



Bioenergy and Food Security Projects  
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# MOZAMBIQUE

## 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

Mozambique is a country located on the Eastern coast of Africa and has a total area of 786,380 square kilometers<sup>1</sup>. It has a semi-arid to tropical climate with an average annual rainfall of around 1,030 mm, and has five river systems<sup>2</sup>. The population in 2010 was 23,390,765 and increasing by an average of 2.3 percent per annum<sup>3</sup>. Of this, nearly 62 percent is classified as rural, but with a growing trend towards urbanization<sup>3</sup>.



## 2.2 ECONOMY

In 2009, Mozambique's GDP grew by 6.3 percent. Between 1999 and 2009, GDP per capita increased from \$ 237 to \$ 372 (in constant US dollars)<sup>3</sup>. In 2010, trade equaled 68.5 percent of the country's GDP, and foreign direct investments equaled 8.2 percent of the latter<sup>3</sup>. In the same year, consumer price inflation amounted to 12.7<sup>3</sup> percent. Services are the main economic sector, with a 45 percent share of GDP in 2009 (down from 49 percent in 1999), followed by agriculture with 32 percent (compared to 28 percent in 1999). Between 1999 and 2009, the contribution of the industrial sector to the GDP remained stable at 23 percent (Figures 1,2)<sup>3</sup>.

FIGURE 1: MOZAMBIQUE GDP BY SECTOR (1999)

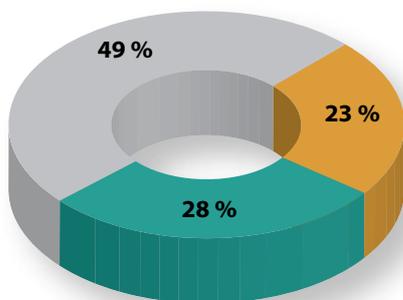
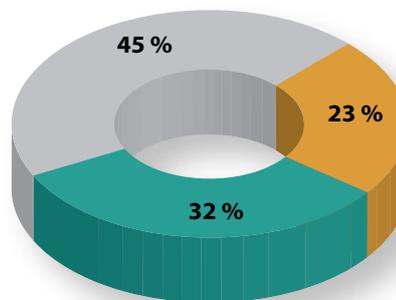


FIGURE 2: MOZAMBIQUE GDP BY SECTOR (2009)



■ Agriculture    
 ■ Industry    
 ■ Services

Source: WDI (2010)

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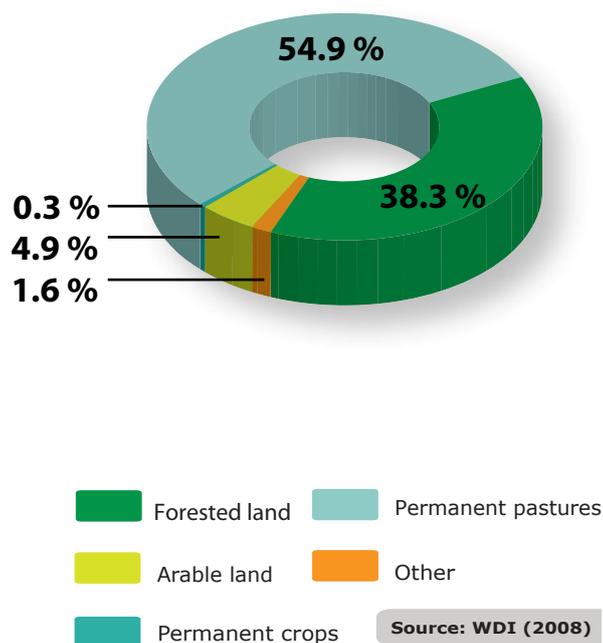
# 3. AGRICULTURE AND BIOMASS

## 3.1 LAND AND WATER

Mozambique has 493,000 square kilometers of agricultural land, which is 62.7 percent of the total land area (**Figure 3**). Of that, 4.9 percent is classified as arable land<sup>1</sup>. The country has over 217 billion cubic meters of renewable water resources available, of which less than half percent is withdrawn annually<sup>4</sup>. Of the total water withdrawn, around 74 percent is used in the agricultural sector<sup>4</sup>.



