



Bioenergy and Food Security Projects
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ZAMBIA

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

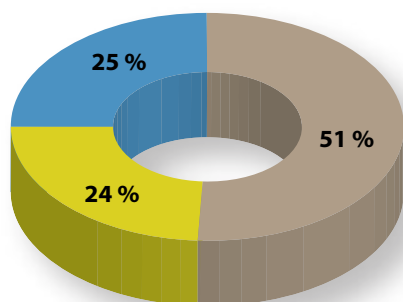
Zambia is a landlocked country located in central Southern Africa. The country has a total area of 743,390 square kilometers, with a tropical wet and dry (or savanna) climate¹. The population in 2010 was 12,926,409 and increasing by an average of 1.6 percent per annum². Of the total population, 64 percent is classified as rural, and has remained steady over the last 10 years².



2.2 ECONOMY

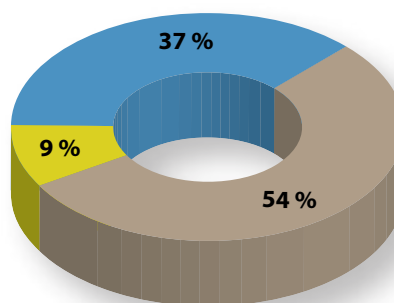
In 2009, Zambia's GDP grew by 6.4 percent. GDP per capita increased from \$314 in 1999 to \$408 in 2009 (in constant US dollars)². In 2010, consumer price inflation was at 8.5 percent. In the same year, trade accounted for 79.1 percent of GDP and foreign direct investments equaled 6.4 percent of GDP². Between 1999 and 2009, the contribution of the agricultural sector to the gross domestic product (GDP) decreased from 24 percent to 9 percent, while the share of the industrial sector increased from 25 percent to 37 percent. Services remained the most important sector, with a share of 51 percent in 1999 and 54 percent in 2009 (Figure 1 & 2).

FIGURE 1: ZAMBIA GDP BY SECTOR (1999)



Source: WDI (2010)

FIGURE 2: ZAMBIA GDP BY SECTOR (2009)



Source: WDI (2010)

Agriculture
 Industry
 Services

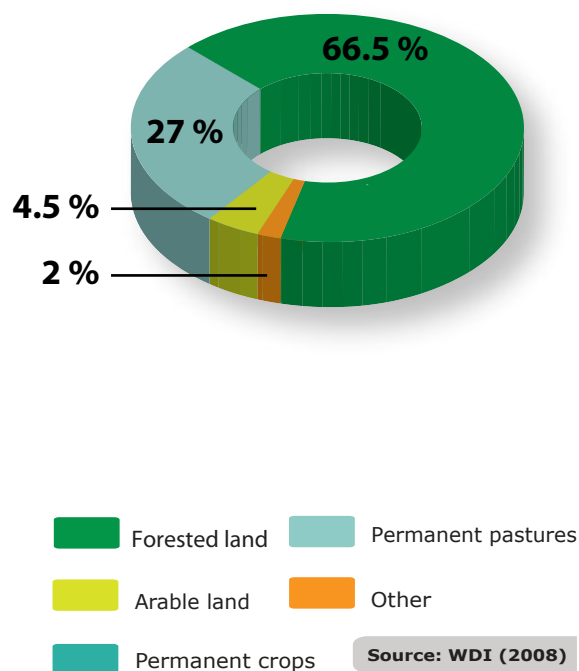
3. AGRICULTURE AND BIOMASS

3.1 LAND AND WATER

Zambia has approximately 233,850 square kilometers of agricultural land, or 31.5 percent of the total land area (**Figure 3**). Of that, 4.5 percent is classified as arable land. The country has over 105 billion cubic meters of renewable water resources available, of which 2 percent is withdrawn annually³. Of the total water withdrawn each year, around 76 percent is used in the agricultural sector³.



