VII EE 2016 Seminario Latinoamericano y del Caribe de Eficiencia Energética

VII Latin American and the Caribbean Energy Efficiency Seminar

"Sustainable Energy Development Cornerstone"

Efficient Energy Use in Agrifood Chains

Systematization of indicators and case studies

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eficiencia energética

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Who we are?

As the specialized agency of the Inter-American System for agriculture, the Inter-American Institute for Cooperation on Agriculture (IICA) supports the efforts of the Member States to achieve agricultural development and rural well-being.

- **Mission**

To encourage, promote and support our Member States in their efforts to achieve agricultural development and rural well-being through international technical cooperation of excellence.

- **Vision**

To create a competitive, inclusive and sustainable inter-American agriculture that feeds the hemisphere and the world, while at the same time generating opportunities to reduce hunger and poverty among farmers and rural dwellers.

The agriculture that we promote

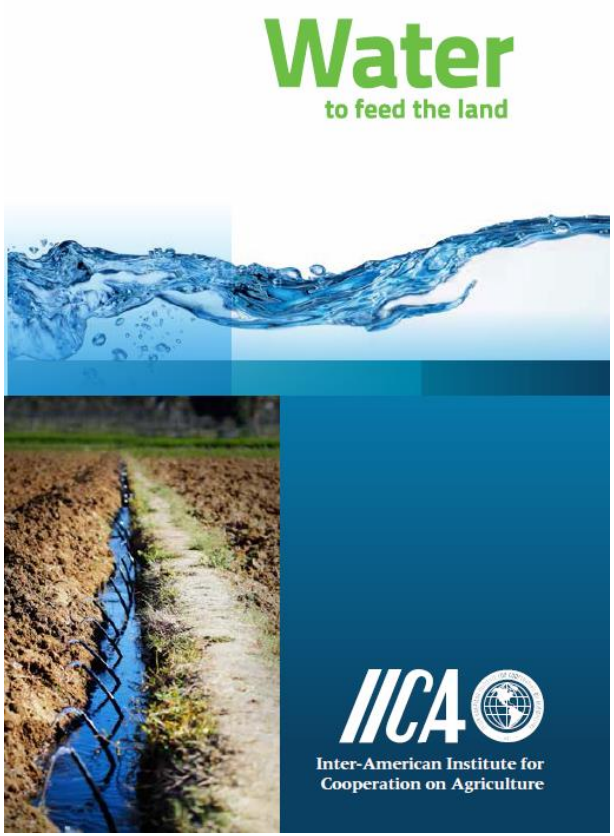
Strategic plan 2010-2020
(objectives)

The IABA Commitments:
Innovation and water resources integrated management

The agriculture challenges:
Productivity and competitiveness, sustainable, inclusion y food security and nourishment.

1. Improve the ***productivity and competitiveness*** of the agricultural sector.
2. Strengthen agriculture's contribution to the ***development of rural areas and the well-being of the rural population.***
3. Improve agriculture's capacity to mitigate and adapt to ***climate change*** and make better use of natural resources.
4. Improve agriculture's contribution to ***food security.***

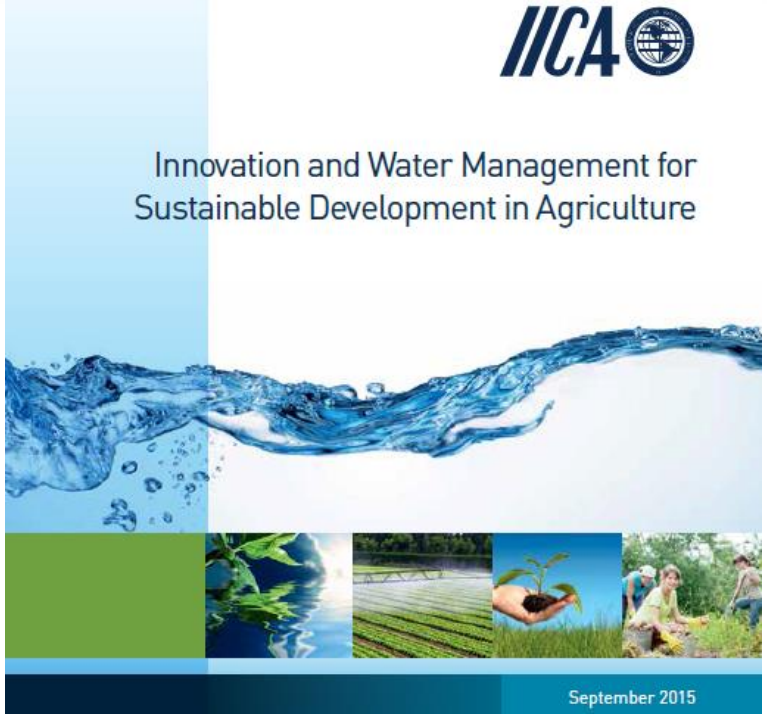
Creating sustainable cities: agriculture point of view



It is estimated that, by 2050, over 75% of the continent's population will live in urban areas. This will generate greater demand for food and water for human consumption, sanitation services, and the production of energy and other satisfiers, a situation that will further increase competition between different sectors for the resource.

Source: Document to support the development of a hemispheric agenda to improve the sustainable use of water in agriculture as contribution from the IICA to the Inter-American Board of Agriculture (IABA) 2013.

Creating sustainable cities: agriculture point of view



Publication available on:
http://www.iica.int/es/content/innovaci%C3%B3n-y-gesti%C3%B3n-del-agua-para-el-desarrollo-sostenible-en-la-agricultura-innovation-and

i. *More efficient use of water on farms via pressurized irrigation systems.*

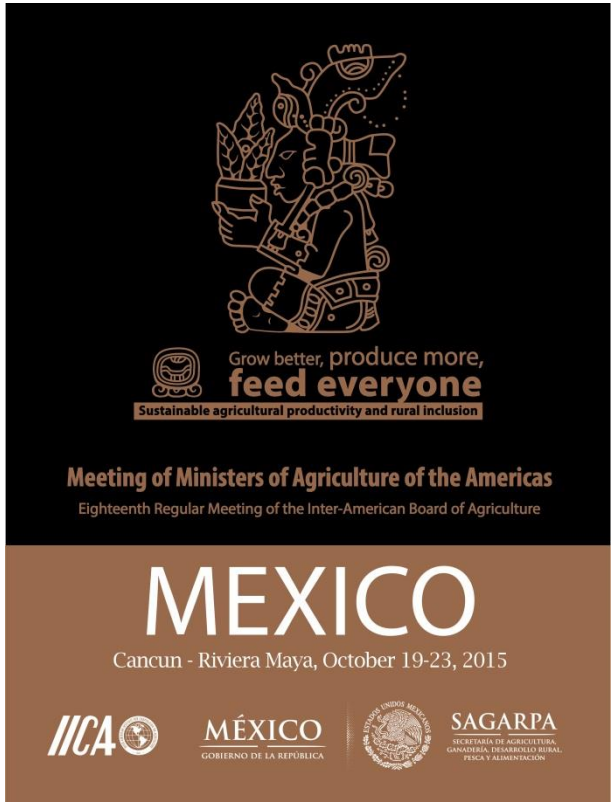
ii. *Reducing **energy consumption** for water usage on farms.*

iii. *Progress made in water harvesting at the farm and community levels.*

iv. *Micro dams: a new investment trend for achieving greater democratization of the benefits of water collection.*

