



Bioenergy and Food Security Projects
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SOUTH AFRICA

BEFS COUNTRY BRIEF



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Design: Runya Virattiya, Kaiwit Triamdarnong

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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

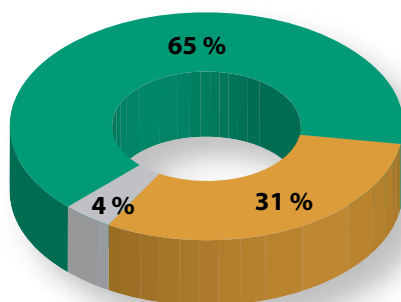
South Africa is a country located on the Southern coast of Africa and has a total area of 1,214,470 square kilometers¹. It has a subtropical to semi-arid climate, with an average annual rainfall of 495 mm². The population in 2010 was 49,991,300 and increasing by an average of 1.4 percent per annum³. Of this, approximately 38 percent was classified as rural in 2010, down from around 43 percent in 1999³.



2.2 ECONOMY

In 2010, South Africa's GDP grew by 2.8 percent. Between 1999 and 2009, GDP per capita increased from \$2,972 to \$3,795 (in constant US dollars)³. In 2010, trade equaled 54.8 percent of GDP³. In the same year, consumer price inflation amounted to 8.1 percent. Services are the main economic sector, with a 66 percent share of GDP in 2009, followed by the industry with a 31 percent share. The agricultural sector accounted for only 3 percent of the gross domestic product in 2009, down from 4 percent in 1999 (**Figures 1,2**).

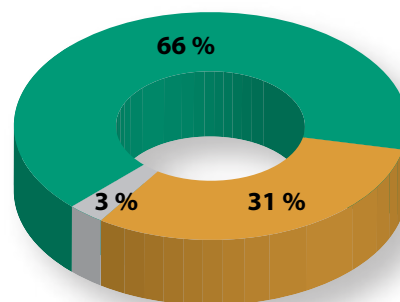
FIGURE 1: SOUTH AFRICA GDP BY SECTOR (1999)



Agriculture Industry Services

Source: WDI (2010)

FIGURE 2: SOUTH AFRICA GDP BY SECTOR (2009)



Source: WDI (2010)

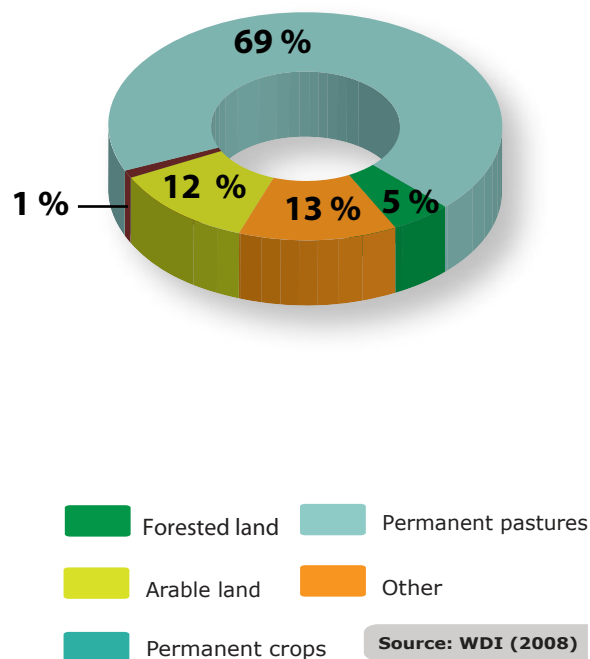
3. AGRICULTURE AND BIOMASS

3.1 LAND AND WATER

South Africa has a total of 992,280 square kilometers of agricultural land, or 81.7 percent of the total land area (**Figure 3**). Of that, 12 percent is classified as arable land. The country has over 50 billion cubic meters of renewable water resources available, of which 20 percent is withdrawn annually⁴. Of the total water withdrawn, around 63 percent is used in the agricultural sector⁴.



FIGURE 3: SOUTH AFRICA LAND USE (2008)



3.2 AGRICULTURE AND LIVESTOCK

The agricultural sector employs around 5 percent of the total labour force and accounts for 7 percent of total exports^{2,3}. In South Africa, there are both subsistence farms and commercial farms can be found, with the latter producing mainly for the export market. Part of the agricultural production is rain-fed, while the rest is irrigation-based³.

