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Bioenergy and Food Security Project

Overview of the Bioenergy and Food Security (BEFS) project in FAO

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FAO FIAT PANIS

Outline of the presentation

- The Bioenergy and Food Security (BEFS) project timeline
- The BEFS Assessment Approach
- Some examples from Tanzania and Peru
- Where the project stands
- Some concluding remarks

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The Bioenergy and Food Security Project

BEFS Objective: Mainstreaming food security concerns into national and sub-national assessments of bioenergy potential.

- **Phase 1:** Develop analytical framework and guidance to assess the bioenergy and food security nexus
- **Phase 2:** Implement the methodology in the country based on country specific data
- **Phase 3:** Strengthen country capacity, exchange knowledge, feed into policy development and standard setting

BEFS Partners: Peru, Tanzania and Thailand

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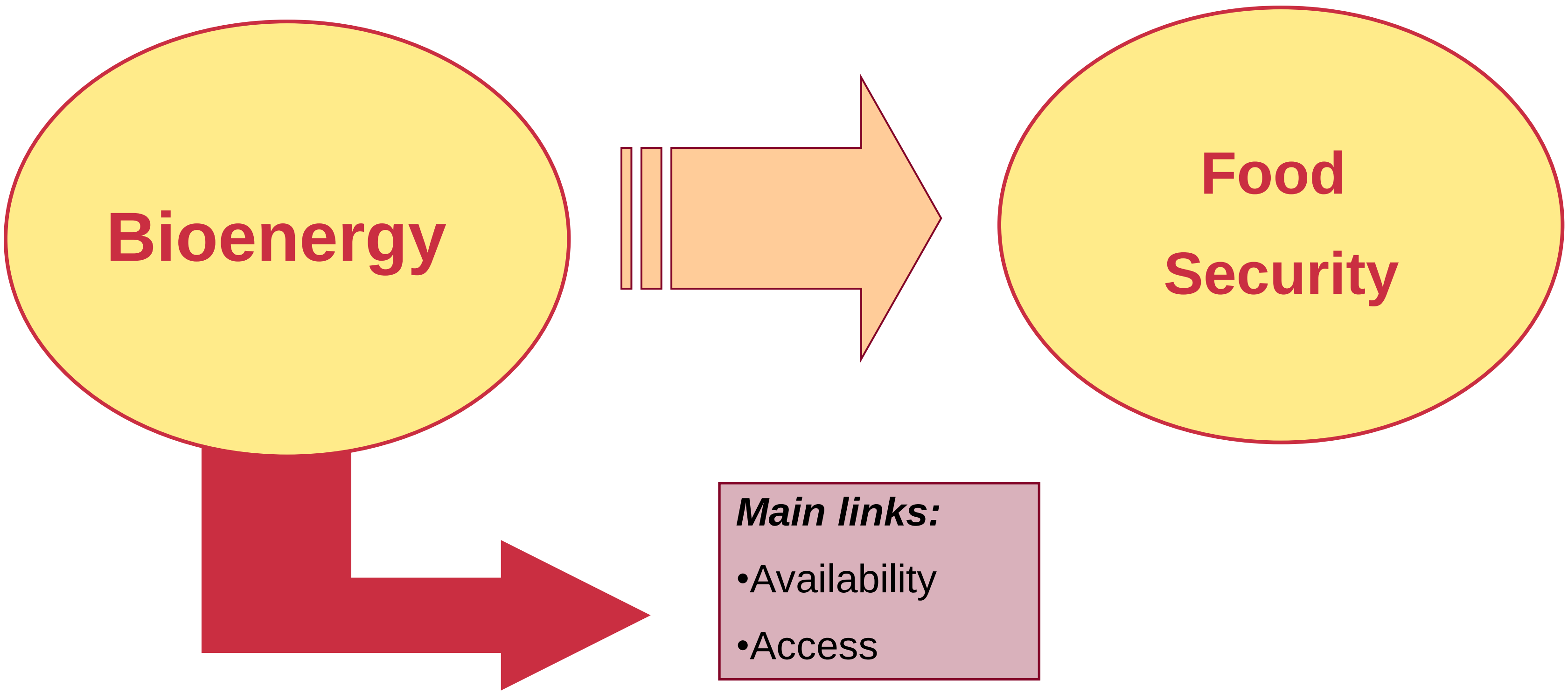
What BEFS assesses and how



Potential (Suitability)

