



Bioenergy and Food Security Projects
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SIERRA LEONE

BEFS COUNTRY BRIEF



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1. BEFS

1.1 BIOENERGY AND FOOD SECURITY

Increasing costs of fossil fuels, the threat of climate change and the need to increase energy security and access have put alternative renewable energy sources, including bioenergy, high on the development agenda. Compared with other sources of energy, bioenergy potentially offers some developmental advantages. Bioenergy can target and stimulate the agriculture sector, a critical sector for development and poverty reduction, while improving energy access, creating a new market for producers, offering new employment opportunities, and potentially contributing to environmental objectives. Nevertheless, there are concerns regarding the actual viability of the sector and its environmental and socio-economic sustainability, also in terms of potential competition with food security.

1.2 THE BIOENERGY AND FOOD SECURITY APPROACH

To date, the rush to develop bioenergy as an alternative to fossil fuels has tended to occur in the absence of an understanding of the associated risks and benefits. In order to assist governments in gaining a proper understanding of the issues at stake, FAO has developed the Bioenergy and Food Security (BEFS) Approach.

FAO's **Bioenergy and Food Security (BEFS) Approach** aims to assist policy-makers in assessing the interplay between natural resource availability, bioenergy production potential, rural development and food security, and in strengthening their capacity to manage the trade-offs associated with bioenergy development.



1.3 THE BEFS COUNTRY BRIEF

Part of the first stage of the implementation of the BEFS Approach in a country, is to undertake a review of the agriculture, energy and food security situation at domestic level. This review provides the basis for the identification of potential bioenergy sources, and for a preliminary assessment of potential risks associated with the development of the sector.



The BEFS Approach consists of a **multidisciplinary** and integrated set of **tools and guidance** that can support countries throughout the following key steps of the bioenergy policy development and implementation process:

- **Identification of the key issues** surrounding **bioenergy and food security**, based on the conceptual foundation provided by the BEFS Analytical Framework, and through an **institutionalized dialogue** among relevant national stakeholders;
- **Assessment of the sustainable bioenergy potential**, based on an assessment of **land suitability** and **production costs**, and through an **analysis** of the **environmental** and **socio-economic** dimensions and implications of different bioenergy development pathways, with particular emphasis on food security;
- **Risk prevention and management**, through good environmental and socio-economic practices and related policy instruments;
- **Investment screening and appraisal** through an assessment of the viability and sustainability of proposed bioenergy investments/projects;
- **Impact monitoring, evaluation and response** at both national and project levels; and
- **Capacity building** both at **technical** and **policy** level through training on the above technical tools and guidance.

The BEFS Approach helps countries design and implement sustainable bioenergy policies and strategies, by ensuring that bioenergy development fosters both food and energy security, and that it contributes to both agricultural and rural development in a climate-smart way.

2. COUNTRY OVERVIEW

2.1 QUICK FACTS

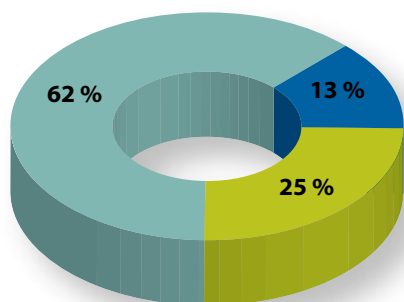
Sierra Leone is located on the west coast of Africa. The country has a total area of 71,740 square kilometers¹. It has four distinct regions- coastal mangroves, woodland, upland plateau, and mountains, and a tropical climate receiving around 2,500 mm of rain a year². The population in 2009 was 5,696,471 people (with a 2.4 percent annual growth rate³), of which 61.6 percent was classified as rural in 2010, down from 64.8 percent in 1999³.