FIGURE 3: ZAMBIA LAND USE (2008)



3.2 AGRICULTURE AND LIVESTOCK

The agricultural sector employs 72 percent of the total labour force and contributes to almost 7 percent of total exports⁴. The main farming systems in Zambia can be divided into four classes: traditional subsistence, small-scale emergent, medium scale commercial, and large scale commercial⁶. The sector is characterized by rain-fed production and low productivity.

Sugar cane is the main crop produced in Zambia in terms of volume, followed by maize and cassava⁵. Raw sugar and unmanufactured tobacco are the main export crops based on value. Between 1999 and 2009, sugar cane production increased by 94 percent, maize production increased by 130 percent and cassava production increased by 20 percent (**Figure 4**).

FIGURE 4: ZAMBIA CROP PRODUCTION- TONNES (2009)

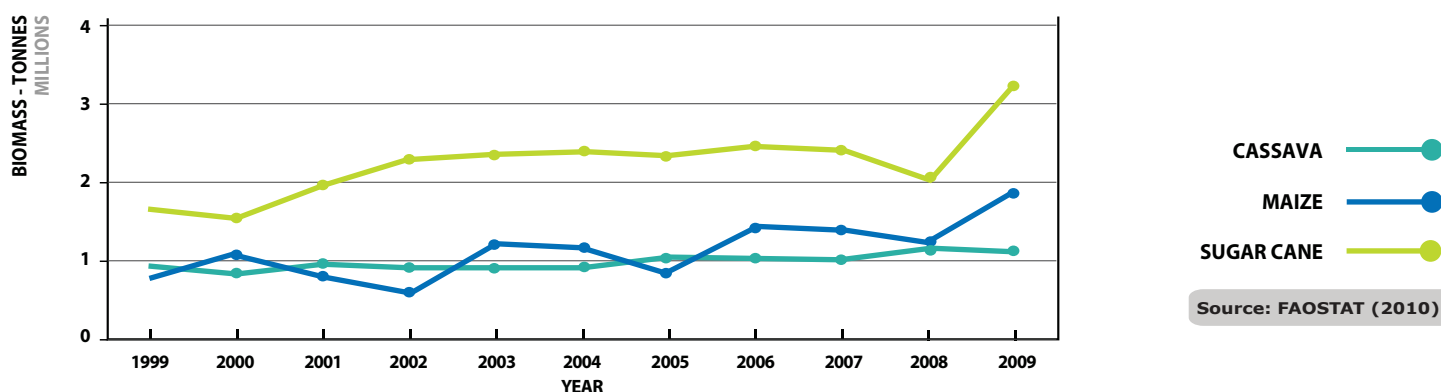
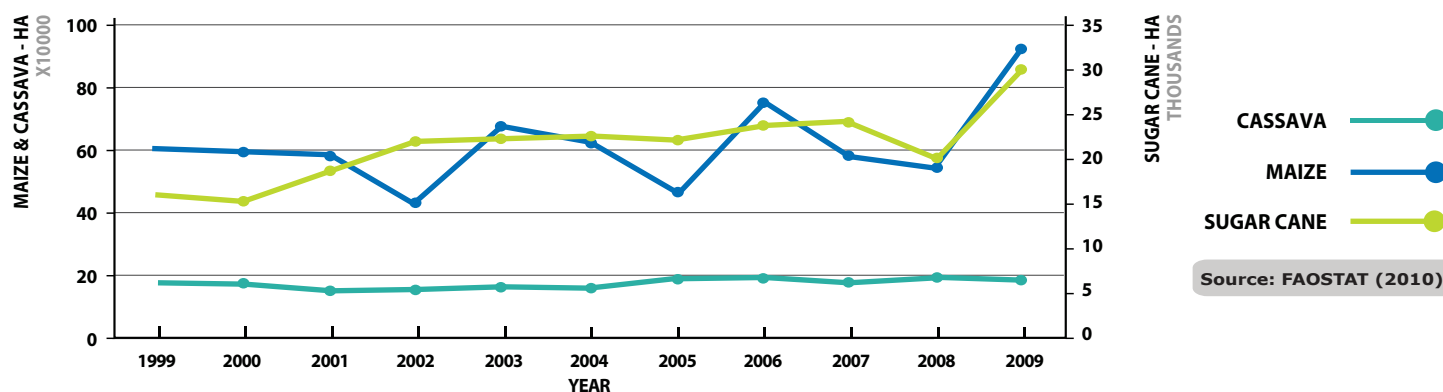
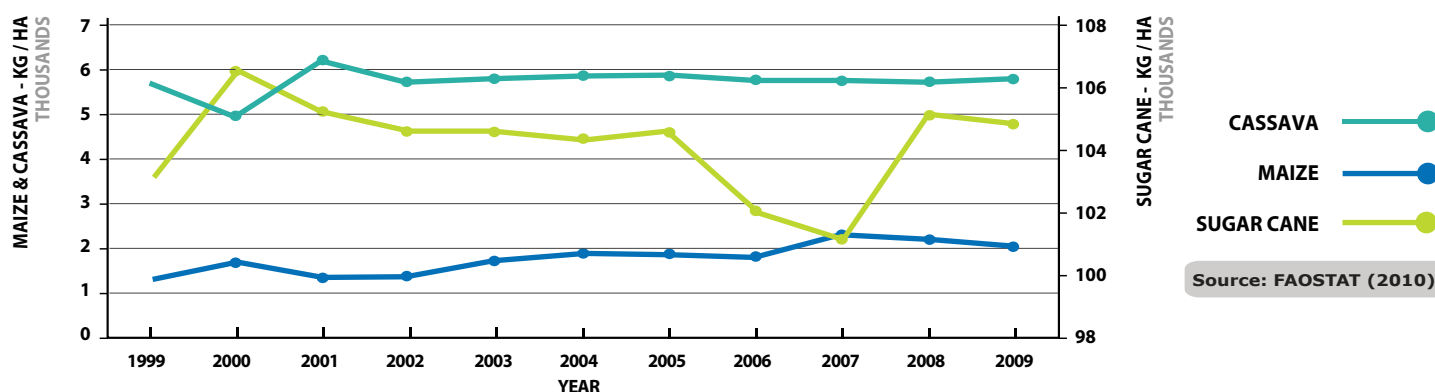