v. *Piping systems for canals to eliminate water losses.*

Creating sustainable cities: agriculture point of view

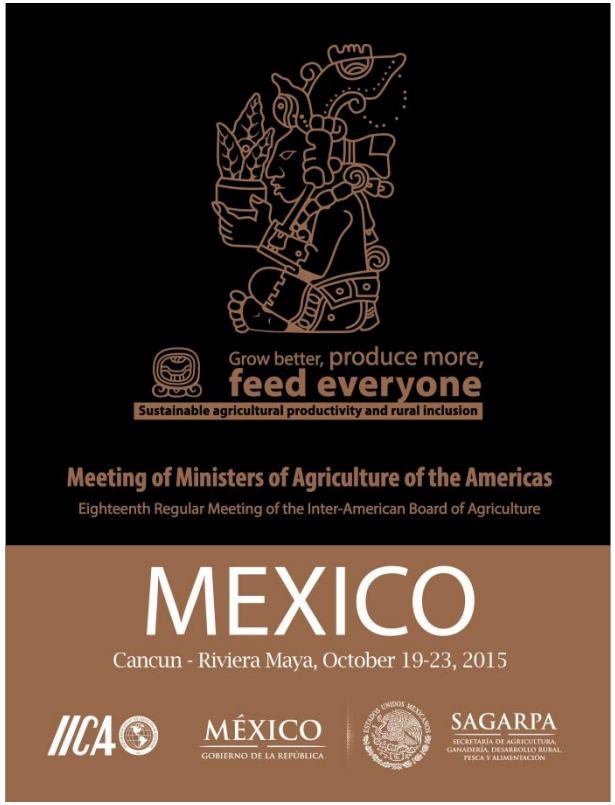


Agriculture must respond to three major trends in consumer demand, given that the vast majority of the population now lives in cities.

- Paying greater attention to the way in which agrifood systems produce food (traceability).
- Consumers' expectations about the food they eat, quality and safety and their impact on human health and wellbeing.
- The expectation of foods that are easier and quicker to prepare.

Source: IICA. Technical Document ***"Competitive, Inclusive, and Sustainable Productivity: Opportunity For The Americas"***. Meeting of Ministers of Agriculture of the Americas 2015

Creating sustainable cities: agriculture point of view



Soil, water, energy, and biodiversity: pillars of agricultural productivity

- Agriculture is a process of converting ***energy into food*** by means of photosynthesis, with plants using solar energy, water, and soil nutrients to generate the wide range of agricultural products with which we are all familiar..

Source: IICA. Technical Document ***"Competitive, Inclusive, and Sustainable Productivity: Opportunity For The Americas"***. Meeting of Ministers of Agriculture of the Americas 2015

Creating sustainable cities: agriculture point of view

Challenges and opportunities stablished

IICA MTP 2014 - 2018

Challenge:

Regarding productivity and competitiveness.

Opportunity:

Improve yields and make more efficient, sustainable use of natural resources, especially water and soil; and making intelligent use of energy sources.

Challenge:

Regarding sustainability and climate change.

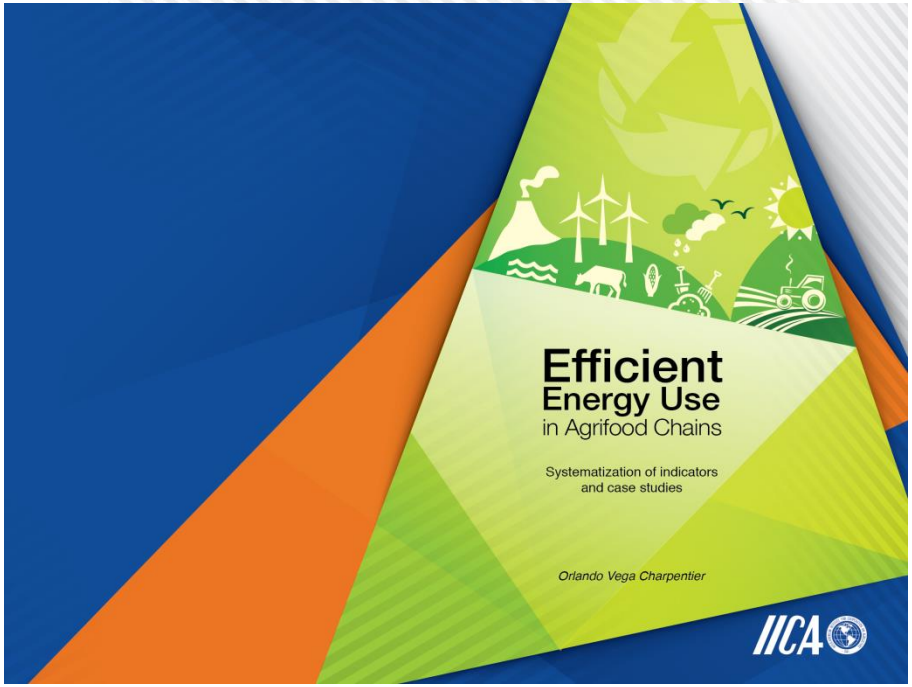
Opportunity:

Generate production models that will increase production and avoiding impact on the environment, soil erosion, inefficient use of water and energy, and GHG emissions.

Conceptual and technical framework

Approach : *Efficient energy use that contributes to the improvement of the competitive and sustainable performance of the agricultural food chains*

Efficient Energy Use in Agrifood Chains

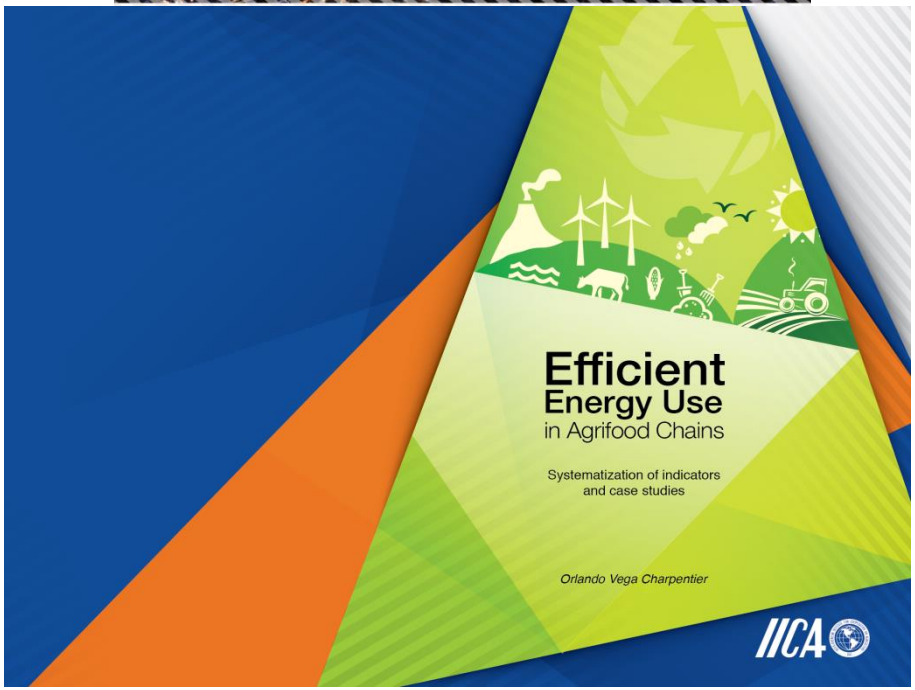


Scope expected:

Contribute to the challenges and opportunities posed by agriculture, to increase the levels of productivity and competitiveness, through:

- ✓ Using energy sources intelligently and efficiently.
- ✓ Achieving the sustainability of productive systems.
- ✓ Avoiding the emission of greenhouse gases.
- ✓ Sustainable use of the soil
- ✓ Promoting of renewable sources of energy.

