

SUN BIOFUELS

Jatropha feedstock supply chains and energy in Mozambique & Tanzania

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Introduction

Background To Sun Biofuels



- Environmentally sustainable biofuel production based on *Jatropha Curcas*
- Sun Biofuels (SBF) established in 2005
 - Now employs over 1,500 people in Mozambique & Tanzania
- Commercial plantation operations commenced 2007
 - 5,000Ha ex-tobacco plantation in Chimoio, Mozambique
 - 8,000Ha of deforested bush in Kisarawe, Tanzania
- Over 3,000Ha already cleared and planted
 - Infrastructure and facilities in place
 - R&D operations
 - Experienced management team
- US\$25m invested to date
 - Principal shareholder: Trading Emissions PLC
- Continued rollout targeting 20,000Ha



Mozambique & Tanzania

A Brief Overview



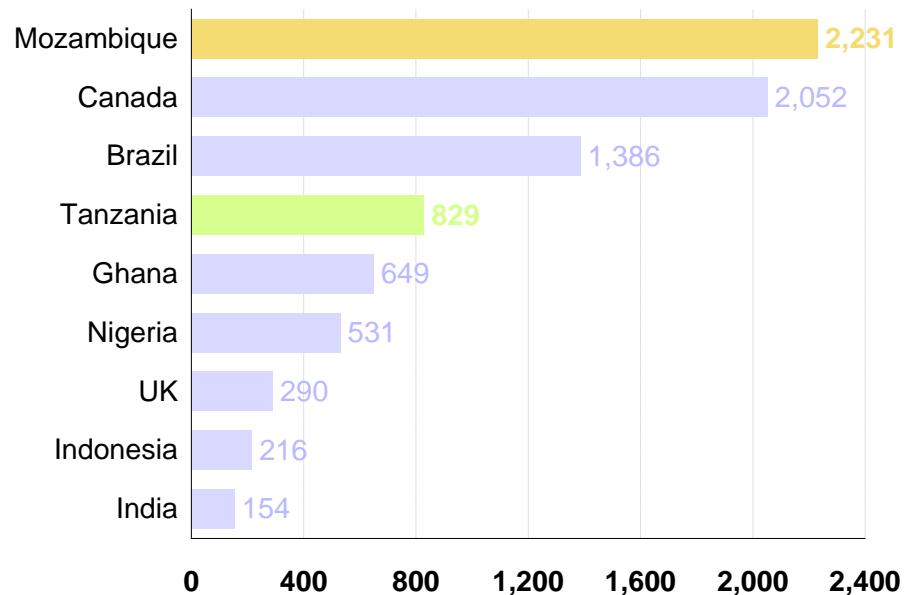
Mozambique

- 2006 total energy requirement 9m tonnes oil equivalent (80% derived from wood/charcoal)
- Access to electricity is 6% nationally (2% in rural areas)

