

The header features a collage of images: a sunflower, a field of crops, a blue sky with clouds, and a golden energy grid. An orange horizontal bar is positioned above the main text area.

Evaluating Agricultural Residues as an Energy Source

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Outline

- Introduction
- Facts
- Lignin extraction
- Results
- Conclusions

Relevant Figures

Employment growth by sector in Latin America and Caribbean
(percents), 1990 -1997

Sector	Employment Growth	Total Contribution
Agriculture	-0.9	-11.1
Manufacturing Industry	1.2	9
Building	2.8	8.4
Trade, Hotels and Restaurants	3.5	30.9
Electricity, gas, water and transport		
Storage and Communications	4.9	12
Financial Services, Insurances and bussiness services.	6.8	14
Social and Community services	2.8	40.3
Others	-3.2	-3.5
Total	2	100

Source: Stallings, B., Peres W. (2000). "Growth, Employment, and Equity: The impact of the economic Reforms in Latin America and caribbean". Taken from Moorley (2000).

Natural Resources

 Deterioration of natural resources.

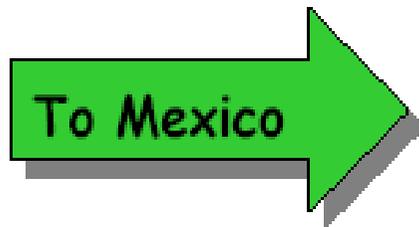


- ⇒ Between 130 and 170 million hectares in erosion conditions.
- ⇒ 470 thousand hectares with salty land
- ⇒ 40 million hectares of lost forest in 50 years.
- ⇒ Waste in water management: about 70% to 76% are lost in the distribution process.

➤ Scarce equipment of physical and services infrastructure.

Rural Human Resources

➤ Low education.



- ⇒ High number of functional illiteracy.
- ⇒ 3 years in elementary against 7.1 in the urban sector
- ⇒ 9 of each 10 producers does not have access to technological support.

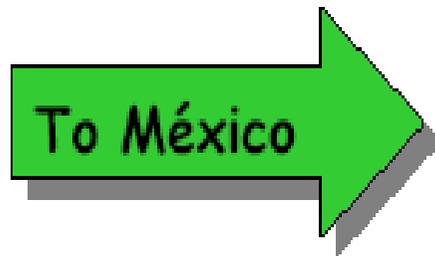
➤ Low Nutritional Quality.

➤ High Morbidity.

<http://www.sagarpa.gob.mx/sdr/publics/ponenc.htm>

Rural Social Situation

- **Scarce development of the social capital.**



- ✓ 8 of each 10 producers are not organized for work.
- ✓ 80% of families with at least one member living outside the community.

- **Weakness of the rural social actor.**

<http://www.sagarpa.gob.mx/sdr/publics/ponenc.htm>



Gross Domestic Product (GDP)

Year 2002

Total GDP **1,481,781,250** thousands pesos

Agriculture and livestock, forestry and
fisheries **83,311,990** thousands pesos

% share of total GDP 5.7

Source: INEGI

	Apparent Consumption 2001	National Production 2001	Difference
Rice	631	379.4	-251.6
Beans	1 195	877.6	-317.4
Corn	26 244	17 917.4	-8 326.6
Wheat	6 154	3 262.2	-2891.8
Sesame	47	41.3	-5.7
Safflower	110	121.6	11.6
Soja	4 601	103.2	-4 497.8

(Thousands of metric tons)

Source: INEGI



Facts

- Shortage on food supply
- The rural and agricultural development policies do not have capacity to balance the unfavorable macroeconomic context
- It is necessary to find alternative activities or processes to re-activate the agricultural sector
- Energy crops has been suggested as an alternative
- Bio fuels are being studied



Sustainable Development

- Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs..."