Efficient Energy Use in Agrifood Chains



- Context
- Conceptual framework and concepts definition
- Systematization criteria
- Cases of study
- Conclusions

Issues guide

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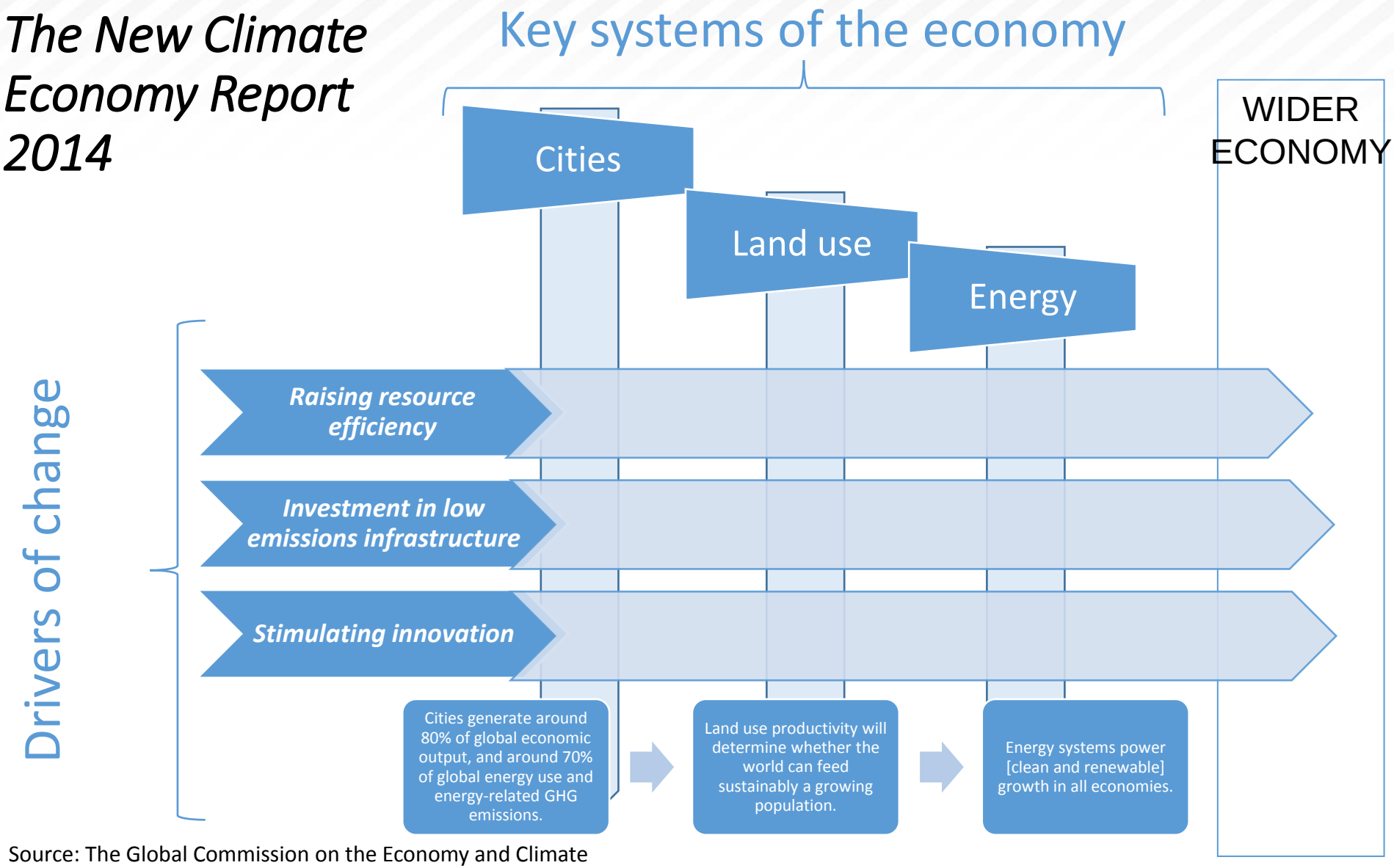
The New Climate Economy Report 2014



Source: The Global Commission on the Economy and Climate

Two important systems amalgam

• *Sustainable patterns for the **use of land** constitute a key factor for:*	• *It becomes relevant to promote the construction of sustainable **energy systems**, for :*
i. The increase in food production and agricultural productivity. ii. A more sustainable and efficient use of resources by agriculture. iii. The adoption of agricultural techniques that will contribute to the resilience of crops. iv. The restoration of degraded lands and forests.	i. Energy efficiency in all sectors, including agriculture. ii. Electricity supply under low C emission conditions, using renewable sources, as well as implementing carbon sequestering and capturing techniques. iii. A shift from fossil fuels to electricity and advanced, sustainable biofuels in the transportation sector.

Realization of energy efficient opportunities

• Land use system

i. The adoption of minimum tillage agriculture practices that diminish the intensity of energy use in agricultural machinery and that help to prevent soil erosion:
   - ✓ Productive diversification.
   - ✓ Conservation tillage.

ii. The introduction of crop varieties and animals that require less intensive use of resources and inputs.

iii. The introduction of bio-fertilizers or other bio-inputs.

iv. Precision application of water and fertilizers on farmlands.

• Energy system

i. The efficient use management on machinery and irrigation pumps.

ii. Construction of energy-efficient agricultural infrastructure.

iii. Efficient heat management in greenhouses or cooling systems or other controlled environments.

iv. The optimal and efficient dosage of biomass for energy.

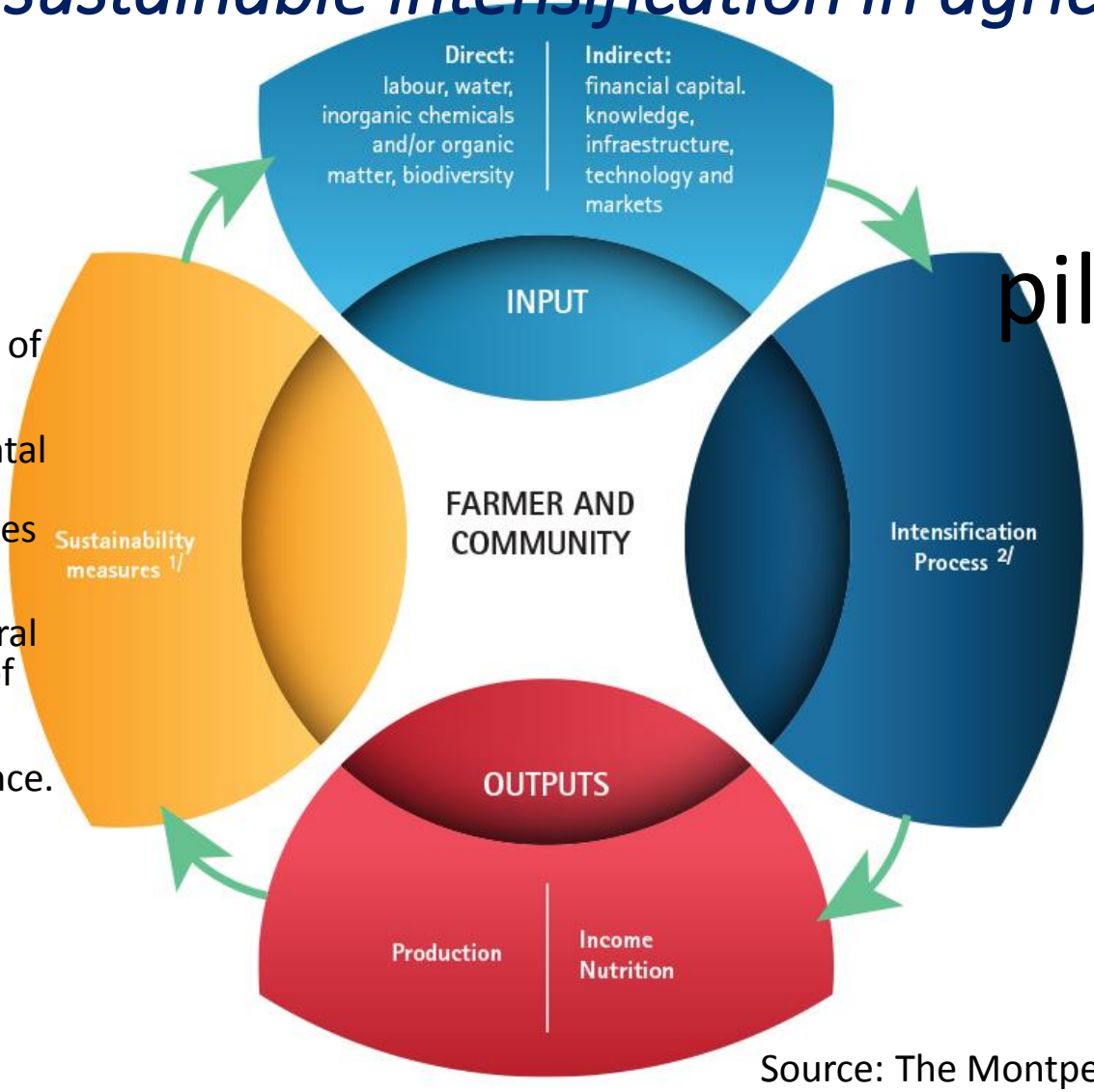
v. Efficiency on storage and transportation of inputs and agricultural products, as well as value adding through agricultural and industrial food processing.

