

**IDENTIFYING COST EFFECTIVE JME
PRODUCTION
Economics
Technologies
For Start-up to Mid-sized Projects**

GHP Biodiesel- Who We Are!

- GHP Biodiesel is a German based technology provider for bio-diesel systems, focusing on a decentralized, modular, containerized approach, optimized for low cost production and alternative feedstocks like jatropha, used cooking oils (UCO).
- Started in 2002. Continuously improving/ expanding our own technology.
- 5.000t / 1,5mmgls → 8.000t / 2,4mmgls → 15.000t / 4,5mmgs.
- Marketing a system with 30.000 tons/ 9,0 mmgls p.a. capacity.
- Have partnership established focusing on UCO; developing jatropha projects.



GHP = BIODIESEL

Miami, June 11th, 2008



What are the cornerstones for a successful bio-diesel project?



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What Are the Cornerstones for a successful Bio-diesel Project?

- # 1 feedstock integration
- # 2 feedstock integration
- # 3 feedstock integration



- Need a technology which goes along with market dynamics and offers all the flexibility you need in a new industry!
- Truly multifeed!

Feedstock integration: Master Business Plan Challenges specific to Jatropha!

- Feedstock is not available as of day 1 but will develop gradually!
- Jatropha growing in many emerging markets – need to build bio-diesel market at a similar pace!

→ Modularity!



Market dynamics bring more challenges for a successful business plan!

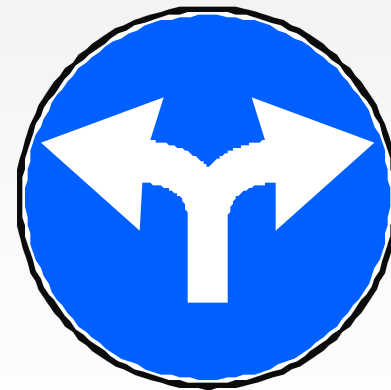
- Biodiesel regulation highly uncertain!
- Regulators might decide to favor certain feedstock over others!
- Sustainability schemes to ensure minimum CO₂ capture.
- Minimize global logistics, encourage local value chain.



→ **FLEXIBILITY**

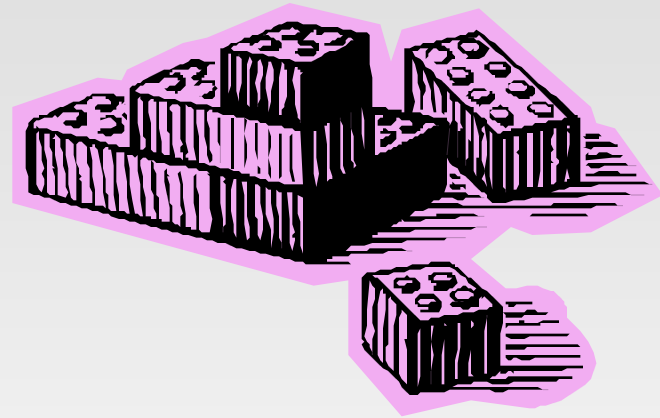
FLEXIBILITY...

- Flexibility to feedstock:
Use whatever offers best economics: virgin, UCO, jatropha.
- Flexibility to location:
If market conditions change you want to be free to move on.
- Flexibility concerning your staff/ geography:
Robust technology which works under (almost) all environmental conditions.



...and then **SCALABILITY** is needed!

- Modular approach!
- Because you want to grow with the market and the Jatropha volumes.
- You want to have a certain customer base established before you move to the next capacity level!
- You want to have the freedom to put capacity **WHERE** it is needed.



Modular, scalable, flexible.....but you need to ensure cost are competitive!

- You need to be as competitive on production cost, because feedstock cost is (almost) the same for everybody!
- Both investment cost as well as operational cost!



Some more things we did....!

- “Buy Local – Sell local” - Local feedstock!
- Establish a regional business model, based on local feedstock, maximizing the use of low cost feedstock. Local low cost feedstock can be significant share of your total feedstock. → Blend whatever is available!
- Savings on logistics:
In a start-up scenario, whilst not yet ready to capture efficiencies of large scale global logistics (barge transport starts at 5000 tons per shipment), local sourcing is the only reply!
- Makes a big difference in long-term sustainability of your project!

Some more things we did....!

- Reasonable investment in technology:
Take a critical look at you overall investment cost, because depreciations will accompany you for 10-20 years. GHP target: 3% max moving below 1,5% as project matures (German producer of alternative feedstock reported 5,3% depreciation in his annual report 2007!).
- Investment cost per ton capacity vary between € 90 and up to € 400 in the market, depending on complexity of technology and project set-up.
- Contain costs for set-up/ start-up: A standardized, containerized pre-assembled, pre-tested concept saves you months in set-up time....and lots of nerves!!
- “Stay slim”: A brand-new factory floor looks great, but again you have to pay for it with every gallon sold. Rented factory floors in commercial areas often offer great deal (and if you don't like it you can always move on...) .

Some more things we did....!

- “Stay slim /2”
Go for a technology which can be run with minimum manpower!
GHP runs 2 of our installations with as little as 1 man/ shift, 2 man per day (because night shift can be unmanned).
- Manpower cost in GHPs experience: can be managed at 3-5% at small scale operations (a German producer of alternative feedstock reported manpower cost of 6,5% in his annual report with 50.000 tons bio-diesel produced).
- “Focus on your core”
What is the potential for side-products?
Today we were offered € 180 for our glycerin phase...for most of the time during our 5 years of operation it were 5- 25 €

It all needs coming together in realistic business plan assumptions to attract investors!