Brundtland, *Our Common Future*, 1987



Agricultural Residues

- Cattle feed
- Enrichment nutrient process
- Fine chemical production through bioprocesses
- Environmental impact of being left unattended



Research interest

- Evaluating energy content in cane bagasse and maize stover
- Lignin content
- Integrate potential energy production to existing processes (sugar cane and pulp and paper)



Lignin extraction

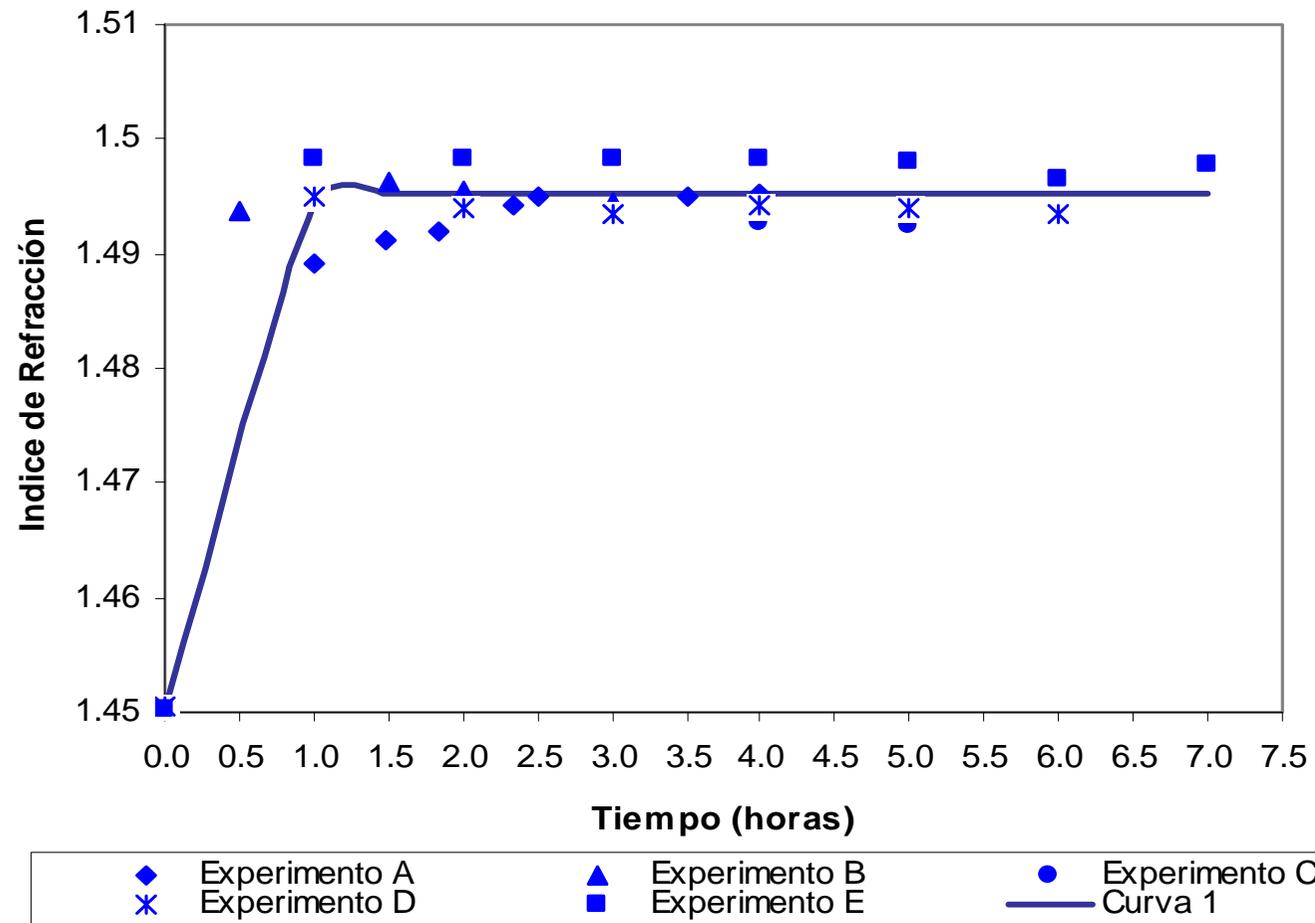
- Extraction time
- Particle size
- Solvent ratio