Technoeconomic feasibility

Module 1 and 2

Food Production

Food Access

Modules 3, 4 and 5 building on Module 1 and 2

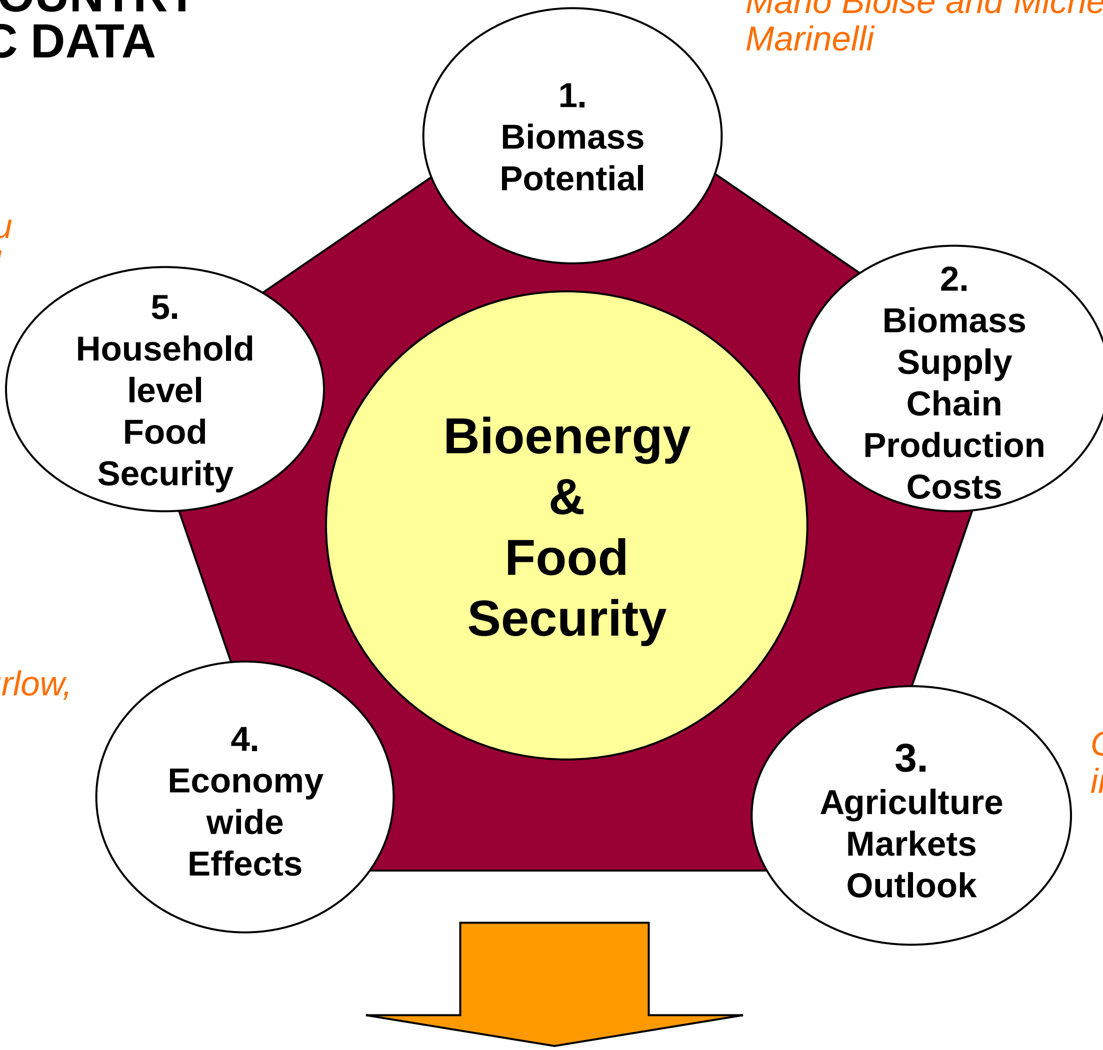
BEFS Analytical Framework

Fed with COUNTRY SPECIFIC DATA

Mirella Salvatore, Amir Kassam, Mario Bloise and Michela Marinelli

Irini Maltsoglou and David Dawe

Erika Felix and the University of Manizales Colombia



James Thurlow, IFPRI, with input from BEFS

COSIMO Team, with input from BEFS

Supporting national policy development

Tanzania

Economic Indicators (2005)
GDP/Capita (Constant 2000 Int$, PPP) 662
GDP Growth 7.0%
Agriculture Share 44.5% , revised to 26%
Percent of rural population 75.8%

Current energy supply mix (IEA, 2004)

- More than 90 percent of national energy supply comes from biomass, mostly woody
- Petroleum and electricity are imported and make up for approximately 7 percent of energy supply
- Some local hydro, gas and coal production, 1 percent

Current energy use in the country

- Energy use per capita in Tanzania is 498 ktoe/capita (versus 703 ktoe/capita in Africa and 1793 ktoe/capita in the World, WDI 2007)
- Based on the household budget survey of 2001, 10 percent of households have access to electricity, this swivels down to 1 percent in rural areas

Which commodities do we focus on in Tanzania?

- **Potential bioenergy feedstock-Government's indications:**
  - Ethanol: **Sugar** and **Cassava**
  - Biodiesel: **Palm oil and Jatropha**

- **Food security commodities:**

  Selected based on calorie consumption data.