Plantation		2008	2009	2010	2011	2012
WITHOUT IRRIGATION						
Nursery - seedling needed		32,282,250	40,950,000	40,950,000	47,775,000	0
Nursery - Land needed in ha		43,0	54,6	54,6	63,7	0,0
Hectares (ha)with irrigation		1,350	1,350	1,350	1,350	1,350
Yield tons/ p.a.		0,5	1,0	1,5	2,0	2,5
Seeds produced		675	1,350	2,025	2,700	3,375
Hectares (ha)		0	23,650	23,650	23,650	23,650
Yield tons/ p.a.		0,0	0,5	1,0	1,5	2,0
Seeds produced		0	11,825	23,650	35,475	47,300
Hectares (ha)		0	0	30,000	30,000	30,000
Yield tons/ p.a.		0,0	0,0	0,5	1,5	2,5
Seeds produced		0	0	15,000	45,000	75,000
Hectares (ha)		0	0	0	30,000	30,000
Yield tons/ p.a.		0,0	0,0	0,0	0,5	1,5
Seeds produced		0	0	0	15,000	45,000
Hectares (ha)		0	0	0	0	35,000
Yield tons/ p.a.		0,0	0,0	0,0	0,0	0,5
Seeds produced		0	0	0	0	17,500
Total hectares		1,350	25,000	55,000	85,000	120,000
Total Seeds produced		675,0	13,175,0	40,675,0	98,175,0	188,175,0
# of farmers		675	12,500	27,500	42,500	60,000
# of trees in mio		1,8	32,6	71,5	110,5	156,0
Costs of fruits		67,500	1,317,500	4,067,500	9,817,500	18,817,500
Fertilizer		35,100	650,000	1,430,000	2,210,000	3,120,000
Pest Control		13,500	250,000	550,000	850,000	1,200,000
Logistics to crushing		8,438	164,688	508,438	1,227,188	2,352,188
Land preparation		591,250	750,000	750,000	875,000	0
Nursery - Cost for seeds		16,141	20,475	20,475	23,888	0
Ongoing cost irrigation		0	0	0	0	0
Total Costs		731,929	3,152,663	7,326,413	15,003,575	25,489,688
Cost per seed (\$/t)		1,084	238	180	153	135
Oil Crushing						
WITHOUT IRRIGATION						
Input Seeds w irrigation		675	13,175	40,675	98,175	188,175
oil content		25%	28%	30%	30%	30%
recovery rate		24%	27%	29%	29%	29%
Cake produced		506	9,670	29,083	70,195	134,545
Oil produced		160	3,505	11,592	27,980	53,630
Selling Price Cake		25	25	25	25	25
Processing costs per ton of oil		100	100	100	100	100
Crushing Costs		16,031	350,455	1,159,238	2,797,988	5,362,988
Shipping cost to BD facility		25	25	25	25	25
Shipping cost total		4,008	87,614	289,809	699,497	1,340,747
TOTAL CRUSHING						
Oil produced		160	3,505	11,592	27,980	53,630
Crushing costs		20,039	438,069	1,449,047	3,497,484	6,703,734
Crushing + Shipping cost		125	125	125	125	125
Biodiesel						

Plantation assumption need to tie-in with bio-diesel assumptions!

Biodiesel						
Installed capacity						
Installation 1	(t/a)	0	30.000	30.000	30.000	30.000
Installation 2	(t/a)	0	0	0	0	30.000
Installation 3	(t/a)	0	0	0	0	0
Usage Jatropha	(%)	0%	12%	39%	93%	88%
Total Capacity	(t)	0	30.000	30.000	30.000	60.000
Biodiesel						
Yield		0%	97%	97%	97%	97%
(t)		0	3.398	11.245	27.140	52.021
(t/Liter)		0,00	0,883	0,883	0,883	0,883
(Liter)		0	3.849.846	12.734.546	30.736.689	58.913.906
(Liter/Gall)		0,0000	3,7854	3,7854	3,7854	3,7854
(Gall)		#DIV/0!	1.017.026	3.364.122	8.119.794	15.563.456
(\$/Gall) average		0,00	3,60	3,60	3,60	3,60
(\$/Liter)		0,00	0,95	0,95	0,95	0,95
(\$/t)		0,00	1.077,04	1.077,04	1.077,04	1.077,04
(\$ Sales)		0	3.661.289	12.110.837	29.231.259	56.028.441
Glycerin						
	(t/t Biodiesel)	#DIV/0!	29,1%	29,1%	29,1%	29,1%
	(t)	0	990	3.275	7.905	15.152
	(\$/t)	100	100	100	100	100
(\$ Sales)		0	99.017	327.529	790.538	1.515.249
Input	(t)	0	4.390	14.520	35.046	67.173
Output	(t)	0	4.390	14.520	35.046	67.173
Methanol						
	(t)	0	477	1.578	3.906	7.812
	(t/t Biodiesel)	16,0%	16,0%	16,0%	16,0%	16,0%
	(\$/t)	450	450	450	450	450



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Thank You!

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Miami, June 11th, 2008