FIGURE 5: ZAMBIA AREA HARVESTED- HECTARES (2009)



As shown in figures 5 and 6, the increase in maize production between 1999 and 2009 was due to both an expansion in area harvested of 53 percent and a yield increase of 50 percent. Most of the increase in the production of sugar cane was linked to an expansion in area harvested of 90 percent, while yields remained substantially stable, increasing by 2 percent. With regard to cassava, the area harvested increased by 18 percent, while yields rose by 2 percent in the same time period (Figures 5, 6).

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



In Zambia, a share of agricultural output is wasted due to post-harvest losses (Table 1). In 2009, 4 percent of maize and 5 percent of cassava consumed within the country was lost to waste.

TABLE 1: ZAMBIA 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	3 200 000	3 200 000	-	3 200 000	-	-	-	-
Maize	1 887 010	1 548 462	1 402 678	30 006	57 871	30 000	27 358	549
Cassava	1 160 853	1 161 057	1 102 810	-	58 043	-	-	204

Source: FAOSTAT (2009)

With regard to livestock, permanent pastureland accounts for 27 percent of total available land according to 2010 data³. Around 30 million chickens, 2.85 million cattle, 2 million goats, 340 thousand pigs, 200 thousand sheep, and 50 thousand beehives are raised and kept in Zambia.

3.3 POLICY

The National Agricultural Policy aims to achieve four main objectives by 2015: to ensure national and household food security; to contribute to sustainable industrial development; increase agricultural exports; and generate income and employment within the sector⁶. The overarching aim is to liberalize and commercialize agriculture, and to provide effective services.

4. FOOD SECURITY

4.1 NUTRITION

In Zambia, maize makes up 49.4 percent of the average daily calorie intake in the country, followed by cassava with 13.9 percent and wheat with 5.4 percent (**Table 2**). Overall, these commodities account for 68.7 percent of the average daily calorie intake, while animal products contribute 5.3 percent to the latter.

