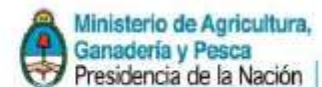




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Implementing GBEP Indicators in Argentina: Summary of results and lessons

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A. Introduction

- Study conducted by a multi-disciplinary team of consultants and researchers (6 economists – 2 engineers) from Centro de IDEAS (University of San Martin, UNSAM, Argentina)
- The consultancy team worked in cooperation with and under supervision of the Agroenergy Directorate, Ministry of Agriculture (Miguel Almada and Agustina Branzini)
- The team had previous experience with biofuel sustainability analysis
- The implementation project took 18 months including publication editing and printing



B1. Focus

- Focus : Two biofuel production chains in Argentina
 1. Biodiesel (soybean oil)
 2. Ethanol (sugar cane)
- These were the only biofuels produced at commercial scale in Argentina at the time the study was initiated
- Objective: quantitative or qualitative evaluation of GBEP indicators (and of their relevance) in the case of Argentinean biofuels
- Recommendations were made in two regards:
 1. Whether to regularly measure the indicators (local relevance)
 2. How to improve methodologies/definitions of GBEP indicators



B2. Data and information sources

- Priority given to :
 - Use of local data – preferably at regional level
 - Use of regular statistics data (e.g. from Agriculture Ministry or local Industry Associations)
- Previous (local) studies were considered (as benchmarks)
- Whenever regular statistics or other data sources were unavailable, specific (point) estimates by the study team were reported
- If point estimates were impossible due to lack of data, results or general information from available studies were cited to reach (at least) a qualitative approach



Sources of information: a few examples

- Regular Agricultural and industrial statistics (on oil-sugar-biofuel sectors) : SIIA – INTA- AABH-CADER-CARBIO-CIARA-Cámara Alcoholes, sector publications (Márgenes Agropecuarios)
- Regular Energy Statistics (Energy Secretariat)
- Data on soil quality /land use: INTA-specific publications
- Sugar cane sector data: INTA/EEAOC/Ministry of Economics
- International sources : FAO – WINROCK-AMIS OUTLOOK



C. Methodology

- GBEP methodologies-recommendations were prioritized
- In some cases, methodologies required adaptation (lack of data – to adequately reflect specific local conditions)
- Selected methodologies and their suitability in the Argentine case were validated with local experts
- Preliminary results (estimates) presented and discussed with local experts at a specific workshop (Sept.2014).
- Results were revised and completed (with improved information sources and approaches) . Final results /report presented in October 2015

D. List of Tested Indicators



Indicador	BIODIESEL	ETHANOL	Type
1. GHG EMISSIONS	Dark Green	Light Green	E N V I R O N M E N T A L
2. SOIL QUALITY	Light Green	Yellow	
3. WOOD RESOURCES USE	Grey	Grey	
4. AIR EMISSIONS (NON GHG)	Orange	Yellow	
5. WATER USE AND EFFICIENCY	Yellow	Yellow	
6. WATER QUALITY	Orange	Orange	
7. BIODIVERSITY	Light Green	Light Green	
8. LAND USE CHANGE (DIRECT)	Light Green	Light Green	
9. LAND ALLOCATION –TENURE	Light Green	Light Green	S O C I A L
10. EFFECTS ON FOOD AVAILABILITY AND PRICE	Light Green	Light Green	
11. INCOME	Light Green	Yellow	
12. EMPLOYMENT	Light Green	Yellow	
13. CHANGE IN TIME USED FOR BIOMASS COLLECTION	Grey	Grey	
14. BIOENERGY TO EXPAND ACCESS TO MODERN ENERGY SERVICES	Grey	Grey	
15. CHANGES IN ILLNESS DUE TO INDOOR POLLUTION	Grey	Grey	
16. OCCUPATIONAL HEALTH	Yellow	Yellow	

- Non relevant indicator – in the case of Argentina
- Unable to evaluate due to lack of data
- Highly relevant and related topics were identified
- Partial or qualitative approach to evaluation
- Evaluated following GBEP methodologies

Indicador	BIODIESEL	ETHANOL	TYPE
17. PRODUCTIVITY	Dark Green	Dark Green	E C O N O M I C
18. NET ENERGY BALANCE	Dark Green	Light Green	
19. VALUE ADDED	Dark Green	Dark Green	
20. CHANGE IN FOSSIL FUEL CONSUMPTION	Dark Green	Dark Green	
21. EDUCATIONAL EFFECTS ON WORKFORCE	Yellow	Yellow	
22. ENERGY (SUPPLY) DIVERSITY	Dark Green	Light Green	
23. INFRASTRUCTURE AND LOGISTICS	Yellow	Yellow	
24. CAPACITY AND FLEXIBILITY FOR BIOENERGY USE	Yellow	Yellow	



E. Some examples of GBEP indicators tested in Argentina




17. PRODUCTIVITY

- 1) Agricultural yields
 - 2) Industrial efficiency
 - 3) Biofuel quantity per ha (per year)
 - 4) Production costs
- 1-3 WERE ESTIMATED IN ARGENTINA
 - 4 NOT CONSIDERED DUE TO LACK OF DATA


INDICATOR 17.