Model of sustainable intensification in agriculture

Less (-)

- Minimizing emissions of greenhouse gases.
- Reducing environmental impact through innovative technologies and processes.
- Increase in both natural capital and the flow of ecosystem services.
- Strengthening resilience.

More (+)

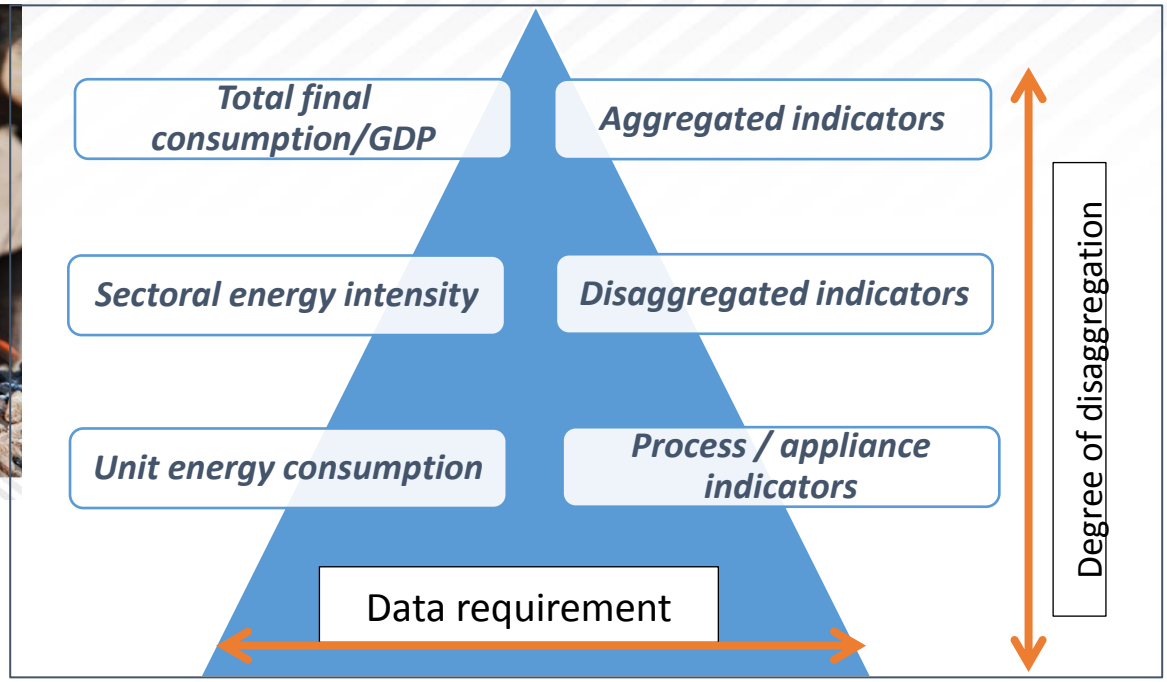


Three pillars (3)

- Socioeconomic intensification.
- Ecological Intensification.
- Genetic intensification.

Source: The Montpellier Panel (2013).

The IEA energy efficiency indicators pyramid & criteria



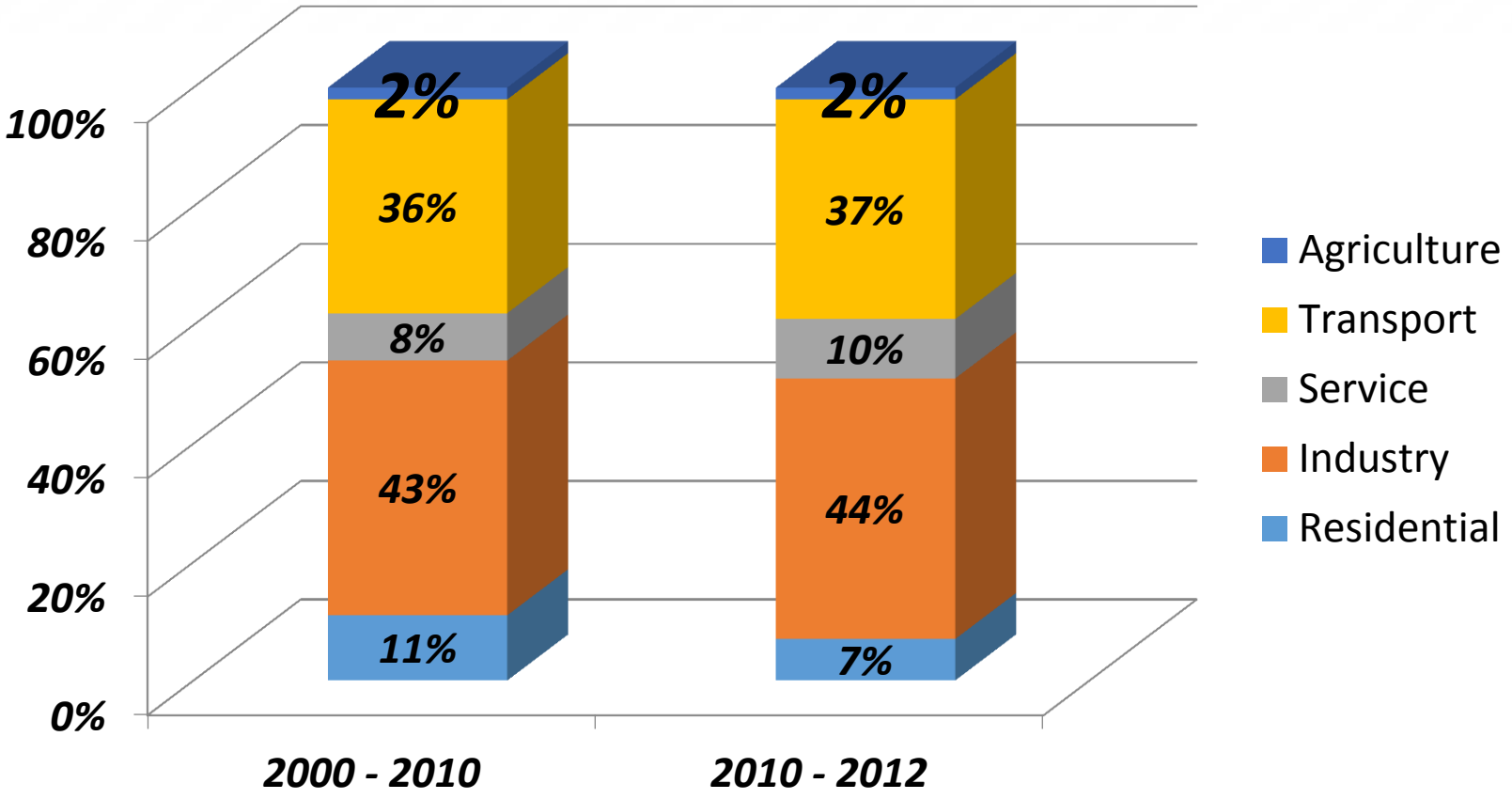
Significant: the results of implementing the methodology or tool should be useful for making food chains more efficient and productive.

Relevant: they should bear a direct relationship to agrifood chains, especially regarding water and soil.

