likely to yield a number of cases in this regard. There are possibly lessons that can be drawn from the protection worthy areas that integrate a number of enterprises taking into account sustainability issues.

Table 24. Adoption of and importance assigned to ecosystem approaches in production systems in the Country.

Production system	Ecosystem approach adopted (name)	Extent of adoption (2,1,0,NA)	Importance assigned to the ecosystem approach
Crops/Forest	Agroforestry	1	1

61. For each production system in which an ecosystem and landscape approach has been widely adopted (as indicated in Table 24) describe:

a. The specific actions that have been taken to ensure adoption;

Agro-forestry was introduced through the Swaziland Agricultural Development Project programme. Adoption is encouraged through training.

b. Any observed results from adoption;
The programme is in its early stages.

c. Plans for adoption or for further adoption in new or existing production areas;
The Ministry of Tourism and Environmental Affairs is continuing to promote this practice as part of its programme of promoting the contribution of the forest sector economic growth and social wellbeing climate resilience enhancement.

d. Lessons learned.
Lessons are yet to be shared as the project is in its early phases.

Gaps and priorities

62. With respect to the use of management practices or actions that favour or involve the use of biodiversity for food and agriculture:

a. **What are the major gaps in information and knowledge?**

- Impacts of use of management practices on production,
- Impacts of use of management practices on associated biodiversity and ecosystem services,
- Analysis of trade-offs.

b. **What are the main capacity or resources limitations?**

- Capacity gaps relate to:
  - Inadequate human capacity (numbers and some specialist skills)
  - Inadequate infrastructure including transport for regular monitoring
  - Inadequate budgets.

c. **What are the main policy and institutional constraints?**

- Sectoral approach to implementation of programmes.
- Poor culture of documentation of lessons and experiences leading to inadequate knowledge to inform policy and planning.

d. **What actions are required and what would be the priorities?**

- Establishment of baselines to facilitate future monitoring,
- Establishment of required capacities with particular emphasis on community and farmer level capacities

63. With respect to the sustainable use of biodiversity for food and agriculture:

a. What are the major gaps in information and knowledge?

The Forest sector	• Lack of a regular programme of assessment, • Inadequate capacity to support establishment of documentation system for forest reproductive material. • Lack of a programme for seed production for forest and other woody species
Fisheries sector	• Lack of records of capture fisheries • A weak surveillance and control system
Plant Genetic Resources	• Inadequate understanding of levels of genetic diversity in the country's genetic resource base • Lack of / inadequate representation of wild relatives, weedy and vegetatively propagated species in the national collection • Lack of on-farm conservation programmes

b. What are the main capacity or resources limitations?

Animal Genetic Resources Sector	• Lack of resources to maintain the functioning of the National Advisory Committee (NAC) and Technical Committee • Inadequate skills among many of the sector's personnel as the majority are trained up to Certifcate/ Diploma level

	• Lack of specialist skills e.g. molecular genetics and biotechnology.
Fisheries	• Inadequate human capacity • Inadequate infrastructural capacity e.g. equipment such as boats • Inadequate financial resources
Forest Sector	• Lack of trained personnel to run the National Tree Seed Centre • Budgetary resources to establish the National Botanical Gardens
Plant Genetic Resources	• Inadequate human capacity (the NPGRC is currently understaffed) • Lack financial resources to support functioning of the National Plant Genetic Resources Committee

c. What are the main policy and institutional constraints?

Animal Genetic Resources	• Lack of a policy for the development, use and conservation of animal genetic resource • Lack an animal breeding policy to address processes such as identification, record keeping, performance recording, breeding value evaluations and breeding programmes • Lack of a policy that recognises indigenous AnGR as the basis for livestock development including use, development and conservation of indigenous cattle, chicken, goats, pigs and sheep.
Plant Genetic Resources	• Lack of a policy to guide access to the country's plant genetic resources for food and agriculture • Lack of a policy to guide recognition of local communities in management of genetic resources

d. What actions are required and what would be the priorities?

- Development of processes for mainstreaming and strengthening biodiversity information in policy making and planning and practice
- Development of institutional capacity for mainstreaming biodiversity information in planning and practice
- Strengthening coordination to enhance sharing of information sharing
- Allocation of adequate resources
- Elaboration of policies and programmes to respond to identified needs.

64. With respect to the contribution of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification:

e. What are the major gaps in information and knowledge?
f. What are the main capacity or resources limitations?
g. What are the main policy and institutional constraints?

The main constraint here is a fragmented institutional set up with information systems that have no to weak linkages, in this case, the early warning system within Ministry of Agriculture and initiatives under the Meteorology Department of Ministry of Tourism and Environmental Affairs, Swaziland National Trust Commission and other stakeholders.

- Poor recognition of the role of

h. What actions are required and what would be the priorities?

65. With respect to the adoption of ecosystem approaches:

i. What are the major gaps in information and knowledge?

- Inadequate understanding of biodiversity and ecosystem approaches (making the link from theory to practice)
- Inadequate knowledge on practices that are suited to the ecological and socio-cultural of especially the more marginal areas in the country.
- Lack of baselines to facilitate monitoring of trends.

j. What are the main capacity or resources limitations?

k. What are the main policy and institutional constraints?

- A piecemeal approach to programme implementation with inadequate documentation and capturing of lessons
-

l. What actions are required and what would be the priorities?

CHAPTER 5: The state of interventions on conservation and use of biodiversity for food and agriculture

Proposed structure of the chapter and information to be included in the Country Reports

The main objective of this chapter is to provide an assessment and analysis of national and local interventions and activities, along with the state of international collaboration, that support conservation and sustainable use of biodiversity for food and agriculture. The analysis of interventions specific to plant, animal, forest and aquatic genetic resources will be based on the information provided in the respective State of the World Reports.

Information on the following topics should be covered in the Country Report:

- National policies, programmes and enabling frameworks that support or influence conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services;
- Policies, programmes and enabling frameworks governing exchange, access and benefits;
- Information management;
- Local and informal-sector actors and initiatives;
- Availability of capacity and resources;
- Participation in international and regional policies, legal frameworks and collaboration with other countries;
- Knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture.

National policies, programmes and enabling frameworks that support or influence conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services

66. Identify and describe the main policies, programmes and enabling frameworks that support or specifically address the objectives below, briefly describing the policies, programmes or enabling frameworks listed and provide any available information on the extent of implementation or of lessons learned. For each objective, list up to 10 major policies, programmes and enabling frameworks.

a. **Support the integrated conservation and sustainable use of biodiversity for food and agriculture across sectors;**

The National Development Strategy (NDS): In recognition of the fact that a large proportion of the country's population derives its livelihood from agriculture the NDS identifies agricultural development as a key strategic thrust. Particular emphasis is placed on improving productivity whilst protecting the environment, commercialisation of agriculture on SNL as well as rationalizing allocation and use of water resources. The NDS also recognises the importance of knowledge in decision making and in this regard it stresses the importance of adequate funding for research, a broad research base spanning areas such as natural science, production technology, social science, humanities, education, population and health, adaptive research as well as aspirations of local research finding applications abroad. In line with sustainability principles, the NDS recognizes the importance of the balancing meeting current development needs with ensuring that the ability of future generations to meet theirs is not compromised. With reference to biodiversity conservation, the NDS identifies development of measures to conserve endangered animal

and plant species in addition to curbing and preventing soil erosion, conservation and management of water and land resources and others as key actions (Kingdom of Swaziland, 1999).

The Swaziland Poverty Reduction Strategy and Action Plan: The Swaziland Poverty Reduction Strategy and Action Plan (PRSAP) recognizes the importance of environmental protection and gender equity in poverty reduction and sustainable development. It underlines the threat that continued loss of biodiversity and degradation of land resources poses to the livelihoods of the poor and as such elaborates a range of strategies for conservation as well as involvement of the rural poor in conservation initiatives (Government of the Kingdom of Swaziland, 2007).

The Comprehensive Agriculture Sector Policy: The CASP recognizes that whilst indigenous breeds are more tolerant to heat, pests and parasites they have an intrinsically lower productivity potentials compared to genetically improved exotic breeds. It also notes the poor genetic quality of the national herd. The Policy statement in this regard is the local herd be improved through breeding, the indigenous gene pool be protected, and internationally acceptable animal quality assurance standards be applied. In terms of research, the CASP notes among others, insufficient research on plant breeding (particularly on indigenous plants), drought tolerant varieties, water use efficiency and soil fertility, agro-biodiversity, conservation and preservation of local plant genetic resources, and farming systems. The strategy identified is to initiate research programmes to maintain agro-biodiversity and establish a breeding programme for food crops that fits local conditions, for example open-pollinated varieties and to control and eradicate harmful alien invasive plants (GOS,2005).

The National Forest Policy: The National Policy Forest has among its three objectives that are relevant to the objectives of this report i.e.:

- To improve the forest productivity, and ensure sustainable supply of multiple forest products and services by maintaining the forest areas.
- To conserve the biodiversity of the forest resources, encourage its sustainable use and ensure that benefits accrued are shared equitably.
- To enhance the national capacity to manage and develop the forestry sector in collaboration with other stakeholders (GOS, 2002).

The National Forest Policy is one of a few, if not the only National Policy that directly addresses traditional knowledge systems related to biodiversity and natural resource management.

The Swaziland Agricultural Development Project seeks to develop improved smallholder production and marketing systems which lead to sustainable food security and an improved quality of life for rural households in Swaziland. Its three target outcomes are feasible improvements to current smallholder agricultural practices are identified, tested and documented; The Ministry of Agriculture's capacity to effectively undertake field activities, research and service delivery is reoriented, strengthened and delivery performance is improved; and; smallholder links to markets are increased (FAO, 2011).