FIGURE 3: MOZAMBIQUE LAND USE (2008)



## 3.2 AGRICULTURE AND LIVESTOCK

The agricultural sector employs approximately 80 percent of the labour force and accounts for 4.4 percent of total exports<sup>2,3</sup>. The main farming system in Mozambique is rain-fed subsistence farming, with low levels of productivity.

Cassava is the main crop produced in Mozambique in terms of volume, followed by sugar cane and maize. Tobacco and sugar products are the main export crops based on value. Between 1999 and 2009, cassava production increased by 2 percent, maize production by 8 percent, and sugar cane production by 394 percent (**Figure 4**).

FIGURE 4: MOZAMBIQUE CROP PRODUCTION - TONNES (2009)

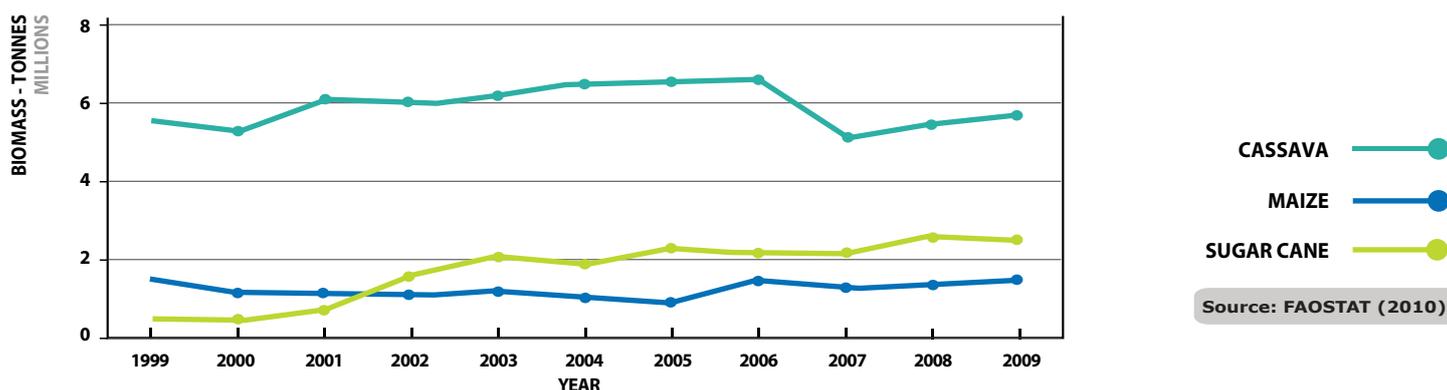
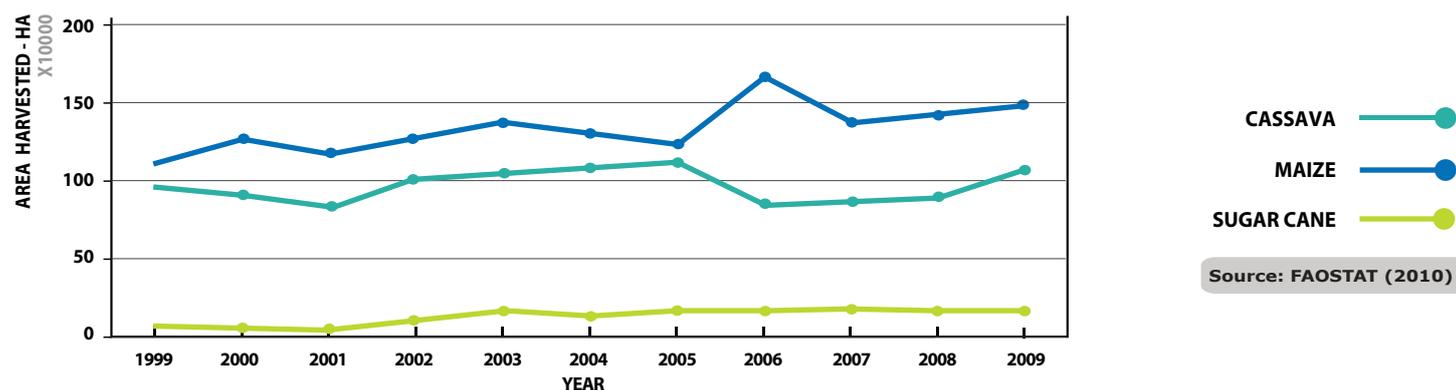
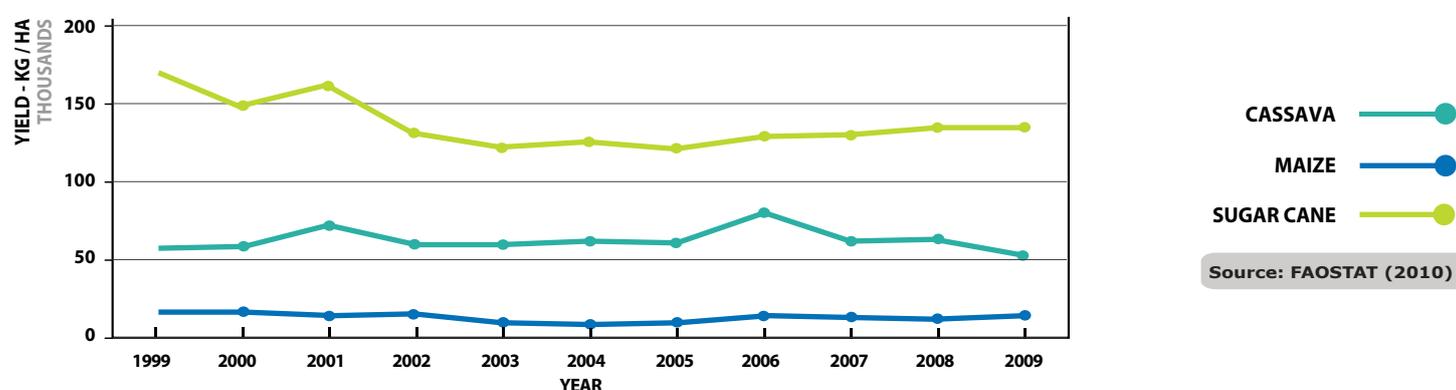