  Main focus on **Maize** and **Cassava**.

Ranking	Commodity	Calorie Share
1	Maize	33.4
2	Cassava	15.2
3	Rice (Milled Equivalent)	7.9
4	Wheat	4.0
5	Sorghum	4.0
6	Sweet Potatoes	3.3
7	Sugar (Raw Equivalent)	3.3
8	Palm Oil	3.0
9	Beans	2.9
10	Beverages, Fermented	2.7
11	Milk – Excluding Butter	2.2
12	Bovine Meat	1.8
13	Pulses, Other	1.7
14	Plantains	1.5
15	Millet	1.4
Subtotal share for selected items		88.5
Total Calories per capita		1959

Source: FAOSTAT

Net trade position for key commodities

Items	Production quantity (MT)	Import quantity (MT)	Export quantity (MT)	Net-importer	Net-exporter
Maize	3,288,000	44,500	98,985	-	0.02
Cassava	7,061,867	0	839	-	-
Rice	957,000	18,846	3,717	0.02	-
Wheat	87,133	254,732	36,428	0.71	-
Sorghum	653,644	0	0	-	-
Sweet potatoes	781,567	0	0	-	-
Sugar Cane	1,374,633	140,895	27,537	0.08	-
Palm oil	63,333	117,272	6,464	0.64	-
Beans	261,667	541	9,253	-	0.03
Banana	2,007,480	0	0	0	0

Source: FAOSTAT

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Determining the biomass potential

Land Suitability Assessment Model and consists of two components:

1) the ***Land Resources Inventory****:* biophysical information is compiled such as temperature, rainfall, soil and land-form

2) the ***Land Suitability Assessment***. Once the inventory is set up, identify crop suitability areas based on climatic and soil-related criteria.

This assessment requires the identification of the **land utilization types** (LUTs), which are a combination of crop type, production system (tillage-based and conservation agriculture) and input level (low and high).

Crops: cassava, sugar cane, sweet sorghum, oil palm and sunflower Having determined suitable areas by crop and based on the attainable yield, the potential production is calculated. In this, non-agricultural and environmentally sensitive areas (such as forest areas, protected areas, urban areas, etc.) are excluded. An evaluation of the potential competition with food production is undertaken using land cover, land use and agriculture statistics.

Irrigation and infrastructure

To date the analysis is showing that infrastructure access will be one of the key parameters to enable the country to reap the benefits from the development of bioenergy schemes.

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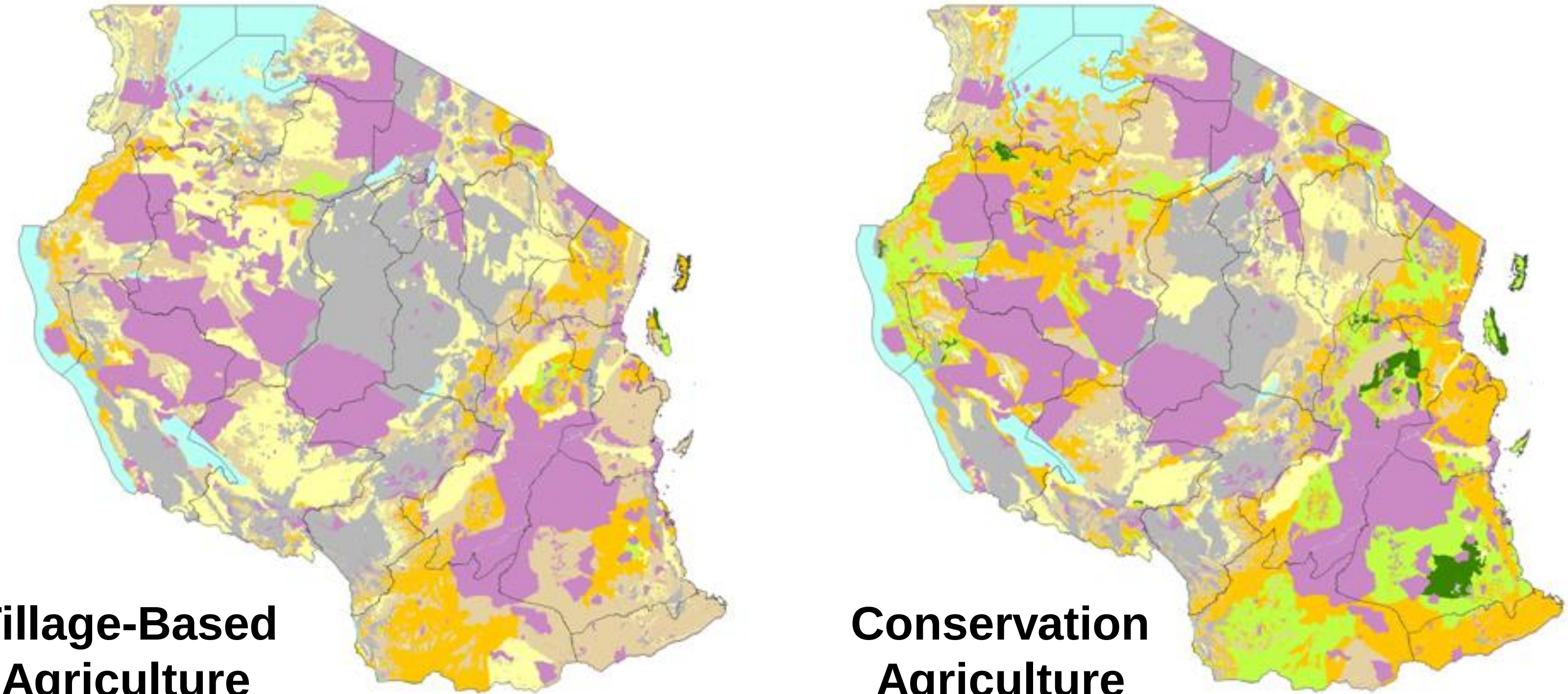
Suitability index for cassava



