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Bioenergy and Food Security Projects

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TANZANIA

BEFS COUNTRY BRIEF

FAO FIAT PANIS

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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

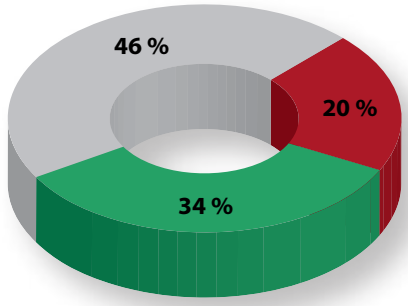
2.1 Quick facts

Tanzania is located in East Africa and has a total area of 885,800 square kilometers[1]. It has a sub-tropical climate with 7 agro-ecological zones and an average annual rainfall of around 1,000 mm[2]. The population in 2010 was 44,841,226 and increasing by an average 3 percent per annum[3]. Of this, 73.6 percent was classified as rural, down from 78 percent in 1999[3].

2.2 Economy

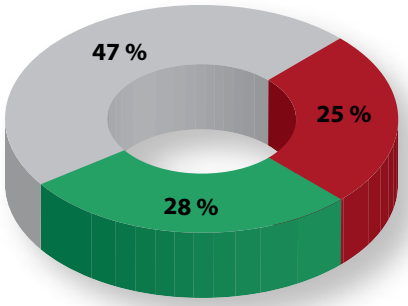
In 2009, Tanzania's GDP grew by 6 percent. Between 1999 and 2009, GDP per capita increased from $300 to $439 (in constant US dollars)[3]. In 2010, consumer price inflation amounted to 6.2 percent[3]. In the same year, trade equaled 63.8 percent of the gross domestic product, and foreign direct investments equaled 1.9 percent of the latter[3]. Between 1999 and 2009, the contribution of the agricultural sector to the GDP decreased from 34 percent to 28 percent, while the share of the industrial sector increased from 20 percent to 25 percent. Services remained the most important sector, with a share of 47 percent in 2009 **(Figures 1,2).**

Figure 1: Tanzania GDP by Sector (1999)



Source: WDI (2010)

Figure 2: Tanzania GDP by Sector (2009)



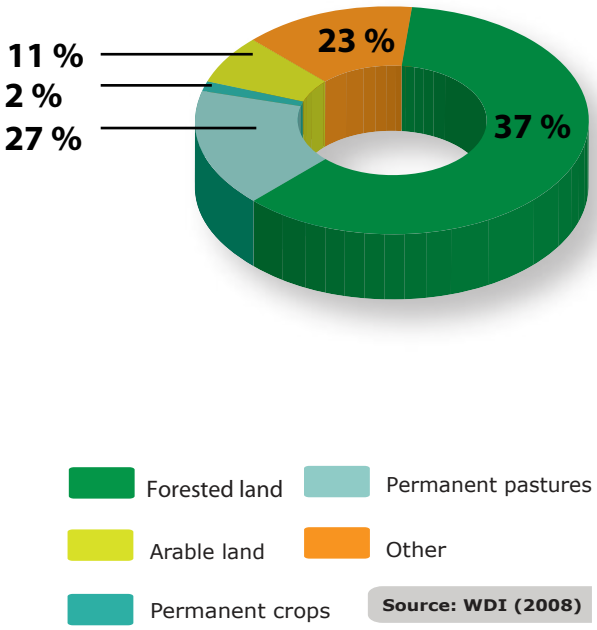
Source: WDI (2010)

3. Agriculture and Biomass

3.1 Land and water

Tanzania has a total of 355,000 square kilometers of agricultural land, or 40 percent of the total land available **(Figure 3).** Of that, 11 percent is classified as arable land. The country has over 96 billion cubic meters of renewable water resources available, of which roughly 5 percent is withdrawn annually[4]. Of the total water withdrawn each year, around 89 percent is used in the agricultural sector[4].

Figure 3: Tanzania Land Use (2008)



3.2 Agriculture and livestock

Tanzania's agricultural sector employs approximately 75 percent of the total labor force and contributes 31.4 percent of total exports[2,5]. The main farming systems in Tanzania include subsistence based agriculture and cash crop farming. Smallholder farming is still mainly rain-fed, while commercial farming has become more modernized and uses irrigation.