FIGURE 5: MOZAMBIQUE AREA HARVESTED- HECTARES (2009)



The increase in the production of these three crops between 1999 and 2009 was entirely due to an expansion in the area harvested, while yields decreased by 9 percent for cassava, 17 percent for maize, and 20 percent for sugar cane (Figures 5,6).

FIGURE 6: MOZAMBIQUE CROP YIELD- KILOGRAM/HECTARE (2009)



A considerable volume of agricultural output is wasted due to post-harvest losses (Table 1). In 2009, 4 percent of the cassava, 5 percent of the maize, and 2 percent of the sugar cane produced was lost to waste<sup>2</sup>. This is equivalent to 200 thousand tonnes, 100 thousand tonnes, and 44 thousand tonnes of waste, respectively.

TABLE 1: MOZAMBIQUE CROP UTILIZATION (2009)

Commodity	Production	Domestic Consumption	Food Supply	Processing	Wastage	Feed	Seed	Other Utility
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Cassava	5 672 365	5 672 361	4 859 745	-	200 000	612 616	-	0
Maize	1 932 000	1 555 426	1 223 276	-	100 690	200 000	31 460	-
Sugar Cane	2 207 000	2 207 000	11 035	2 151 825	11 140	-	-	-

Source: FAOSTAT (2009)

With regard to livestock, permanent pastureland accounts for nearly 55 percent of total available land according to 2010 data<sup>3</sup>. In 2009, 18 million poultry, 4.3 million goats, 1.5 million guinea fowl, 1.4 million ducks, 1.2 million cattle, 1.2 million pigs, and 42,000 beehives were being raised in Mozambique<sup>3</sup>.

### 3.3 POLICY

Under the framework of the 1995 *Agricultural Policy and Implementation Strategy (PAEI)*, PROAGRI was launched in 1998 with the aim of reforming and modernizing the state machinery and of improving coordination of interventions and resource management efficiency at the institutional level in the agricultural sector. More recently, the four-year *Agrarian Priorities Document* has reinstated the centrality of agricultural production, with the emphasis on food security and poverty reduction<sup>5</sup>.

# 4. FOOD SECURITY

## 4.1 NUTRITION

Stunting was found in 44 percent of children under the age of five in 2010<sup>6</sup>. In Mozambique, cassava makes up 30.2 percent of the average daily calorie intake, followed by maize with 20.4 percent and rice and wheat with around 9 percent each. Animal products account for 4.1 percent of the calorie intake (**Table 2**).