Nutrition remains a serious concern in Zambia. Stunting was found in 45 percent of children under the age of five in 2010⁷.

4.2 FOOD SECURITY AND FOOD PRICES

Zambia is classified as a Low Income Food Deficit Country. Currently, 59.3 percent of the population lives below the poverty line³ and 44 percent is undernourished⁷. With a high percentage of the country's population living in poverty, food security is a national concern. In 2009, staple crop production was sufficient to meet the domestic demand, with imports making up a small portion of consumption (**Table 3**). Potential increases in the price of commodities on the international market can still affect the trade balance, as well as the welfare of net consuming households.

TABLE 2: ZAMBIA FOOD CROP CALORIC INTAKE (2009)

Ranking	Commodity	Calorie Share (%)
1	Maize	49.4
2	Cassava	13.9
3	Wheat	5.4
4	Sugar	5.4
5	Groundnuts	3.4
6	Palm Oil	2.7
Subtotal Food Crop share		80.2
Animal Products Share		5.3
Total Calories (kcal/capita/day)		1 879

Source: FAOSTAT (2009)

TABLE 3: ZAMBIA NET FOOD CROP TRADE (2009)

Commodity	Production	Import	Export	Stock Variation	Domestic Consumption	Import Share of Consumption
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	%
Maize	1 887 010	43 376	31 924	- 350 000	1 548 462	1
Cassava	1 160 853	204	0	-	1 161 057	0
Wheat	195 456	22 763	51 755	3 125	169 589	0

Source: FAOSTAT (2009)

4.3 POLICY

The *2002-2004 Poverty Reduction Strategy Paper (PSRP)* was prepared to help implement programs deemed necessary to reduce poverty and increase food security⁶. Four main strategies are outlined in the PSRP: to promote growth and diversification in agricultural production and exports; to improve the delivery of social services; and to incorporate cross-cutting policies for important issues such as gender, health, and the environment⁶.

5. ENERGY AND BIOENERGY

5.1 ENERGY SUPPLY AND DEMAND

Approximately 19 percent of the country has access to electricity³. The majority of electrified households live in urban areas, while only 2.2 percent of rural people have access to electricity⁸.

Zambia is heavily reliant on imported petroleum products, which supply 37 percent of the energy needs of the country⁸. In 2010, fuel imports accounted for 11.6 percent of total merchandise imports in Zambia³. Biomass (mostly primary solid biofuels⁹) provides the largest contribution to primary energy supply in the country (**Figure 7 & 8**). Other potential renewable energy options include modern bioenergy, solar energy, wind energy, and increased hydroelectricity production⁸.

FIGURE 7: ZAMBIA TOTAL PRIMARY ENERGY SUPPLY (2009)

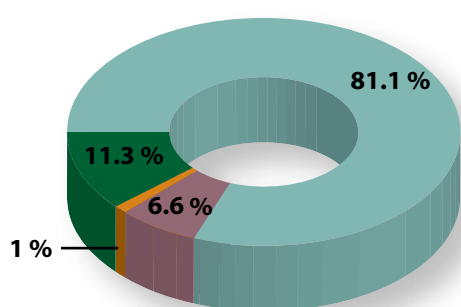
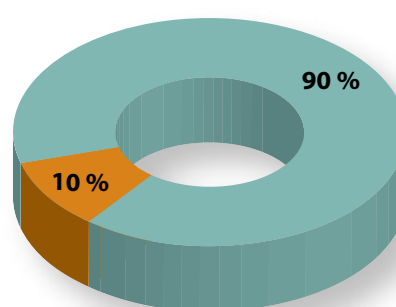


FIGURE 8: ZAMBIA TOTAL FINAL CONSUMPTION (2009)