- **The Swaziland Agricultural Development Project (SADP):** SADP seeks to develop improved smallholder production and marketing systems which lead to sustainable food security and an improved quality of life for rural households in Swaziland. Its three target outcomes are feasible improvements to current smallholder agricultural practices are identified, tested and documented; The Ministry of Agriculture's capacity to effectively undertake field activities, research and service delivery is reoriented, strengthened and delivery performance is improved; and; smallholder links to markets are increased (FAO, 2011).

- **Integrated Fire Management Project in Swaziland**: This was an FAO Technical Cooperation Project (TCP) implemented by the Department of Forestry to support the implementation of Integrated Fire Management in Swaziland. It specifically aims at improving rural livelihoods and reducing poverty in Swaziland through integrated fire management to minimize uncontrolled wildfires and enhance land use, natural resource sustainability and socio-economic development. It is aimed at assisting Swaziland to align fire management with international and regional commitments, networks and initiatives (MTEA, 2014).

b. **Support the conservation and sustainable use of associated biodiversity:**

National policy generally refers to biodiversity in general terms. Instruments that can be considered here include:

- The Wild Birds Protection Act
- The Flora Protection Act
- The Wild Mushroom Control Order which requires a license for sale, export and picking of wild mushrooms.
- The Plant Control Act which seeks to control movement and growing of plants as well as prevention of pests, diseases and weeds.

c. **Address food security and nutrition with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods;**

The Food Security Policy: The Food Security Policy recognizes that Swaziland's resource base for agriculture (crops and livestock), fisheries and forestry is under stress and is threatened by problems such as desertification, deforestation, overgrazing, loss of biodiversity, climate change, as well as inefficient use of water. It also recognizes that destruction and degradation of natural ecosystems and the attendant loss of biodiversity is threatening critical ecosystem services, among them purification of air and water, regulation of rainwater run-off and drought, waste assimilation and detoxification, soil fertility and nutrient cycling, control of pests and diseases, plant pollination and seed dispersal, and maintaining biodiversity for agriculture. It thus recognizes and stresses the importance of sustainable and diversified patterns of agricultural production (GOS, 2005).

The Comprehensive Agriculture Sector Policy: The Comprehensive Agricultural Sector Policy (CASP) seeks to focus the contribution of the agriculture sector to the realization of the country aspiration of the Vision 2022 and to the achievement of national development goals of the NDS. Among the objectives of CASP are increasing agricultural output and productivity, increase earnings for people engaged in agriculture through diversification, intensification and adoption of appropriate technology, and, to enhance food security among others.

d. **Address the maintenance of ecosystem services with explicit reference to biodiversity for food and, associated biodiversity and/or wild foods;**

Swaziland, in line with the CBD has adopted an ecosystems approach to conservation and sustainable use of biodiversity but there are no specific instruments that provide for maintenance of ecosystem services explicitly food and, associated biodiversity and/or wild foods.

e. **Improve resilience and sustainability of production systems with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods:**

The National Climate Change Policy. The policy elaborates policy statements which support the policy goal across all sectors. It also emphasizes mainstreaming of climate resilience and adaptation into national and regional development plans, processes and implementation, and as far as biodiversity and ecosystems is concerned, the policy emphasizes restoration and maintenance of ecological infrastructure, with focus on

our highest value ecological assets such as biodiversity hotspots and wetlands, including the clearing of invasive alien plants (MTEA, 2015[1]).

f. **Support farmers, pastoralists, forest dwellers and fisher folk to adopt and maintain practices that strengthen the conservation and use of biodiversity for food and agriculture.**

There are a number of community-based or community driven initiatives that contribute to supporting farmers and communities to adopt and maintain practices that strengthen the conservation and use of biodiversity for food and agriculture. These include:

- Conservation agriculture initiatives implemented by the Ministry of Agriculture, Swaziland Water Development Enterprise and NGOs such as Cooperation for Development in Emerging Countries.
- Agroforestry initiatives promoted by the Forestry Department.

67. List up to 10 major policies, programmes and enabling frameworks in your country that enhance the application of an ecosystem approach or a landscape approach and that contain an explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods. Include a brief description of the policies, programmes and enabling frameworks together with any information on the extent of their application (production system and area) and observed effect. Where possible provide examples of best practices or lessons learned.

The Biodiversity Conservation and Participatory Project (BCPD) implemented and managed by the by the Ministry of Tourism, Environment and Communications. BCPD seeks to facilitate an ecosystem management approach to biodiversity conservation and socio-economic development within broad spatial corridors known as Biodiversity and Tourism Corridors (BTC"s) (see www.sea.org.sz).

Swaziland, through SNTC and the United Nations Development Programme is currently implementing the Strengthening the National Protected Areas Systems" (SNPAS) project. Output 1.3 under Component 2 (Landscape approach operationalised and leads to expansion of PA network) is *Protected Areas and Landscape based management plans that integrate conservation efforts with sustainable economic development practices in the wider landscape are developed and implemented, incorporating field monitoring and knowledge-based management mechanisms. Stakeholder consultations and prioritisation of the eighteen new formal and informal PAs as per land-owner application, feasibility studies and boundary demarcation and clarification of the appropriate legal framework for each PA to be gazetted.*

It is anticipated that the project will lead to improvement in the management of natural resources in the community Protected Areas, which will increase food productivity and availability of natural products on the farms, with direct benefits to the communities The Project includes a number of alternative livelihood strategies that are related to this theme. These include game ranching and production of game meat, practices for enhanced farm productivity including

agro-forestry, improvements to soil fertility through use of green manure, and the introduction of other off-season cash crops (KOS/UNDP, undated).

68. Describe up to 10 major policies, programmes and enabling frameworks in your country that embed the use of biodiversity for food and agriculture, including its different components, into disaster management and response

Swaziland has established the National Disaster Management Agency to oversee all Disaster related issues in the country. A number of Policy and Strategy documents related to disaster mitigation have been developed but some of these are silent on use of biodiversity for food and agriculture, including its different components, into disaster management and response. The National Disaster Risk Management Policy includes only one biodiversity related statement i.e. advocates use of open pollinated varieties of seeds. Examples of policies here include:

The Swaziland Emergency Response, Mitigation and Adaptation Plan (NERMAP) January 2016-March 2022: The NERMAP identifies Agriculture and Food security as a key strategy. The overall objective is stated as "*to ensure national food security and support affected households (HHs) restore their agricultural productive capacity and eventually build resilience to future climatic shocks".* Examples of initiatives include:

- Identification of arable and irrigable land on which to produce maize throughout the year giving two crops per year are on 6000 hectare amounting to an output of 96 000 tonnes of maize.
- Training of farmers from affected Rural Development Areas on climate smart agriculture, and
- Provision of access to water for animals in drought stricken areas.

No mention is made of components of or wild foods.

69. Describe up to 10 major policies, programmes and enabling frameworks in your country that embed the use of biodiversity for food and agriculture, including its different components, into climate change adaptation and mitigation strategies and plans (NAPAs, NAPs, NAMAs, etc.).

Swaziland's Intended Nationally Determined Contributions: Swaziland has developed and submitted her Intended Nationally Determined Contributions on (INDC) which elaborates measures that the country is taking towards the development of an effective climate change response in terms of reducing GHG emissions and adapting to the impacts of climate change. The INDC identifies among two other sectors as key to building adaptation and resilience to climate change the biodiversity and ecosystems sector which provides a range of services for the country's population and the vulnerability of the rural poor to the degradation of healthy ecosystems through climate change; and, the agriculture sector for its contribution to the GDP ad rural livelihoods (MTEA, 2015[2]).

Swaziland has also developed a **Vulnerability and Adaptation Assessment for Biodiversity and Ecosystems** Report: It identifies strategic actions to be taken for adaptation, discussed earlier in this report.

Briefly describe policies, programmes and enabling frameworks that meet the objectives described in questions 68 and 69. Consider the following discussion points in your responses, where information is available:

a. extent of implementation;
b. production systems involved;

Swaziland has conducted an analysis of vulnerability for the country's biodiversity and ecosystems. The Vulnerability and Adaptation Assessment: Biodiversity and Ecosystems provides a coherent analysis of the biodiversity and ecosystems sector's vulnerability to climate change impacts as well as identify the potential adaptation measures to reduce biodiversity vulnerability and increase adaptive capacity. Nine strategic areas are identified to facilitate adaptation (MTEC, 2014).

Swaziland has also developed her Intended Nationally Determined Contribution (INDC) which outlines steps that she is taking towards the development of an effective climate change response. This is both in terms of reducing Green House Gas emissions and adapting to the impacts of climate change. Agriculture as well as Biodiversity and Ecosystems are among the key sectors identified as a foundation for adaptation. The range of interventions identified in the biodiversity and ecosystems are agro-forestry; ecological pest management; flood mapping; grazing land management; degraded land rehabilitation; fire management; and erosion control through terracing. In the agriculture sector include conservation tillage; crop diversification; greenhouse farming; hydroponics; livestock selective breeding; micro irrigation; organic farming; and solar dryers (MTEA, 2015).