## 4.2 FOOD SECURITY AND FOOD PRICES

Mozambique is classified as a Low Income Food Deficit Country. Currently, 54.7 percent of the population lives below the poverty line<sup>3</sup> and 38 percent is undernourished<sup>6</sup>. With a high percentage of the country's population living in poverty, food security is a national concern. In 2009, domestic supply and demand of both cassava and maize, which are two main staple crops, were more or less equivalent<sup>2</sup>. Imported rice accounted for 62.8 percent of domestic consumption in the same year (**Table 3**).

TABLE 2: MOZAMBIQUE FOOD CROP CALORIC INTAKE (2009)

Ranking	Commodity	Calorie Share (%)
1	Cassava	30.2
2	Maize	20.4
3	Rice	8.8
4	Wheat	8.8
5	Sugar	5.3
6	Sweet Potatoes	4.1
Subtotal Food Crop share		77.6
Animal Products Share		4.1
Total Calories (kcal/capita/day)		2 112

Source: FAOSTAT (2009)

TABLE 3: MOZAMBIQUE NET FOOD CROP TRADE (2009)

Commodity	Production	Import	Export	Stock Variation	Domestic Consumption	Import Share of Consumption
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	%
Cassava	5 672 365	0	4	0	5 672 361	0
Maize	1 932 000	88 643	15 218	- 450 000	1 555 426	4.7
Rice	179 000	431 299	146	76 923	687 076	62.8

Source: FAOSTAT (2009)

## 4.3 POLICY

In 1998, Mozambique adopted the *Food and Nutritional Security Strategy* and established the *Secretariat of Food and Nutritional Security, or SETSAN*<sup>7</sup>. SETSAN, which is run by the Ministry of Agriculture, aims to assist with the formulation of policies, and with the planning, implementation, evaluation, and monitoring of the actions necessary to improve living conditions and address food security<sup>7</sup>.

The *Second Food and Nutritional Security Strategy (ESAN II)* was adopted in 2007, with the aim of increasing people's purchasing power, reducing acute malnutrition, and guaranteeing food self-sufficiency and the stability of supply<sup>7</sup>.

# 5. ENERGY AND BIOENERGY

## 5.1 ENERGY SUPPLY AND DEMAND

Approximately 14 percent of the country has access to electricity<sup>3</sup>. The majority of electrified households live in urban areas, with only around 5 percent of rural people having access to electricity<sup>8</sup>.

Biomass and more precisely primary solid biofuels are the main energy source in Mozambique, accounting for over 89 percent of final energy consumption<sup>9</sup>. The remaining 11 percent is provided almost entirely by oil products, most of which are imported<sup>8</sup>. (Figures 7,8). Other potential renewable energy options include modern bioenergy, solar energy, and further development of hydropower<sup>8</sup>.

FIGURE 7: MOZAMBIQUE PRIMARY ENERGY SUPPLY (2009)

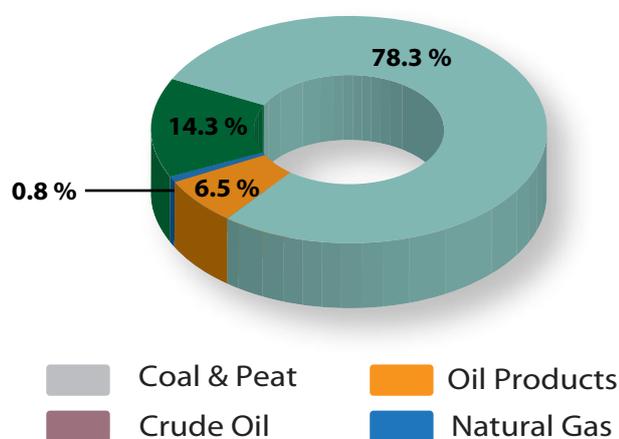
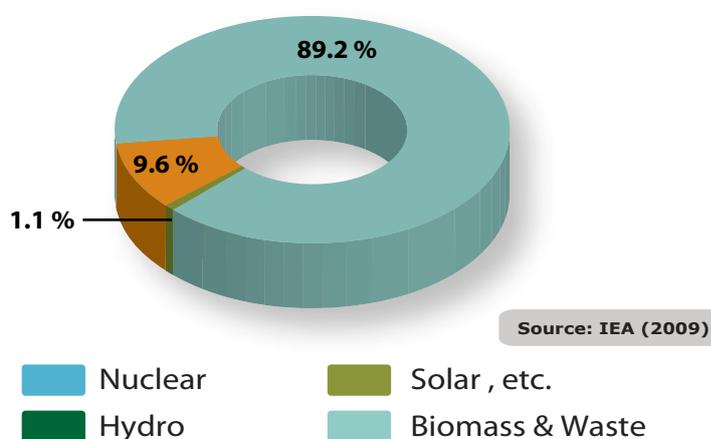


