

# ELQUI GLOBAL ENERGY

## Cactus, an exceptional biofuel



The world knows that there is a point of breakthrough in which the nature already not can repair the damage caused by human activity, example of this are the Chinese towns contaminated with particles of thermoelectric coal, in the India the River Ganges saturated garbage or closer in the port cities in the Peru with household waste sent to the sea. Its high pollution product of irresponsible industrial activity and excessive growth of the population envisions a bleak future for its inhabitants compromising their health and development.

Anaerobic fermentation allows the obtaining of a gas with characteristics similar to the natural gas obtained from underground gas deposits. The main features of the biogas of Nopal (Cactus) are the absence of acid sulfhidric and the rapid generation of biogas with very short retention times.

The nopal is an extraordinary plant a survivor of wide geographical spread, finding varieties from Chile, Peru, passing through the Ecuador, Brazil (Recife) Mexico, Spain, china India, etc. It is perhaps forgotten biofuel. Its capacity of globalization is enormous, while poorer and desertified the greater area is its potential as a crop.

### **What is bioenergy?**

Bioenergy is renewable energy obtained from biological materials. In its strictest sense is a synonym for biofuels, fuels derived from biological sources. In its broadest sense it includes biomass, the biological material used as a biofuel, as well as the social, economic, scientific and technical situation related to the use of biological energy sources. There is a slight tendency for bio-energy in Europe, compared with biofuels in North America. (Wikipedia)

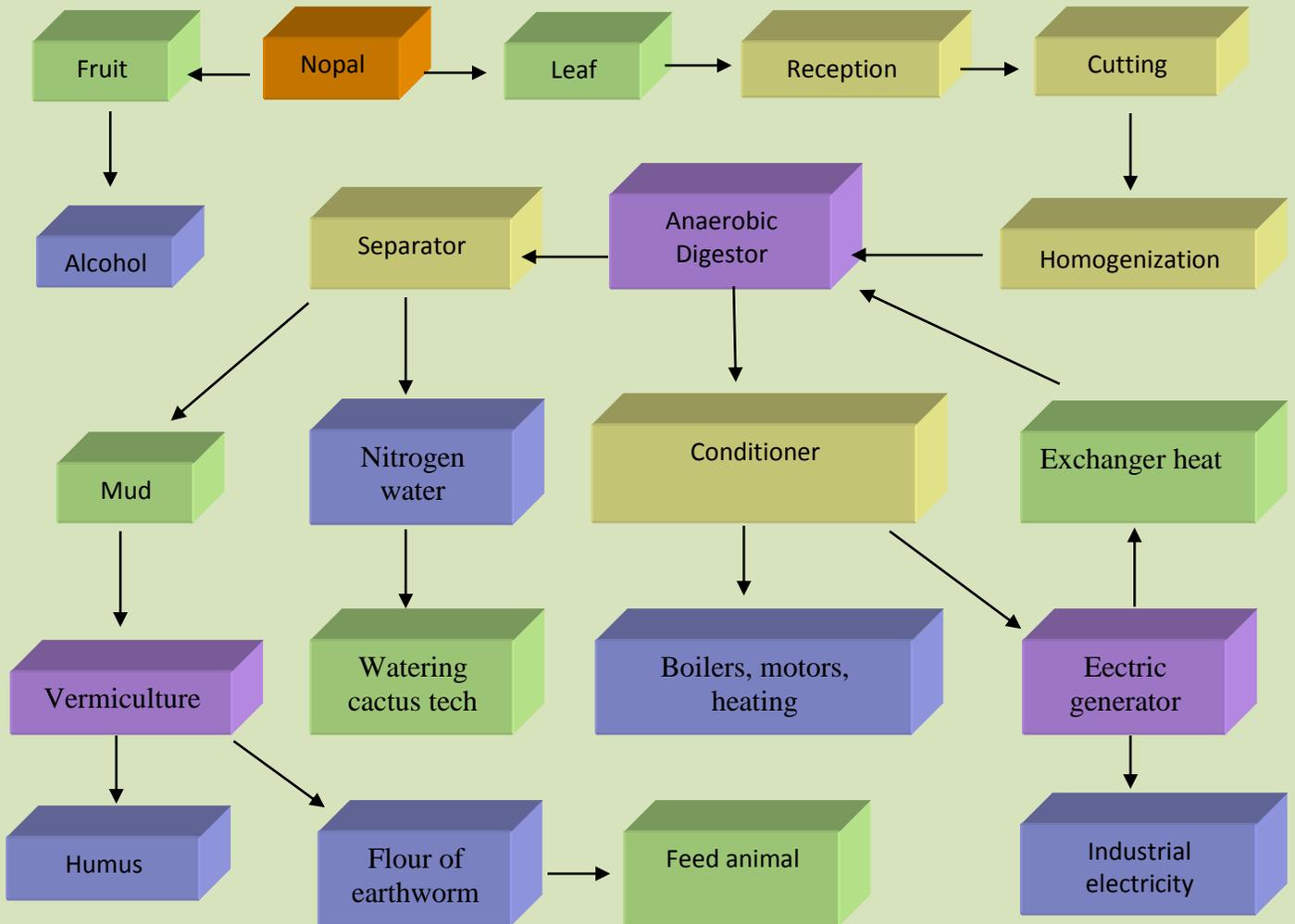
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What is the cycle of the process?