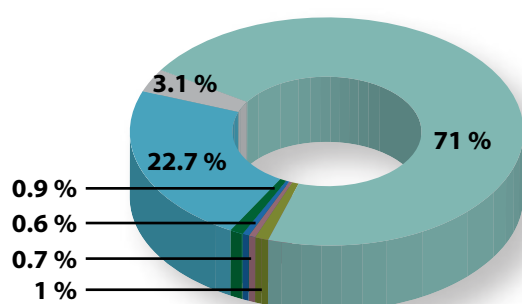


Source: IEA (2009)

- Coal & Peat
- Oil Products
- Nuclear
- Solar , etc.
- Crude Oil
- Natural Gas
- Hydro
- Biomass & Waste

The main consumer of energy in Zambia is the residential sector, accounting for 71 percent of energy use. The industrial sector is the second biggest consumer with 22.7 percent total energy use (**Figure 9**).

FIGURE 9: ZAMBIA ENERGY USE BY SECTOR (2009)



Source: IEA (2009)

- Industry
- Transport
- Agriculture
- Non-energy use
- Residential
- Commercial
- Non-specified

5.2 MODERN BIOENERGY

As of May 2010, five bioenergy projects were being established, while other projects were still in the planning phase. These projects aim to produce ethanol from molasses, sugar cane, and sweet sorghum and biodiesel from jatropha, castor oil, sunflower oil, safflower, cottonseed, and soybeans¹⁰. Further assessment is needed in order to adequately understand the potential role of bioenergy within Zambia's energy mix.

5.3 POLICY

The 1994 *National Energy Policy* is the main document guiding energy development in Zambia. The policy aims to promote the optimum utilization and supply of indigenous forms of energy; to facilitate socio-economic development; and to work towards maintaining a safe and healthy environment⁸. The plan focuses more on hydroelectricity than on other renewable energy options, but acknowledges the importance of renewable energy diversification to ensure a secure and sustainable energy supply⁸.

6. ENVIRONMENTAL CONCERNS

6.1 CLIMATE CHANGE

Climate change has already started to impact Zambia. Average temperature has increased 1.3 degrees Celsius since 1960, and the country is currently experiencing shifting seasonal rainfall patterns, heavy flooding, increased periods of drought, and more incidences of malaria¹. CO₂ emissions have fluctuated considerably over the past few decades (**Figure 10**). Liquid fuel consumption is the main emission source, accounting for 81.4 percent of total CO₂ emissions in 2008³.

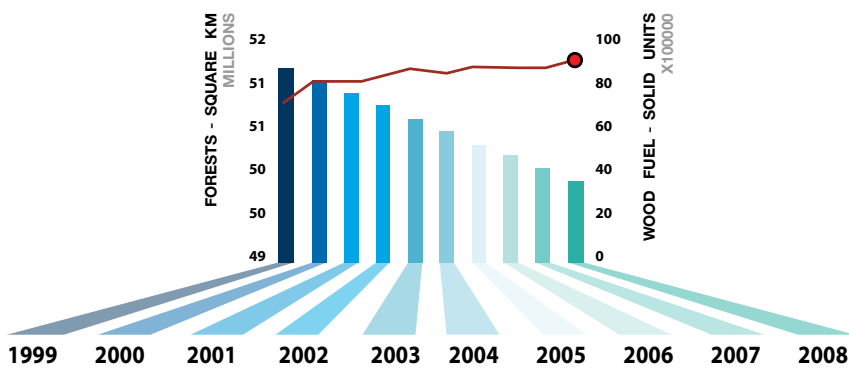
FIGURE 10: ZAMBIA CO₂ EMISSIONS - KT (2008)



Source: WDI (2010)



FIGURE 11: ZAMBIA 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 Zambia. As noted previously, forestry and forest products are heavily utilized, with primary solid biofuels providing the largest contribution to primary energy supply in the country⁹. Forested areas are rapidly shrinking to meet domestic demand for wood fuel and export demand for wood products (**Figure 11**). In addition to GHG emissions, unregulated harvesting of wood fuel is causing other environmental problems as well, especially in terms of biodiversity loss.

