BIOGREEN OIL

Background Materials Prepared For

JatrophaWorld Asia 2011

By Adolfo Larran & Diego Wassner Adolfo.Larran@biogreenoil.com

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Biogreen Oil Strategy

- Industrial approach to jatropha
  - mechanized planting, maintenance and harvesting
  - Scientific treatment of soil and plants
- Significant research into the practical needs of farming jatropha
- Proponents of intercropping grass for cattle.
- Strict financial and operational controls
- Strict sustainability guidelines

Who should do what, in Jatropha's concept?

- **Governments**
- In Biogreen we see the biofuel business, with the same eyes as the business of Petro Oil. We see governments willing to expend in exploring and R & D of Petro Oil, and more reluctant to invest in R & D for biofuels.
  In Biogreen, we suggest that governments should be responsible for investing in genetic improvement, and research in jatropha agricultural best practices.
- **Investors**
- Institutional investors, funds, hedge funds, should stop thinking in Excel farming.
- Definitely seeking for millions, or hundreds of thousands hectares will not only delay the grow of jatropha concept, but will put a goal impossible to reach, with the following disappointing of another jatropha project. Off course the scapegoat will always be the CROP.
- Our humble advice is that, the entire concept should be tested first in a small/medium size project. From logistics, land lease/acquisition, clearing, soil preparation, seeding/transplanting, crop maintenance, harvesting, mechanical oil extraction, oil storage, and sales in a small medium scale. For later proving the scalability of the project.

Who should do what, in Jatropha's concept?

- **Farmers**

  Actual farmers with **marginal land**, should do Jatropha in a medium size scale, combined, as we will show later in the presentation, with Cattle.

  To use a simple farmer language.

  We are, above everything, **farmers seeking for profits**, and in order to do that, we cannot afford to do a mono crop investing all our money under the soil.

  Why? Simple, Biogreen is going to show in this presentation 3 things:

1. Doing **only** jatropha, is not using 65% of your land.
2. Doing cattle the old fashion way is not a tempting business by itself.
3. It makes economical sense, combine both activities.

Win to win scenario

1. Increased the vegetal oil offer for the biodiesel industry trough more marginal land, dedicated to oil production and, as consequence of its perennial habit, the supply will be more stable trough time.

2. Increase the economic income of farmers trough their productive diversification that is complementary to their traditional activities.

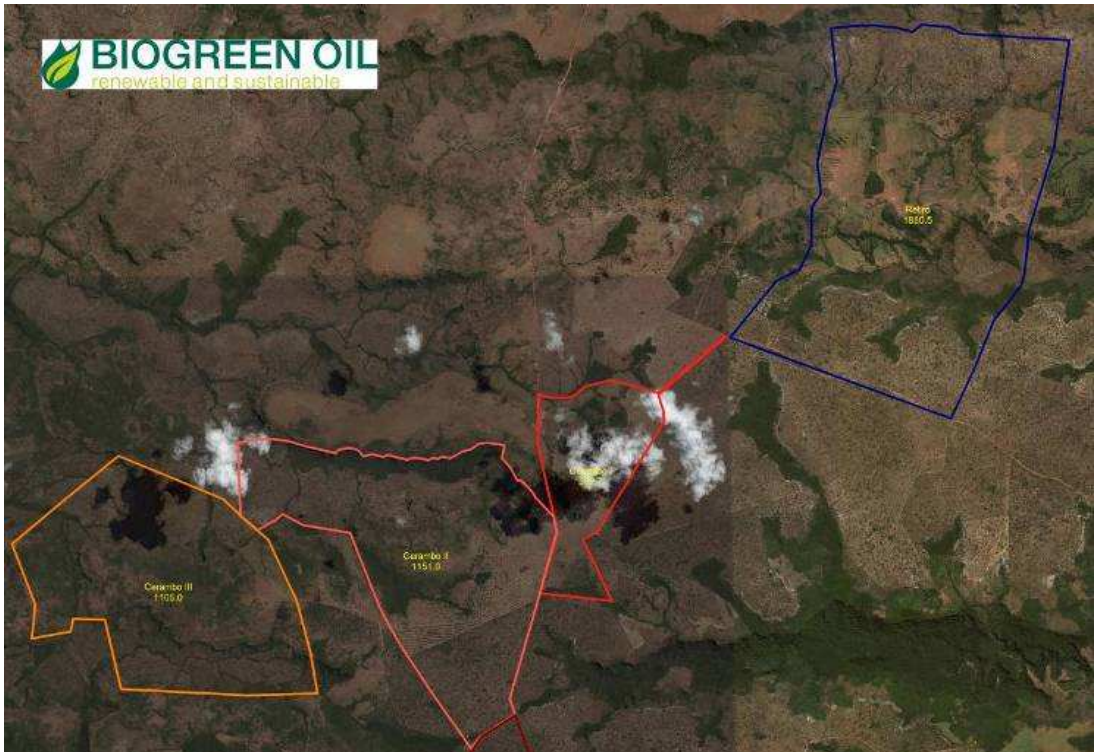
3. Plantations of *J.curcas* implicate a more sustainable land use pattern due to the perennial habit of the specie and the implantation of pastures beneath the canopy.

4. Biodiesel production based on *J.curcas* have a positives energetic and carbon balances.

We believe that these aspects should be taken into account because it will become increasingly important in international trade in biodiesel.