The SNPAS currently underway, involves a number of production systems and land uses as follows:

Proposed Protected Areas	Area (ha)	**Production systems or other land use**					
		Grassland based livestock	Irrigated Crops (sugar cane)	Rain-fed crops	Resource harvesting	Ecotourism	Human settlements
Bulembu Mountain	552	Yes	-	-	Yes	-	-
Jilobi Forest	1,763	Yes	-	-	Yes	-	-
Mah	2	Y	-		Y	Ye	Y

amba	,104	es			es	s	es
Mambane	9,290	Yes	-	-	Yes	-	-
Manzimnyame	17,886	Yes	-	-	Yes	-	-
Mahhuku	9,039	Yes	-	-	-	-	-
Makhonjwa	8,159	Yes	-	-	Yes	-	-
Mdzimba	8,315	Yes	-	-	Yes	-	-
Mhlumeni	2,319	Yes	-	-	Yes	-	-
Mkhaya West	85	Yes	-	-	Yes	-	-
Motjanevlei	397	Yes	-	Yes	-	-	-
Ndlotane	7,781	Yes	-	-	Yes	-	-

Nsongweni	4,714	Yes	-	-	Yes	-	-
Ngwempisi (Ntungulu)	11,487	Yes	-	-	Yes	Yes	Yes
Nkhalashane	4,343	Yes	-	-	Yes	-	-
Nyonyane	19,295	Yes	Yes		Yes	-	-
Shewula	3,215	Yes	-	-	Yes	Yes	
Sibebe	2,856	Yes			Yes	Yes	

c. the extent of use of biodiversity for agriculture;
d. lessons learned;

The project is ongoing. The major use of biodiversity for agriculture involved here is livestock grazing with some irrigated crops, rain-fed crops and a significant amount of resource harvesting. The Ministry of Agriculture is a key stakeholder in SNPAS. SNPAS aims at targeting women at all stages of planning and implementation (KOS/UNDP, undated).

e. evidence of indicators of vulnerability that have decreased as a result of these efforts;

f. describe the value added of mainstreaming gender in programmes, policies and enabling frameworks, providing sex- disaggregated data where possible.

It is anticipated the SNPAS will contribute to women's empowerment and encourage gender equality through the range of activities that are designed to enhance participation and gender equity including management of protected areas and capacity building initiatives (Kingdom of Swaziland, undated).

70. What arrangements are in place or foreseen in your country that help to ensure that the conservation of biodiversity for food and agriculture is taken into account in national planning and policy development of sectors other than agriculture (e.g. NBSAPs or infrastructure development such as transport or energy)?

Swaziland's NBSAP advocates mainstreaming of biodiversity issues into sectoral policies, programmes and national and regional plans. This is also advocated in the National Development Strategy. Environmental Impact Assessment are mandatory for infrastructural and agricultural developments. However, Swaziland Environment Authority (2009) reports that follow-up monitoring is sub-optimal.

71. Has your country identified any obstacles to developing and implementing legislation that would protect associated biodiversity? List and describe initiatives in Table 25.

Table 25. Obstacles to developing and implementing legislation that would protect associated biodiversity identified in the country.

Component of associated biodiversity	**Obstacles to legislation for protection of associated biodiversity**
	No obstacles have been identified yet

Provide a concise description of the obstacles to legislation reported in Table 25, and specify a course of action proposed to address this, where possible. Where possible provide examples of best practices or lessons learned.

Whilst strategies for managing detrimental biodiversity in production systems are in place, beneficial components of associated biodiversity remain ignored at all levels. This lack of awareness is likely to be the main obstacle. At the next level, the challenge is likely to be enforcement unless strategies can be put in place to ensure effective enforcement of the legislation once developed.

Policies, programmes and enabling frameworks governing exchange, access and benefits

72. Has your country taken measures with the aim of ensuring that access to its genetic resources shall be subject to its prior informed consent (PIC) and that benefits arising from their utilization shall be shared in a fair and equitable manner? If yes, identify for which resources and for which uses (e.g. to conduct research and development on the genetic and/ or biochemical composition of the genetic resource) prior informed consent has to be obtained and benefits have to be shared. Indicate in Table 26 for the different categories (and possibly uses) of associated biodiversity, if prior informed consent has to be obtained and benefits have to be shared.

Table 26. Policies and programmes governing the access to its genetic resources of associated biodiversity established in the country.

Component of associated biodiversity	Intended use (e.g. any use, research and development,	PIC and benefit-sharing required
None		

There are no policies / programmes governing the access to genetic resources of associated biodiversity have been established at present.

73. Has your country taken measures with the aim of ensuring that the prior informed consent or approval and involvement of indigenous and local communities is obtained for access to genetic resources and that benefits arising from the utilization of genetic resources that are held by indigenous and local communities, are shared in a fair and equitable way with the communities concerned, based on mutually agreed terms? If yes, provide a description of the measures and where possible, examples of best practices or lessons learned.

Swaziland has not as yet established measures to ensure PIC, involvement of local communities and fair and equitable sharing of benefits prior to access to their genetic resources. Swaziland recently ratified the Nagoya Protocol on ABS and has prepared draft guidelines to address issues of access and benefit sharing. There is still a need to develop an overarching framework on ABS. Activities undertaken include:

- An awareness raising and communication strategy has been developed,
- A capacity needs assessment on access and benefit sharing, and,
- Sensitization workshops for key stakeholders.

Prior to adoption of the Nagoya Protocol, the Access and Benefit Sharing Bill (2008) had been developed with intent to establish and confirm Swaziland's sovereignty over her genetic resources, regulate access and benefit-sharing and other related issues. Rights of local communities regarding their indigenous knowledge systems were also covered.

Information management

74. List and describe any linkages between sector information systems on biodiversity for food and agriculture at national level. Where possible provide examples of best practices or lessons learned.

At present, sector information databases are fragmented with each stakeholder institution developing and maintaining its own information. SEA has recently established Swaziland's Biodiversity Clearing House as required under Article 18(3) of the Convention on Biological Diversity. The plan is to establish a coordinating committee bringing together representatives from key stakeholder institution that generate or are custodians of biodiversity information in the country. This would include for example the Swaziland National Trust Commission, Big Game Parks, the National Plant Genetic Resources Centre, Fisheries Section, the Veterinary Services unit etc. It is envisaged that when fully functional, the Swaziland Biodiversity Clearing House will provide a single point of entry with access (to be moderated by individual institutions) to other related information systems.

75. Has your country established national information systems on associated biodiversity? List in Table 27, along with a description of the components of associated biodiversity addressed, and a brief description of information included, use and applications of the information system.

Swaziland has not as yet developed specific information systems on associated biodiversity. There are some initiatives that have been developed with intent to contribute to national goals of conservation and sustainable use of biodiversity. These are shown in Table 27.

Table 27. National information systems on associated biodiversity in the Country.

National information system (List)	Components of associated biodiversity addressed (List)	Concise description of information systems
Biodiversity Clearing House Mechanism	All levels of biodiversity	The webpage contains general information on biological diversity. There are plans to establish links with all other information systems to provide a single point of entry.
National Biosafety Clearing House Mechanism	All elements of biodiversity that may be impacted by use of Living Modified	Information on modern biotechnology applications in the country.
The Swaziland National Trust Commission	All species that occur in the country including Red Data lists. Swaziland's	A searchable database containing information on the country's fauna and flora.
Big Game Parks	All levels of biodiversity	Big Game Parks maintains species lists for all taxa that occur within the three game parks including • Tees • Plants and wild flowers • Big mammals • Birds
Ministry of Agriculture: Data Processing Unit	Cattle	The National Beef Breeding Information System (NBBIS)
Ministry of Agriculture: (Veterinary Services)	Livestock	The Livestock Database Management System (LDMS): A system for entry, update, retrieval and reporting of livestock census data and dip tank information. It has potential for use in monitoring the status of the country's farm animal genetic resources (FAGR), particularly that of endangered breeds and species. Another database designed specifically for small ruminants is still under development.

		The Swaziland Livestock Information and Traceability System (SLITS) is a system of livestock identification and traceability integrated within an Animal Health Information System aimed at ensuring lifetime traceability of each individual animal in the national herd.

76. Has your country established information systems intended to support maintenance of traditional knowledge on biodiversity for food and agriculture, including associated biodiversity? If yes, describe these and include information where available on socio-economic, policy and collective action aspects.

Swaziland has not as yet developed an information system to support maintenance of traditional knowledge on BFA and associated biodiversity. A review on management of traditional knowledge in Swaziland identified a number of gaps and challenges around maintenance of traditional knowledge on biodiversity for food and agriculture, including associated biodiversity in Swaziland. Dlamini (2005) reported that the Swaziland National Library Service (SNLS) has done very little in terms of developing a system for managing traditional knowledge. The main challenges identified include lack of funds, lack of skills for management of IK among personnel and lack of recognition of traditional knowledge (TK) as intellectual property. A more recent study also reported lack of policies on TK in the country (Dlamini, 2009).

Stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture

77. List the most important stakeholder groups, including groups or associations of farmers, forest dwellers, fisher folk and pastoralists, NGOs or other civil society organizations active in the conservation of biodiversity for food and agriculture. Briefly summarize their scope, objectives and activities and any outcomes to date. Where possible provide examples of best practices or lessons learned.

A. **Ministry of Agriculture:** The Ministry has a mandate for household food security and increased sustainable agricultural productivity through diversification and enhancement of commercial agricultural activities. MoA is also responsible for the development and promotion of appropriate technologies and efficient extension services while ensuring stakeholder participation and sustainable development and management of natural resources in the country. A number of Departments within MoA are key to the subject matter:
   i. Department of **Land Use Planning and Development (DLUPD):** DLUPD is responsible for promoting rational land use and the development of agricultural land and water resources, particularly on Swazi Nation Land (SNL).
   ii. **Fisheries Section:** The mandate of the fishery section is to ensure sustainable fisheries management and aquaculture development in order to secure national food and nutrition security at both household and national levels. The Fisheries Development Unit seeks conservation and sustainable use of all aquatic genetic resources in the country.
   iii. **The Department of Veterinary Services and Livestock Development:** This department is responsible for issues related to animal genetic resources
   iv. **The Department of Agricultural Research and Specialist Services:** They are responsible for for the development and identification of applied and adaptive agricultural production technologies that ensure household and national food security, sustainable growth of the agro-business sector and national economy. The department is also responsible for phytosanitary

services, safe-guarding food safety measures and conservation of national plant genetic resources heritage.