6.2 POLICY

The 2005 *National Policy on Environment* is the main document addressing environmental management in Zambia. The objectives of the policy are to promote the protection and management of natural resources, biodiversity, and the environment; to streamline environmental management at all levels; to improve the overall quality of life for all Zambians by accelerating economically and environmentally sustainable growth; to promote environmental awareness; to regulate and enforce environmental laws; and to ensure that industrial and commercial development is carried out in a sustainable and environmentally responsible fashion⁶.



SUMMARY

- The agricultural sector employs 72 percent of the total labour force and accounts for 9 percent of the country's GDP (2009 data).
- Out of Zambia's total land area, 31.5 percent is used for agricultural purposes, with 4.5 percent of this area classified as arable land. Around 2 percent of the country's renewable water resources is withdrawn annually, mostly for agriculture.
- Maize, cassava and wheat make up 68.7 percent of the average daily calorie intake. Maize alone provides 49.4 percent of this total. Animal products contribute 5.3 percent to the calorie intake .
- Zambia is classified as an LIFDC. Production levels of staple crops in Zambia were enough to meet domestic consumption with commodity imports accounting for a small amount of total consumption. Changes in international maize prices can still affect the trade balance and the welfare of net consuming households.
- Around 19 percent of households have access to electricity, mostly in urban areas. Biomass provides the largest contribution to primary energy supply in the country. Zambia is also heavily reliant on imported petroleum products.
- As of May 2010, five projects for the production of bioethanol and biodiesel were being established, while other projects were still in the planning phase . Further assessment is needed in order to adequately understand the potential role of bioenergy within Zambia's energy mix.
- Zambia's forest area is declining as the demand for forest products and wood fuel increases. Policies that decrease dependence on traditional biomass and promote environmental sustainability could deliver a range of benefits.
- Over the last ten years, Zambia 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 would 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 Zambia.

REFERENCES

1. Infoplease, 2012. World- Countries- Zambia. [online] Available at: <<http://www.infoplease.com/ipa/A0108165.html>> [Accessed 27 February 2012].
2. The World Bank Group, 2012. Data by Country: Zambia. [online] Available at: <<http://data.worldbank.org/country/zambia>> [Accessed 2012].
3. The Food and Agriculture Organization of the United Nations, 2012. AQUASTAT. [online] Available at: <<http://www.fao.org/nr/water/aquastat/dbase/index.stm>> [Accessed 2012].
4. The Food and Agriculture Organization of the United Nations, 2012. Countries- Zambia. [online] Available at: <<http://www.fao.org/countryprofiles/index/en/?iso3=ZMB>> [Accessed 2012].
5. The Food and Agriculture Organization of the United Nations, 2012. FAOSTAT. [online] Available at: <<http://faostat.fao.org/site/291/default.aspx>> [Accessed 2012].
6. Southern African Development Community, 2011. Regional Agricultural Policy- Country Summary Agricultural Policy Review Reports. [pdf] Available at: <http://www.sadc.int/fanr/docs/rap/RAP_Combined_Summary_Reports-8_May_2011.pdf> [Accessed 2012].
7. The Food and Agriculture Organization of the United Nations, 2011. The State of Food Insecurity in the World. [pdf] Available at: <<http://www.fao.org/docrep/014/i2330e/i2330e.pdf>> [Accessed 2012].
8. Renewable Energy and Energy Efficiency Partnership, 2012. REEGLE Country Profiles. [online] Available at: <<http://www.reegle.info/countries>> [Accessed 2012].
9. International Energy Agency, 2012. Statistics & Balances. [online] Available at: <<http://www.iea.org/stats/index.asp>> [Accessed 2012].
10. Southern African Development Community, 2010. SADC Biofuels State of Play Summary. [pdf] Available at: <http://www.probec.org/fileuploads/fl110902010040316-_SADC_BIOFUELS_STATE_OF_PLAY_STUDY.pdf> [Accessed 2012].
11. United Nations Development Programme, 2012. UNDP Climate Change Country Profiles. [online] Available at: <<http://geog.ox.ac.uk/research/climate/projects/undp-cp/#documentation>> [Accessed 2012].