Suitability classes

- Very Suitable (80-100%)
- Suitable (60-80%)
- Moderately Suitable (40-60%)
- Marginally Suitable (20-40%)
- Very Marginally Suitable (< 20%)
- Not Suitable
- Inland water bodies
- Excluded areas
- Region administrative boundaries

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Production costs of biomass supply chains (Module 2)

- Each feedstock is assessed under different processing conditions based on the relevance of the following characteristics for the feedstock analyzed:
  - (i) stand alone versus integrated mill and **refinery**
  - (ii) **plant scale**: large, medium or small
  - (iii) **feedstock origin**: (a) commercial, (b) outgrowers (c) a mix of these two

- Based on the relevant mix of (i), (ii) and (iii), this part of the assessment evaluates technical and economic aspects of biofuel production taking into account the local knowledge base and manufacturing capacity.

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An example:
Production cost cassava ethanol in Tanzania

- Comparison of medium (~160K liters/day) and large (~300K liters/day) refinery technologies including co-products credit (biocompost, biofertilizers)

Input costs	Medium-size (fresh)	Medium-size (dry)	Large-size (dry)
Raw material	$0.20	$0.25	$0.26
Processing	$0.15	$0.15	$0.14
Capital	$0.064	$0.064	$0.046
Cost at plant	$0.42	$0.47	$0.44
Distribution costs			
Domestic	$0.46	$0.51	$0.48
International	$0.54	$0.59	$0.56

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Agriculture Market Outlook (Module 3)

Module 3 focuses on the domestic agriculture markets

- It is based on the 10 outlook produced by AGLINK COSIMO
- This Module analyses the impacts of bio-fuel production and bio-fuel policies on agricultural markets in the context of selected country over a 10 year period by providing an outlook for international and national agricultural commodity markets and simulates a set of scenarios
- Allows to assess
  - ✓ What is the outlook for main food corps in Tanzania under different conditions including International agriculture and biofuel policies?
  - ✓ What are the implications of domestic and global biofuel policies for biofuel development in Tanzania?

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The Outlook in Tanzania

- **Baseline Outlook:** Overall, the projections show that for most crops (the ones that Tanzania receives most of its calories from) the country will have to rely on more imports to meet domestic demand and this is in the absence of biofuels markets.
- **Scenario 1:** Blending mandates 49 million litres of ethanol (10%) and 55 million litres of biodiesel (5%) by 2017, no land expansion
- **Scenario 2:** Based on investors requests for land (314,000 ha) for biofuel development, ethanol production would reach 800 Mlt in 2017 and biodiesel 695 Mlt. Biofuel production would exceed domestic demand and be directed to exports.

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Outlook in Tanzania (contd.)

- The biofuels blending mandate does not require a significant amount of biofuels feedstocks and it could be possible to meet these mandates with limited expansion of cultivated lands and moderate increase in average yields
- Based on investors requests for land for biofuel development, ethanol production would reach 800 Mlt in 2017 and biodiesel 695 Mlt. Biofuel production would exceed domestic demand and be directed to exports.
- Total production would by far exceed domestic demand and would heavily rely on EU and EBA agreement

Economy wide effects

- National dynamic computable general equilibrium model
- Based on 2007 economy wide database (social accounting matrix)
- Survey-based microsimulation module for poverty-effects
- New feedstock and biofuels sectors in the model are based on Module 2's technologies and production cost estimates

- The model is run forward for the period 2007-2015
- Initially tracks recent demographic and growth trends
- Then simulates different biofuel production scenarios or options:
- Feedstock (sugarcane/molasses vs. cassava)
  - ✓ Scale of production (large estates vs. smallholder outgrower schemes)
  - ✓ Source of production (land expansion/displacement vs. yield improvements)
  - ✓ Scale of biofuel processing (small plants vs. single large-scale plant)