ESTIMATES FOR BIODIESEL

- 
- 1) Agricultural yields: 2.1-2.8 (ton per ha) (considering quantities of soy used for oil production and quantities of oil used for biodiesel production);
 - 2) Productivity: 180-184 kg biodiesel per ton of soy oil; 95-97%
 - 3) Productivity in soy processing : 0.41-0.55 tons of oil per ha
- Agricultural production/area/yields and oil production data taken from regular statistics (Min. Agriculture – INDEC-Argentinean Edible Oil Industry Association –CIARA-).
 - Team had to rely on own estimates of share of oil used for biodiesel production (no regular statistics).

INDICATOR 17.

ESTIMATES FOR BIOETHANOL

- 
- 1) Agricultural yield: 60-90 ton sugarcane per ha
 - 2) Industrial productivity or yield: 75-85 litres of ethanol per ton of sugar cane

Most data available from regular statistics:

- Sugar cane and ethanol production (INDEC).
- Agricultural area with sugar cane (Sugar Industry Association of Argentina –CAA-).
- Sugar cane production and yields (FAO, no regular statistics are available locally).
- Team had to rely on own estimates of sugar cane quantities used to produce ethanol (no regular statistics on sugarcane production and use for different by products).



INDICATOR 17.

LESSONS AND RECOMMENDATIONS

- Biodiesel productivity is relatively stable and not expected to change in the incoming years. However , regular follow up of the indicator is recommended.
- Ethanol productivity estimates are interesting but need to be checked in subsequent years.
- Regular statistics should also cover for the allocation of raw materials (eg. sugar cane) for different byproducts of the production chain (e.g. sugar; alcohol) .
- Cooperation among industry associations and Ministry of Agriculture in order to measure the cost indicator (17.4) would be valuable .



20. Change in Fossil Fuel Consumption

1) Fossil fuel substitution, in m^3 (and savings in fossil fuel imports, %)

2) Substitution of traditional biomass

Only (1) was estimated as traditional biomass use is very low (and not substituted by liquid biofuels)

Data sources: Regular statistics (Energy Secretariat) on fossil fuel markets and international trade. Regular data from Biofuel Industry Association (AABH) on production and exports of biofuels.



INDICATOR 20.

METHODOLOGY

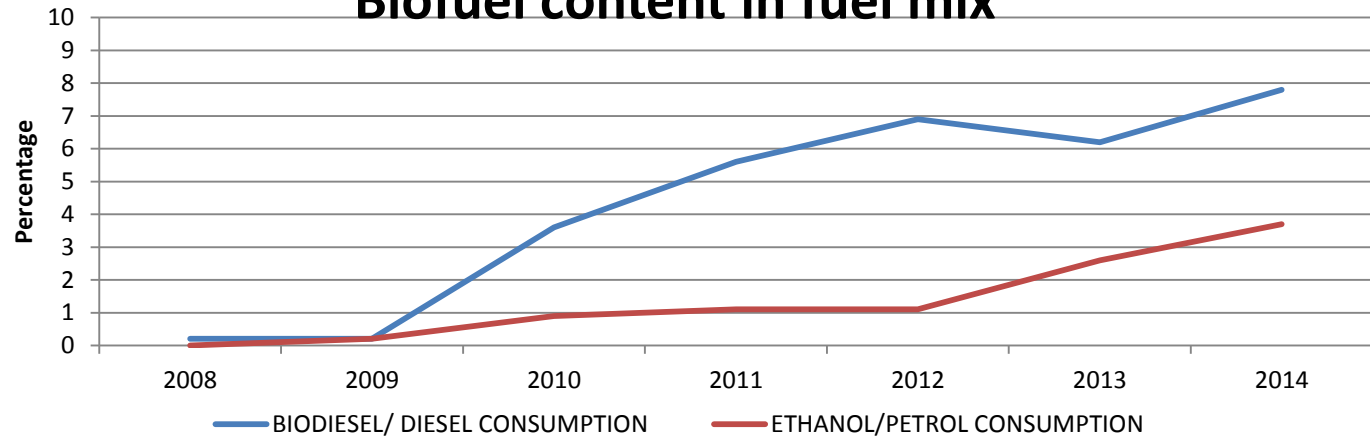
- Quantity of biofuels substituting for fossil fuels (%)
- Ethanol consumption as % of petrol consumption
- Biodiesel consumption as % of diesel consumption
- The quantity of fossil fuel imports avoided with the use of biofuels was estimated