## OUTLINE GENERAL UTILIZATION OF NOPAL (CACTUS)



Source: Wayland 2010

### What are the advantages over fossil fuels?

Main, from the environmental point of view is the removal of carbon dioxide from the environment through the photosynthesis of plants, by which biogas by burning it only produces a fraction of the molecules of carbon dioxide that has set the plant. The biogas generated by the Cactus does not contain sulfide or particles therefore does not pollute the environment with these components.

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## The competitive with other non-conventional renewable energy?

Table 1.1 is detailed comparative aspects of wind, photovoltaic energy and the generation of biogas with nopales.

	<b>Biomass nopal</b>	<b>Wind energy</b>	<b>Photovoltaic energy</b>
<b>Availability</b>	Continuous 24 X 365 days	Irregular depending on the time of the day.	Irregular depending on the time of the day.
<b>Maintenance</b>	Under the conditions of operation, every two years painting. Shortage of personnel	Bass, very few staff in normal conditions	Bass, very few staff in normal conditions
<b>Fault maintenance</b>	Fast, low -cost. Average staff	Highly qualified with major failures, slow and costly repairs.	Highly qualified with major failures, slow and costly repairs.
<b>Type of generated energy</b>	Electric, biogas, thermal (hot water)	Electric	Electric
<b>Power generation efficiency</b>	80-90 %	30% of the installed capacity in land.	10-20% depending on the cost of cell
<b>Duration of equipment and installations</b>	15-20 years	20 years	10 years
<b>Environmental benefit</b>	It generates soil, organic fertilizers Change the microclimate to retain water the soil. Remove carbon dioxide from the atmosphere. It allows the sale of carbon credits Completely organic process	It does not emit carbon dioxide. Neutral effect on the environment.	It does not generate carbon dioxide.
<b>Environmental damage</b>	Unknown	High-impact on migratory routes of birds, noisy energy production because of the blades to the rotal.	Construction of cells and batteries is highly polluting
<b>Availability of spare parts</b>	Available in domestic market immediately.	They must be imported	They must be imported with the importer and distributor unit.
<b>Time of study and implementation of project</b>	Short, 1 year	Long, 8 years minimum to study winds	Short 1 year.
<b>Social benefit</b>	Generates permanent jobs for planting, harvest and process plants.	It generates jobs in the mounting of equipment.	It requires little maintenance and personnel. Applicable to small scale in marginal sectors.
<b>Positive externalities</b>	Culturally the cultivation of the nopal is accepted and promoted by institutions of the State. Allow the opening of new markets being considered	Known and implemented on a global basis technology	Attractive and widely known technology, widely positive image for their implementation.

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	to be a green company that cares for the environment.		
<b>Negative externalities</b>	Few built plants in the world, unknown in Mexico	The money comes from the country to the factories in Europe mainly. The money is not invested in human and technological resources	The batteries generate polluting toxic. The teams are fragile to impacts and damage. The money is not invested in local human and technological resources.
<b>Installation installed KWh cost</b>	US1200-1300 / KWH (does not include income for by-products and carbon credits)	US1.800-3.000/kWh	US4.000 - 6000/KWh
<b>Return on investment</b>	1 to 2 years	5-8 years	12-15 years

## What are wastes that are generated by the process?

The process of obtaining methane is generated organic sediment and water as by-products which are treated by Vermiculture for incorporation into the soil. Retrieved from the reactor nitrogen water is again incorporated in the plantations of Cactus as fertilizer re injected modernized irrigation system.

## Why use Cactus?.

The nopal has excellent molecular features allowing to deliver a large amount of biogas in a very short time, in comparative terms for a same volume of biogas the nopal degrades 5 - 10 times faster than animal manure This allows that one team is 5-10 times more productive. Moreover does not produce hydrogen sulfide which being burned in contact with the air turns oxides of sulphur and sulphuric acid to produce acid rain.

## What are the environmental, social and economic advantages of this biofuel?

Generates sustainable development poles, both economic, social and environmental, in addition the nopal is renewable which contracts to producers are based on service life of the project to 15 years which the producer cannot risk their capital and consumers are guaranteed production for a long period. The energy of the nopal is clean, inexhaustible, creates bonds of carbon, permanent jobs and solve the energy problem in a sustainable manner in the short, medium and long term.

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## Why is it that the reactors are low-cost?