2.2 ECONOMY

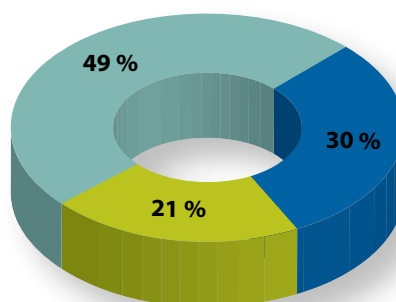
When the civil war began in 1991, Sierra Leone was one of the world's poorest countries. After the war, real economic growth rebounded strongly: 27 percent in 2002, 9 percent in 2003, and just over 7 percent from 2004 - 2007, before slowing down in 2008 - 2010⁴. In 2011, real gross domestic product (GDP) increased by 5.6 percent, while in 2012 a 6 percent growth rate is expected⁴. GDP per capita is also on the rise, increasing from \$152 US dollars in 1999 to \$261 US dollars in 2009³. Trade accounted for 46.6 percent of the nation's GDP in the same year, and net inflows of foreign direct investment equated to 4.5 percent of GDP³. The structure of the country's economy is changing as well, experiencing a shift away from agriculture and more towards industry and services (**Figure 2 & 3**). Consumer price inflation increased from 16.6 percent in 2010 to 18.5 percent in 2011, due to higher global commodity prices, currency depreciation and the removal of fuel subsidies⁴. Higher global prices also contributed to an increase in the current-account deficit, which equaled 28.8 percent of GDP in 2011, although a decrease is expected in 2012 thanks to higher exports⁴. Overall, in spite of remarkable progress since the war ended in 2002, problems of poor infrastructure – including roads and energy – low capacity, widespread rural impoverishment and youth unemployment, among others, still persist⁴. With regard to the latter, for instance, in 2006 three of every 10 men aged 20 to 24 were neither formally employed nor in school⁴.

FIGURE 2: SIERRA LEONE GDP BY SECTOR (1999)



Source: WDI (2010)

FIGURE 3: SIERRA LEONE GDP BY SECTOR (2010)



Source: WDI (2010)

Agriculture Industry Services

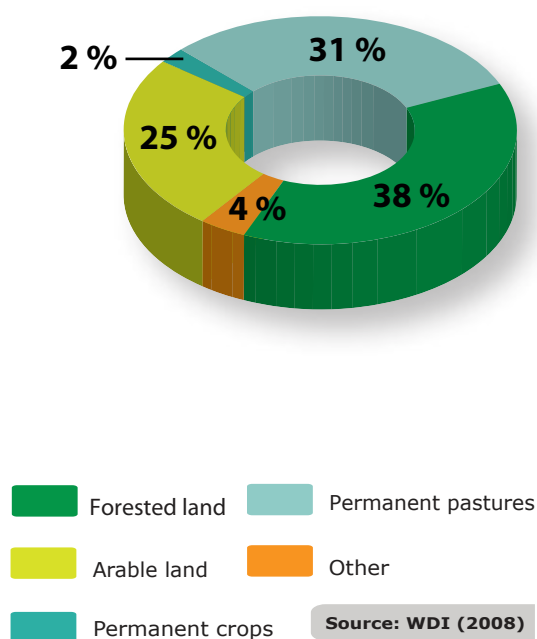
3. AGRICULTURE AND BIOMASS

3.1 LAND AND WATER

Sierra Leone has approximately 41,300 square kilometers of agricultural land, or 58 percent of total land area (**Figure 4**). Of that land, 25 percent is classified as arable. Only 15 percent of arable land, or 111,510 hectares, is currently under cultivation². The country has over 160 billion cubic meters of renewable water resources available, of which less than half a percent is used annually⁵. Of the total water withdrawn each year, around 70 percent is used in the agriculture sector⁵.



FIGURE 4: SIERRA LEONE LAND USE (2008)



3.2 AGRICULTURE AND LIVESTOCK

The agriculture sector employs 60 percent of the population³. The main farming system in Sierra Leone is subsistence farming. The system is still mainly rain-fed and characterized by low productivity. Agriculture value added was 49 percent of the country's GDP in 2010, and 12.1 percent of total exports were from agriculture³.