B. **Swaziland Environment Authority (SEA):** SEA has the overall mandate for all biodiversity components outside of protected areas.
C. **Swaziland National Trust Commission (SNTC):** SNTC is responsible for all biodiversity components in national protected areas.
D. **Big Game Parks:** A private not-for-profit Trust mandated with responsibility for management of Biodiversity within the country's Big Game Parks. They are also mandated for administration of the Convention on International Trade in Endangered Species of wild flora and fauna (CITES) and the Game Act in Swaziland.
E. **The University of Swaziland (UNISWA):** UNISWA is a key stakeholder in education and research on biodiversity. A number of departments including the Department of Biological Sciences, the Department of Geography and Environmental Planning, the Department of Crop Production, the Agricultural and Biosystems Engineering, the Department of Animal Science are among several that have interests in this area. UNISWA has also established the Swaziland Institute for Research in Traditional Medicine, Medicinal and Indigenous Food Plants (SIRMIP): The objectives of SIRMIP are:
   - To serve as Swaziland's leading institution for the design, coordination and execution of multidisciplinary research in traditional medicine, medicinal and indigenous wild edible plants.
   - To combine the expertise of scientists and Traditional Medical Practitioners (TMPs) to produce plant-derived pharmaceuticals and promote the use of traditional medicine in national health care.
   - To raise general awareness regarding the nutritional value of underutilized indigenous wild edible plants.

Activities in which SIRMIP is involved in include conducting and promoting ethnobotanical surveys for indigenous non-cultivated fruits, vegetables, and medicinal plants in order to establish and maintain a database, documentation of bioresources, and development of a gene bank with intent to broadening the food base among others.

F. Swaziland Water and Agricultural Development Enterprise (SWADE): SWADE is a government company established to facilitate planning and implementation of the Komati Downstream development Project (KDDP) and Lower Usuthu Smallholder Irrigation Project (LUSIP) and any other large water and agricultural development project that may be assigned by Government.
G. Lubombo Conservancy: A collection of public sector, private sector and communal area stakeholders among them five established reserves i.e. Mlawula Nature Reserve, Shewula Nature Reserve, Mbuluzi Game reserve, Hlane National Park and Inyoni Yami Swaziland Irrigation Scheme (IYSIS).
H. **Swaziland Game Ranchers Association (SGRA)**: SGRA is an association of private game ranchers for promoting a conservation that supports and expands wildlife ranching industry in Swaziland. Current membership is at 26.
I. Civil society: Included here is ACAT, Lutheran Development Service, Pelum Swaziland, World Vision,
J. Cooperation for Development in Emerging Countries (COSPE):

78. Describe any incentives or benefits to support activities for the conservation and sustainable use of biodiversity for food and agriculture or associated biodiversity (such as payments, provision of inputs, subsidies or other forms of incentives/ benefits). Briefly describe how these have been applied, to what extent and the stakeholders involved (including provisions on gender balance if any). Indicate any lessons learned and planned development incentives.

The Ministry of Agriculture has introduced a Farm Input Supply Subsidy Programme as part of her drive to increase productivity. The programme is was established a loan grant from the Government of India

and has been running since 2014. Inputs are supplied to farmers through the Rural Development Areas to any farmers who have registered and paid for the package.

79. List up to 10 major projects (either in progress or completed in the last five years) that support the conservation and sustainable use of biodiversity for food and agriculture, associated biodiversity and/or wild foods. For each project listed describe the components of biodiversity, the production system and area covered, and the results, outcomes and lessons learned. Projects described in sector reports need not be described here.

The Swaziland Agricultural Development Project (SADP): The SADP seeks to develop improved smallholder production and marketing systems which lead to sustainable food security and an improved quality of life for rural households in Swaziland. Its three target outcomes are feasible improvements to current smallholder agricultural practices are identified, tested and documented; The Ministry of Agriculture's capacity to effectively undertake field activities, research and service delivery is reoriented, strengthened and delivery performance is improved; and; smallholder links to markets are increased (FAO, 2011). SADP initially targeted the elderly and youth uplifting them through support for vegetable gardening. The programme later move on to the rain-fed crop production system on SNL focussing on production and processing.

The Innovative Beef Value Chain Development Schemes in Southern Africa Project (IBVCDSSAP) is implemented by the International Livestock Research Institute (ILRI) in collaboration with the Swaziland Water and Agricultural Development Enterprise (SWADE) and the Ministry of Agriculture (MoA). In Swaziland, the objective of the project is to improve and sustain the livelihoods of smallholder beef cattle farmers in the Lower Usuthu Smallholder Irrigation Project (LUSIP) area as well as in the Komati Downstream Development Project (KDDP) area through improved and sustainable production and marketing systems (ILRI, undated).

80. List in Table 28 up to 10 major landscape based initiatives to protect or recognize areas of land and water in your country of particular significance for biodiversity for food and agriculture.

Table 28. Landscape based initiatives to protect or recognize areas of land and water in the country with particular significance for biodiversity for food and agriculture.

Landscape based initiatives	Description of sites and their characteristics of relevance to biodiversity	Ext
Shewula Conservancy	This is a natural conservancy managed by the Shewula community on the Lubombo plateau. It combines grassland based livestock, resource harvesting, wild game and Ecotourism	3215 ha

Lower Usuthu Smallholder Irrigation Project–Global Environmental Facility (LUSIP-GEF) Sustainable Land management Project / Lower Usuthu Sustainable Land Management Project) (LUSLM)	Seeks to catalyse rural development through sustainable agriculture to bring local, national and global environmental benefits. It targets semi-arid land in the lowveld around the LUSIP area to transform it from impoverished subsistence rangeland and rain-fed arable cropping systems into irrigated commercial cropping land. The area is characterized by adverse effects of climate change, loss of agro ecosystem and biodiversity functions, invasion	5000 ha (target)
Komati Downstream Development Project (KDDP)	The Project The project seeks to effectively utilise the country's portion of 83 Million cubic metres out of the 332 Million cubic metres in Maguga dam whilst improving the standard of living for the communities in the North Eastern part of the country. The project also includes 74 livestock projects carried out at individual and group level. These include dairy, poultry,	6,000 ha of which 4616 is planted to sugar
Lower Usutu Shareholder Irrigation **Project (LUSIP)**	The project takes a holistic approach to development combining sanitation, transforming subsistence farming into commercial agriculture building environmental sustainability. The project is also implemented in the lowveld. Among the expected outcomes of the project are: • Reduced land degradation,	6500 ha growing to 11500ha on comp

Collaboration between institutions and organizations

81. Describe existing linkages and collaboration between sectors in national programmes and policies governing conservation and sustainable use of biodiversity for food and agriculture. These may include overall strategies and plans developed by your country, committees or other national bodies which oversee or support collaboration, shared actions, facilities or resources and specific activities which involve inter-sector collaboration.

Swaziland recognizes the importance of multi-stakeholder cooperation collaboration in all areas related to planning and implementation. The approach used is to establish multi-disciplinary and multi-stakeholder committees composed of representatives of key stakeholder institutions often including farmer and community representatives. Examples of these include:

- The Biodiversity Programme Implementation Committee coordinates biodiversity programmes under Swaziland Environment Authority.
- The National Plant Genetic Resources Committee oversees operations of the National Plant Genetic Resources Centre and related issues.
- The National Biosafety Advisory Committee oversees implementation of the Biosafety Act.
- ABS Project Steering Committee coordinates implementation of all ABS projects in the country.
- The National Climate Change Committee coordinates all climate change issues in the country as well as the implementation of climate change related projects.
- The National Wetlands Working Group coordinates the implementation of wetlands programmes in the country

82. How are ministries working together to meet Aichi Targets as they may apply to the conservation and sustainable use of biodiversity for food and agriculture in your country?

The Government of Swaziland has a long history of establishing multi-stakeholder platforms with the intention of enhancing cooperation and collaboration. Currently, the responsibility for coordination of biodiversity issues rests with BIPC as previously described. There are various other examples of multi-stakeholder platforms established by other Departments for this purpose. The challenge however is that in many cases, participation is driven by project funding and; mechanisms for how this representation translates into action within stakeholder institutions are not clear leading to superficial linkages with minimal flow of information.

83. What future actions have been planned to support your country's efforts in addressing Aichi Targets as they may apply to the conservation and sustainable use of biodiversity for food and agriculture in your country?

The Government of Swaziland has developed her Programme of Action and Action Plans which outline a number of initiatives that will contribute to attainment of the Aichi Targets under each stakeholder Ministry.

84. Implementation of regional and/or international initiatives targeting the conservation and sustainable use of associated biodiversity?

Swaziland is a contracting party to the Convention on Biological Diversity as well as the Cartagena Protocol on Biosafety and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. In line with her obligations under the CBD, Swaziland has developed her second NBSAP. She has also enacted her Biosafety Act and has initiated measures towards domesticating the Nagoya Protocol. Swaziland is also a member of the Food and Agriculture Organization Commission on Genetic Resources for Food and Agriculture (CGRFA). She has developed a number of national reports to contribute to global assessments under the CGTFA. Other relevant international instruments to which Swaziland is a member include the Convention on International Trade in Endangered Species (CITES), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS).

At regional level, Swaziland has participated in a number of regional initiatives including:

- The Biodiversity Conservation Participatory Development (BCPD) whose objective was to promote environmentally, economically and socially sustainable development and enhance incomes in the rural areas of Swaziland, based on conservation and sustainable use of its rich biodiversity resources and local participation in tourism development. The Malolotja-Songimvelo TFCA was established as part of this initiative (Ramutsindela, 2007).
- The Southern African Biodiversity Support Project (SABSP):
- The Lubombo Spatial Development Initiative (LSDI), carried out in collaboration with South Africa and Mozambique identified nature-based tourism as a priority objective for infrastructure development.
- The Southern African Botanical Diversity Network (SABONET) was a regional network of botanical institutions involving botanists, herbaria and botanic gardens throughout southern Africa. Among others, its aim was to strengthen botany capacity in the region. The southern Africa Red Data list was one of the outputs of the initiative.
- The Service for Biodiversity Conservation and Sustainable Development (SECOSUD):

Table 29. Regional and/or international initiatives targeting the conservation and sustainable use of associated biodiversity.