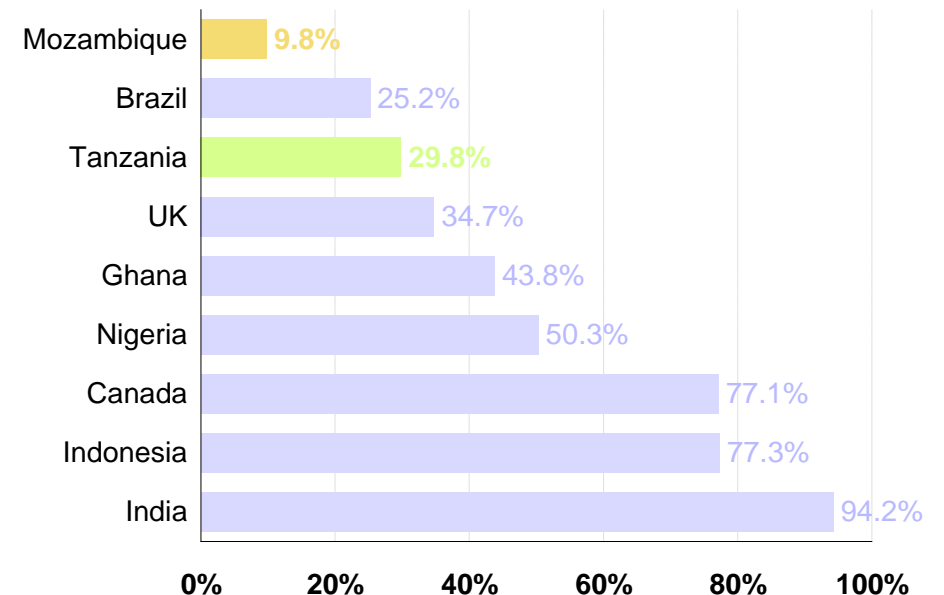
Tanzania

- 2006 total energy requirement 21m tonnes oil equivalent (90% derived from wood/charcoal)
- Access to electricity is 10% nationally (2% in rural areas)

Agricultural land per head of population (Ha/person)



Proportion of agricultural land currently planted

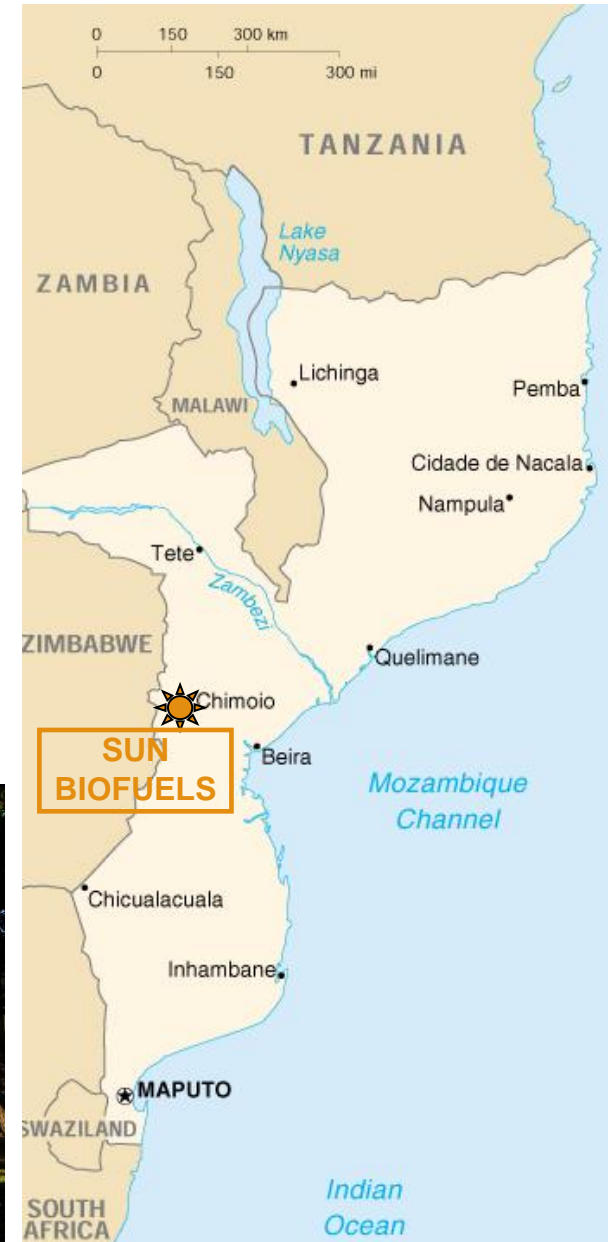


SBF's Current Operations

Mozambique Plantation



- 5,000Ha ex-tobacco plantation acquired in Manica Province
- Close to busy provincial capital of Chimoio (population 300,000)
- Located on the 'Beira corridor' (main transport artery to Beira port)
- 1,100mm annual rainfall and moderate temperatures
- Existing plantation infrastructure refurbished/reinstated by SBF
- Over 1,000 new jobs created by SBF
- 2,000Ha cleared and planted (2008/2009)