Rice is the main crop produced in Sierra Leone, followed by cassava and to some extent palm oil. Cocoa beans and coffee are the main export crops. In the last 11 years, production of all of these crops has increased. Rice production levels have risen 217 percent, cassava 46 percent, and palm oil 11 percent (**Figure 5**).

FIGURE 5: SIERRA LEONE FOOD CROP PRODUCTION - TONNES (2009)

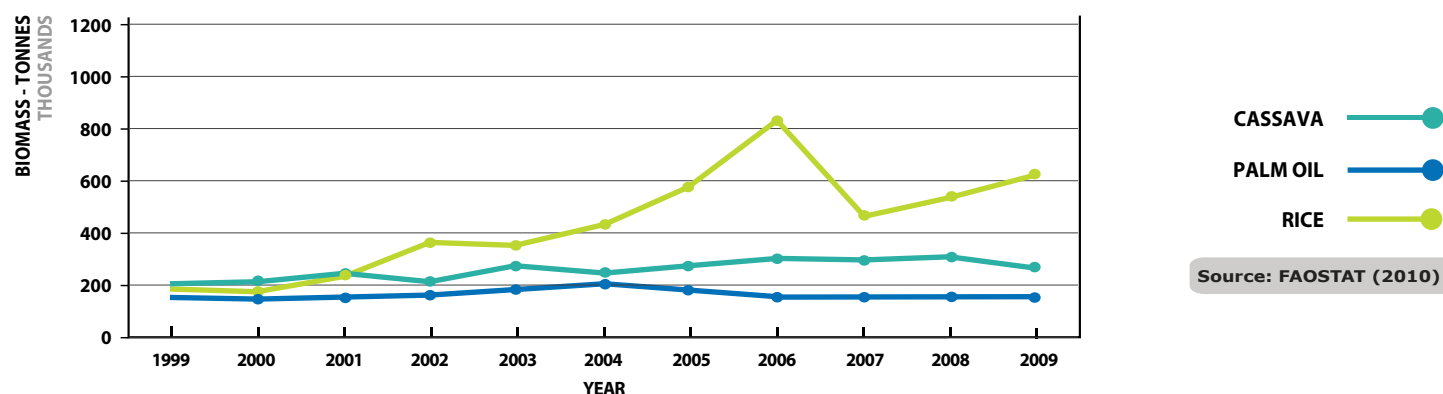
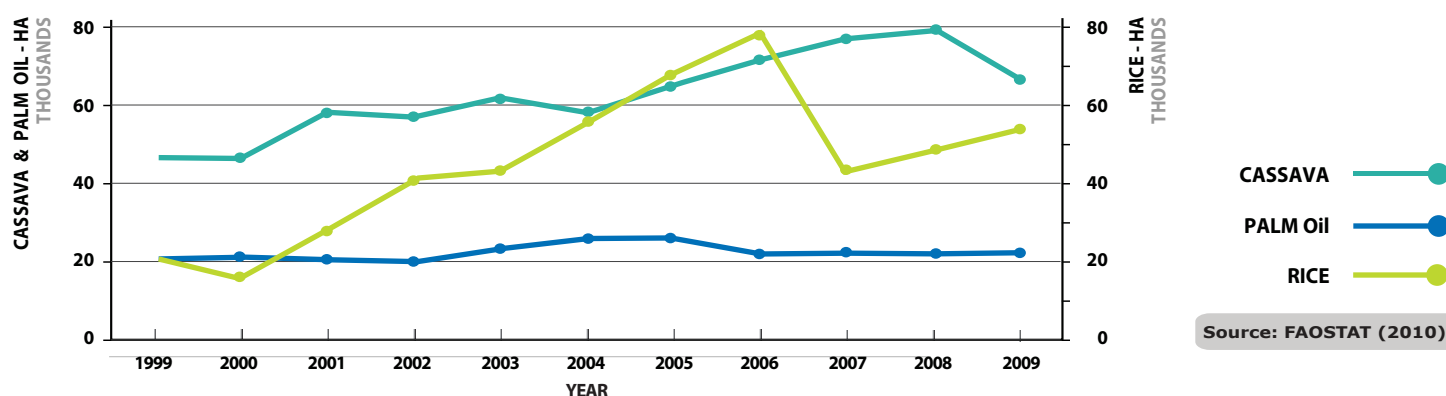
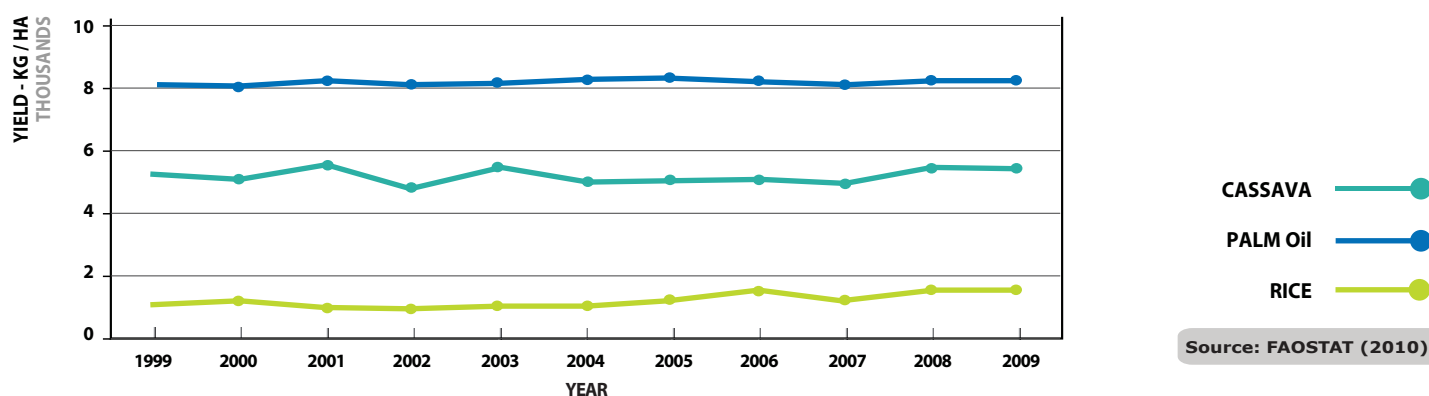