Methodology

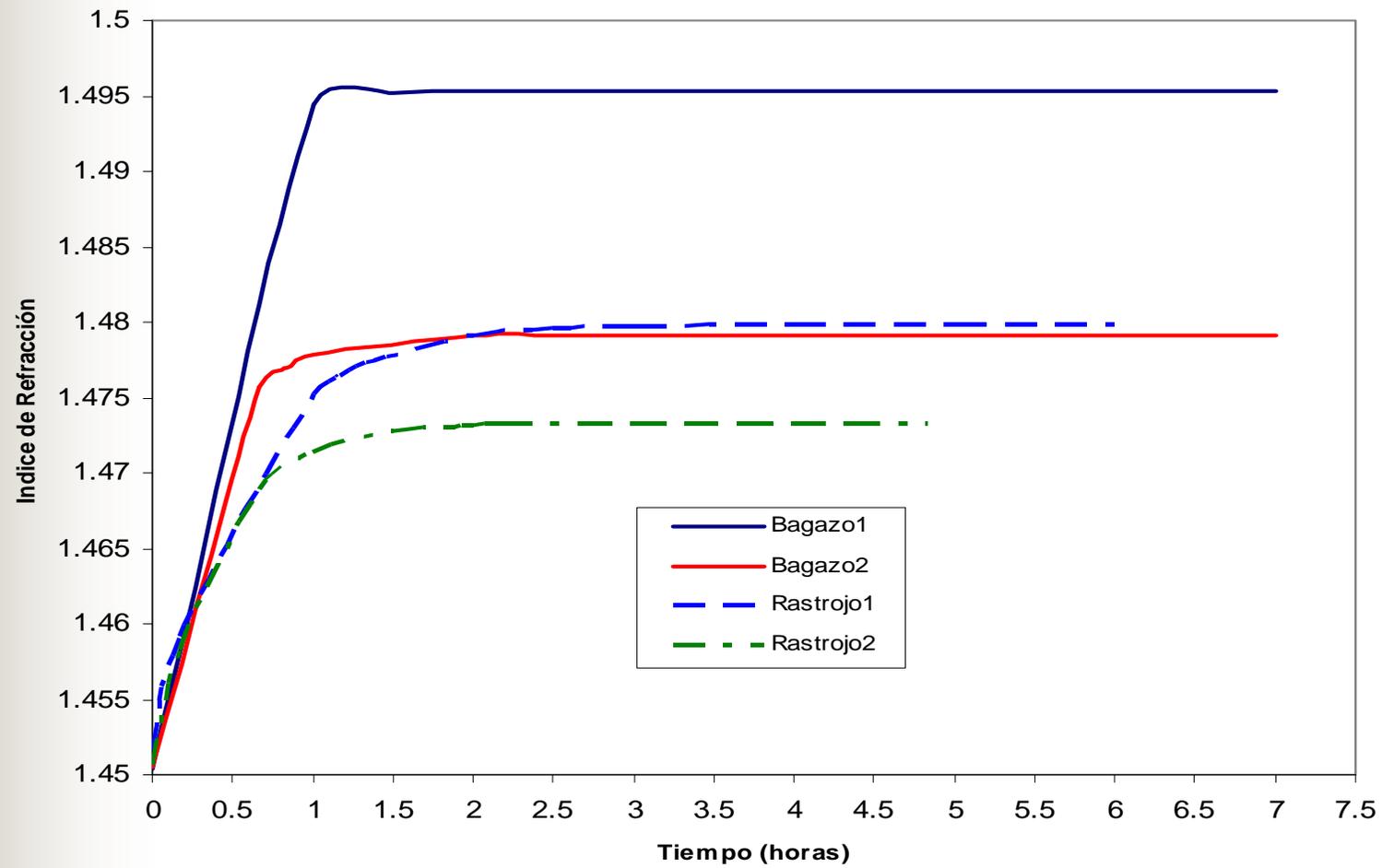
- Soxhlet extraction
- Reflection index
- Particle size 0.42-0.84mm and 1.0-3.36mm
- Toluene-Ethanol ratio 1:1 and 1:2
- Lignin precipitation