Sugar cane is the main crop produced in South Africa in terms of volume, followed by maize and wheat. Maize and oranges are the main export crops based on value. Between 1999 and 2009, maize production increased by 52 percent and wheat production by 13 percent, while sugar cane production decreased by 3 percent (**Figure 4**).

FIGURE 4: SOUTH AFRICA CROP PRODUCTION - TONNES (2009)

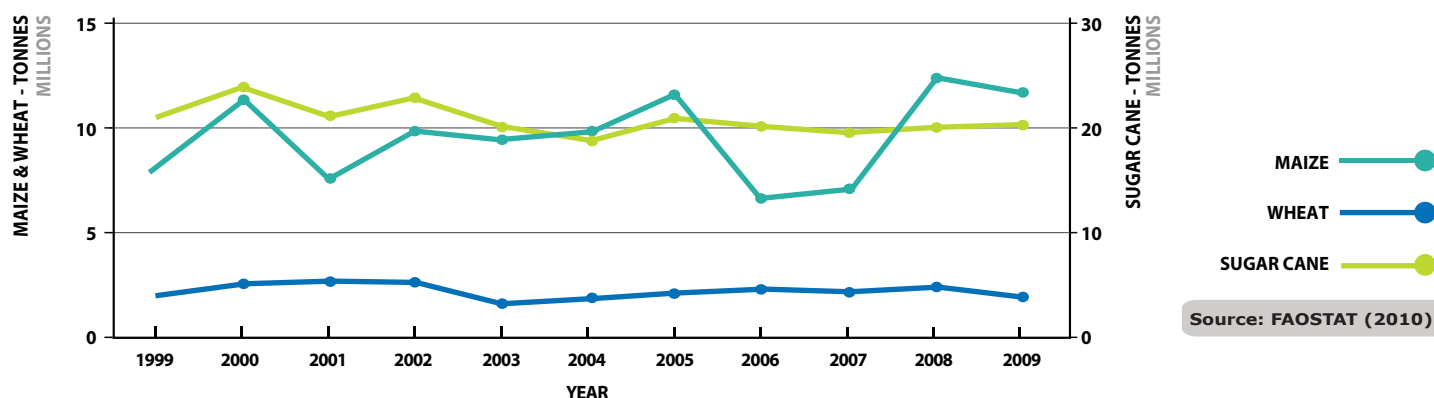
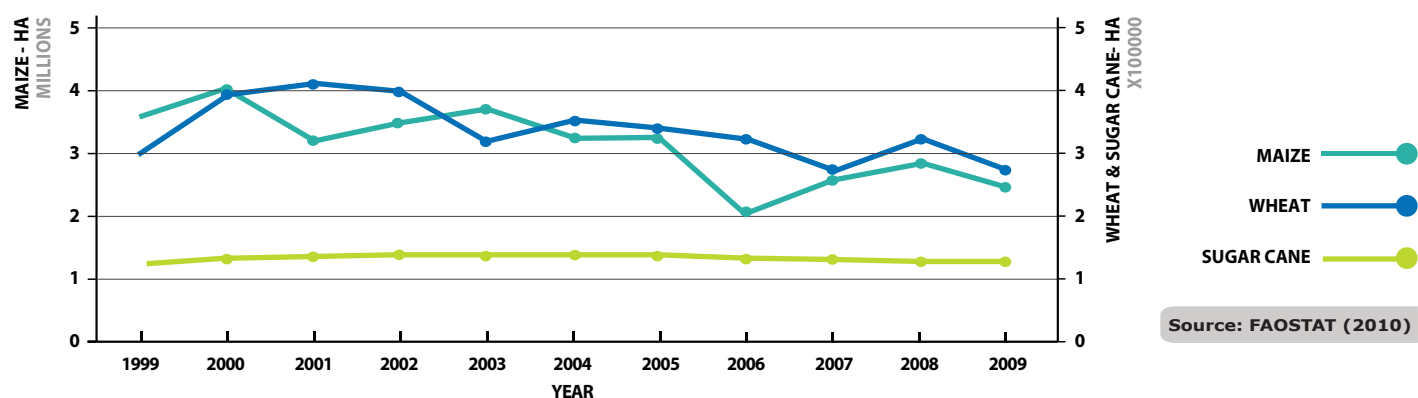
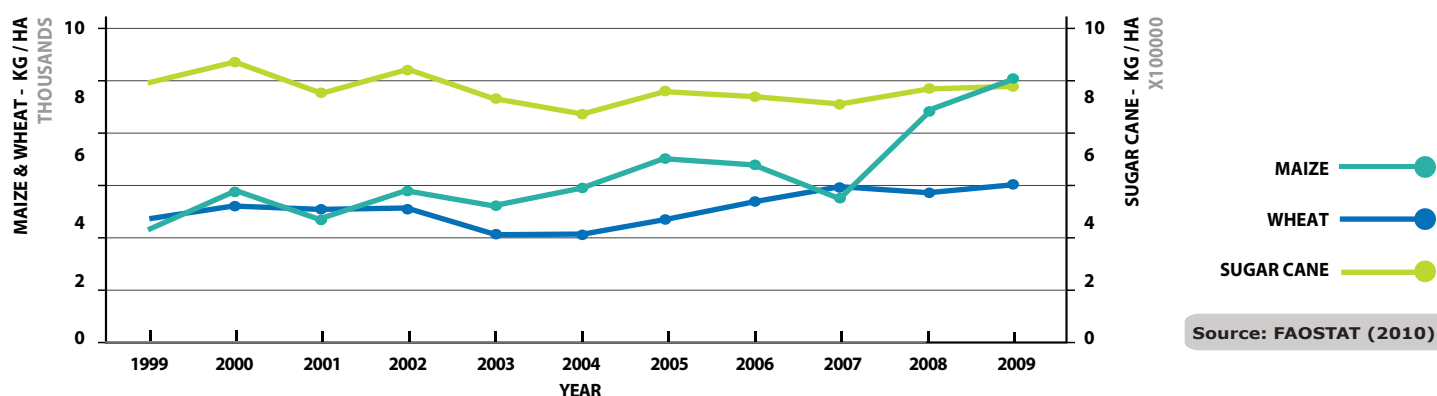