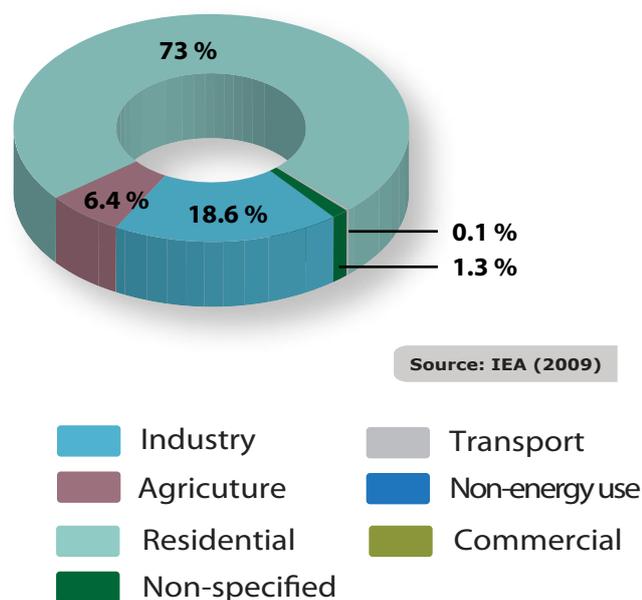
FIGURE 8: MOZAMBIQUE FINAL ENERGY CONSUMPTION (2009)



Source: IEA (2009)

The main consumer of energy in Mozambique is the residential sector, accounting for 73 percent of energy use<sup>9</sup>, followed by the industrial sector with around 18 percent (Figure 9).

FIGURE 9: MOZAMBIQUE ENERGY USE BY SECTOR (2009)



Source: IEA (2009)

## 5.2 MODERN BIOENERGY

As of May 2010, there were six projects for the production of ethanol from sugar cane and molasses in the planning or implementation stages. In addition, five projects for the production of biodiesel from jatropha were under way<sup>10</sup>. Further assessment is needed in order to adequately understand the potential role of bioenergy within Mozambique's energy mix.

## 5.3 POLICY

The *Energy Policy* of Mozambique was adopted in 1998, with the following objectives: guaranteeing the reliable supply of energy at the lowest cost possible to meet current and projected demand; diversifying household energy options; securing more efficient energy utilization; promoting environmentally friendly conversion technologies; and promoting competition and more dynamic and efficient entrepreneurs<sup>11</sup>.

In 2009, the *Policy for Renewables* was adopted. This policy aims to: increase access to high quality modern energy services at reasonable prices; reduce poverty and contribute to the Millennium development Goals; and contribute to local and national income generation and employment<sup>11</sup>.

# 6. ENVIRONMENTAL CONCERNS

## 6.1 CLIMATE CHANGE

Average annual temperature has increased by around 0.6 degrees Celsius since 1960, at an average rate of 0.13 degrees Celsius per decade. During the same period, average annual rainfall has decreased at an average rate of 2.5 mm per month (3.1 percent) per decade. A further increase in average annual temperature is projected in the coming decades, together with a significant increase in the frequency of 'hot' (based on current climate) days and nights<sup>12</sup>. These projected changes could have major impacts on the agricultural sector.

CO<sub>2</sub> emissions have fluctuated considerably over the past few decades, with a sharp decrease during the 1980s followed by a steady increase since the late 1990s (**Figure 10**). In 2008, 74.8 percent of total emissions came from the consumption of liquid fuels<sup>3</sup>.