FIGURE 6: SIERRA LEONE AREA HARVESTED- KG/HA (2009)



The total hectares of the main crops harvested in Sierra Leone also increased over the past decade. Rice area increased by 14.6 percent, cassava by 39 percent, and palm oil by 10 percent (Figure 6). Yield levels increased during the same time period. Rice yields rose by 29 percent, cassava by 5 percent, and palm oil by just over 1 percent (Figure 7).

FIGURE 7: SIERRA LEONE FOOD CROP YIELD- KG/HA (2009)



A considerable share of agricultural output is wasted due to post-harvest losses. For instance, 11.5 percent of milled rice consumed within the country, over 77 thousand tonnes, was lost to waste in 2007² (Table 1).

TABLE 1: SIERRA LEONE CROP UTILIZATION (2007)

Commodity	Domestic Consumption	Food Supply	Processing	Wastage	Feed	Seed	Other Utility
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Cassava	370,225	370,225	-	-	-	-	-
Palm Oil	49,545	44,312	-	-	-	-	5,233
Milled Rice	649,907	500,838	5,233	77,131	-	66,700	5

Source: FAOSTAT (2007)

3.3 LIVESTOCK

Livestock is also an important component of Sierra Leone's agricultural sector. Permanent pastureland accounts for 31 percent of total land available according to 2008 statistics². In excess of 7,800,000 head of poultry, 730,000 goats, 620,000 sheep, 470,000 head of cattle, and 415,000 horses are raised in Sierra Leone for meat, milk and egg production.

3.4 POLICY

Policies in this sector have only recently begun to take shape. The *National Sustainable Agriculture Development Plan (2010-2030)* has laid out goals and a framework to make the agricultural sector of Sierra Leone more productive, efficient, competitive and well-managed⁶. In collaboration with the *Comprehensive Africa Agriculture Development Programme (CAADP)* and the UNDP, a series of short, medium, and long-term investment programmes and strategies are being initiated through the Ministry of Agriculture, Forestry and Food Security. These include intensifying agricultural productivity; promoting private sector (commercial) agricultural investment; improving technology, research and transportation; and improving all facets of the sector's management⁶.