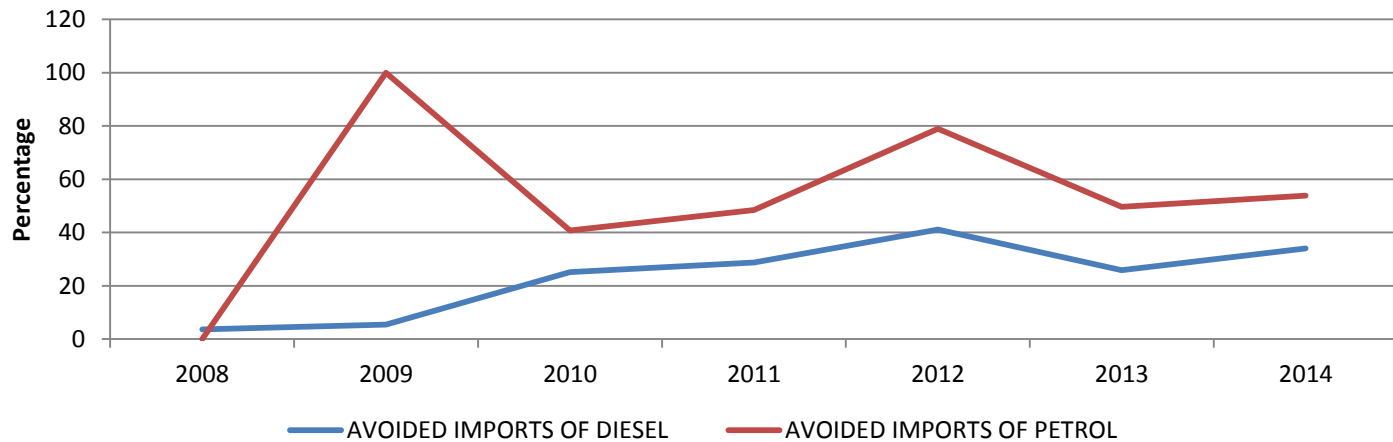
INDICATOR 20.

RESULTS

Biofuel content in fuel mix



Fossil Fuel Import Substitution





INDICATOR 20.

RESULTS

- The share of biofuels in the domestic market fuel mix exhibits continuous growth.
- The share of biodiesel in domestic market sales of diesel reached 7.8% in 2014, leading to a 34% reduction in diesel imports.
- In the case of ethanol, its share in domestic market of petrol was estimated at 3.7% for 2014. The reduction in petrol imports reached 53.8% in that year.

Lessons and recommendations

- Regular statistics and data availability allow for regular evaluation of this highly relevant indicator. Annual follow-up is highly recommended. Public-private cooperation may be needed to maintain availability of consistent statistics over time.



F. General lessons

- Indicators with positive impact of biofuels on the sustainability of the whole production chain (in Argentina) :
 1. employment/income
 2. value added
 3. (lower) GHG emissions
 4. Energy balance (+)
 5. Energy diversity – fossil fuel substitution (import reduction – energy security)
- Indicators with neutral impact on sustainability:
 1. Food availability and price
 2. Productivity
 3. Soil quality



General lessons (2)

- Traditional biomass- related indicators not relevant in the Arg. case
 - GBEP indicators helped highlight some issues related with agroindustrial development in general (regardless of the energy or food use of raw materials) that need further consideration/analysis at local level :
 1. Conversion of natural ecosystems (biodiversity loss) due to agricultural/cattle breeding expansion
 2. Water pollution – health problems due to pesticide use
 3. Land tenure conflicts in areas where land use has changed
 4. Water pollution (fish mortality) due to uncontrolled disposal of liquid effluents from ethanol production
- Note: Only point 4 above relates only/directly to the biofuel production stage (the rest mostly relate to agricultural raw material production)
- Other indicators not evaluated due to lack of “benchmark” (lack of previous studies): occupational safety– water use/efficiency – infrastructure – flexibility for bioenergy use



G. Recommendations

For indicators follow-up in Argentina

1. Need to generate regular statistics on the biofuel sector (especially in the case of ethanol) :
production/trade/employment/accidents/infrastructure
2. Need to guarantee data provision and statistics continuity over time for sugarcane production, ethanol production , soy oil production and biodiesel production (and allocation of raw materials to different by products).
3. Need to strengthen local follow -up of sustainability indicators and methodologies



Recommendations (2)

For future revisions of GBEP indicators

1. GBEP indicators very useful for a global sustainability assessment
2. Some basic “hypotheses” underlying the definition of some of the indicators do not apply in this case (e.g. biofuels are seen as a main driver of LUC and modern technology adoption: that is not necessarily the case as the Argentine case shows)
3. Need to include technology related indicators (especially if sustainability indicators will be measured every 5 -10 years, the need to identify production technology changes may arise in order to explain change/trends in sustainability results.
4. Results are highly sensitive to methodologies (e.g. GHG balance). Need to explicitly consider this sensitivity in methodology recommendations/guides.