FIGURE 5: SOUTH AFRICA AREA HARVESTED - HECTARES (2009)



The expansion in the production of maize and wheat between 1999 and 2009 was the result of a significant increase in yields, which was equal to 123 percent for maize and 26 percent for wheat, even with the decrease in the area harvested of 32 percent and 11 percent, respectively. Sugar cane production decreased due to the decrease in area by half of one percent by and yields by 3 percent (**Figures 5,6**).

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



A considerable volume of agricultural output is wasted due to post-harvest losses (**Table 1**). In 2009, 932,754 tonnes of sugar cane, 362,422 tonnes of maize, and 49,108 tonnes of wheat were lost to waste in South Africa².

TABLE 1: SOUTH AFRICA CROP UTILIZATION (2009)

Commodity	Production	Domestic Consumption	Food Supply	Processing	Wastage	Feed	Seed	Other Utility
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Sugar Cane	18 655 090	18 655 090	–	17 722 330	932 754	–	–	–
Maize	12 050 000	9 599 427	5 158 183	46 666	362 422	3 752 000	30 156	250 000
Wheat	1 958 000	3 147 860	3 029 388	354	49 108	32 739	36 270	–

Source: FAOSTAT (2009)

With regard to livestock, permanent pastureland accounts for 69 percent of total available land according to 2010 data³. Approximately 125 million chickens, 25.5 million sheep, 13.7 million cattle, 6.4 million goats, 1.6 million pigs and 65 thousand beehives are raised in South Africa.

3.3 POLICY

The Strategic Plan for South Africa's Agriculture, which was adopted in 2001, has the overall goal of generating "equitable access and participation in a globally competitive, profitable, and sustainable agricultural sector contributing to a better life for all⁴". The specific objectives outlined in the Plan are: to enhance access and participation in the sector; to improve global competitiveness and profitability; and to ensure sustainable resource management⁵.

4. FOOD SECURITY

4.1 NUTRITION

Nutrition remains a concern in South Africa. In 2010, 12 percent of children under the age of five were underweight⁶. In South Africa, maize makes up 29.5 percent of the average daily calorie intake, followed by wheat with 16.5 percent and sugar cane with 9.7 percent (**Table 2**). Animal products account for 15.7 percent of the daily calorie intake².

4.2 FOOD SECURITY AND FOOD PRICES

Currently, 23 percent of the population lives below the poverty line³ and nearly 5 percent is undernourished⁶. With nearly a quarter of the country's population living in poverty, food security is a national concern. In 2009, imports accounted for 37.8 percent of domestic wheat consumption² (**Table 3**). Potential increases in the price of wheat on the international market could thus affect the trade balance, as well as the welfare of net consuming households.