FIGURE 10: MOZAMBIQUE CO<sub>2</sub> EMISSIONS- KT (2008)



Source: WDI (2010)

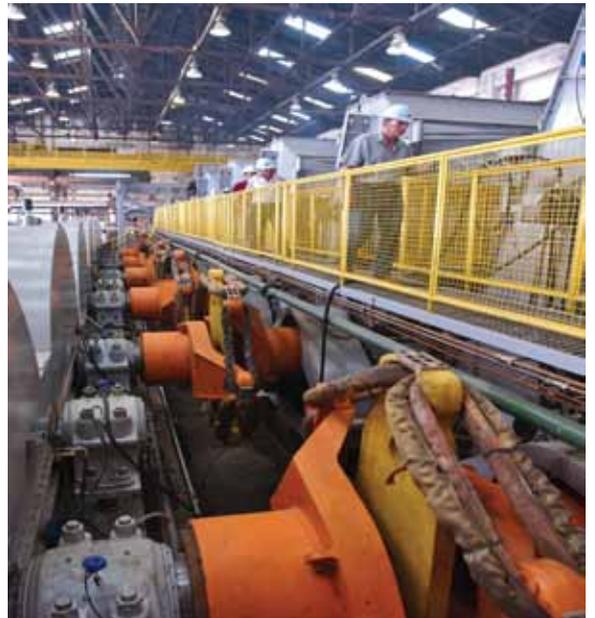
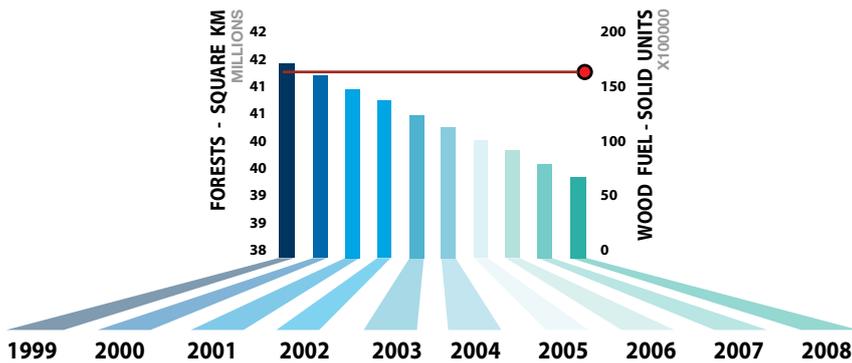


FIGURE 11: MOZAMBIQUE FOREST AREA VS. WOOD FUEL PRODUCTION (1999-2008)



Source: FAOSTAT (2010)

Land-use change and especially deforestation and forest degradation are major sources of GHG emissions in Mozambique. As noted previously, primary solid biofuels account for over 89 percent of final energy consumption<sup>9</sup>. Forested areas are rapidly shrinking due to a number of factors, including domestic demand for wood fuel and international demand for wood products (**Figure 11**). In addition to GHG emissions, unregulated harvesting of woodfuel is causing other environmental problems as well, especially in terms of biodiversity loss.

## 6.2 POLICY

*The National Environmental Policy* of 1995 aims to: ensure functional and productive environment and natural resource management; ensure quality of life for all citizens of Mozambique; incorporate environmental considerations into socio-economic planning; promote community participation on natural resource utilization; foster ecosystem protection; and work with regional and global efforts to solve environmental problems<sup>13</sup>.



## SUMMARY

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- Mozambique's agricultural sector employs 80 percent of the labour force and accounts for 32 percent of the country's GDP.
- Out of Mozambique's total land area, 62.7 percent is used for agricultural purposes, with 4.9 percent of this area classified as arable land. Less than half percent of the country's renewable water resources is withdrawn annually.
- Cassava and maize make up 50.6 percent of the average daily calorie intake. Animal products account for 4.1 percent of the latter.
- Mozambique is classified as an LIFDC. Domestic supply and demand of both cassava and maize are more or less equivalent, with rice imports accounting for 62.8 percent of domestic consumption.
- Around 14 percent of households have access to electricity. Biomass and more precisely primary solid biofuels are the main energy source in Mozambique, accounting for over 89 percent of final energy consumption. There are currently several projects for the production of ethanol from sugar cane and molasses and biodiesel from jatropha in the planning or implementation stages. Further assessment is needed in order to adequately understand the potential role of bioenergy within Mozambique's energy mix.
- Although the demand for wood fuel has remained stable in the last decade, Mozambique's forest area has been declining, most likely due to wood fuel collection, shifting agriculture, forest fires, timber exports, and lack of plans for land use.
- Over the last ten years, Mozambique 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 Mozambique.

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