Initiatives	**Scope (R: regi**	**Description**	**Ref ere nce**
SADC Plant Genetic Resources Centre	R	This is a SADC initiative which includes a regional genebank located in Lusaka, Zambia where SADC member country National Plant Genetic Resources Centres deposit their base collections.	

SADC Transfrontier Conservation Areas (TCFA) Programmes	R	The mission of SADC's TFCAs programme is to develop SADC into a functional and integrated network of trans-frontier conservation areas where shared natural resources are sustainably co-managed and conserved to foster socioeconomic development, and regional integration for the benefit of people living within and around TFCAs, the SADC region, and the world. The programme has seven components which include enhancement of local livelihoods and reducing vulnerability of ecosystems and people to the effects of climate change. The Lubombo Transfrontier Conservation Area	SADC Secretariat (2013)
New Partnership for Africa's Development (NEPAD) /SANBio Mushroom	R	Regional programme aimed at promoting research and developmental work on mushroom production and value addition in six countries i.e. Angola, Malawi, Mozambique, Namibia, Swaziland and Zambia. The programme commenced in 2009 and Swaziland was targeted for the establishment of a regional mushroom gene	(SANBio, 2010); Mabuza *et al*.,

Capacity development

85. Training and extension programmes, or elements of programmes, at all levels, exist that target the conservation and sustainable use of associated biodiversity?

Swaziland has no specific training and extension programmes that target the conservation and sustainable use of associated biodiversity. The responsibility for extension falls under Extension Services, Department of Agriculture and Extension within the Ministry of Agriculture. Their focus is on equipping farmers with relevant skills to ensure increased agricultural production and productivity, establishment of Agriculture-based industries and businesses in order to help enhance rural farm income and employment creation in the rural and peri-urban areas of the country, supporting farmers to achieve increased production and improved quality of farm produce to meet demands for export among others. Departments of the Ministry of Agriculture that have extension programmes include:

- **Department of Livestock & Veterinary Services (Range Management and Nutrition**): Provides advice to farmers on both SNL and TDL on range management, fodder production and conservation, and animal nutrition.
- **Department of Livestock & Veterinary Services (Poultry & Rabbit Division):** Extension is provided to individual farmers, Non-governmental organizations and community groups through workshops, meetings and individual visitations on broiler production, egg production, indigenous chickens and rabbit production.
- **Department of Livestock & Veterinary Services (Piggery Production): Farmers are trained** in all aspects of piggery production including ideal breeding stock to purchase for the climate of Swaziland.

- **The Fisheries Development section**, also under the Ministry of Agriculture has elements of extension in the area of fish production.

86. Higher education programmes that target the conservation and sustainable use of associated biodiversity genetic resources?

Table 30. Higher education programmes specifically targeting the conservation and sustainable use of associated biodiversity genetic resources in the country.

Institution	Programme	Level	Enrolment	Enrolment	Enrolment
University of Swaziland, Faculty of Agriculture &	BSc Agricultural and	Undergraduate			
University of Swaziland, Faculty of Agriculture &	BSc Agronomy	Undergraduate			
University of Swaziland, Faculty of Agriculture &	BSc Animal Science	Undergraduate			
University of Swaziland, Faculty of Agriculture &	BSc Animal Science (Dairy)	Undergraduate			
University of Swaziland, Faculty of Agriculture &	BSc (Food Science, Nutrition &	Undergraduate			
University of Swaziland, Faculty of Agriculture &	BSc (Horticulture)	Undergraduate			
Faculty of Science and Engineering	BSc (Biology combinations)	Undergraduate			
University of Swaziland, Faculty of Science,	MSc Environmental Resource	Post-graduate			
University of Swaziland, Faculty of Agriculture and	MSc Crop Science	Post-graduate			
University of Swaziland, Faculty of Agriculture &	Doctor of Philosophy in Agricultural	Post-graduate			
University of Swaziland, Faculty of Agriculture &	Master of Science in Agricultural	Post-graduate			
University of Swaziland, Faculty of Agriculture &	Doctor of Philosophy in Agricultural	Post-graduate			

87. Major institutions directly involved in research on the conservation and sustainable use of associated biodiversity.

Knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture

88. With respect to information management, national policies, programmes and enabling frameworks that support or influence the conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services, and govern exchange, access and benefits:

a. **What are the major gaps in information and knowledge?**

One of the main limitations in this area appears to be a lack of a culture of information management and documentation in many stakeholder institutions. Opportunities for learning from past experience are often missed because lessons are not properly documented during programme implementation. There is need to inculcate a culture of knowledge and information management in stakeholder institutions.

b. **What are the main capacity or resources limitations?**

Swaziland is faced with a challenge of inadequate capacity across all sectors related to knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture. This includes:

- Lean and overstretched staff complement across most stakeholder activities
- Inadequate budgetary allocations
- Inadequate infrastructure

c. **What are the main policy and institutional constraints?**

In addition to budgetary constraints, inadequate arrangements for collaboration and resource sharing among stakeholder institutions are lacking. Despite collaboration arrangements being in place in many institutions through multi-stakeholder committees for example, the reality is that collaboration is often superficial. Furthermore, biodiversity conservation programmes are currently fragmented as institutions that are mandated to implement or promote conservation these programmes and plans are also not coordinated. These institutions currently fall under 3 ministries, namely the Ministry of Agriculture, Ministry of Tourism and Environmental Affairs, Ministry of Natural Resources and Energy as well as the King's Office. activities work in silos are in fragmented. As such, the implementation of biodiversity conservation programmes in a coordinated manner under the current set-up is a huge challenge. Hence even reporting on output targets progress for example under the SADC Food, Agriculture and Natural Resources (FANR) as a country remain a challenge. Similarly, the implementation of the NBSAP without clear mechanism and road map in the form of harmonized policies and legislations on biodiversity in general remain, remain a major challenge. Hence there is need for elaboration of policy statements to position Swaziland to transform towards a knowledge-based economy supported by policy and actions to change mind sets. Strategies for ensuring meaningful stakeholder involvement and participation in coordinating mechanisms need to be strengthened. Current institutional arrangements also fail to provide for mechanisms for identification of information required by decision makers.

d. **What actions are required and what would be the priorities?**

- Allocation of resources for documentation and knowledge management

- Development and implementation of knowledge management and knowledge sharing strategies,
- Establishment of platforms for synthesis, packaging and management of existing information with a view to facilitating identification of gaps.
- More importantly, there is need to review existing policies with the view of realigning or developing a policy or set of biodiversity legislations that will harmonize biodiversity conservation programmes and plans. Hopefully, such an approach would enable the establishment by law, of a high level institution or body that would be commissioned by the head of government or highest authority in the country to coordinate all biodiversity issues. This mother body or institution which would have to be accorded some level of autonomy would have to be allocated some resources in order to be able to fund biodiversity programmes and activities or plans by both public and private sector institutions.

89. With respect to stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture and collaboration between institutions and organizations:

a. **What are the major gaps in information and knowledge?**

Inadequate awareness is a major constraint to the participation of stakeholders in activities that support maintenance of biodiversity for food and agriculture and collaboration between institutions and organizations. Another limitation is with regards to developing the necessary behaviour change and system thinking and transformation to change mind-set from the current silos approach that is common among many stakeholder institutions.

The lack of focused research that will provide information to enable regular monitoring of the state and trends of biodiversity including research dedicated to associated biodiversity in order to fully uncover their potential role and contribution to food, nutrition and sustainable agriculture remain a major challenge and thus a gap.

b. **What are the main capacity or resources limitations?**

Many of the country's stakeholder institutions are characterized by a lean staff complement leaving personnel with multiple responsibilities, which result in poor delivery by the few but multi-tasked staff. Whilst there have been efforts to recruit qualified staff, the multiple obligations make it difficult to respond to all the requirements. Another constraint is lack of budgetary allocations to effectively support activities that support maintenance of biodiversity for food and agriculture and collaboration. As a result of the poor staff compliment, it then become a challenge for institutions to engage the few or lone personnel on long term training especially on post-graduate research based Masters and PhD programme. This then compromise the generation of information than if the personnel in these institutions were properly trained.

c. **What are the main policy and institutional constraints?**
Due to inadequate financial and human resources, government currently does not support long-term post-graduate training to PhD level, yet, the due to the complexity of the area of biodiversity, personnel in biodiversity institutions need to be capacitated so that they can be able to conduct independent research to appropriately inform policy decisions.

d. **What actions are required and what would be the priorities?**
There is also need to prioritize funding of BFA related programmes including staff capacities and their training.

90. With respect to capacity development:

a. **What are the major gaps in information and knowledge?**
Currently, the local training institutions do not provide sufficient training programmes or course that are focussed on BFA at undergraduate level to fully capacitate graduates will knowledge and skills

on BFA. Hence, personnel only acquire more knowledge and skills once employed by these institutions.

b. **What are the main capacity or resources limitations?**
There is currently a poor staff complement in these institutions especially in government departments. There is no fully-fledged staff in most institutions within ministries. This leaving personnel with multiple responsibilities, which result in poor delivery by the few but multi-tasked staff.

c. **What are the main policy and institutional constraints?**

Due to inadequate financial and human resources, government currently does not support long-term post-graduate training to PhD level, yet, the due to the complexity of the area of biodiversity, personnel in biodiversity institutions need to be capacitated so that they can be able to conduct independent research to appropriately inform policy decisions.

d. **What actions are required and what would be the priorities?**

There is an urgent need for government to relax or modify its policies especially on capacity development, including revising the age limit for supporting its personnel on long-term training.