Consistent: they should provide a sound conceptual framework for quantifying, monitoring, verifying and comparing energy performance indicators in agrifood chains.

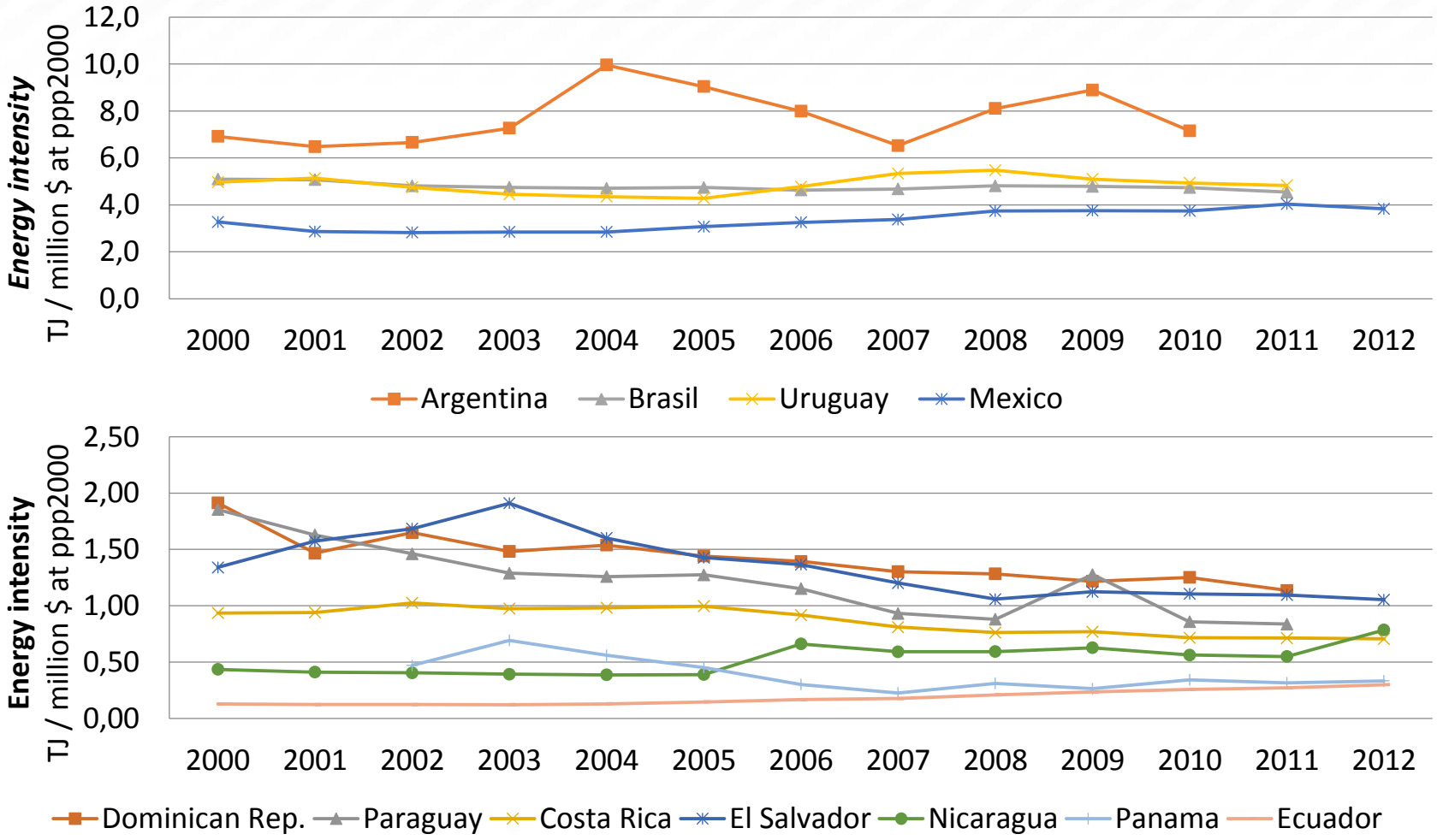
Replicable: they should promote improvements in production processes to step up the pace of innovation, and they should encourage policy interventions to eliminate barriers, for managing energy efficiency in food chains and using land more sustainably.

Overall contributions to final avoided energy consumption by sectors, according to time periods



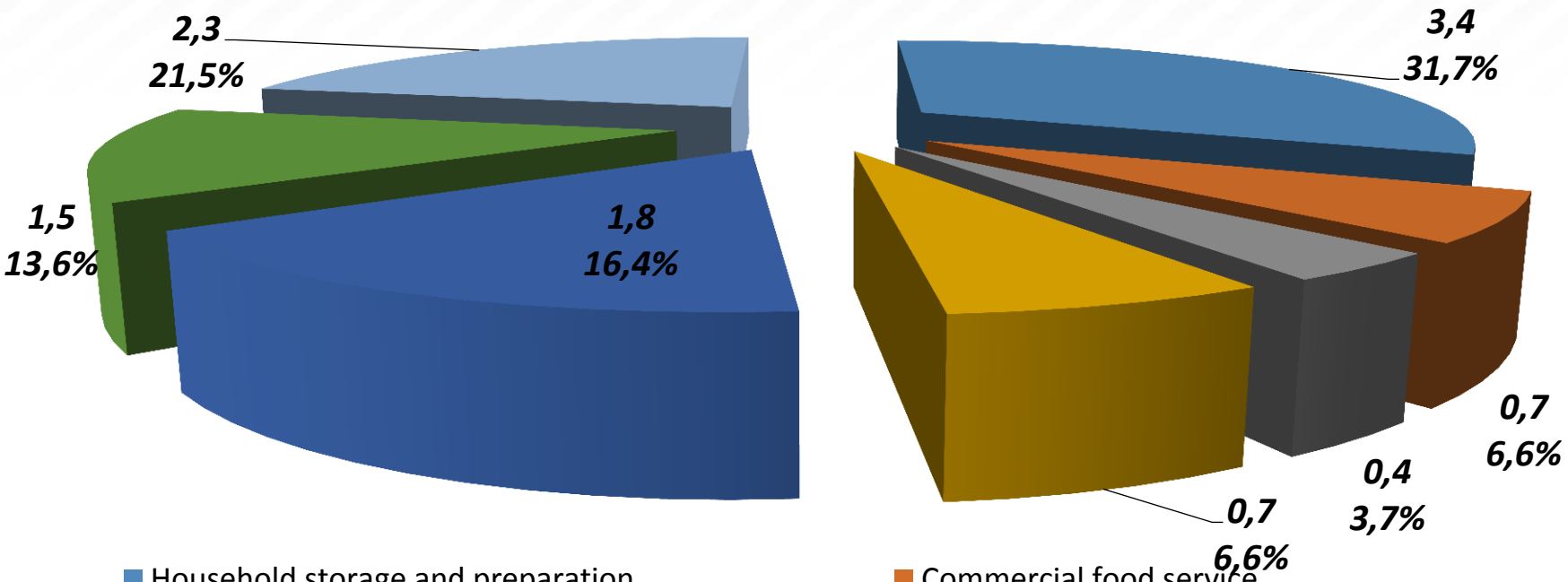
Source: International Energy Agency (IEA)/World Development Indicators (WDI)/United Nations.

Energy intensity in the agricultural sector in LAC selected countries 2000 -2012 (in TJ / million $ produced at purchasing power parity 2000).



Source: Base of Indicators for Energy Efficiency (BIEE).