4. FOOD SECURITY

4.1 NUTRITION

Nutrition remains a serious concern in Sierra Leone. Stunting was found in 34 percent of children under the age of five in 2010, and wasting occurred in 10 percent of children in the same age category⁷. Rice contributes 42 percent of total calories in the country, cassava 10 percent and palm oil 9 percent (**Table 2**). In total these three commodities account for 61 percent of total calorie intake. Animal products make up just over 4 percent of the this total, which can lead to other developmental problems due to the low amount of protein consumed.

4.2 FOOD SECURITY AND FOOD PRICES

Sierra Leone is classified as a Low Income Food Deficit Country (LIFDC). Currently, 70 percent of the population in Sierra Leone live below the national poverty line³ and 35 percent are undernourished⁸. With a high percentage of the country's population living in poverty, food security is a national concern. Most affected are low-income households in urban areas and smallholder farmers during the less-productive June to October crop season⁹. Sierra Leone is heavily dependent on rice for food security. Rice is grown by 96 percent of farmers in Sierra Leone and it accounts for 42 percent of the average person's calorie intake (**Table 2**). Even with such a large number of domestic rice growers, the country is a net importer of rice. In 2008, Sierra Leone imported 18 percent of the rice that was consumed domestically (**Table 3**), while in 2012 rice imports are expected to reach approximately 100,000 tonnes, about 20 percent of requirements¹⁰.

TABLE 2: SIERRA LEONE FOOD CROP CALORIC INTAKE (2007)

Ranking	Commodity	Calorie Share (%)
1	Rice	42
2	Cassava	10
3	Palm Oil	9
4	Groundnuts	6
5	Wheat	4
6	Sugar	3
Subtotal Food Crop share		74
Animal Products Share		4
Total Calories (kcal/capita/day)		2 130

Source: FAOSTAT (2007)

TABLE 3: SIERRA LEONE NET CROP TRADE (2007)

Commodity	Production	Import	Export	Stock Variation	Domestic Consumption	Import Share of Consumption
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	%
Milled Rice	667 000	115 281	–	-132 374	649 907	18
Cassava	370 000	225	0	–	370 225	0
Palm Oil	36 000	9 197	152	4 500	49 545	18
Sugar Cane	70 000	–	–	–	70 000	0

Source: FAOSTAT (2007)

As a net food importer, changes in world food prices could have a significant impact on the national trade balance and on the food security situation of poor and vulnerable communities in Sierra Leone. In 2008, rice prices more than doubled in 6 months⁹.

4.3 POLICY

New policies have been implemented to deal with the problem of food insecurity in Sierra Leone. *The National Rice Development Strategy (2009)* aims to increase sustainable rice production; improve and promote post-harvest handling, processing and marketing; develop technology and infrastructure for the sector; and improve the capacity of stakeholders and investors to increase rice production to a level that will positively affect food security and economic growth¹¹. The *"Agenda for Change" (2008-2012) Strategy Paper* also outlines a framework to reduce overall poverty in Sierra Leone. It emphasizes the need to improve agriculture production and value; establish a national transportation network; provide reliable energy supplies; and improve social services to ensure sustainable human development¹².

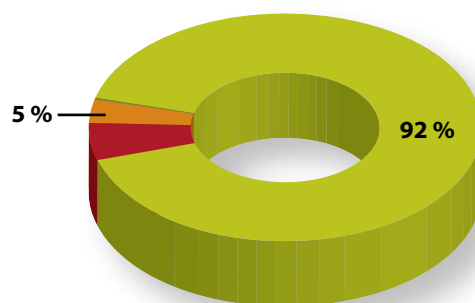
5. ENERGY AND BIOENERGY

5.1 ENERGY SUPPLY AND DEMAND

The energy sector in Sierra Leone is underdeveloped. Less than seven percent of the country has access to electricity¹³. The majority of the population with access to electricity live around the capital, Freetown. With oil production limited to around 30 barrels a day and no coal or natural gas resources available, the country is heavily dependent on local wood fuel, charcoal and imported fossil fuels¹⁴.