TABLE 2: SOUTH AFRICA
FOOD CROP CALORIC INTAKE (2009)

Ranking	Commodity	Calorie Share (%)
1	Maize	29.5
2	Wheat	16.5
3	Sugar	9.7
4	Sunflowerseed	4.9
5	Rice	4.8
6	Soyabean oil	3.4
Subtotal Food Crop share		68.8
Animal Products Share		15.7
Total Calories (kcal/capita/day)		3 017

Source: FAOSTAT (2009)

TABLE 3: SOUTH AFRICA NET FOOD CROP TRADE (2009)

Commodity	Production	Import	Export	Stock Variation	Domestic Consumption	Import Share of Consumption
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	%
Maize	12 050 000	35 953	1 886 525	-600 000	9 599 427	0
Wheat	1 958 000	1 351 407	161 547	0	3 147 860	37.8
Sugar Cane	18 655 090	0	0	–	18 655 090	0

Source: FAOSTAT (2009)

4.3 POLICY

The *Integrated Food Security Policy* of 2002 has the overall goal eradicate hunger, malnutrition, and food security by 2015. In particular, this policy aims to: increase household food security; improve job creation and income generation; improve nutrition and food safety; increase safety nets and emergency management systems; improve information analysis and management systems; provide capacity building; and hold stakeholder dialogue⁸.

5. ENERGY AND BIOENERGY

5.1 ENERGY SUPPLY AND DEMAND

Approximately 75 percent of the country has access to electricity³, compared to only 36 percent in 1994, when the *Integrated National Electrification Program* was introduced⁷.

South Africa is heavily reliant on fossil fuels, with oil products accounting for over 46 percent of final energy consumption, followed by coal and peat with around 34 percent³. The share of biomass is around 20 percent⁷ (**Figures 7,8**). South Africa has large reserves of coal, crude oil, and natural gas. Other Potential renewable energy options include modern bioenergy, solar energy, wind energy, and hydropower⁷.

FIGURE 7: SOUTH AFRICA TOTAL PRIMARY ENERGY SUPPLY (2009)

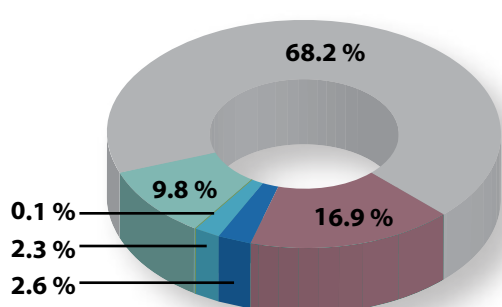
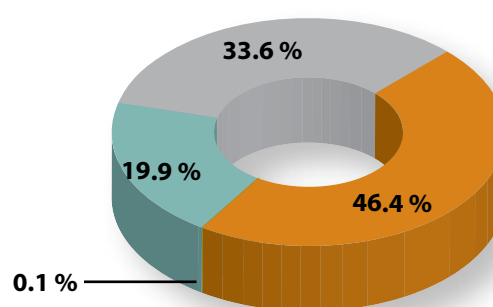


FIGURE 8: SOUTH AFRICA TOTAL FINAL ENERGY CONSUMPTION (2009)

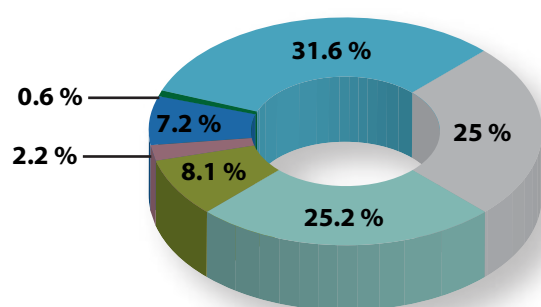


Source: IEA (2009)



The main consumer of energy in South Africa is the industrial sector, accounting for 31.6 percent of total energy use, followed by the residential sector and by the transport sector, each with a share of around 25 percent (**Figure 9**).

FIGURE 9: SOUTH AFRICA ENERGY USE BY SECTOR (2009)



Source: IEA (2009)



5.2 MODERN BIOENERGY

In 2009, South Africa produced 604,223 TJ of energy from primary solid biofuels⁵. As of May 2010, there were four bioenergy projects in the implementation stage and other four projects in the planning stage. These projects aim to produce ethanol from sugar cane, sugar beet, and sweet sorghum, and biodiesel from soybeans, sunflower seed, canola oil, and vegetable oil⁸.

Further assessment is needed in order to adequately understand the potential role of bioenergy within South Africa's energy mix.

5.3 POLICY

The *1998 White Paper on the Energy Policy of the Republic of South Africa* outlines the following objectives: to increase access for all South Africans to affordable energy; to improve energy governance; to stimulate economic development; to effectively manage energy-related health and environmental effects; and to secure sustainable energy supply through diversification of energy sources⁹.

