

**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!

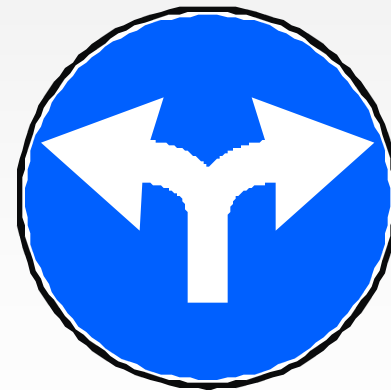
- Biodiesel regulation highly uncertain!
- Regulators might decide to favor certain feedstock over others!
- Sustainability schemes to ensure minimum CO₂ capture.
- Minimize global logistics, encourage local value chain.



→ **FLEXIBILITY**

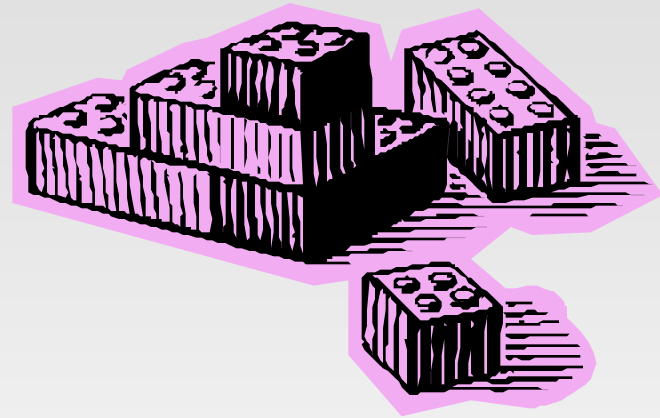
FLEXIBILITY...

- 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 | 7.706 |
| | (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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