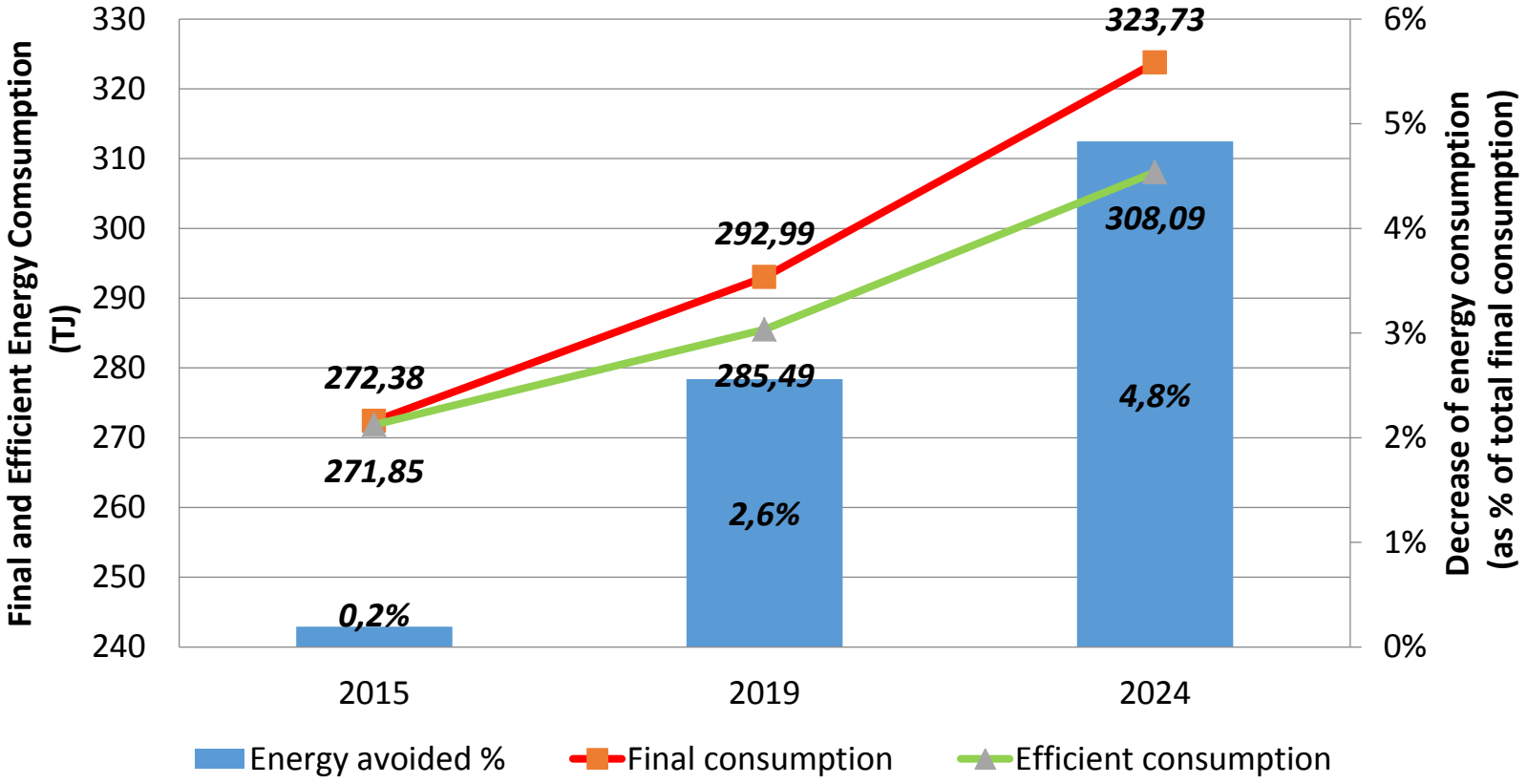
Energy use in the U.S. food supply system. (EJ y %)



Notes: [a] 1 EJ (exajoule) = 1 x 10^{18} joules. [b] Energy consumed by the seed industry (research, development and production not included); nor energy in food waste (landfills, waste disposals, and effluent treatment).

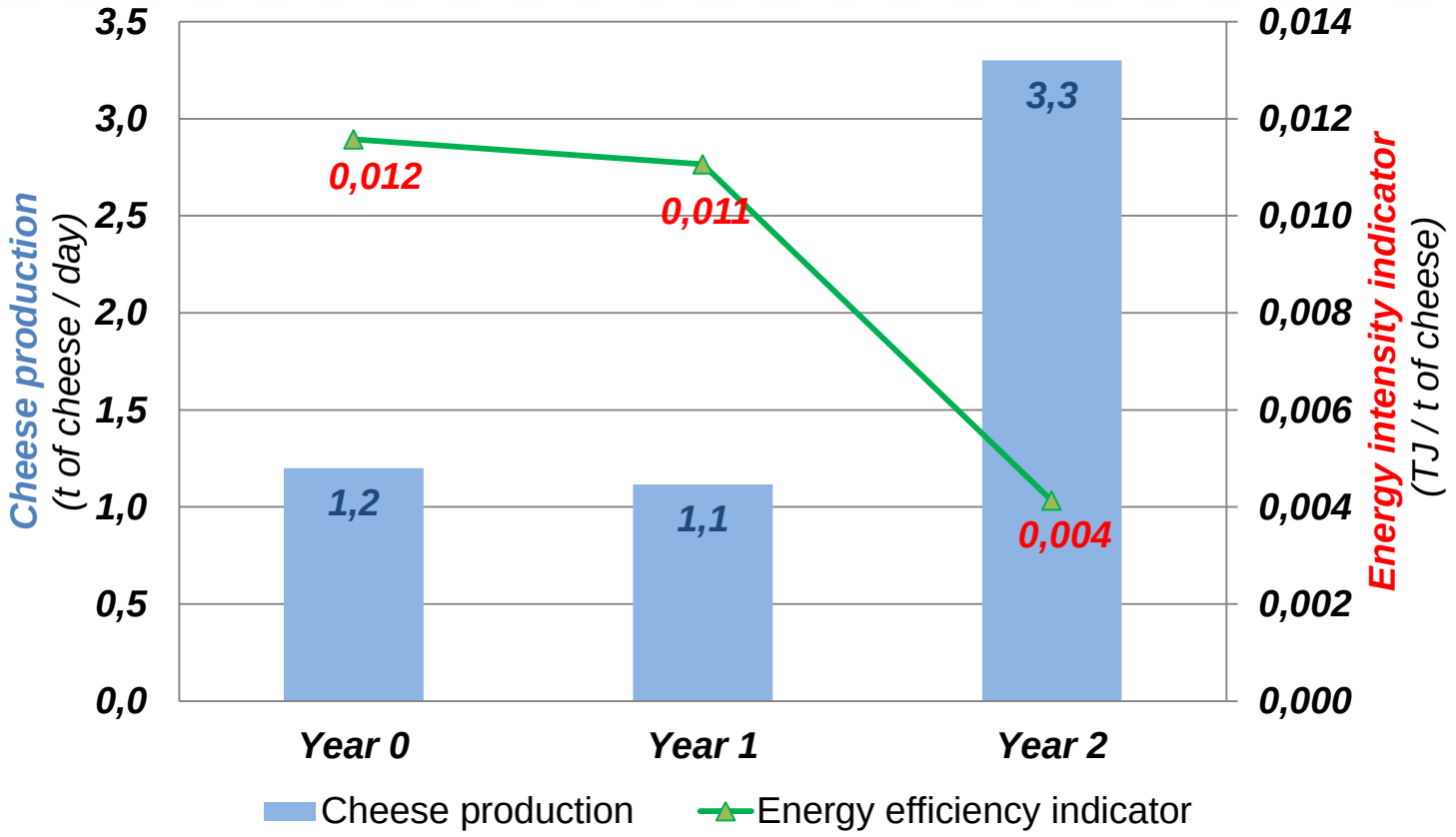
Source: Heller, MC; Keoleian, GA. 2000. Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System. Michigan, US, The Center for Sustainable Systems. December 6. 59 p.

Brazil. Agricultural sector: Consumption avoided as a process or result of the reduction of final energy consumption (by TJ and as percentage of reduction).



Source: Energy Resource Company, Brazil.