91. With respect to knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture:

a. **What are the major gaps in information and knowledge?**

- Quantification and valuation of ecosystem services in all sectors
- Drivers of change in each ecosystem
- Monitoring of trends
- Lack of regular surveys and studies
- Systematic analysis of trade-offs.

b. **What are the main capacity or resources limitations?**
    - **Lack of well training or capcitated personell**
    - **Lack of funding to procure relevant monitoring gargets and transport.**

c. **What are the main policy and institutional constraints?**
    - Lack of policies that adequately recognize the role of ecosystem services.
    - Lack of legislative frameworks that would fully enforce the implementation of policies

d. **What actions are required and what would be the priorities?**
– Need for government and stakeholder commitment towards recognizing the importance of BFA, and its management for the benefit of current and future generations.
Need for strengthening stakeholder (including decisions makers) awareness on the

CHAPTER 6: Future agendas for conservation and sustainable use of biodiversity for food and agriculture

Proposed structure of the chapter and information to be included in the Country Reports

This chapter provides an opportunity to describe plans and priorities to secure and improve the conservation and sustainable use of biodiversity for food and agriculture. Particular attention should be given to future opportunities to enhance the contribution of biodiversity for food and agriculture to food security and nutrition, as well as the elimination of rural poverty. Planned actions and initiatives should be listed that intend to support the following:

i. Strengthening the contribution of biodiversity for food and agriculture to secure the multiple benefits of agriculture, including food security and nutrition, rural development, sustainable intensification, and the enhanced sustainability and resilience of production systems;
ii. Improving recognition and involvement of farmers, pastoralists, fishers and forest dwellers, addressing gender equality,
and supporting the roles and contributions of women;
iii. Contributing to the UN Strategic Plan for Biodiversity and to achieving the Aichi Targets and linking to other related processes undertaken through the Convention on Biological Diversity.

Additionally, Chapter 6 allows an assessment of future needs with respect to policies and legal arrangements, economic frameworks, knowledge creation, capacity development and collaboration.

This part of the Country Report should build on the results presented in earlier Chapters and provide an integrated overview with, where possible, clear priorities for national, regional or global actions. This chapter is structured to benefit countries through an overall synthesis of information provided elsewhere in the report. Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources, may wish to take full advantage of their different sectoral reports to identify an overall perspective.

Enhancing the contribution of biodiversity for food and agriculture

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them on enhancing the contribution of biodiversity for food and agriculture to human wellbeing, environmental health and sustainable production. Include any information that might be useful in informing future policies to help strengthen the contribution of biodiversity for food and agriculture to the broader sustainability and development objectives listed below.

92. Describe planned actions and future priorities to improve the conservation and sustainable use of biodiversity for food and agriculture with specific reference to enhancing its contribution to:

Area	Planned actions
Improving food security and nutrition	**The Ministry of Agriculture has plans to increase food security through** Increased availability of locally produced food commodities and value addition. This involves attainment of 140,000MT maize per year by 2018 through irrigation development. There are also plans for

	Increased food and nutrition security at household level through improved dietary diversity through: • Promotion of production of leguminous, roots and tuber crops for improved dietary diversity and income generation • Development of a nutrition education programme for households (including food preparation) and • Establishment of Food and Nutrition Gardens (FNGs) • Promoting establishment of a mini-orchard of at least 10 fruit trees per household
Improving rural livelihoods	The Ministry of Agriculture has plans to enhance commercialisation of agriculture on SNL through ensuring sufficient land for agricultural production to be achieved through development of a minimum of 12 Chiefdom Plans and their implementation. There are also plans for engaging at least 32 community-based vegetable schemes.
Improving productivity	The Ministry of Agriculture has a target of attaining a minimum yield of maize of 4 MT/ha through • Enhancing technical and input support for 21 500 farmers / 21 500 ha • Increasing availability of tractors in the government tractor pool • Soil testing and lime application for 21 500 farmers. There are also plans to enhance livestock production through: • Increased fodder production and provision of feed supplements. • Strengthening animal breeding programme • Commercialisation of small stock farming, • Development of a cow- calf programmes to increase slaughter stock.
Supporting ecosystem function and the provision of ecosystem services	There are no specific plans
Improving the sustainability and resilience of production systems	The Ministry of Tourism and Environmental Affairs has plans for: Introducing climate resilient agricultural farming technologies and practices such as Agroforestry
Supporting sustainable intensification	Training programes for farmers in various production areas

Based on Government's Programme of Action 2013-2018 and Plan of Action 2018-2022.

Planned actions for improving capacity and operations of the institutions concerned with or affected by the maintenance and use of biodiversity for food and agriculture include:

- Building the human, material and financial capacity
- Improving staff performance and welfare in the workplace.
- Strengthening competence and quality of agricultural research extension services

- Design a strategy for mobilisation of resources
- Implementation of resource mobilisation strategy
- Recruitment and training of qualified and competent personnel to drive research.

With regards to ways of improving collaboration with other stakeholder institutions, the Ministry of Agriculture has the following plans as published in Government's Five Year Plan:

- Engaging stakeholders to identify priority areas for the national agricultural research agenda
- Strengthening and widening the links of research institution with other local and international research organizations'
- Mapping out the agricultural research agenda/roadmap/programme
- Establishing exchange programmes with other research institutions.
- Sharing of information and innovations with other research organization.
- Publication of research findings in international journals.

Among the gaps that remain are characterization of the country's genetic resources and assessment of intra- and inter-species diversity.

Targets 6, 7 and 13 in Swaziland's NBSAP 2 and planned actions that will contribute to them are shown below:

Target and Strategic Initiative	**Planned actions**
Target 6: By 2022 all of Swaziland's aquatic resources are sustainably managed **Strategic Initiative 1:** Ensure optimal utilization and conservation of aquatic resources (wetlands, rivers, etc.)	**The Ministry of Natural Resources has plans for the following:** • To produce an abridged version of the Integrated Water Resources Management (IWRM) Masterplan by 2018. • To establish and gazette five river basin institutions for effective and efficient water resources management by 2018. • Providing support and capacity building to River Basin Authorities and providing support to Irrigation Districts to facilitate implementation of their responsibilities under the Water Act 2003. • Supporting River Basin Institutions in development and implementation of their water resource plans. **The Ministry of Tinkhundla has the following plans:** • Capacitating one hundred communities (100) on appropriate technology to produce water harvesting tanks. **The Ministry of Agriculture plans to:** • Enhance efficient irrigation water management • Raise awareness and train all household in the country on water harvesting techniques • Promotion of rain water harvesting techniques and drip irrigation.

Target 7: By 2022, all areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of Swaziland's biodiversity. **Strategic Initiative 1:** Promotion of Sustainable agriculture, fisheries, aquaculture and forestry	**The Ministry of Agriculture has the following plans:** • Training 20 000 farmers on Good Agricultural Practices • Implementation of cost effective and environmentally friendly animal disease control programmes: dipping, vaccination. • Up-scaling of climate smart agriculture practices • Training of farmers on Conservation Agriculture • Conducting research trials on climate smart agriculture • Rangeland management • Land management and reclamation with a target of reclamation of 150 ha by 2018 • Land use and resettlement for increased agricultural production (including livestock rearing). • Land management and reclamation • Land use and resettlement for increased agricultural production (including livestock rearing). **The Ministry of Tourism & Environmental Affairs:** • Reduced deforestation through planting of deforested areas • Training communities of sustainable forest management and conservation
Target 11: By 2022, at least 20 per cent of Swaziland's land area, especially areas of particular importance for biodiversity and ecosystem services, protected landscapes and multiple resource use areas are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas. **Strategic Initiative 1:** Assessment of the country's biodiversity and ecosystems to identify hotspots (protection-worthy areas). **Strategic Initiative 2:** Expand the protected area network and governance types using the landscape approach. **Strategic Initiative 3:**	• Identified Protection Worthy Areas gazetted (target is for 5%)

Strengthening protected areas through improved conservation management and operational support. **Strategic Initiative 4:** Develop management plans for PWAs.	
Target 13: By 2022, the genetic diversity of cultivated plants and domesticated animals and their wild relatives, including other socio-economically as well as culturally valuable species, in Swaziland, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity. **Strategic Initiative 1:** Assessment of genetic diversity of cultivated plants, farmed and domesticated animals and their wild relatives. **Strategic Initiative 2:** Maintain the genetic diversity of crops, livestock, fish, harvested tree species and wildlife and other valuable species.	**The Ministry of Agriculture has the following Plans:** • Promoting animal and plant genetic resources conservation, • Identify, collect, characterise and conserve indigenous genetic resources, • Increasing the number of for indigenous chicken multiplication centres The Ministry of Tourism & Environmental Affairs has plans to: • Develop of maps detailing forest coverage and plant biodiversity resources, • Strengthen existing government nurseries to produce medicinal plants

Strengthening the conservation and management of associated biodiversity and wild foods

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them on the conservation and management of associated biodiversity and of wild foods.

93. Describe planned actions and future priorities to support conservation and management of the components of associated biodiversity and wild foods including the development of monitoring programmes and of information systems or databases.

There are no specific plans for management of components of associated biodiversity and wild foods in the Government Five Year Plan. There are plans to strengthen nurseries handling medicinal plants within the Forestry Department.

The Swaziland Environment Authority is the main agency responsible for biodiversity issues outside protected areas whilst SNTC and Big Game Parks are responsible for biodiversity management in protected

areas. Coordination across stakeholder institutions is achieved through the Biodiversity Implementation Committee (BIPC) composed of stakeholders of different expertise and representing stakeholder institutions. BIPC is responsible for among others, coordinating biodiversity projects implemented by SEA. At present BIPC includes representation from Ministry of Agriculture, Swaziland National Trust Commission, Big Game Parks, University of Swaziland, private sector, civil society and others. One of the main limitations of BIPC is that its functionality is linked with project funding. Another challenge is lack of clarity about:

- How representatives of stakeholder institutions gather inputs from the institutions they represent on issues to be discussed,
- How resolutions are reported and how they feed back into sectoral planning in stakeholder institutions.