SBF's Current Operations

Tanzania Plantation



- 8,000Ha deforested bush acquired from local villages
- 70km from Dar es Salaam (capital city and principal port)
- Connected by tarmac roads and the Tan-Zam Central Railway
- Tropical climate with 1,100mm annual rainfall
- Plantation infrastructure under construction by SBF
- Close to 600 new jobs created (and rising)
- Over 1,000Ha cleared and planted (2009)



Semi-intensive Plantation Model

Maximising Benefit from Resources Utilised



- Commercial plantation model is the starting point for Sun Biofuels
 - Can be technical/financial focal point for wider smallholder/community projects
- Large scale operation offers efficiency savings
 - SBF targets 5,000Ha for a single plantation 'unit' (10,000 tonnes oil per annum)
- Optimising quality & quantity of inputs ('value for money')
 - Capital costs (incl. land prep. & planting) US\$12-16m per 5,000Ha
 - Materials (fertiliser, pesticides, herbicides, fuel) US\$175 per Ha
 - Labour US\$250-300 per Ha
- Ideal platform for R&D around Jatropha cultivation



Photographs: 1+2) Plantation activities in SBF Mozambique; 3) Bricks manufactured on SBF's plantation site in Tanzania (low cost and environmentally responsible)

Land Acquisition, Preparation & Planting

The Foundation of Any Agricultural Project



Acquiring land can be an emotive subject anywhere, perhaps more so in Africa

- **Leases and permissions fully secured** – bureaucratic and time-consuming but maximises security
- **Stakeholder participation** – national, regional and local consultation prior to all other activities
- **Sustainability validation** – environmental and social impacts independently assessed
- **Mechanised land clearing and seed bed preparation** – delivers both speed and quality
- **Planting directly from seed** – saves on the costs of nurseries and delivers stronger root stock

Quick revenue generation is less important than long-term quality and security



Ethical & Sustainable Development

Our Approach (And Contribution To The Debate)



If intelligently conceived and properly managed, no biofuel project should present a threat to the environment or to food security

- **Availability of agricultural land** – African countries with low population densities
- **Energy-poor communities** – deforestation for fuel wood, health impact of charcoal and kerosene
- **Carbon sequestration** – perennial tree crop grown un-irrigated on already degraded bush
- **Preservation and protection** – areas of high biodiversity are marked out and allowed to flourish
- **Planting food crops** – we grow maize, sunflower and other food staples at our plantations



Photographs: 1) Charcoal burning operation close to SBF's site in Tanzania (felling trees to manufacture domestic fuel has become a staple industry resulting in massive deforestation and degradation); 2) Area of intact forest preserved behind Jatropha field preserved by SBF 3) Maize growing at SBF Mozambique (food crops planted alongside Jatropha can help to sustain the local workforce and their families)

Research & Development

Improving Productivity & Efficiency

We believe that Jatropha's productive oil yield of 1.5-2.5T/Ha can triple in 10 years

- **Site selection** climate → terrain → soil
- **Propagation and cultivation** understanding every aspect of plant growth and lifecycle
- **Genetic improvement** plant selection → breeding → genetic modification
- **Production inputs** fertiliser → pest & disease control → harvesting → processing
- **Maximising biomass utility** animal feed (detoxification) → fertiliser → solid fuel



Photographs: 1) Fruit and flower buds sprouting simultaneously on a Jatropha plant in SBF Mozambique. Developing a full understanding of the species' flowering and fruiting patterns may lead to significant yield improvements ; 2) SBF is trialling various cultivation techniques, including pruning for optimal canopy architecture, in order to improve mature plant yields; 3) Seedling specimens at SBF's R&D facilities

Extending The Supply Chain

Beyond Oil Production (Energy Solutions)



Jatropha powered generators

- Low-cost generator running on pure plant oil
- 10kW pilot unit being tested in Tanzania
- Includes CHP to purify water



A 10kW generator modified by Aquafuel Research to run on pure Jatropha oil. The unit is being tested by SBF in Tanzania for practical applications such as powered flour mills (shown above). It has the added benefit of utilising exhaust waste heat to purify water to drinking quality