6. ENVIRONMENTAL CONCERNS

6.1 CLIMATE CHANGE

According to UNFCCC projections, in the next 40 years South Africa might experience a 1-3 degrees Celsius increase in mean annual temperature, and a 5-10 percent decrease in average annual rainfall¹⁰. These projected changes could have a severe impact on the agricultural sector of the country.

CO₂ emissions have increased significantly over the past few decades (**Figure 10**). In 2008, consumption of solid fuels (mainly coal firing) accounted for 84.6 percent of total CO₂ emissions³.

FIGURE 10: SOUTH AFRICA CO₂ EMISSIONS - KT (2008)

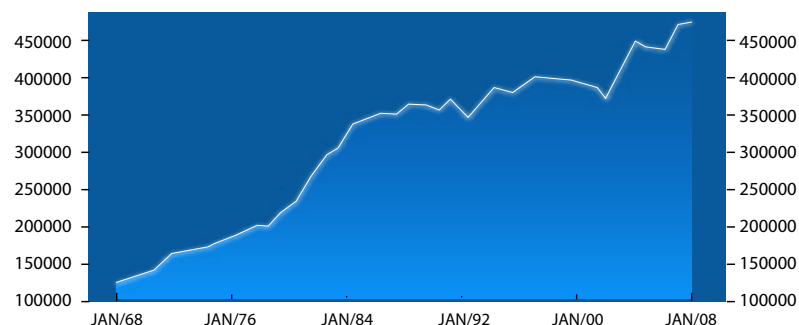
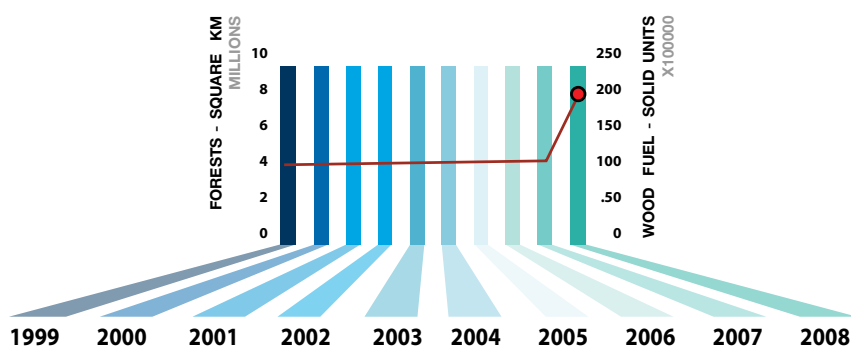


FIGURE 11: SOUTH AFRICA FOREST AREA VS. WOOD FUEL PRODUCTION (1999-2008)



Source: FAOSTAT (2010)



The amount of forested land has remained steady in the last decade, despite a recent increase in the demand for wood fuel on the domestic market and for wood products for the export market (**Figure 11**).

6.2 POLICY

The *National Framework for Sustainable Development*, which was adopted in 2008, outlines the following objectives: to enhance systems for integrated planning and implementation; to sustain ecosystems and promote efficient use of natural resources; to encourage economic development by investing in sustainable infrastructure; to create sustainable human settlements; and to provide appropriate responses to emerging human development, environmental, and economic challenges⁵.



SUMMARY

- South Africa's agricultural sector employs 5 percent of its total labour force and accounts for 3 percent of the country's GDP.
- Out of South Africa's total land area, 81.7 percent is used for agricultural purposes, with 12 percent of this area classified as arable land. Around 20 percent of the country's renewable water resources is withdrawn annually.
- Maize, wheat, and sugar cane make up 55.7 percent of the average daily calorie intake, while animal products account for 15.7 percent of the latter.
- In 2007, imports accounted for 37.8 percent of domestic wheat consumption. Potential increases in the price of wheat on the international market could thus affect the trade balance, as well as the welfare of net consuming households.
- Around 75 percent of households have access to electricity. South Africa is heavily reliant on fossil fuels, with oil products accounting for over 46 percent of final energy consumption, followed by coal and peat with around 34 percent³. The share of biomass is around 20 percent.
- South Africa currently produces over 604,000 TJ of energy from primary solid biofuels. In addition, a number of projects for the production of ethanol and biodiesel are currently being planned or implemented. Further assessment is needed in order to adequately understand the potential role of bioenergy within South Africa's energy mix.
- Over the last ten years, South Africa 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 South Africa.



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