Unlike more traditional processes for obtaining biogas from manure which usually takes two stages one acid and another methanogenic whose pH are quite more acidic, the nopal is processed to only pH slightly acid 6.5 - 6.8 and single stage since that time that the material is inside the reactor is very short. This makes inappropriate expensive stainless steel reactor, since it is only necessary to coat the interior with painting epoxy or other plastic type every two years for a good maintenance.

On the other hand, the implemented design lines are acquirable teams in the local industrial market and commonly used.



## What is the reason for using this technology?

The technology has existed for over 100 years it has been used in India, China, Germany and many other countries. It presents significant advantages in terms of cost, environmental and social benefits. It is also considered to be a very gentle solution from the point of view engineering works at low pressure and temperature, compared to methane extraction from grounds on the high seas.

## Why not been done before?

The history of mankind can be seen that fuels, as well as the means of transport and a number of inventions require not only knowledge but the technological capacity to exploit, for centuries was used wood, then coal which, together with the industrial revolution, boost the development of humanity.

The only oil in the past 150 years, has been the technical capacity of extract of terrestrial and submarine grounds at great depth.

In the case of the cactus, the biogas is used for more than 100 years in china and other Asian countries, but only in 1984 (Contreras and Toha, U Chile) is gender knowledge that this plant was capable of producing large amounts of energy under marginal growing conditions.

## What is the yield per hectare?

The nopal is an extraordinary plant, with a modernized irrigation, two or three annual crops, allows to provide continuously from 800 to 1,200 ton of biomass / year, in terms of energy is equivalent to 20,000 - 25,000 liters of diesel / hectare.

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## **Why is it that he allows the sale of carbon credits?**

Through the process of photosynthesis green plants take carbon dioxide from the environment and transform it into more complex organic compounds which are the different cell structures of the plant.

As any production process there is a maximum performance achievable in the case of the nopal approximately 90% of the biomass dry can be transformed into biogas, the remaining 10% turns into sediment and is washed with water to release the cell of the nopales.

The sediment eventually is eaten by earthworms and transformed into soil (humus) and meat of worms for further treatment to flour.

## **It is a clean system?**

No, the entire process is fully professional; do not use pesticides or toxic elements that harm the environment.

## **Can you replicate?**

Yes, we work with cluster of 1,000 hectares which allows to deliver a system modular for its replication.

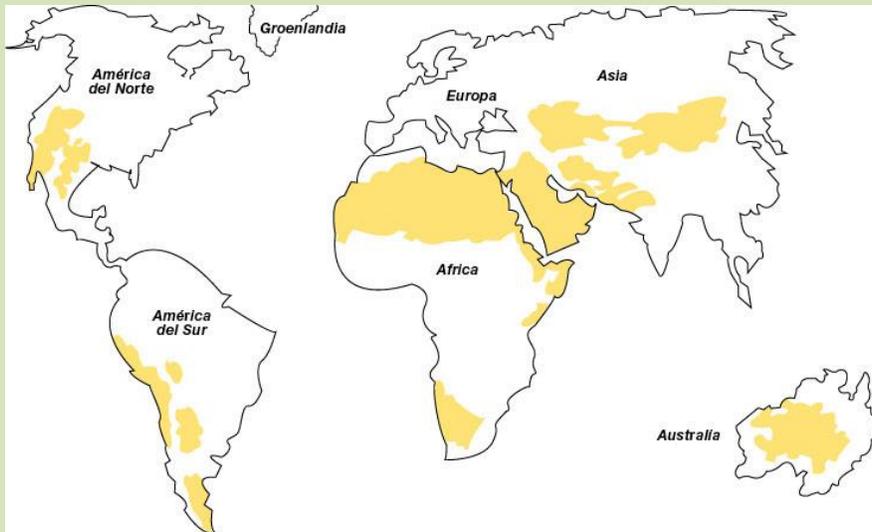
## **Where can be planted?**

The basic interest is in degraded soils, of low quality, given that the nopal is well adapted to climatic conditions unfavorable for other crops. There are species adapted to alkaline soils, acid.

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## **It requires more water than other crops?**

Quite the contrary, the Cactus is a plant of marginal conditions, can be grown in extreme drought conditions.

## **Is the harvest manual or mechanized?**

As various industrial processes, it is necessary to mechanize the harvest for its optimum productive performance.

## **Is it necessary that the plantations of Cactus are near my consumption to generate electricity?**

Depending on the legislation of each country in some cases the State retains the monopoly of fuels and electricity generation, however allow self-generation, is for this reason it is possible to generate electric power at a point far from the same network and transport it by the public system to the point of consumption which is lowered.

## **What products do generated?**

Biogas, electricity, humus, nitrogen water, flour worms for animal feed, carbon credits

## **What is the use of earthworms?**

It allows treating the sediment generated in anaerobic reactors; it transforms this effluent into more worms and humus to fertilize soil.

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