In 2009, 97 percent of household energy was generated using forest products (**Figure 8**). However, this situation is starting to change, with the partial opening of the Bumbuna hydropower plant in 2009. Other potential renewable energy sources in Sierra Leone are modern bioenergy, solar energy, wind energy and increased hydroelectric production¹³.

FIGURE 8: SIERRA LEONE HOUSEHOLD ENERGY CONSUMPTION (2008)



Source: Agenda for Change (2008-1012)



5.2 MODERN BIOENERGY

At present, Sierra Leone does not supply or consume modern bioenergy. With the implementation of new agricultural policies, production and yields could increase enough to consider additional production for an emerging bioenergy market. There could also be considerable biomass feedstock from crop residues and wastes. However, greater assessment is needed in order to adequately define real potential in the country and clearly understand how much demand and what type of demand could be met through bioenergy production. Modern bioenergy could potentially increase energy diversification and reduce the dependence on imported fossil fuels. The potential benefit is further increased when combined with other forms of renewable energy.

5.3 POLICY

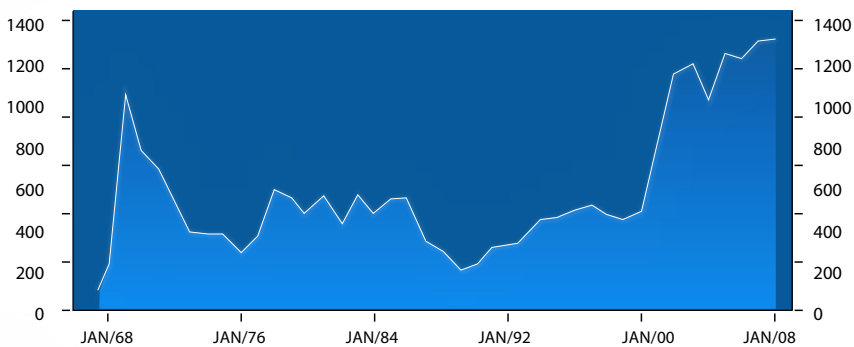
The *National Energy Policy (2009)* aims to provide affordable, sustainable, and secure energy to all Sierra Leoneans. Additional goals include increasing economic stability and developing rural and urban areas using energy as a tool for growth. Utilizing indigenous resources, reducing reliance on imported fuels, environmental conservation and sustainable resource management are other key focus areas of this policy¹⁵.

6. ENVIRONMENTAL CONCERNS

6.1 ENVIRONMENTAL PRESSURES

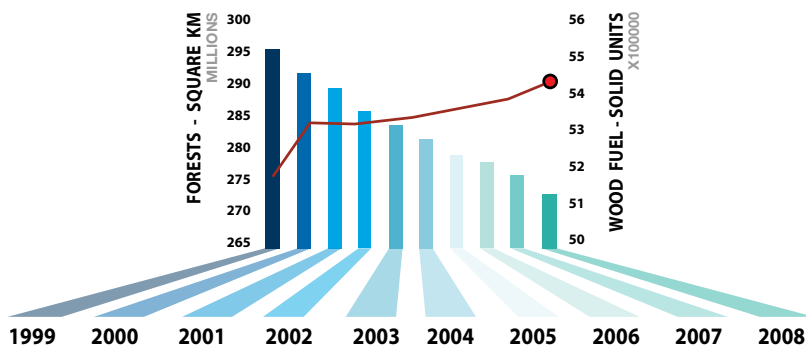
With Sierra Leone quickly recovering after years of conflict, the impact on the environment is a pressing issue. The government's increasing emphasis on economic growth will require that environmental policies and sustainable resource management be implemented to avoid the risk of irreversible damage. With reference to greenhouse gas emissions, CO² emissions have more than doubled in the last 10 years (**Figure 9**).