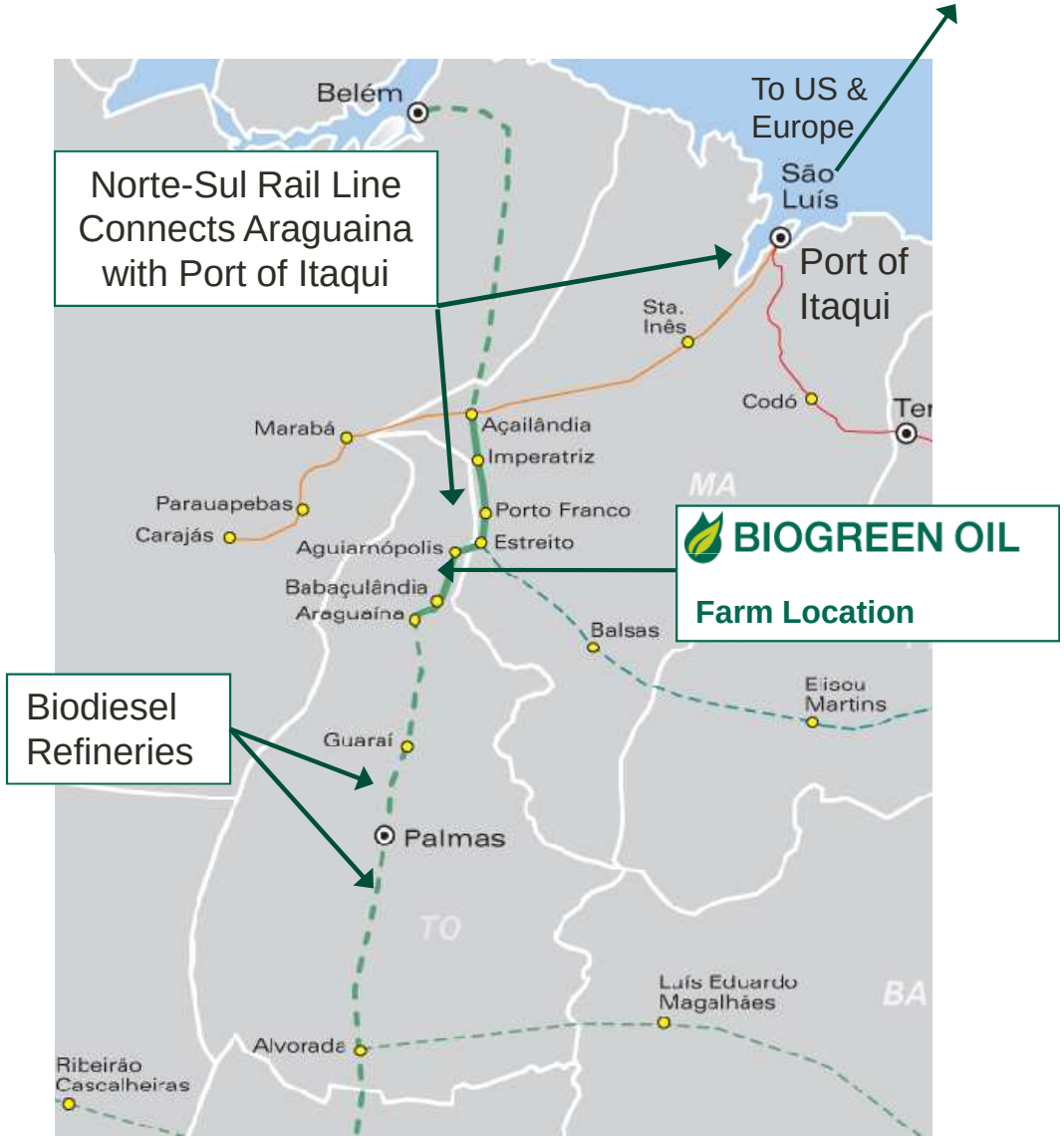
Tocantins Brazil Farm

Fazenda Cerambo is in the northern part of Tocantins and totals 4,400 ha. Of this, approximately 2,500 ha can be used after environmental reserves. The property divided into three legal parcels.



