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DIBANET

# Latin American Feedstocks



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# DIBANET PROCESS



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Ideally of low value, abundant and composed mainly of lignocellulose.

Selection and preparation of potential biomass, followed by acid hydrolysis process.

Analyses of sugars content, and development rapid analytical methods.

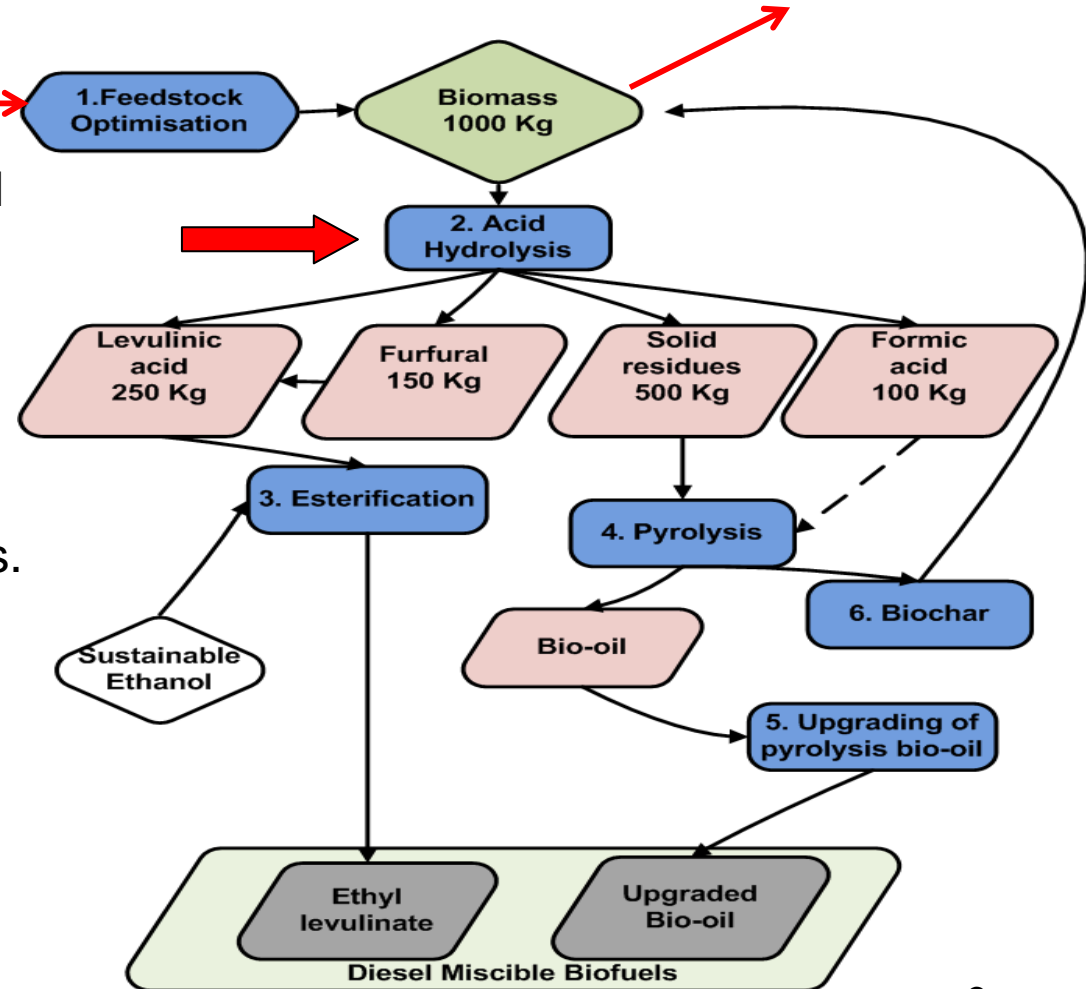
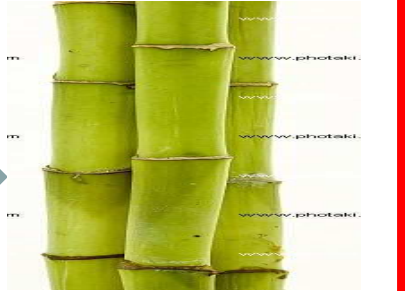


Figure 1.2: Representation of DIBANET processes and products and their linkages



# Biomass waste used





# Feedstocks



## Rice husks

- In terms of total production, rice is the third most important grain in the world, about **650 millions of tons**. It is estimated that, from rice produced, 20% corresponds to the husks (**130 millions of tons**);
- Brazil is **the ninth greatest** country that produces rice, and the **greatest** producer from the West, with **11.50 millions of tons**.