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Some of the economy wide effects in Tanzania

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- Biofuel production accelerates growth and poverty reduction
- There is no medium to long-run food/fuel trade-off
    - ✓ An appreciating exchange rate from expanding biofuels exports (or reducing fuel imports) hurts existing traditional agricultural exports
    - ✓ Tanzania's large existing export crop sector means that food production remains 'unaffected' by land/labor displacement for biofuel crops
- ✓ Engaging more smallholder farmers strengthens poverty-effects
    - ✓ Outgrower sugarcane schemes are currently not a cost-effective option
    - ✓ But smallholder cassava is cost-effective and is also more pro-poor
    - ✓ Improving yields rather than displacing cultivated lands makes sugarcane and cassava outgrower schemes equally pro-poor and more cost-effective
- Switching to small-scale sugarcane processing plants has only small additional employment- and poverty-effects

Short run effects on households' access to food-- Some reminders

- Bioenergy developments one of the causes of food price increases
- Changes in food prices can derive from international and domestic supply and demand shocks including biofuels' demand.
- What matters for households are domestic price increases, whereby domestic prices can change due to international and national price movements depending on policies, exchange rate movements, level of price transmission etc..

- Price increases will affect different groups in different ways:
  - ✓ *Net consumers*: Those who buy more food than they sell will be hurt by higher prices.
  - ✓ *Net producers:* Those who sell more food than they buy benefit from higher prices.

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Measurement of household level net welfare impacts

- The impact of a price change on household welfare can be decomposed into:
  - ✓ the impact on the household as a consumer of the good and
  - ✓ the impact on the household as a producer of the good.

  The **net welfare impact** will be the **difference between the two**

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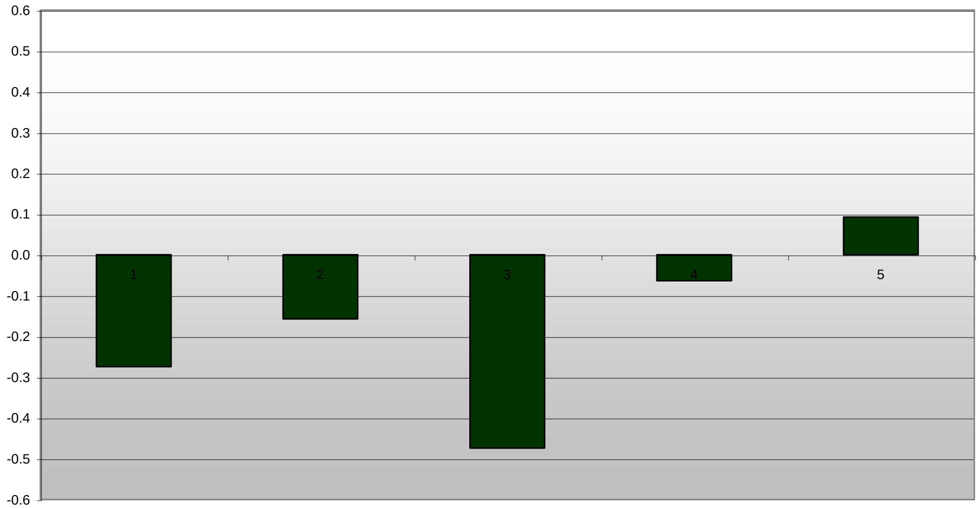
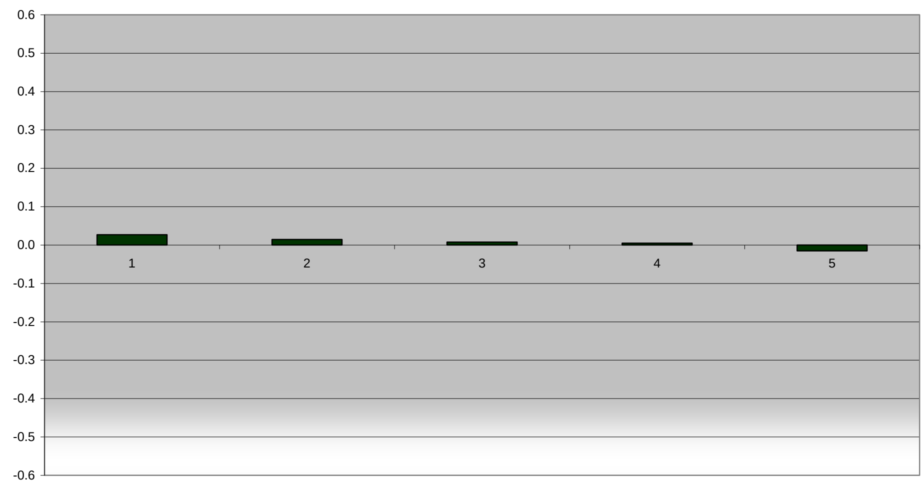
Kilimanjaro