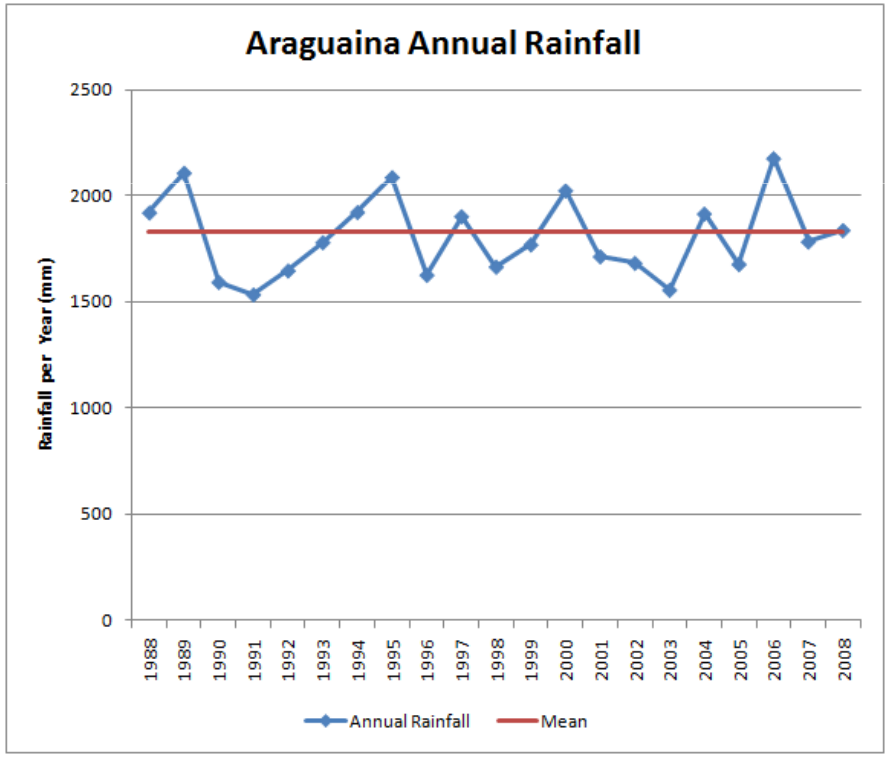
Tocantins Logistics

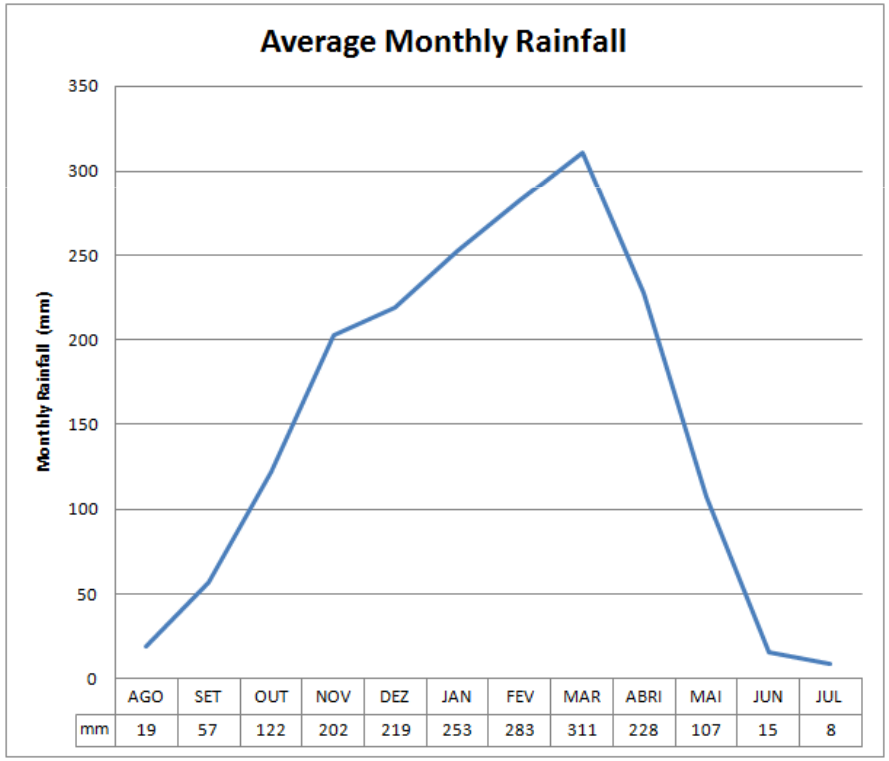
Fazenda Cerambo is in the northern part of Tocantins on the border of Babaçulandia and Wanderlandia, near the city of Araguaina. The property is located directly on TO-010 which is in the process of being paved. The farm is approximately 50km from the Norte-Sul rail line loading spur at Araguaina where Biogreen Oil has a lease on a 5 ha loading and storage location. The Norte-Sul rail line connects to the port of Itaqui which can be used to ship overseas



Tocantins Conditions

- Tocantins is a less developed area of Brazil so land prices are not as high as other areas.
- A sizable cattle industry already exists, with seven processing facilities in the vicinity of Araguaina alone.
- Climate is well suited to Jatropha with significant rainfall.
- Logistics are good and improving rapidly. The Norte-Sul rail line is completed to the port of Itaqui
- Tocantins provides tax advantages and access to development bank funding.
- Significant local biodiesel processing capabilities. Alternatively we can also export oil, biodiesel and seeds/seed cake.





	AGO	SET	OUT	NOV	DEZ	JAN	FEV	MAR	ABRI	MAI	JUN	JUL
mm	19	57	122	202	219	253	283	311	228	107	15	8

Soils

	Soil depth (cm) (0-20)
Sand (%)	35
Silt (%)	11
Clay (%)	54
Classification	Clay
pH	4,3
Cation exchange capacity (CEC)	6,42
Bases saturation (%)	14,33
Al+H/CEC (%)	85,67
Organic matter (%)	2,2
Phosporus (Mel. Ppm)	2,1

Main characteristics

✓Heavy soils

✓Too acidic

✓Higher levels of Al available

✓Low chemical fertility

✓In some areas with high erosion risk.

Soils preparation

To start the plantation was necessary to fertilize and to correct the soil adding lime and gypsum .