Cassava is the main crop grown in Tanzania in terms of volume, followed by maize and bananas. Coffee and tobacco are the main export crops based on value. Between 1999 and 2009, cassava production increased by 10 percent, maize production by 37 percent and banana production by 329percent **(Figure 4).**

Figure 4: Tanzania Crop Production- tonnes (2009)

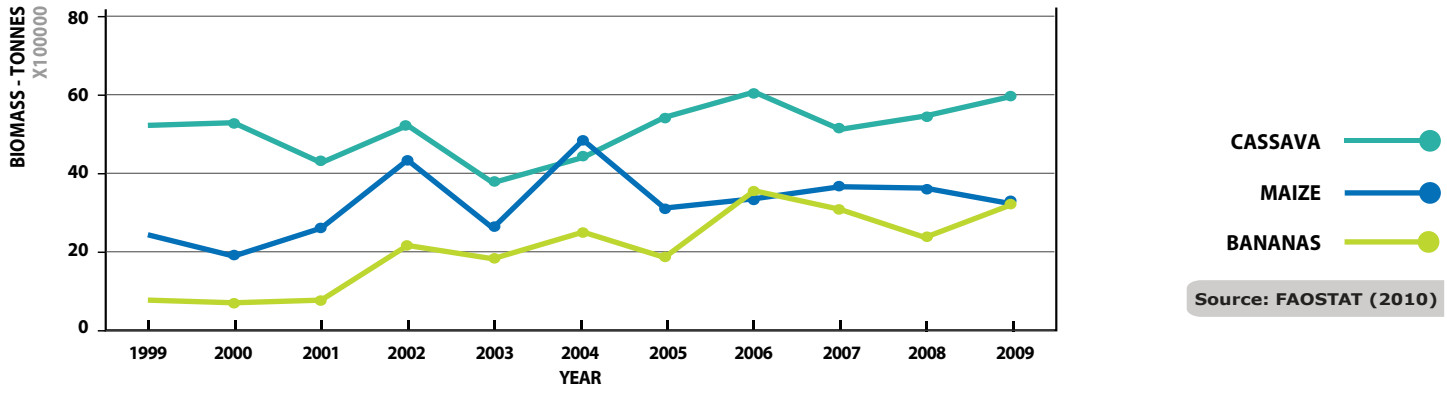
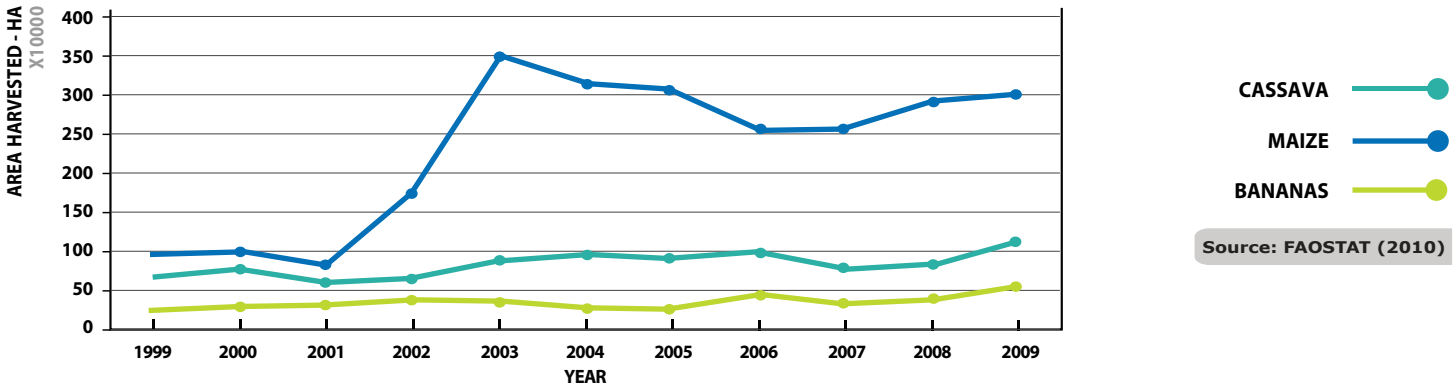
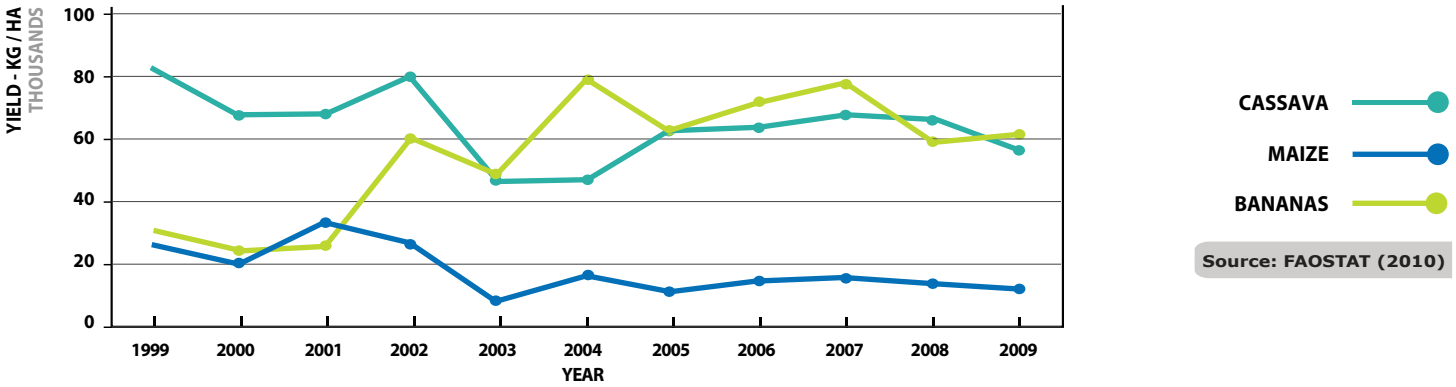