- Maize



- Cassava



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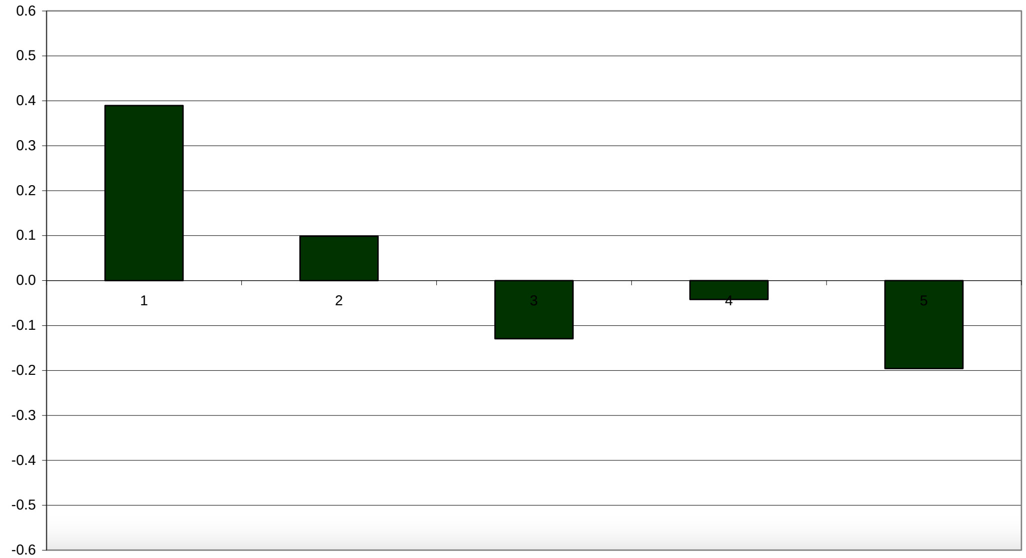
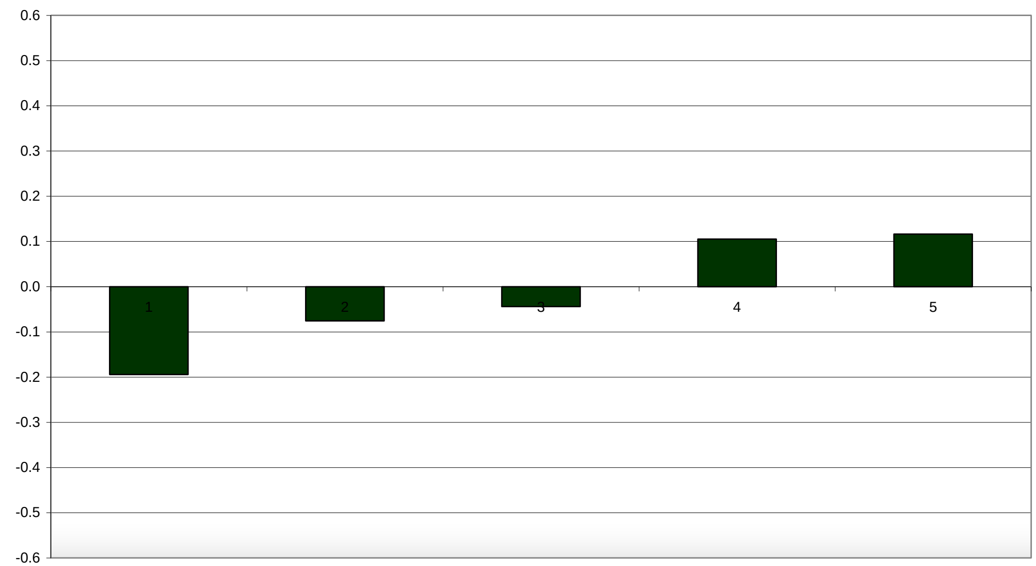
Ruvuma

- Maize



- Cassava



Maize and Cassava Price Changes

Commodity and Marketing Level	Domestic Retail Fresh Cassava	Domestic Retail Dried Cassava	Domestic Maize Wholesale
Real Percent Change Between 2003 and 2008	50	42	44

Source: Ministry of Trade, Calculations by the authors

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Which commodities do we focus on in Peru?

- **Potential bioenergy feedstock-Government's indications:**
  - ✓ Ethanol: **Sugar** and **sweet sorghum**
  - ✓ Biodiesel: **Palm oil and jatropha**

- **Food security commodities:**

  Selected based on calorie consumption data.