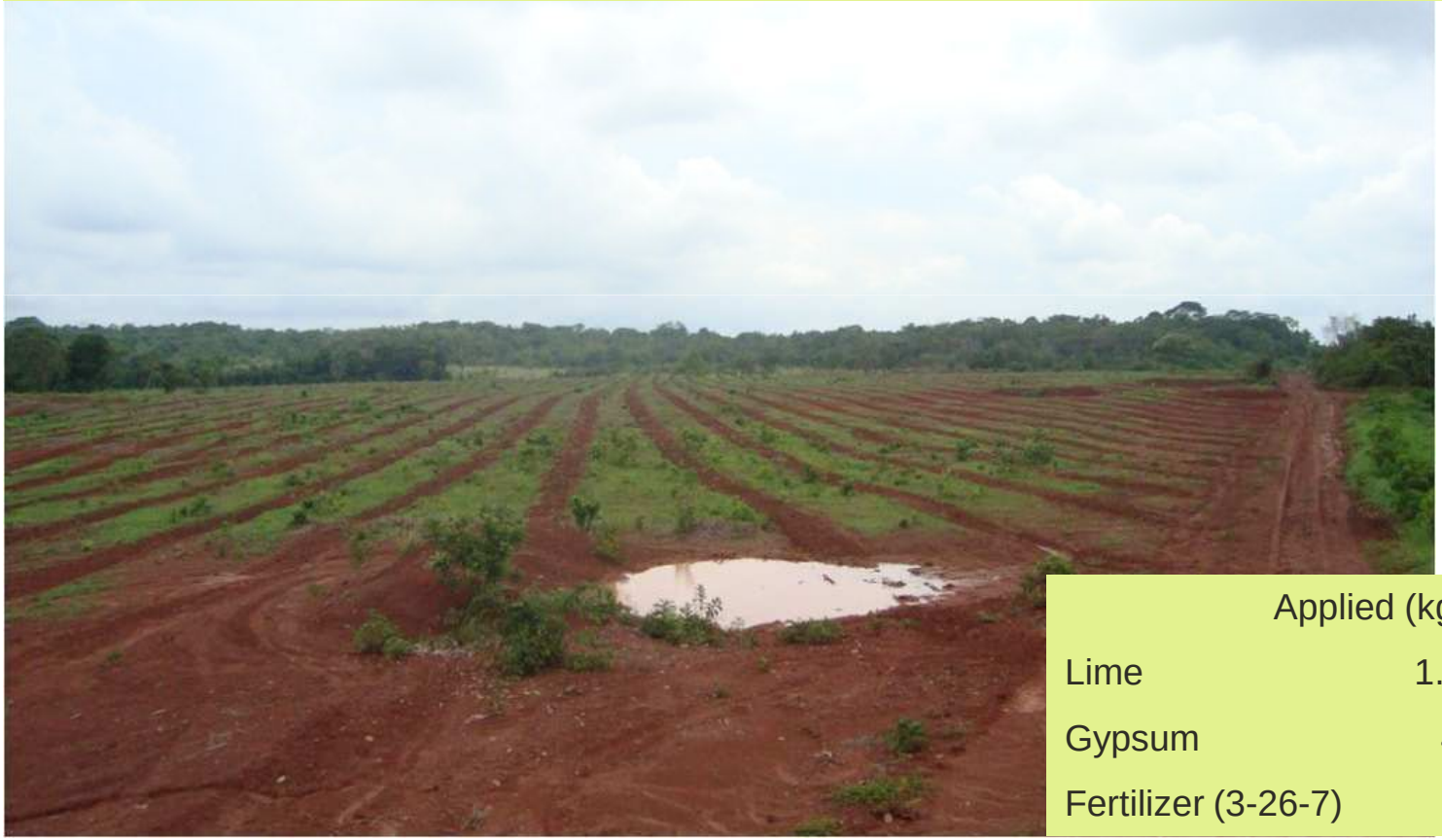
This is necessary in-depth subsoiling and fertilization

Once established, we use organic fertilizers and plan to return to the ground meal extraction and shells.

Below are our average expectations but applications will vary based on soil samples for each plot.

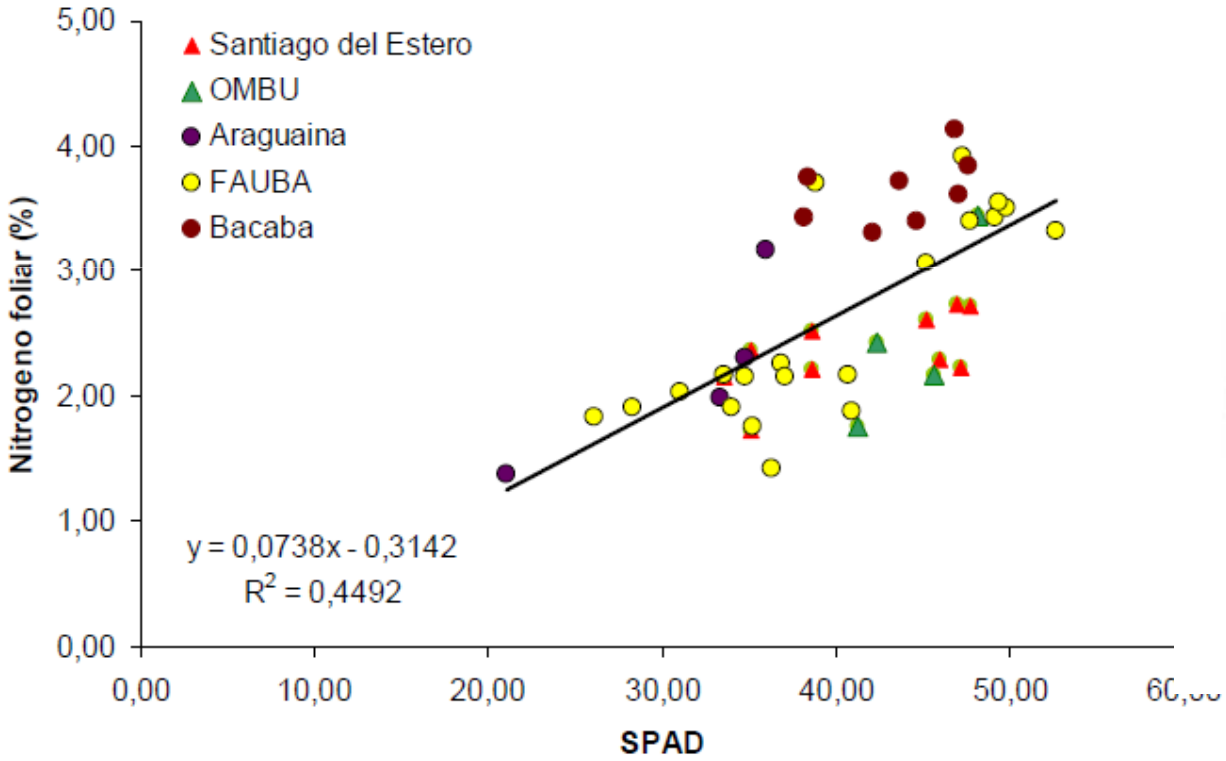
Fertilization strategy

Our strategy to optimize the economic outcome of the application of fertilizers and amendments is to work over the furrow where it will establish Jatropha, that implicate to **improve only the 35% of total area.**