Figure 5: Tanzania Area Harvested- hectares (2009)



Production levels of cassava and maize was mainly driven by increases in area harvested between 1999 and 2009. Cassava area increased 65 percent and maize area 209 percent, with yields decreasing 33 percent for cassava and 56 percent for maize respectively. The significant increase in production of bananas was due to an increase of area harvested of 111 percent and yields increasing 103 percent **(Figures 5,6).**

Figure 6: Tanzania Crop Yield- kilograms/hectare (2009)



In Tanzania, a considerable volume of agricultural output is wasted due to post-harvest losses **(Table 1).** In 2009, over 106 thousand tonnes of the cassava, 425 thousand tonnes of the maize, and 643 thousand tonnes of the bananas consumed within the country was lost to waste.

Table 1: Tanzania Crop Utilization (2009)

Commodity	Production	Domestic Consumption	Food Supply	Processing	Wastage	Feed	Seed	Other Utility
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Cassava	5 916 000	5 906 847	5 183 125	–	106 488	570 060	–	47 174
Maize	3 324 200	3 740 111	2 527 789	17 827	425 695	700 000	62 000	6 801
BANANAS	3 219 000	3 218 903	2 253 204	321 900	643 800	–	–	–

Source: FAOSTAT (2009)

With regard to livestock, permanent pastureland accounts for 27 percent of total available land according to 2010 data[3]. Over 30 million chickens, 1.3 million ducks, 19 million cattle, 12.5 million goats, 3.5 million sheep, and 2.7 million beehives are kept and raised in Tanzania.

3.3 Policy

The Agricultural Sector Development Strategy (ASDS), which was adopted in 2001, aims to create an enabling environment for investments; to build public and private partnerships for the growth of the sector; to focus on agro-industry and contract grower partnerships in order to increase market penetration and the supply of raw materials; and to diversify the strategy at sub-national levels in order to empower local communities and increase sustainability[6]. Another relevant policy is the *National Livestock Policy* of 2006, which aims to increase the productivity and competitiveness of the sector, including on the international market[6].

4. FOOD SECURITY

4.1 NUTRITION

Maize makes up 24.3 percent of the average daily calorie intake, followed by cassava with 10.5 percent and rice with 9.1 percent **(Table 2).** In total, these crops account for 43.9 percent of the average daily calorie intake, while animal products contribute 6.6 percent of the latter[2].

4.2 FOOD SECURITY AND FOOD PRICES

Tanzania is classified as a Low Income Food Deficit Country. Currently, 33.4 percent of the population lives below the poverty line[3] and 34 percent is undernourished[7]. With one third of the country's population living in poverty, food security is a national concern. However, crop production levels have recently been meeting demand for the most consumed crops within the country. In 2009, domestic consumption of staple crops was minimally supported by imports in Tanzania **(Table 3).**

TABLE 2: TANZANIA FOOD CROP CALORIC INTAKE (2009)