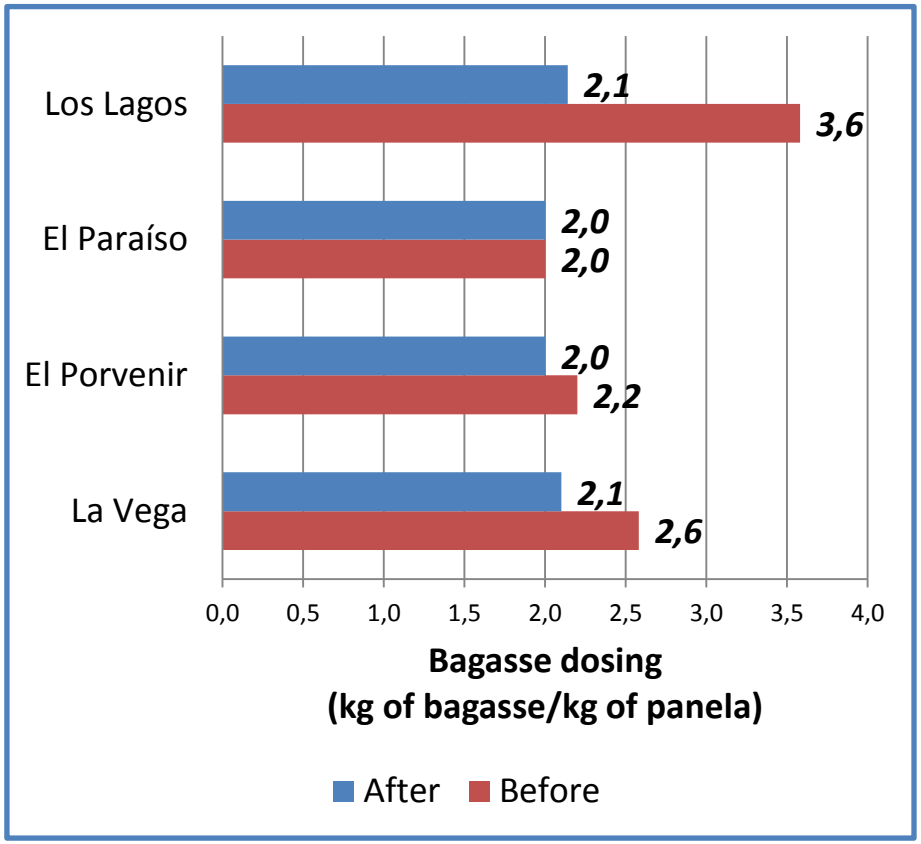
Argentina: results of implementing energy efficiency (EE) measures in a dairy industry.



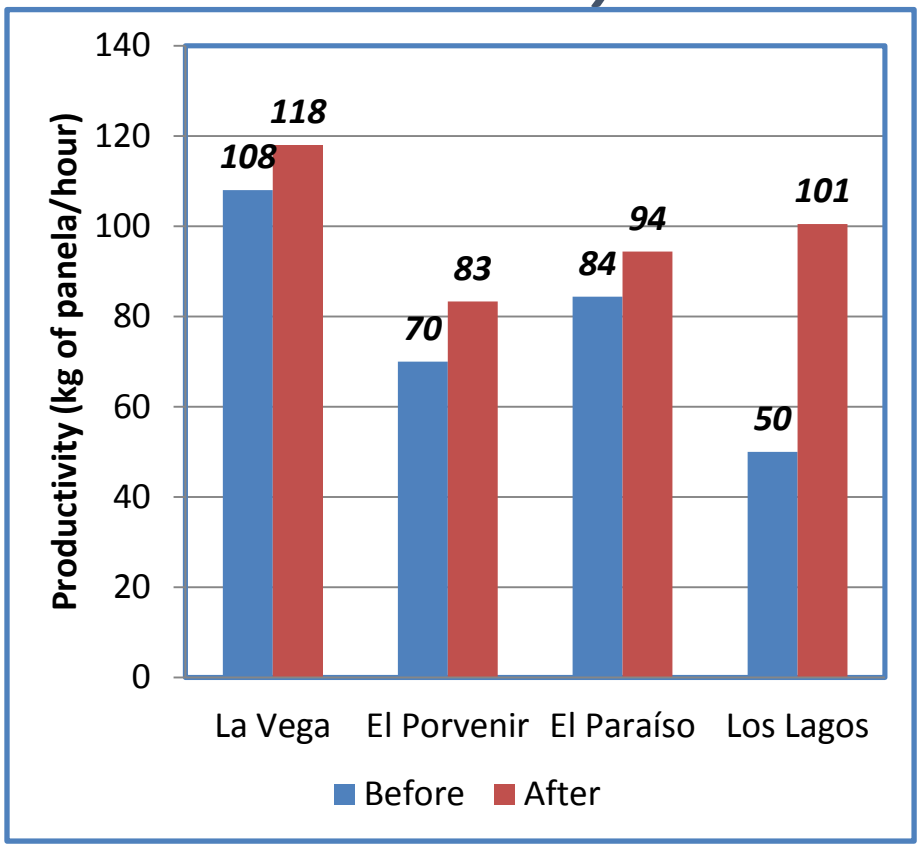
Source: Study of relationships between energy efficiency and economic development. Prepared by the Program on Energy Studies and Research for the German Technical Cooperation Agency (GTZ). Santiago, Chile, July, 2005.

Colombia: Improvements in energy efficiency in the panela production process (by farm)

Dosage



Productivity



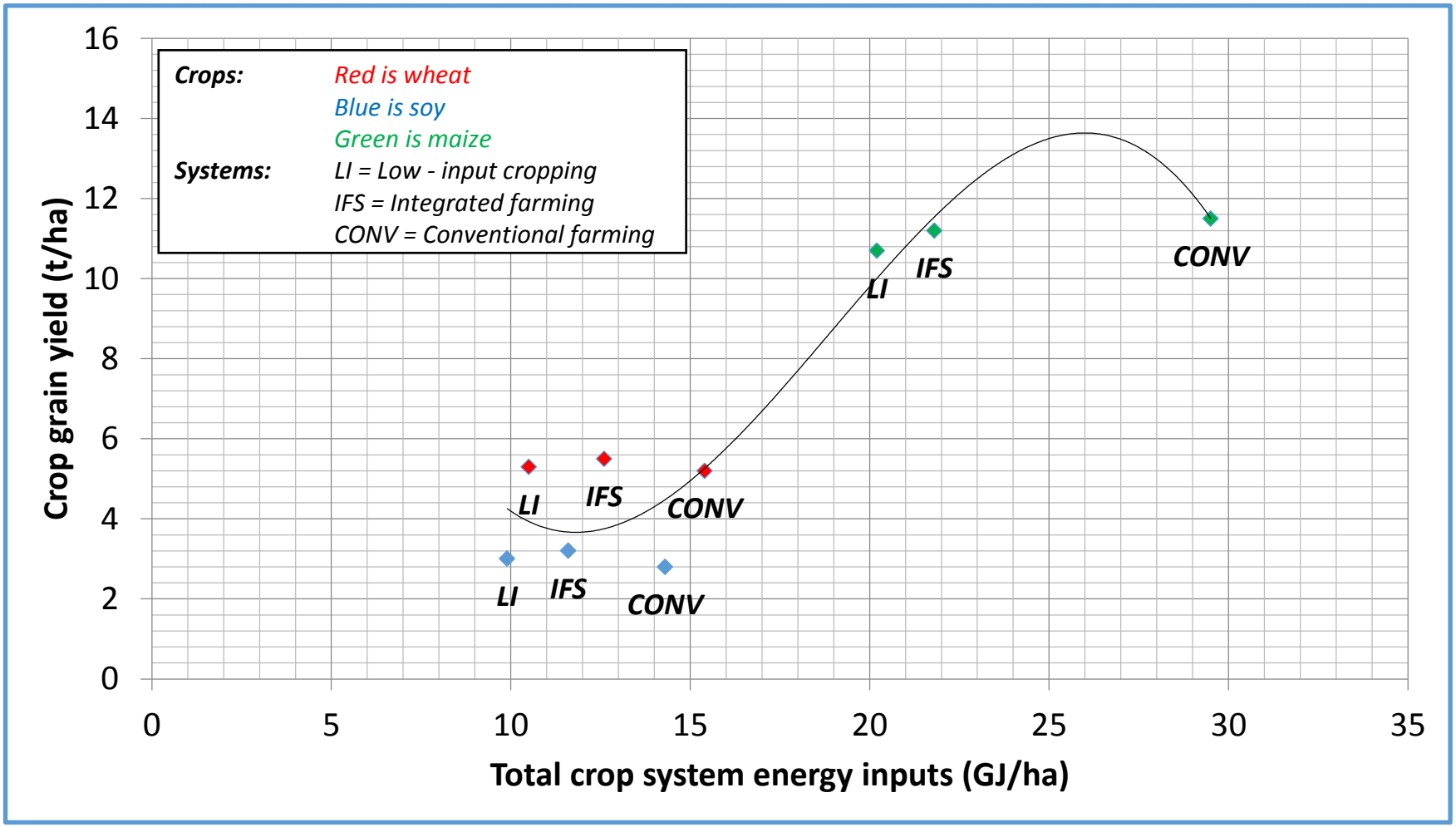
Source: FEDEPANELA – EEP with the Andean Region, implemented by the IICA with financial support from the Finnish Ministry of Foreign Affairs. 2014.