	Applied (kg ha^{-1})	Equivalent to (kg ha^{-1})
Lime	1.510	4.315
Gypsum	400	1.142
Fertilizer (3-26-7)	200	571

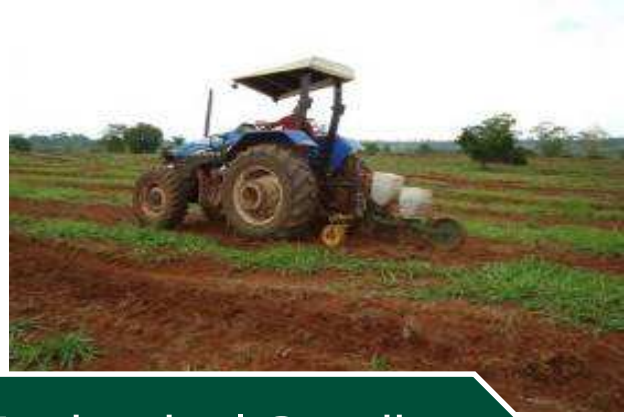
The nutritional status of Jatropha is monitored in real time using SPAD meter technology. To do this we had to perform calibrations using plants growing under different environmental conditions.



Soil reparation and sowing

Heavy disk plowing

Rotovator



Mechanical Seeding

Pre-emergent herbicide application

Jatropha emergence

Jatropha stablished

Soils & Planting

Where necessary we will fertilize and add lime to adjust soil pH. We generally plan on using organic fertilizers. Additionally, we only plan on fertilizing during the initial years needed to establish the trees. Afterwards the seedcake will be put back on the plants as fertilizer.

Below are our average expectations but applications will vary based on soil samples for each plot

Period	Fertilizer Type	Units per ha		Unit Cost		Cost per ha (R$)		Cost per ha (US$)	
Planting	Preemargent	0.23	ltrs/ha	R$ 33.0	R$/ltr	R$ 8	per ha	$4	per ha
	Gypsum	0.40	mt/ha	R$ 82.0	R$/mt	R$ 33	per ha	$18	per ha
	Lime	1.51	mt/ha	R$ 86.0	R$/mt	R$ 130	per ha	$72	per ha
	Phosphoric Rock	0.15	mt/ha	R$ 460	R$/mt	R$ 69	per ha	$38	per ha
	Adubo 3-26-7	0.20	mt/ha	R$ 850	R$/mt	R$ 170	per ha	$94	per ha
	Jatropha Seeds	3.50	kg/ha	R$ 12.0	R$/kg	R$ 42	per ha	$23	per ha
	Fungicide & Pesticide	0.70	ltrs/ha	R$ 5.0	R$/liter	R$ 4	per ha	$2	per ha
	Diesel	55.00	ltrs/ha	R$ 2.1	R$/ltr	R$ 116	per ha	$64	per ha
	Roundup & Other					R$ 10	per ha	$6	per ha
Total Planting						**R$ 580**	**per ha**	**$322**	**per ha**
Year 1	20-0-20	0.15	mt/ha	R$ 798	R$/mt	R$ 120	per ha	$67	per ha
	Diesel	7.00	ltrs/ha	R$ 2.1	R$/ltr	R$ 15	per ha	$8	per ha
Year 2	20-0-20	0.20	mt/ha	R$ 798	R$/mt	R$ 160	per ha	$89	per ha
	Diesel	7.00	ltrs/ha	R$ 2.1	R$/ltr	R$ 15	per ha	$8	per ha
Total Years 1-2						**R$ 309**	**per ha**	**$172**	**per ha**
Total Planting						**R$ 889**	**per ha**	**$494**	**per ha**

Why did we use mechanical seeding?

✓We did not had improved genetic material at that moment, to justify a seedling operation
✓Cheaper than transplant
✓We choose to sacrifice, yield per hectare, against economic sense model, as with the invest per hectare of mechanical seeding, we did have a good IRR business model
✓Adequate for larger areas
✓Easier to generate a better root architecture

FROM SOW STRAIGHT TO THE SOIL

FROM TRANSPLANT

Is the mechanical sowing the unique option?