BPIC instead of being a just a committee needs to be elevated to a body with some level of autonomy that is highly recognized by government and reporting directly to the office of the head of government. This perhaps can enable proper budget allocation of this institution in order to full coordinate biodiversity related action plans. Its effective functioning also needs to be provided for development of mechanisms for stakeholder input and feedback within stakeholder institutions. It should also be mandated to actively scout for funding, manage the funds allocated to it and appropriately allocate them to sub or affiliate institutions that implement programmes and plans to promote conservation and sustainable use of all forms of biodiversity to enhance food and nutrition security, and improve ecosystem and environmental health and protection even for future generations of mankind and life on earth.

There is an urgent need to ensure that all biodiversity related institutions within and outside government affiliate to the proposed elevated BPIC (body) so as to facilitate coordinated implementation of programmes and plans, as well as ensure coordinated reporting and flow of information. Such can enhance stakeholder awareness and further inform policy decisions in line with regional and international.

- **The major information and knowledge gaps that remain to be addressed and options that exist to address them.**

<table>
<tr>
<td>Information required to support policy making
• Role of wild foods in coping strategies and building resilience of poor families and communities
• Valuation of ecosystem services in supporting production across all sectors</td>
<td>Associated biodiversity
• Interaction between crops and livestock and associated biodiversity including beneficial organisms
• Documentation of major complements of associated biodiversity across all sectors
• Monitoring of trends including impacts of climate change, natural and man-made disasters</td>
<td>Ecosystem services
• Specific ecosystem services that support production across all sectors and valuation in economic terms
• Impacts of invasive alien species on ecosystem services
•</td>
</tr>
<tr>
<td>Indigenous Knowledge
• Systematic documentation of IKS related to use and management of biodiversity
• Opportunities for mainstreaming IKS into conservation and sustainable use of biodiversity</td>
<td colspan="2">Biodiversity for food and agriculture and Associated Biodiversity
• Characterization
• Analysis of organization of genetic diversity across all sectors
Conservation programmes</td>
</tr>
<tr>
<td colspan="3">Climate change
Swaziland has developed her Intended National Contribution under the United Nations Framework Convention on climate change. Contributions identified include:
• Scaling up investments in restoring and maintaining ecological infrastructure, with a focus on the priority ecological assets.
• Establishing effective long-term biodiversity conservation, landscape management and natural resource management programmes.
• Strategic planning and management of the ecological infrastructure, including healthy grasslands, rivers, wetlands, woodlands and natural forests.
• Enhance biodiversity and promote ecotourism with benefit sharing for the surrounding communities (MTEA, 2015).
This will require knowledge generation on interactions of biodiversity to support ecosystem services and monitoring of trends</td>
</tr>
</table>

Amongst the priorities with regards to filing these gaps are the following:

i. Enhancement of the institutional arrangements to eliminate redundancy ad facilitate effective collaboration and cooperation
ii. Establishment of a national research agenda and priority setting platform,

94. Describe planned actions and future priorities with respect to implementing ecosystem approaches for the various components of biodiversity for food and agriculture.

Swaziland has adopted an ecosystem-based approach to conservation of biodiversity. The Strengthening the National Protected Areas System of Swaziland Project is based on the ecosystem and landscape approach to management of biodiversity. The Outcome of Component 2 of the Project is "*Landscape approach operationalised and leads to expansion of PA network"*. One of the main challenges that will need to be overcome is that the current institutional capacity and governance framework is inadequate and ineffective for conservation and creation of a protected area network that covers all ecosystem as well as establishment and implantation of programs for sustainable utilisation of biodiversity. The SNPAS Project document notes weak skills and capacities for enforcing biodiversity compatible land-use, particularly in areas adjacent to Protected Aras as well as weak collaboration and coordination between SEA and Ministry of Agriculture as key challenges.

The Forestry Department also has plans to train communities on sustainable forest management and conservation.

Improving stakeholder involvement and awareness

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them with respect to stakeholder involvement in the conservation and sustainable use of biodiversity for food and agriculture with specific reference to the recognition and involvement of farmers, pastoralists, fishers and forest dwellers, addressing gender equality, and supporting the roles and contributions of women.

95. Describe planned actions and future priorities to improve stakeholder awareness, involvement and collaboration in the conservation and sustainable use of biodiversity for food and agriculture. Include a description of the major challenges that will need to be overcome.

Swaziland's NBSAP II has set a target of having at a minimum, 70% of the population cognizant of biodiversity and ecosystems, their value and the steps they can take to conserve and use these biodiversity sustainably. In this regard, SEA has a plan to implement an awareness campaign on biodiversity in general and the NBSAP in particular. The Swaziland Environment Authority has plans to carry out a major awareness raising campaign on biodiversity in general and the NBSAP more specifically. The Government's Five Year Plan has no specific plans for improving awareness on conservation and sustainable use of biodiversity for food and agriculture but there are a number of related initiatives. These include:

- Plans for environmental awareness campaigns in all the country's Tinkhundla by Ministry of Tourism & Environmental Affairs,
- Plans for a Public awareness programme for climate change and meteorology based on radio, television, newspaper, newsletter and community based approaches.
- Planned awareness creation on Flora Protection Act No.5 of 2001 and the importance of forests in the environment.

The major challenge that will need to be overcome is lack of financial resources to implement these plans.

96. Describe planned actions and future priorities to support the role of farmers, pastoralists, fisher folk, forest dwellers, and other rural men and women dependent on local ecosystems in the conservation and use of biodiversity for food and agriculture. Replies should include

information on recognizing and enhancing the role of indigenous peoples. Include a description of the major challenges that will need to be overcome.

The Swaziland Environment Authority runs the UNEP-GEF funded Community Small Grants Programme. This initiative provides financial and technical support to community projects aimed at conservation and restoration of the environment while enhancing people's well-being and livelihoods at community. Examples of projects in progress include the Lawuba Wetland Conservation Project. SEA is also supporting other community driven conservation projects such as the Emvembili Conservancy an eco-tourism based initiative under development. One of the challenges in rolling out these programmes is conflicting demands for land along with limitations of inadequate budgetary allocations.

97. Describe planned actions and future priorities to improve recognition of the contribution of women to the conservation and use of the different components of biodiversity for food and agriculture, including associated biodiversity. Include a description of the major challenges that will need to be overcome.

Swaziland has adopted a decentralised approach to development in which at local level, communities take an active role. There has also been some progress in terms of empowering women to participate in development at community level with more women participating in community development platforms. The Gender Unit, located within the Office of the Deputy Prime Minister a programme for advocacy on the role of women and emphasis on buntfu (humanity) as well as women's equitable access to land and credit.

Empowering communities is expected to have positive outcomes for sustainable use of biodiversity as communities have a closer relationship with their environment. The country has adopted Community Based Natural Resource Management (CBNRM) as a means of involving the private sector and local communities in biodiversity conservation and also providing a mechanism for sharing of benefits with local communities (Swaziland Environment Authority, 2009). Similarly, the Forest Policy and the Poverty Reduction Strategy both advocate establishment of Natural Resources Committees (NRCs). Actions that need to be taken to support the role of communities in conservation and sustainable use of biodiversity for food and agriculture include:

- Draw and document lessons from establishment of successful community-based conservation initiatives e.g. Shewula Conservancy
- Identification and documentation of all species and material that is being used and of importance to communities in a participatory manner
- Empowering communities to document and manage biodiversity of importance to them integrating science with traditional practice for sustainable outcomes,
- Identification of priority species of conservation concern for *ex-situ* conservation
- Empowering communities to develop community level nurseries for multiplication of priority species for restoration / replenishment wild stock
- Explore opportunities for and implement awareness creation and community education on ecosystem services and associated biodiversity
- Participatory valuation of ecosystem services and associated biodiversity.

The Deputy Prime Minister's Office has plans to run advocacy programmes for women's equitable access to land and credit facilities. If implemented effectively, this will go some way towards addressing historical disparities in equity to access to land and credit that has been a challenge to participation of women in Agriculture. Another challenge that will need to be overcome is the burden placed on women as primary carers which then limits their time available to participate in agriculture.