Mini-grids

- Hybrid biofuel/solar 'smart' mini-grid for village community lighting and power
- Working with international technology companies including Philips



In June 2010 SBF hosted the world's first football tournament played under solar powered LED lights as part of the Philips Cairo to Cape roadshow. The event took place in Kisarawe near Dar es Salaam, attended by political leaders and local/international TV and press

Conclusions

Factors For Success



- Untapped potential in African markets – energy demand, labour and sustainability
- Government and NGO support
- Investment in research & development
- Good site locations with secured land
- Efficient plantation operations
- Harnessing diverse skills and experience – includes partnering with other organisations
- Addressing local customer needs – accessible and affordable energy



Photographs: 1) A family from a nearby village collecting fresh, clean water at a pump installed by SBF in Mozambique; 2) His Excellency Antonio Gumende, Mozambique's High Commissioner to London, speaking in support of SBF's plans in Mozambique; 3) A 10kW generator running on pure Jatropha oil, developed by SBF with Aquafuel Research, being demonstrated to political, business and community officials at Tanzania's foremost agricultural show in August 2010

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SUPPLEMENTARY INFORMATION



Background To Sun Biofuels

Vision & Strategy



Company Vision

To become a significant vegetable oil producer in emerging Africa, focussed on semi-intensive cultivation of *Jatropha curcas*, supplying low-greenhouse-gas fuel and energy to local and international markets

Strategic Objectives

Secure good quality land at reasonable prices

Deliver high productivity at relatively low cost

Meet international sustainability criteria

Contribute to development of local communities

Intelligently utilise all available fuel and energy markets



- Rural areas with socio-economic deprivation
- Exhausted farmland or degraded bush (sub-optimal for food crops)
- Rainfall >900mm p.a.
- Close to transport and service infrastructure

- Invest in optimising terrain and soil quality prior to planting
- Tested, regimented cultivation methods
- Rain fed, minimal inputs after maturity
- Yield improvement through ongoing R&D

- No competition with food production
- Preserve and protect high biodiversity areas
- Maximise greenhouse gas savings
- Strict corporate social responsibility policies

- Generate employment for local people
- Target fresh water, health and education
- Enhance local food security
- Stimulate economic growth and prosperity of surrounding areas

- Exploit all production output (oil + biomass)
- Focus on accessible local channels
- Value add through electricity generation and transportation fuels
- International markets to spread risk

Background To Sun Biofuels

Management & Expertise



Board

Richard Morgan, CEO

- Early career managing large-scale plantations in Indonesia – oil palm, cocoa & rubber
- 8 yrs running ED&F Man's West African trading division – sugar, ethanol & cocoa
- MSc in Agricultural Economics (London University), BSc in Agronomy (U of Wales)

Dennis Poole, Non-executive Chairman

- 40 yr career in energy and developing markets, incl. Total (33yrs) and Unilever Africa
- President & CEO of Total's Africa, Middle East & Central America downstream division (to 2002)
- Educated Liverpool University and Harvard Business School

Simon Shaw, Non-executive Director

- Founder, principal shareholder and Chairman of EEA Fund Management
- Renewables and carbon investment expertise
- 25 yrs in investment markets with a degree in Mathematics & Statistics

Management Team

- **Peter Whitehead, COO**) 60+ yrs combined
- **Nico Strydom, GM Moz**) experience in South
- **Peter Auge, GM Tanz**) African forestry, BSc/MBA qualified

- **Harry Stourton (BA), Business Development Director** – 10 yrs' experience in project management, business development and stakeholder relations

- **Gavin Schafer, Soil Scientist** – 30 yrs' experience throughout Africa, MSc in Soil Science (U of Natal)

- **Dr Jiregna Gindaba, Crop Scientist** – impeccable published research career, PhD in Forest Science (U of Stellenbosch), MSc (Swedish U of Agri Sciences)