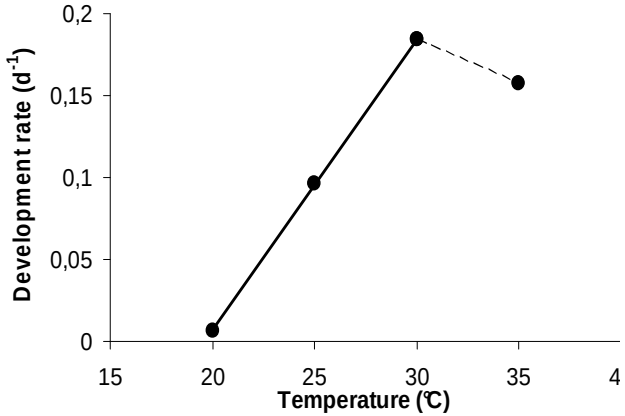
NO

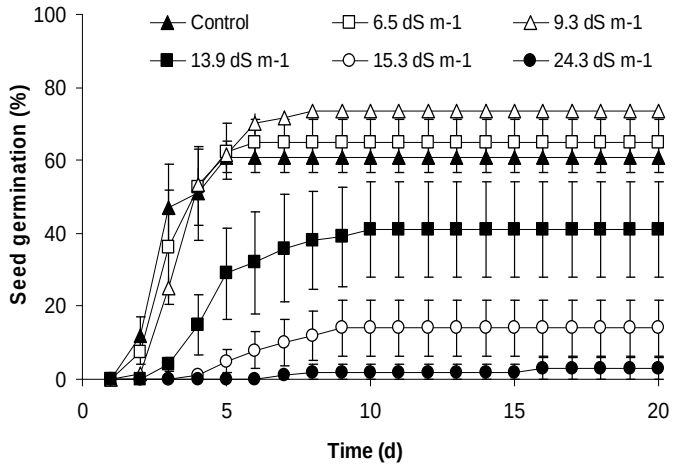
Is more complex, if you do not have the correct skills in soil preparation, nursery, and transplanting, you might have incorrigible problems as absence of pivot root, among others.

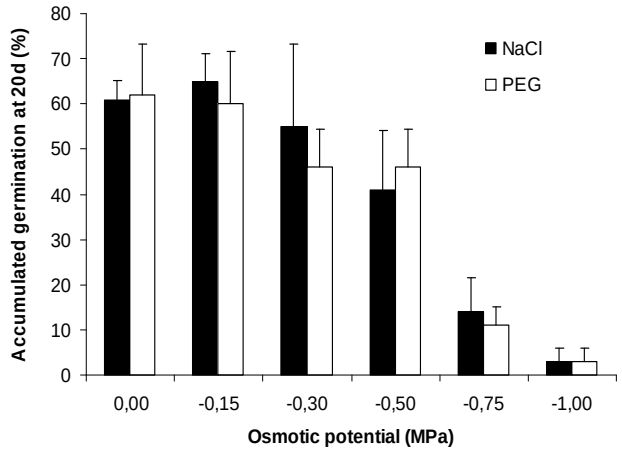
So, the bottom line, is that, if you have the skills, the money, definetely, seedlings, tissue culture, cuttings IS a better propagation system for selected genetic material.

However it makes sense only if you have proof and adapted, to your area the genetic improved material.

Prior to large scale sowing we had to solve:



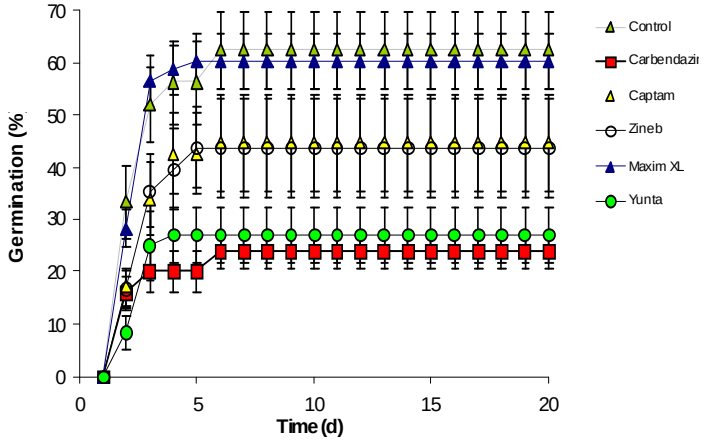


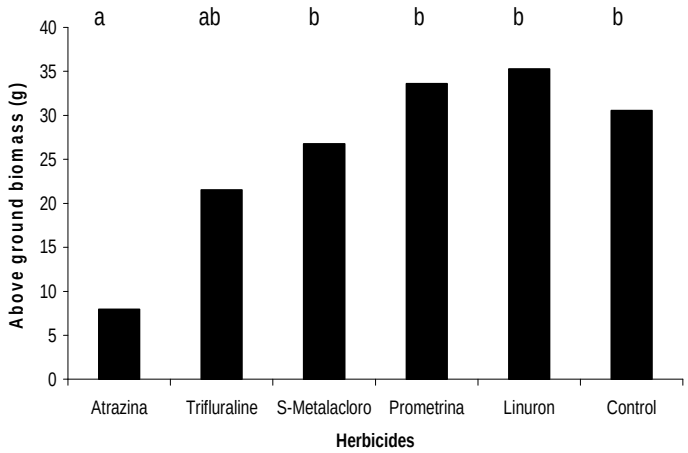


Temperature requirements for germination

Salinity tolerance during germination

Water requirements for germination





Funguices tolerance of seeds

Pre-emergent herbicides tolerance of *J. curcas*

Post –emergence herbicide tolerance of *J. curcas* seedlings

Chemical weed control

Plantation density

As shown in the below pictures, in our first experimental trials since march of 2007, we learn the hard way, that the optimal density for *Jatropha curcas* is 5 m between row and 1,5 m between plants. Nevertheless in the below picture you will see, that a 4 x1.5 m was tested also.