FIGURE 9: SIERRA LEONE CO² EMISSIONS- KT (2008)



Source: WDI (2010)

FIGURE 10: SIERRA LEONE FOREST AREA VS. WOOD FUEL PRODUCTION (1999-2008)



Source: FAOSTAT (2010)

6.2 CLIMATE CHANGE

Sierra Leone's environmental challenges will only be compounded with the effects of climate change. Sierra Leone has been named the fourth most vulnerable country in the world to the adverse effects of global warming¹⁷. The country is already experiencing shifting rainfall patterns, flooding, temperature fluctuation and drought¹⁸. Other potential hazards include landslides, salinisation and damage to the marine environment due to oceanic warming¹⁶. All of these changes have serious implications on the future of the agricultural sector and thus food security.

Land-use change and especially deforestation and forest degradation are major sources of GHG emissions in Sierra Leone. As noted previously, forestry and forest products are heavily utilized, with wood fuels and charcoal meeting 97 percent of household energy demand. With no management schemes in place to regulate harvesting, forested areas are rapidly shrinking to meet domestic demand for wood fuel and export demand for wood products¹⁶ (**Figure 10**). In addition to GHG emissions, unregulated harvesting of fuel wood is causing other environmental problems as well, especially in terms of biodiversity loss. Slash-and-burn agricultural practices are also playing a role in natural habitat destruction and soil degradation¹.

6.3 POLICY

The most current policy relating to environmental issues is the *Environmental Protection Agency (EPA) Act*, enacted by parliament in 2008. This act created a new agency responsible for collecting and disseminating information on the environment to various parties including government officials, NGOs, institutions, businesses, and the public; creating and enforcing new and existing regulations on environmental standards to curb all types of environmental degradation and pollution; and promoting research and education in order to improve environmental management and sustainability¹⁹. The EPA Act was implemented to strengthen enforcement of Sierra Leone's *National Environmental Policy (NEP)*, which was enacted in 1994. The primary objectives of the NEP are:

- to conserve and use the environment and natural resources for the benefit of present and future generations;
- to preserve biological diversity and optimize sustainable yield in natural resource and ecosystem utilization;
- to raise public awareness and promote understanding of the relationships between the environment and development; and
- to encourage individual and community participation in environmental sustainability¹⁷.



SUMMARY

- Sierra Leone's agricultural sector employs around 60 percent of the population and accounts for 49 percent of the country's GDP.
- Out of Sierra Leone's total land area, 58 percent is used for agricultural purposes, with 25 percent of this area classified as arable land. The country has large available renewable water resources, with less than half of one percent withdrawn each year.
- Rice, cassava, and palm oil make up 61 percent of the total calorie intake per day. Rice alone provides 42 percent of this total. Animal products provide an additional 4 percent.
- Sierra Leone is classified as an LIFDC. Sierra Leone imported 18 percent of the total amount of rice and palm oil consumed domestically in 2007. As a result, increases in the world price of rice and palm oil could have an effect on domestic food security.
- Around seven percent of households have access to electricity. The large majority of Sierra Leone's household energy consumption is supplied by wood fuel. Utilization of other forms of renewable energy such as modern bioenergy, solar, wind, and increased hydroelectric production could increase energy access and diversify Sierra Leone's energy profile.
- Sierra Leone does not currently produce modern bioenergy. Further assessment is needed in order to adequately understand the potential role of bioenergy as part of the energy mix and assess potential trade-offs associated with bioenergy development.
- Sierra Leone's forest area is declining as the demand for forest products and wood fuel increases. Policies that decrease dependence on traditional biomass and encourage environmental sustainability will deliver a range of benefits.
- Over the last ten years, Sierra Leone has implemented a range of policies affecting the agricultural, energy, and environmental sectors. The development of better data on the topics covered in this brief will strengthen the government's ability to assess the effectiveness of these policy interventions and improve future decisions regarding food security and energy sector development in Sierra Leone.



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