Results



Results

Comportamiento General para la Extracción de Compuestos Solubles

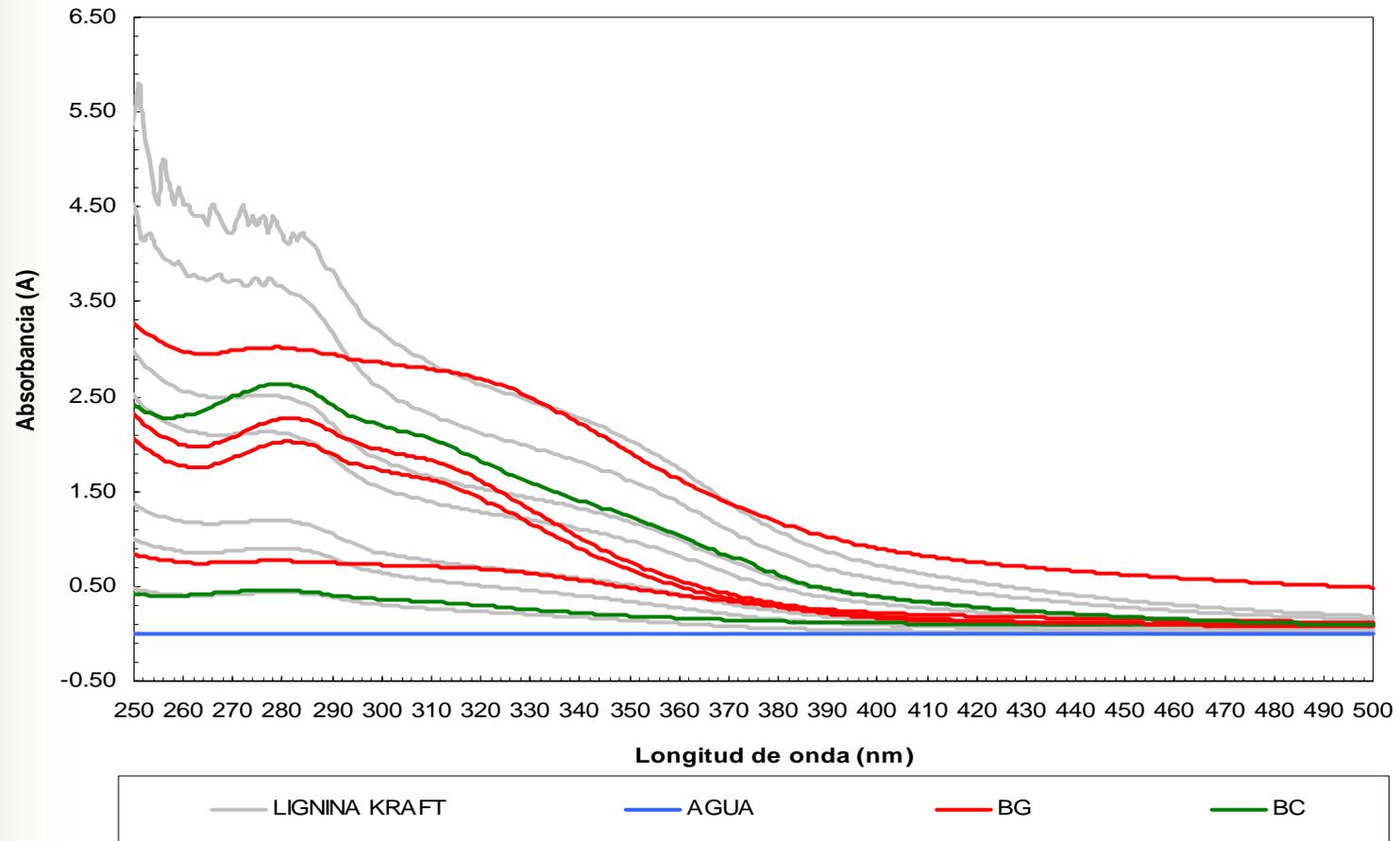


Results

Material	Particle size (mm)	Feed (g)	Reflection Index	Time (h)
Cane bagasse	0.42 – 0.841	20	1.498	2
Maize Stover	0.42 – 0.841	20	1.480	2
Cane bagasse	1.0 – 3.36	20	1.480	3.5
Maize Stover	1.0 – 3.36	20	1.474	3.5

Results

LIGNINA KRAFT COMERCIAL Y LIGNINA EXPERIMENTAL PARA ELBAGAZO DE CAÑA





Conclusions

- Maximum extraction time 2.5 hours
- Best solvent ratio Toluene-Ethanol 2:1
- Further testing in order to determine difussional effects