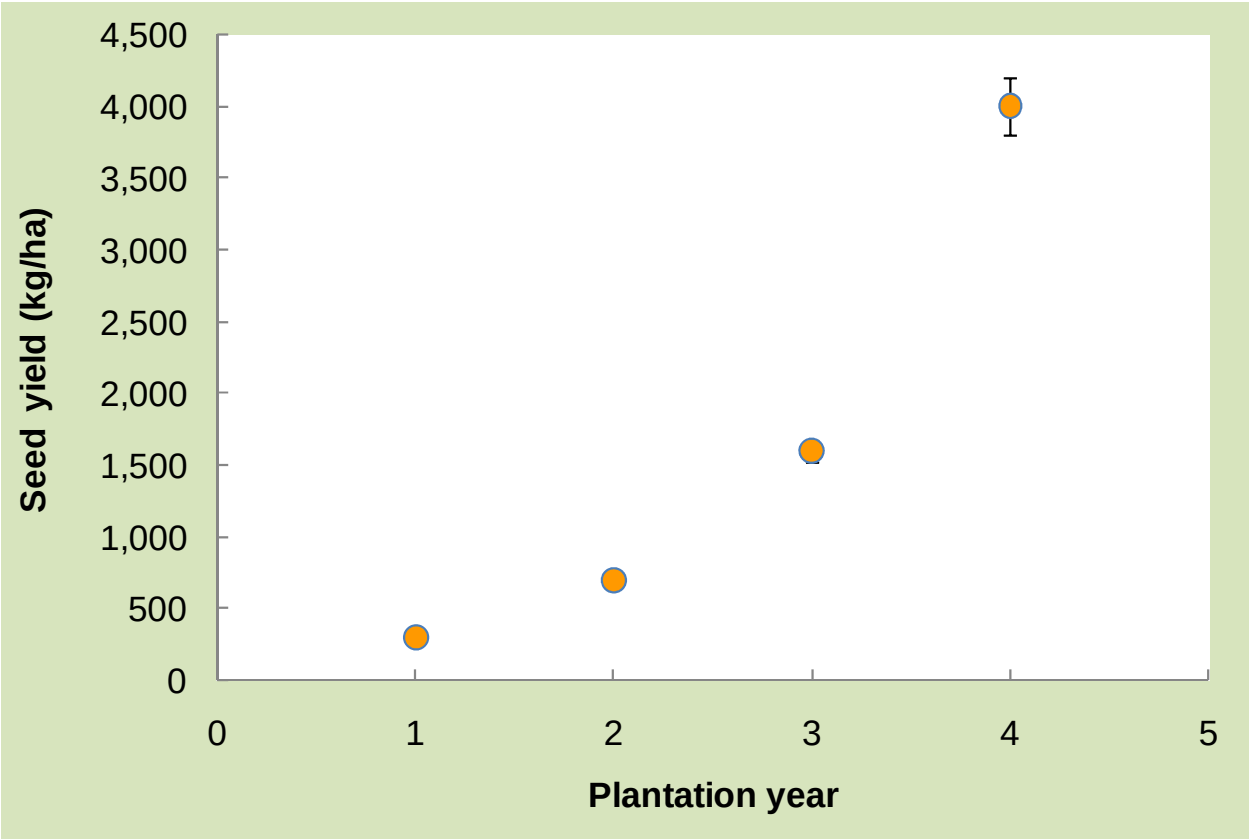
2 x 2 m (2.500 plants/ha)
4 years after sowed

4 x 1.5 m (1.666 plants/ha)idem

Yield of current Jatropha genotype

We are currently planting seeds obtained from local producers, improve done. Only picked from wild trees, and put it into a plantation format.

- We evaluated the yield of our plantation during four years



Pests and diseases: the myth of the Jatropha invulnerability

Trips

Leafhoppers

How do improve the economic results of our farm?

Mechanical harvest of pastures between the jatropha rows, to be used in a feed lot system.

Based in our experience this system have is the best option due to:

✓To optimize the productivity of the pasture due to the ability to manage the frequency and severity of cuts.

✓To allow store the forage excess produced during the rainy season

✓To maximize forage quality because the pasture is harvested before it loses its nutritional quality.