**2.3 Mt/year wastes Brazil**

## Disposal of rice husks

- Husks have low commercial value, because of the presence of  $\text{SiO}_2$  and fibers, and therefore are not used neither as human nor animal food.





## Rice husks



**Table 1.** Chemical composition of rice husk.

Properties	Elements/ substances	Values (%)
Carbohydrates	<b>Hemicellulose</b>	<b>24.3</b>
	<b>Cellulose</b>	<b>31.3</b>
	<b>Lignin</b>	<b>14.3</b>
	<b>Ash</b>	<b>21.7</b>
	<b>Extractives</b>	<b>8.4</b>

ZANZI, R. Pyrolysis of Biomass, Royal Institute of Technology. Dissertation, Stockholm, 2001.





## Eucalyptus Sawdust

- Brazil is the **largest** producer of eucalyptus in the world, that results in **30 millions tons** per year of wood residuals;
- From this quantity of residuals



**0.62 Mt/year wastes Brazil**

## Waste Disposal

- It is urgent to find solutions to the fate of 0.62 millions tons of sawdust stored in open;
- Cause pollution in areas that could be harnessed for agriculture or other economic activity.





## Eucalyptus Sawdust



**Table 2.** Chemical composition of sawdust.

Properties	Elements/ substances	Values (%)
Carbohydrates	Hemicellulose	15.4
	Cellulose	51.7
	Lignin	27.2
	Ash	0.2
	Extractives	10.4

Couto, G. Utilização da serragem de Eucalyptus sp. Dissertation, Minas Gerais, Brazil, 2009.





## Soy Peel

- The largest producers of soybeans in the world are The United States (32%), Brazil (28%), Argentina (21%);
- Brazil is the **second greatest** producer in the world, with **69 millions tons**;
- The soy peel represents the main sub product of the processing industries and composes about 8% of the whole grain;
- The processing of this amount of soy generates;



**5.52 Mt/year wastes Brazil**

## Waste Disposal

- The sub-utilization as animal food does not eliminate all the amount that is produced, then it becomes an environmental problem.





## Soy Peel



**Table 3.** Chemical composition of soy peel.


Properties	Elements/substances	Values (%)
Carbohydrates	<b>Hemicellulose</b>	25.5
	<b>Cellulose</b>	39.7
	<b>Lignin</b>	9.1
	<b>Ash</b>	0.6
	<b>Extractives</b>	13.9

CASSALES, A. Otimização da hidrólise da casca de soja. Dissertation, Porto Alegre, Brazil, 2010.





## Bamboo

- In the world, there are about 1.300 species of bamboo, that are in the most part, adapted to the tropical condition of Brazil;
- Brazil is one of the countries with the most varieties of bamboo in Latin America (more than 200 species);
- The country has one of the largest reserves of native bamboo, with an extension of **180,000 Km<sup>2</sup>, its production is about**  **40 t/year.**
- The bamboo used to make various objects such as furniture and even in construction.



## Bamboo

**Table 4.** Chemical composition of bamboo.

Properties	Elements/substances	Values (%)
Carbohydrates	Hemicellulose	18.8
	Cellulose	44.1
	Lignin	24.2
	Ash	5.3
	Extractives	7.6



## Açaí

- Typical fruit from Brazil;
- Its production reaches **475 tons per year** of fruit; from this total, simply discarded in the environment.



**394 t/year residue Brazil**

**Table 5.** Chemical composition of açaí seed.

Properties	Elements/ substances	Values (%)
Carbohydrates	<b>Hemicellulose</b>	<b>12.3</b>
	<b>Cellulose</b>	<b>34.4</b>
	<b>Lignin</b>	<b>7.7</b>
	<b>Ash</b>	<b>1.3</b>
	<b>Extractives</b>	<b>15.1</b>

REIS, B.O. et al. Produção de briquetes energéticos a partir de caroços de açaí.





## Açaí

- Typical fruit from Brazil;
- Its production reaches **475 tons per year** of fruit; from this total, simply discarded in the environment.