  Main focus on **rice, sugar and wheat**

Ranking	Commodity	Calorie share
1	Rice (Milled Equivalent)	19.2
2	Sugar (Raw Equivalent)	14.0
3	Wheat	13.6
4	Potatoes	7.6
5	Maize	5.2
6	Cassava	4.3
7	Soyabean Oil	3.5
8	Milk - Excluding Butter	3.1
9	Plantains	3.0
10	Fish, Body Oil	2.5
11	Poultry Meat	2.3
12	Barley	1.5
13	Beverages, Alcoholic	1.3
14	Pulses, Other	1.3
15	Palm Oil	1.1
16	Fruits, Other	1.1
Subtotal share for selected items		84.4
Total Calories per capita		2176

Source: FAOSTAT

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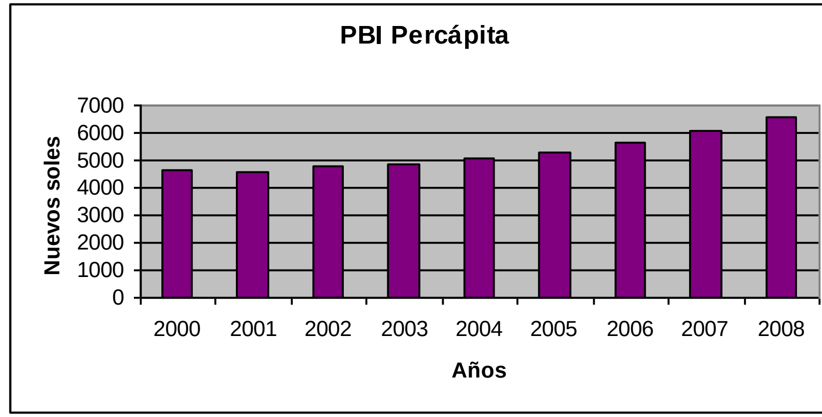
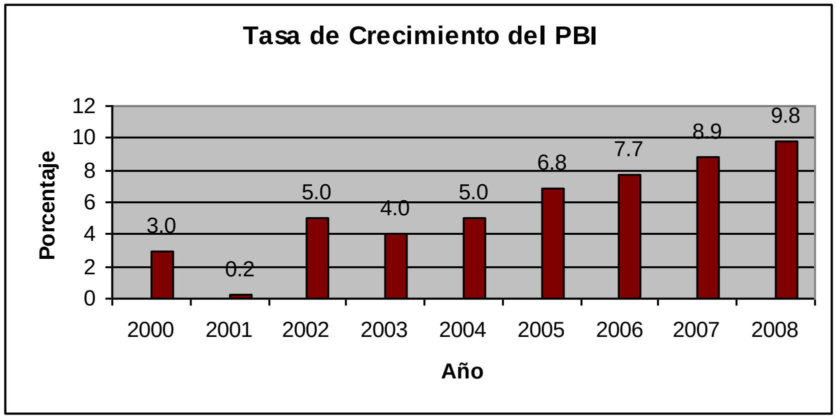
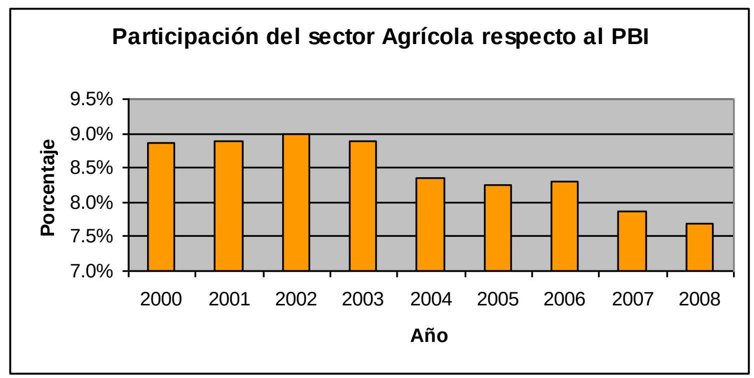
Overview of Energy and Economy in Peru