✓ Weight gain: 1,3 kg d^{-1} $animal^{-1}$

Appearance of the plots after mechanical harvest of forage

Feedlot’s facilities & management

Site silage

Filled with fresh forage and compaction to produce anaerobiosis

Collection of silage

Forage distribution

Feeding animals

Mechanical Harvesting

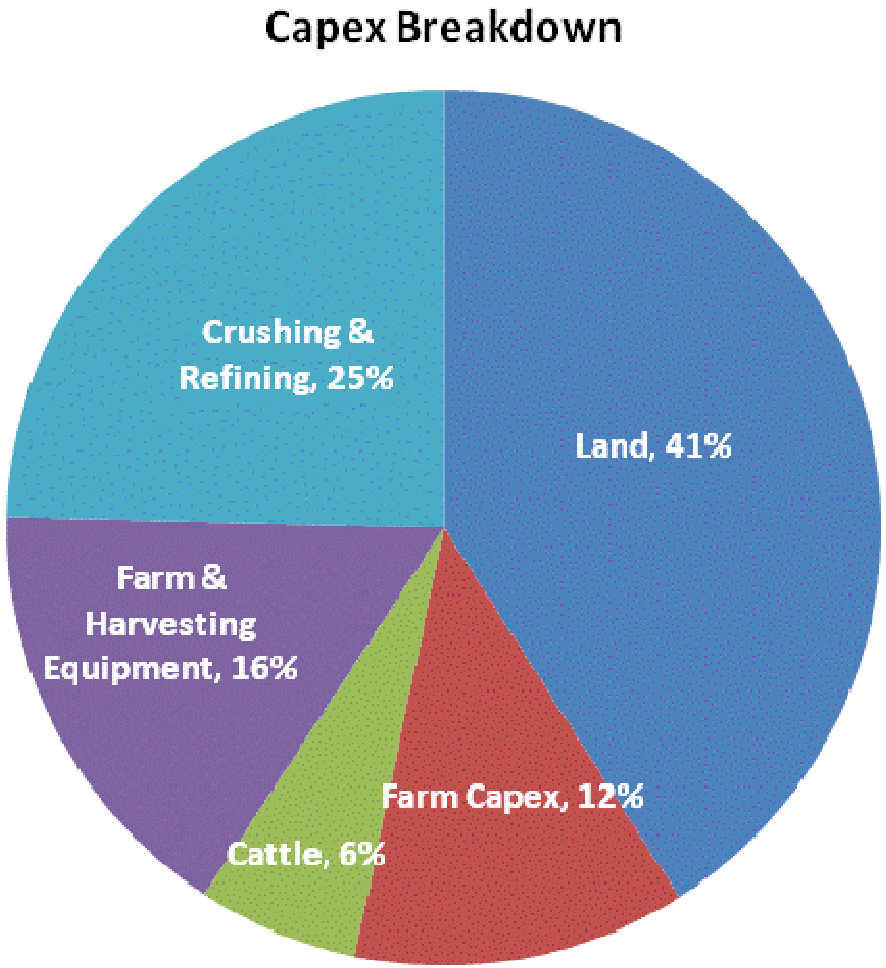
We currently plan to harvest mechanically.

- We are acquiring a BEI International harvester (see below). The machine is a modified berry harvester
- BEI has equipment working at a farm in Honduras. The farm's experience is
  - harvests without breaking branches
  - collects all of the yellow/black fruit
  - only picks 5-7% of the green fruit

Distance per ha	2.0	km/ha
Machine speed	4.0	km/hour per machine
Harvesting speed	0.5	ha/hour
Machine working day (hrs)	12.0	hours per day
Machine working day (km)	48	km. per day per machine
Machine working day (has)	24	has. Per machine per day
Harvesting Cycle	20.0	days between harvests
Machine Coverage	480.0	has per machine
Machine fuel usage	120	liters/12 hrs
Fuel usage per km	2.5	liters/km
Fuel usage for 1 ha	5.0	liters/ha
Harvesting Days per year	200	days/yr
Fuel usage per ha year	50.0	liters per yr per ha
Fuel Cost	$1.00	cost per liter
Fuel Cost per ha per yr	$50.0	cost per ha per year
Seed Yield	6.0	mt/ha
Oil Yield (28%)	1.7	mt/ha
Fuel Efficiency	2.7%	Fuel Used/ Oil Produced
Harvester Fuel Cost	**$8.3**	**cost per mt Seed**
Harvester Price	$190,000	per machine
Harvester Capex	$396	per ha
Amortization period	7	years life
Capex Amortization Cost	$81.3	per year amort per ha
Harvester Amortization	**$13.6**	**per year amort per mt seed**
Total Harvesting Cost	**$21.9**	**total cost per mt seed**

Business Plan: Capital Expenditures

- The bulk of the capital expenditures are in the land and hard assets.
- Only 15% of the budget goes into the actual planting of jatropha and improving the land.
- This means the downside of the project is reasonably low.
- Writing off 2/3 of the planting expenses, and 1/2 of the crushing/refining only reduces the total assets by less than 20%



Biogreen Oil management team

Adolfo Larran Garat

Adolfo's family has been farming in Argentina for over 100 years. For over 12 years Adolfo managed their large farming operation there. Starting in 2002, Adolfo began researching and consulting on the development of jatropha through a private consulting effort and later incorporated as MasJatrofa SRL. His customers ranged small-scale developments, to large institutions such as Kimberly Clark and George Soros´s ADECO AGRO.

Adolfo is recognized as a leading expert in Jatropha curcas cultivation. He has published scientific papers on the temperature sensitivity, water response and salinity tolerance of Jatropha curcas during the germination cycle. He was one of the first to use a mechanical seeding machine in order to dramatically decrease planting costs. He has also developed the first patented jatropha mechanical harvesting machine.

Adolfo has collaborated with Kingdom College, University of Buenos Aires, CRILAR Conicet.

Consulted by several lead people among the world, such as, former USA Senator, **Christopher B. Burnham** appointed Under-Secretary-General of the United Nations for Management by Kofi Annan on June 1, 2005. Mr. Burnham is the senior most American in the United Nations Secretariat. He was tasked by Secretary-General Annan with overhauling the accountability and transparency of the United Nations.

Deutche Bank, Credit Suisse, De Smet Engineers, Baron Jacob Rothschild, etc.

His work has been visited by Toyota Tshusho, Dole Foods, Lufthansa, BEI Intl, Neste Oil, etc.

- **Diego Wassner**

  Diego is an Agronomy Engineer and chemical technician with 10 years' experience in research and development of industrial crops. For five years ago Diego has been concentrating on industrial crops suitable to subtropical areas, specifically with oil crops like, ricinus & Jatropha curcas. Diego specializes in the eco-physiology of crops, agronomy for marginal areas and analytical chemistry of natural products. Since joining Biogreen Oil, his efforts have focused on temperature germination requirements and salinity tolerance, temperature requirements for growth, and the selection of pre-emergent herbicides and fungicides for Jatropha curcas. Diego has begun work on genetic breeding of Jatropha curcas and the development of agronomic technology to improve yields and tolerance to marginal conditions. Diego is widely published in international agronomy journals and textbooks, and is concluding his doctorate thesis at the University of Buenos Aires.

View of our plantation last December