Energy inputs for cassava production in developing countries

Inputs	Amount	Units	MJ
Labor	1,632	hours/ha	22,621
Draught animal	200	hours/ha	2,079
Machinery	5	kg/ha	391
Nitrogen	46	kg/ha	3,591
Phosphorus	33	kg/ha	567
Potassium	43	kg/ha	588
Dung	3,400	kg/ha	23,684
Cuttings	6,000	units/ha	1,126
		Total (inputs)	54,647
Production	12,360	kg/ha	196,510
		Input/production ratio	3.60

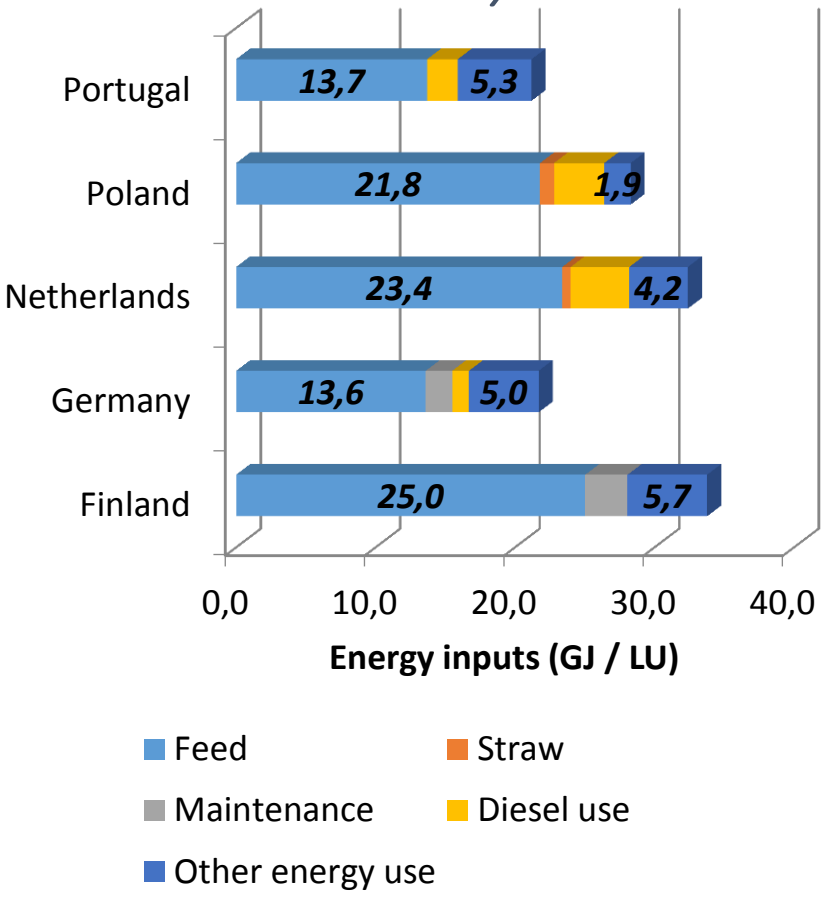
Source: Pimentel, D. *et al.* 2008. Energy inputs in crop production in developing and developed countries. *In* Food, Energy, and Society, ed. Pimentel M, Pimentel D, p. 137-59. New York, US, CRC Press. 3 ed.

Production (t/ha) and energy inputs (GJ/ha) of different crops and farming systems

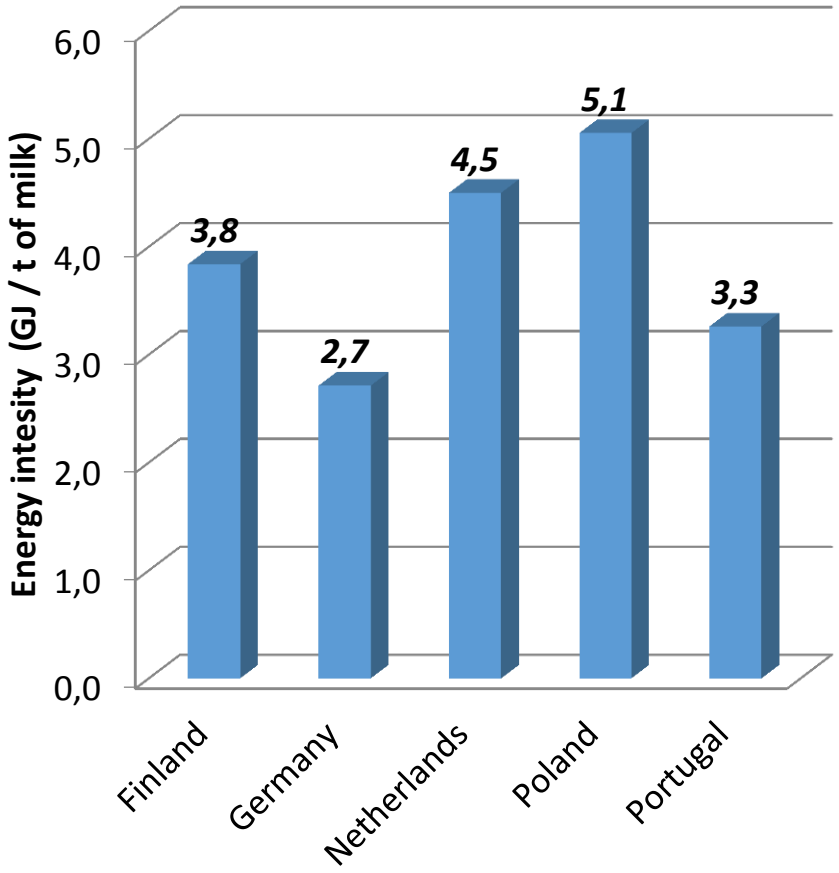


Source: Based on Alluvione, F; Moretti, B; Sacco, D; Grignani, C. 2011. EUE (energy use efficiency) of cropping systems for a sustainable agriculture. Energy 36(7):4468-4481. July 2011.

EU. The structure of energy inputs (GJ/LU) in cow milk production per country



EU. Energy efficiency indicator in cow milk per country (GJ / t of milk)



Source: Gołaszewski, J. et al. 2012. State of the Art on Energy Efficiency in Agriculture. "Country data on energy consumption in different agroproduction sectors in the European countries". Agriculture and Energy Efficiency (agrEE). Project of the European Union's Research and Innovation funding of the Seventh Framework Program.

Conclusions

1. *The current food production system is highly energy-intensive and very dependent on fossil fuels.*
2. *Energy efficiency in food production and consumption starts with the land use system and the energy system.*
3. *Energy intensity in foods can be reduced significantly if better techniques are incorporated into the agricultural and livestock production phase.*

Thanks so much for your attention

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