Ranking	Commodity	Calorie Share (%)
1	Maize	24.3
2	Cassava	10.5
3	Rice	9.1
4	Beans	6.1
5	Wheat	5.9
6	Sugar	4.1
Subtotal Food Crop share		60
Animal Products Share		6.6
Total Calories (kcal/capita/day)		2 137

Source: FAOSTAT (2009)

TABLE 3: TANZANIA NET FOOD CROP TRADE (2009)

Commodity	Production	Import	Export	Stock Variation	Domestic Consumption	Import Share of Consumption
	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	%
Maize	3 324 200	23 721	7 810	400 000	3 740 111	0
Cassava	5 916 000	0	15 218	0	5 906 847	0
Rice	1 334 001	59 150	146	62 805	1 454 614	4

Source: FAOSTAT (2009)

4.3 POLICY

The *Tanzania Development Vision 2025 (TDV 2025)* aims to achieve high quality livelihoods for its people, strengthen the economy, and attain good governance[6]. Food security and self-sufficiency are among the main objectives of the *TDV 2025*. The 2005 *National Strategy for Growth and Reduction of Poverty*, or MKUKUTA, is the national framework focusing specifically on poverty reduction and economic growth[6]. Both the TDV 2025 and the MKUKUTA identified agriculture as a crucial contributor to the obtainment of the aforementioned goals.

5. Energy and Bioenergy

5.1 Energy Supply and Demand

Approximately 14 percent of the country has access to electricity[3]. The majority of electrified households live in urban areas, while only 2 percent of rural people have access to electricity[8].

Tanzania is heavily reliant on imported petroleum products[8], which accounted for 27.6 percent of total merchandise imports in 2010[3]. Primary solid biofuels provide the largest contribution to both total primary energy supply and total final energy consumption, with a share of around 90%[9] **(Figure 7 & 8).** Other potential renewable energy options include modern bioenergy, solar energy, wind energy, hydropower, and geothermal energy[8].

Figure 7: Tanzania Total Primary Energy Supply (2009)

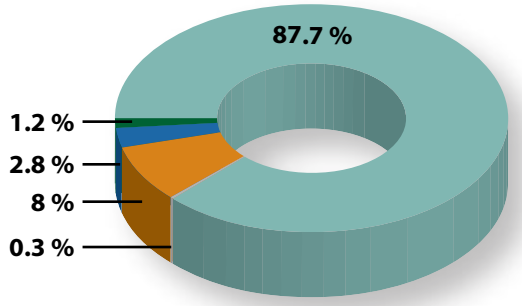
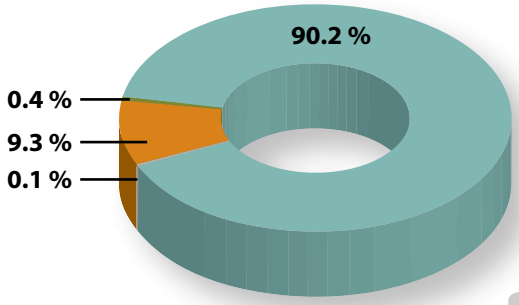


Figure 8: Tanzania Total Final Consumption (2009)

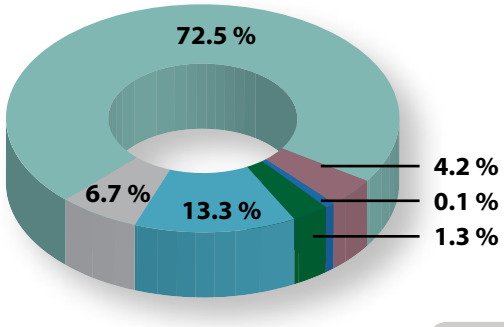


Source: IEA (2009)

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

The main consumer of energy in Tanzania is the residential sector, accounting for over 72 percent of total energy use[9], followed by the industrial sector with around 13 percent (**Figure 9).**

Figure 9: Tanzania Energy Use by Sector (2009)



Source: IEA (2009)

Industry | Transport
Agricuture | Non-energy use
Residential | Commercial
Non-specified

5.2 Modern Bioenergy

As of May 2010, Tanzania produced 33 MW of electricity from bagasse and wood in modern bioenergy facilities[10]. There were also six projects in the implementation stage across the country and over thirty projects in the planning phase. These projects aim to produce ethanol from sugar cane and biodiesel from jatropha and palm oil[10].