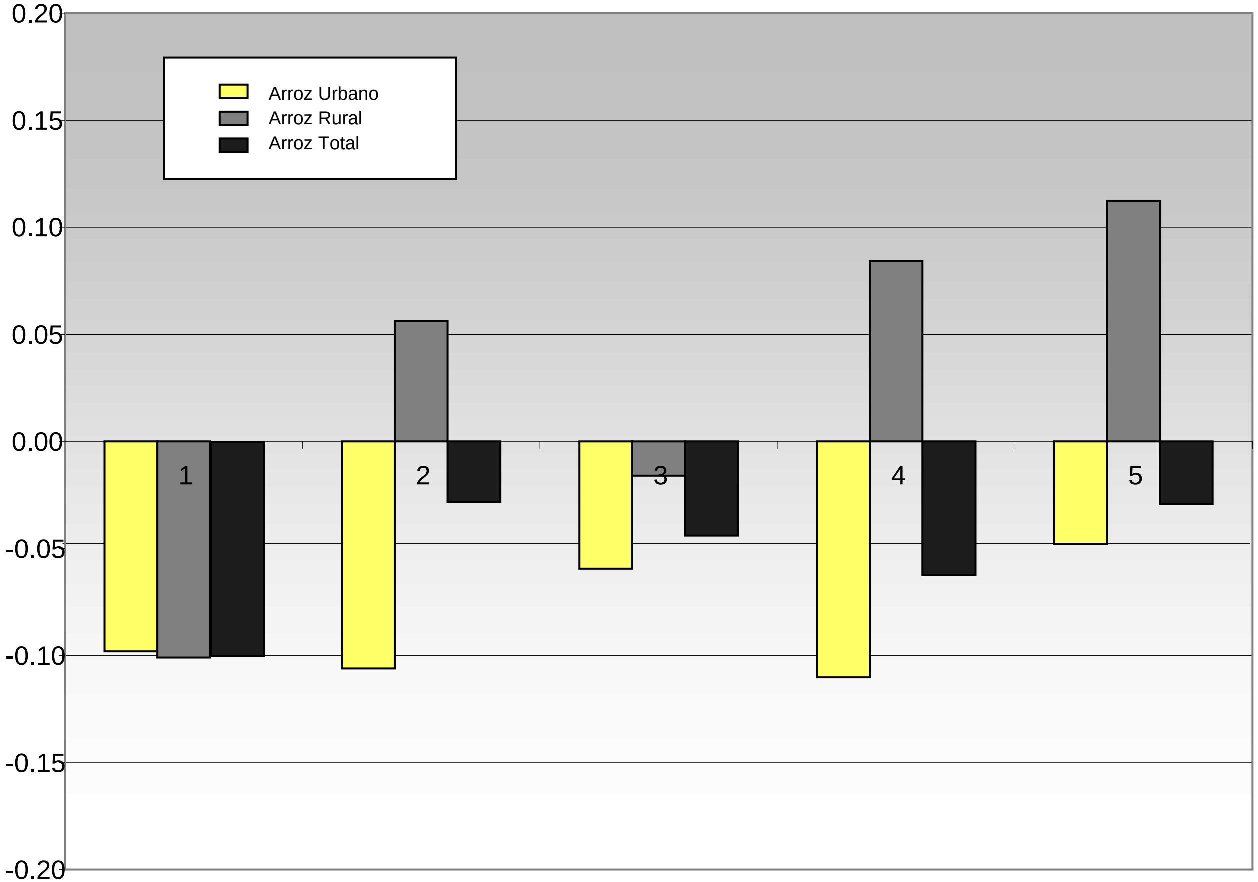


- Energy Matrix

Petróleo y Gas Natural 67.6%, Biomasa 15 % , Hidroenergia 12% , Carbón Mineral 5%, Otros 0.4 %

Fuentes: MINEM-OGP

Welfare impact for a 10% producer price increase for rice



Producer price changes

Commodity	Real percentage price changes 2006-2008
Rice	45
Sugar (White, brown) *	-37 , -57
Wheat	9
Potato	-7
White maiz	30

* Based on the wholesale price

Source: Author calculations based on INEI data

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Country project set up and institutional framework

- Country team
- Bioenergy task force
- Feeding into national policy
- Training activities

Where BEFS stands

- Wrapping up the country assessments, using the technical analysis components to feed into the domestic policy dialogue while considering country institutional constrains

- Training in the country on BEFS Modules methodology: Different issues in different countries

- Supporting domestic policymakers with the two activities above to feed into the National Biofuels Taskforce

A list of requirements for the sustainability of bioenergy developments

- The preliminary conclusions drawn by the BEFS project indicate that **bioenergy development which safeguards food security is *only sustainable if it***
- **does not hinder the natural resource base**
- **involves smallholders, increases employment and takes into account the specific risks for subsistence farmers**
- **increases access to markets and infrastructure**
- **builds domestic skills and expertise**
- **ensures localized benefits and the long term sustainability of the industry**
- **monitors welfare impacts at the household level**
- **respects and protects the livelihoods of women**
- **strengthen farmers associations to ensure fair contract arrangements and full information**
- **further enhances institutional capacity to support the new industry**
- The assessment results contain details on how to achieve this.

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Concluding remarks

- BEFS can show which areas should be developed for biofuel production, whilst accounting for food production and environmental constraints
- BEFS can show implications for the economy, labour, poverty and which segments of the population will loose or will gain

....nevertheless, the success of sustainable bioenergy developments will heavily rely on meticulous managements and, as generally for agriculture, on investment in infrastructure, agriculture R&D and human capital development...

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THANK YOU!

www.fao.org/bioenergy/foodsecurity/befs

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- Propose an alternative calculation for consumer price percentage change accounting for the margin assumption

Dawe and Maltsoglou (FAO, 2009) ftp://ftp.fao.org/docrep/fao/011/aj990e/aj990e.pdf

- Include for purchasing power differences across rural and urban areas
- Include for crop to food transformation chain

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