**394 t/year residue Brazil**

**From our knowledge, little or no research can be found in literature and so the seed are left across the streets and in landfills without any treatment.**



REIS, B.O. et al. Produção de briquetes energéticos a partir de caroços de açaí.





## Coconut



- The yearly world production is approximately **53.5 million tons**;
- Brazil is the fourth largest producer with a production that goes over **3 million** tons;
- The coconut shell are 80% of the weight of the fruit, with high moisture (about 85%). After four days of drying in the sun, moisture is reduced to 15%.

**2.4 Mt/year wastes Brazil**

**0.42 Mt/year wastes Brazil**

## Disposal of waste the coconut

- After their consumption, the coconut shell are thrown on rivers, vacant lots and landfills;
- The coconut shell represent 80% of the waste in Brazilian beaches.





## Coconut



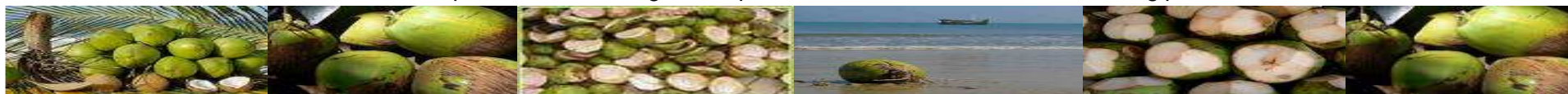
**Table 6.** Chemical composition of coconut.

Properties	Elements/ substances	Values (%)
Carbohydrates	Hemicellulose	16.0
	Cellulose	43.0
	Lignin	31.0
	Ash	6.4
	Extractives	4.0

PASSOS, P. R. A. Destinação sustentável de cascas de coco verde: obtenção de telhas e chapas. Thesis, Rio de Janeiro, Brazil, 2005.

SILVEIRA, M. S. Aproveitamento das cascas de coco verde para produção de briquete . Dissertation, Salvador, Brazil, 2008.

SILVA, M. G.S. Desenvolvimento de compósitos à base de gesso e pó de fibras de coco. Dissertation, Sergipe, Brazil, 2010.





## Banana stem



- Global production of banana is about 64.6 million tons/year;
- Brazil is the third producer with **6.3 million tons/year**;
- After banana harvesting, the main wastes generated are the leaves and the stems;
- The banana stems do not have utilization, contributing to the generation of serious environmental problems.

**0.59 Mt/year wastes Brazil**

**Table 7.** Chemical composition of banana stem.

Properties	Elements/ substances	Values (%)
Carbohydrates	Hemicellulose	12.5
	Cellulose	32.0
	Lignin	8.8
	Extractives	46.7



## Grass

- Cheap and abundant material;
- It is a specie that has fast growth and a high potential as alternative energy source;
- Its production is about. **40 t/year wastes Brazil**



**Table 8.** Chemical composition of grass leaf.

Properties	Elements/ substances	Values (%)
Carbohydrates	Hemicellulose	30.7
	Cellulose	30.2
	Lignin	8.6
	Ash	3.2

**Table 9.** Chemical composition of grass stalk.

Properties	Elements/ substances	Values (%)
Carbohydrates	Hemicellulose	31.6
	Cellulose	40.7
	Lignin	10.9
	Ash	1.6

VILELA, H. Capim elefante paraíso na bionergia.

SANTOS, E. A. et al. Composição Química do Capim-Elefante Cortado em Diferentes Alturas. *Revista brasileira de zootecnia*. 2001.





**Table 10.** Chemical composition of different biomass.

<b>Feedstocks (%)</b>	<b>Cellulose</b>	<b>Hemicellulose</b>	<b>Lignina</b>	<b>Extractives</b>
Rice husks	31.3	24.3	14.3	8.4
Eucalyptus Sawdust	51.7	15.4	27.2	13.4
Soy Peel	39.7	25.5	9.1	13.9
Bamboo	44.1	18.8	24.2	7.6
Açaí	34.4	12.3	7.7	15.1
Coccus	43.0	16.0	31.0	4.0
Banana stem	32.0	12.5	8.8	46.7
Grass	30.2 <sup>a</sup>	30.7 <sup>a</sup>	8.6 <sup>a</sup>	-
	40.7 <sup>b</sup>	31.6 <sup>b</sup>	10.9 <sup>b</sup>	-

a- leaf; b-stalk.

**Ideally low value, abundant and composed mainly of lignocellulose. 19  
and generally discarded in the environment.**



**THANKS**