5.3 Policy

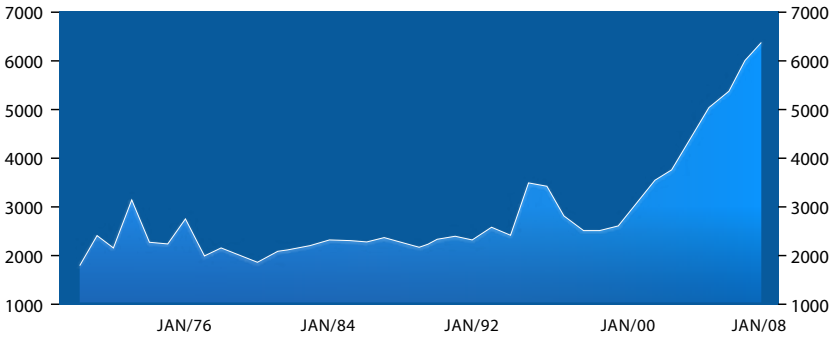
The *National Energy Policy* of 2003 aims to establish an efficient energy production, procurement, transportation, distribution, and consumption system in an environmentally sustainable manner[8]. In order to achieve this overall goal, the National Energy Policy set the following objectives: the development of domestic energy sources; the establishment of economic energy pricing schemes; the encouragement of private sector participation; and the enhancement of energy efficiency and reliability[8]. The research and development of renewable energy sources and biomass is strongly promoted as well.

6. Environmental Concerns

6.1 Climate change

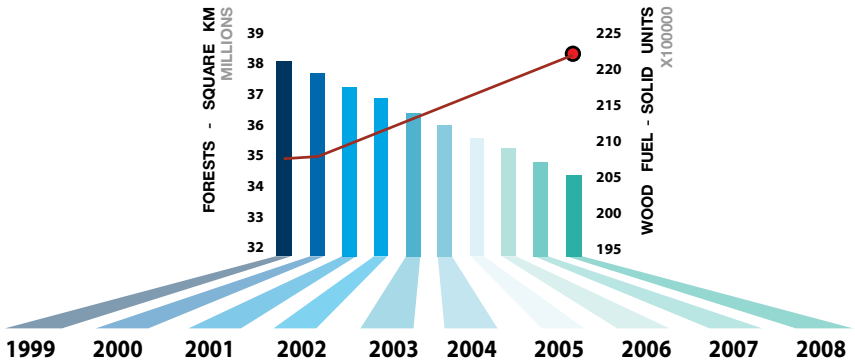
Climate change has already started to impact Tanzania. The annual average temperature has increased by 1 degree Celsius since 1960, and the average monthly rainfall has decreased by 2.8 mm per decade[12]. CO_2 emissions have more than doubled in the last 10 years **(Figure 10).**

Figure 10: Tanzania CO_2 Emissions - KT (2008)



Source: WDI (2010)

Figure 11: Tanzania 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 Tanzania. Forested areas are rapidly shrinking to meet domestic demand for wood fuel and export demand for wood products **(Figure 11).** With regard to the former, as already mentioned primary solid biofuels provide the largest contribution to total final energy consumption, with a share of over 90 percent[9]. 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 *National Environmental Policy* of 1997 aims to ensure secure, equitable, and sustainable use of natural resources whilst controlling and preventing the degradation of land, water, air, and vegetation[6]. The conservation and enhancement of both natural and man-made heritage sites is also a high priority[6], together with the rehabilitatio n of degraded areas[6].

Summary

- Tanzania's agricultural sector employs around 75 percent of the total labour force and accounts for 28 percent of the country's GDP.
- Out of Tanzania's total land area, 40 percent is used for agricultural purposes, with 11 percent of this area classified as arable land. Around 5 percent of the country's renewable water resources is withdrawn annually.
- Maize, cassava and rice make up 43.9 percent of the average daily calorie intake, with maize alone providing 24.3 percent of the total. Animal products account for 6.6 percent of the average daily calorie intake .
- Tanzania is classified as an LIFDC. However, in 2009 domestic supply and demand of maize, cassava and rice are more or less equivalent and only minimally supplemented by imports.
- Around 14 percent of households have access to electricity. Primary solid biofuels provide the largest contribution to both total primary energy supply and total final energy consumption, with a share of around 90%.
- Modern bioenergy facilities producing electricity from bagasse and wood are already in operation. In addition, there are currently 36 projects for the production of bioethanol and biodiesel that are either in a planning or implementation phase.
- Tanzania's forest area is declining as the demand for wood fuel and other forest products increases.
- Over the last ten years, Tanzania 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 Tanzania.

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