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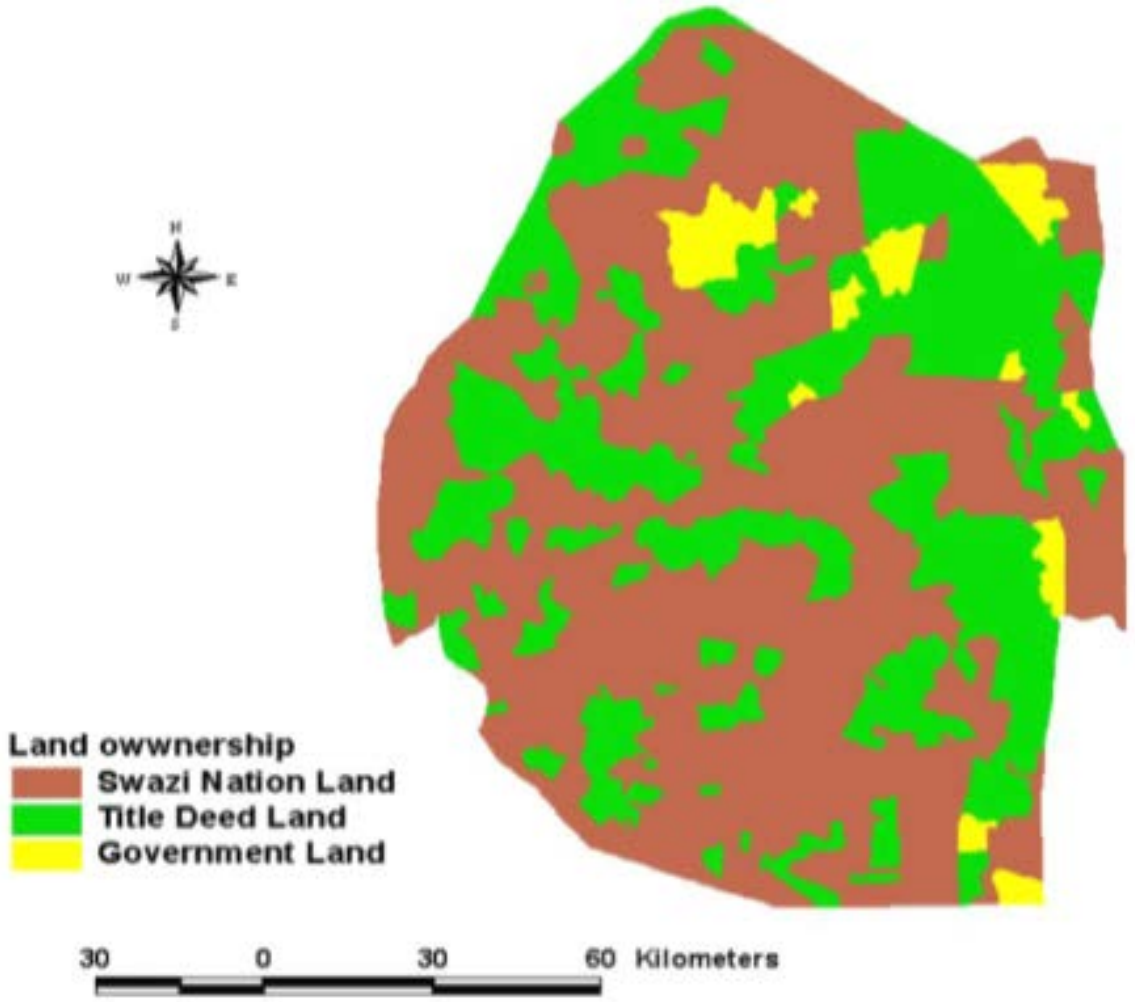
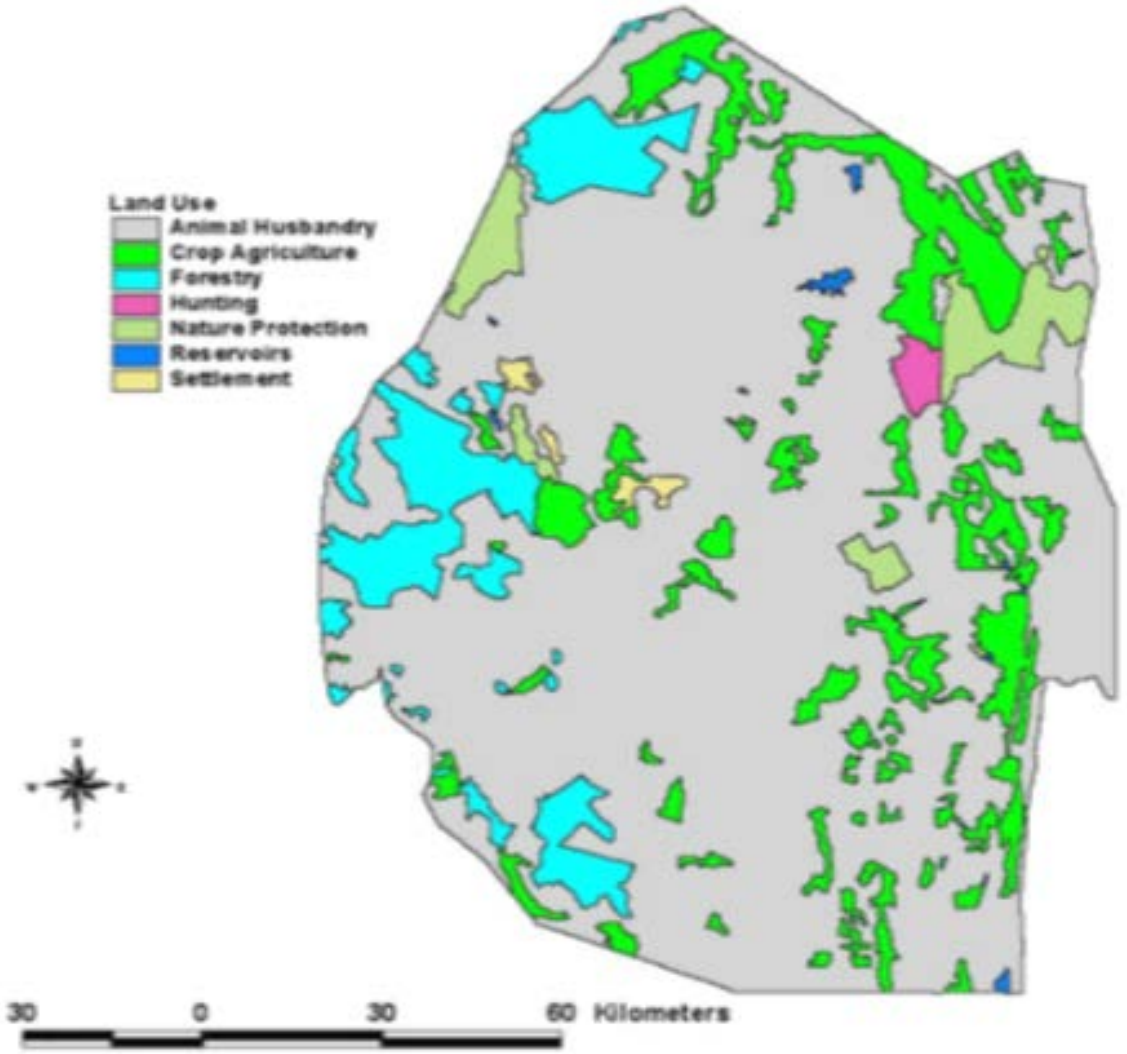
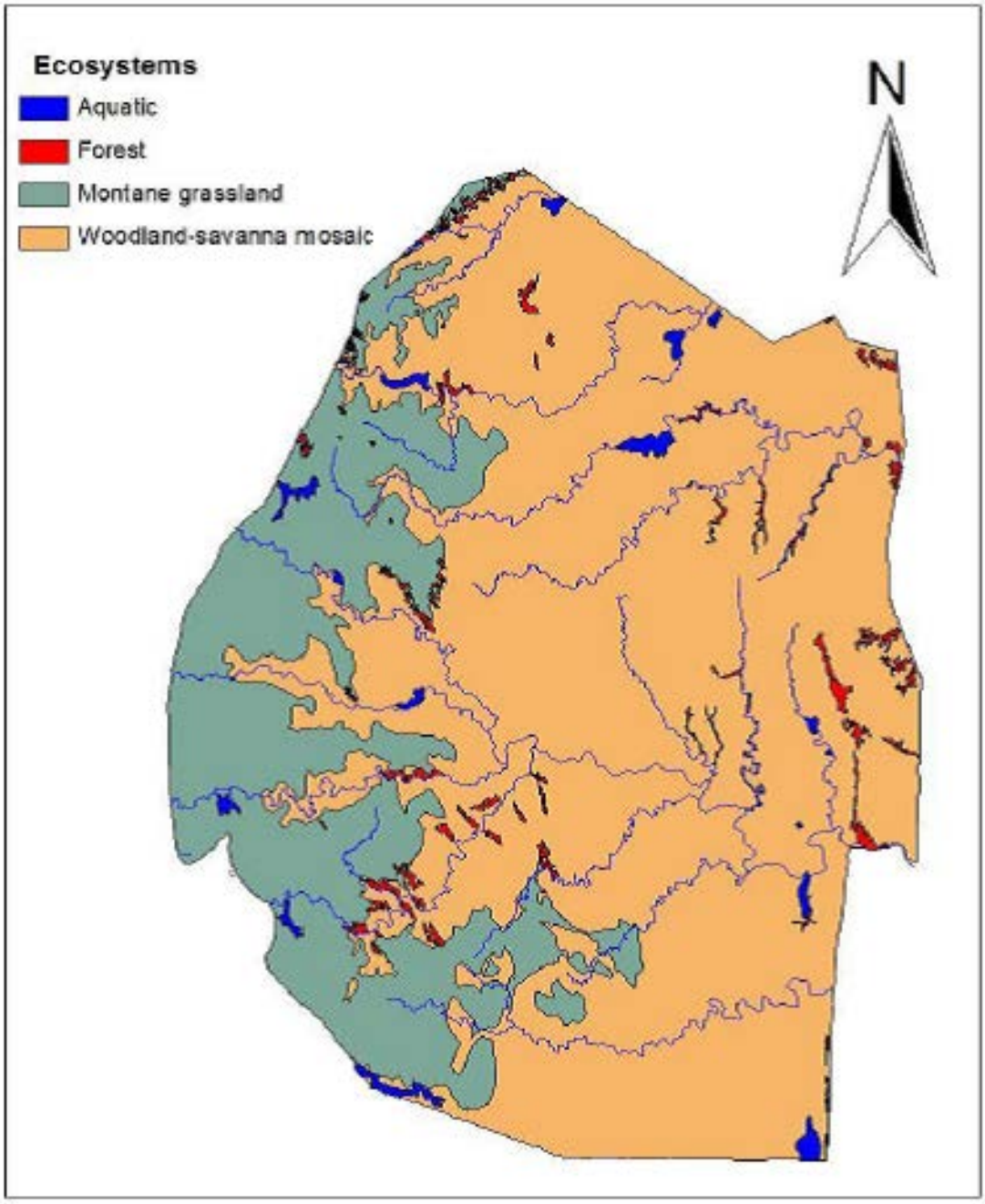

Land owwnership
Swazi Nation Land
Title Deed Land
Government Land
30
0
30
60 Kilometers

Annex 3: Land use map of Swaziland



Annex IV Swaziland's Ecosystems


Ecosystems
Aquatic
Forest
Montane grassland
Woodland-savanna mosaic
N