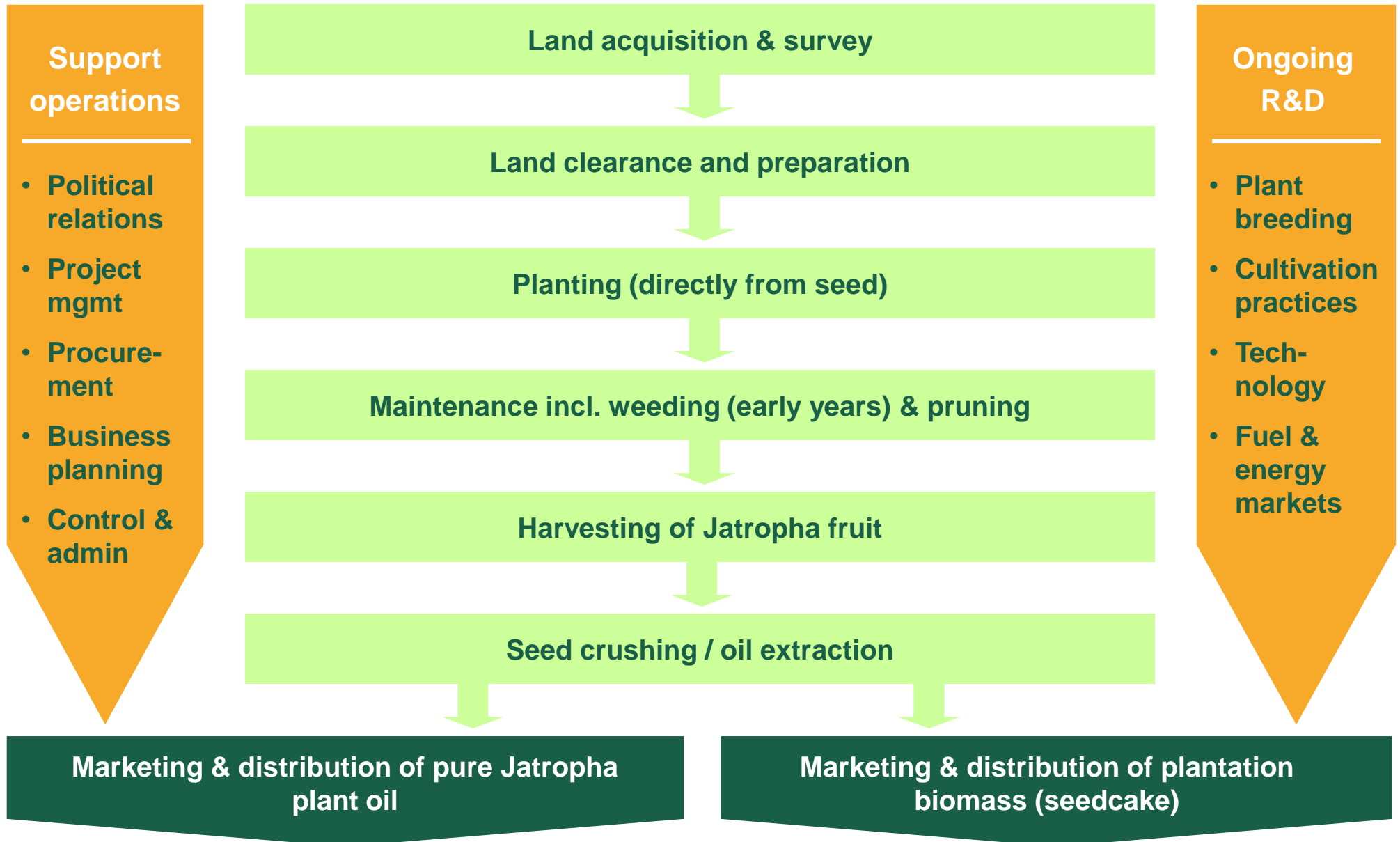
- **Support teams** – business planning, administration and financial control

Other Expertise

- Experienced consultants in key disciplines
- Affiliated companies in complementary sectors
- Network of industry contacts

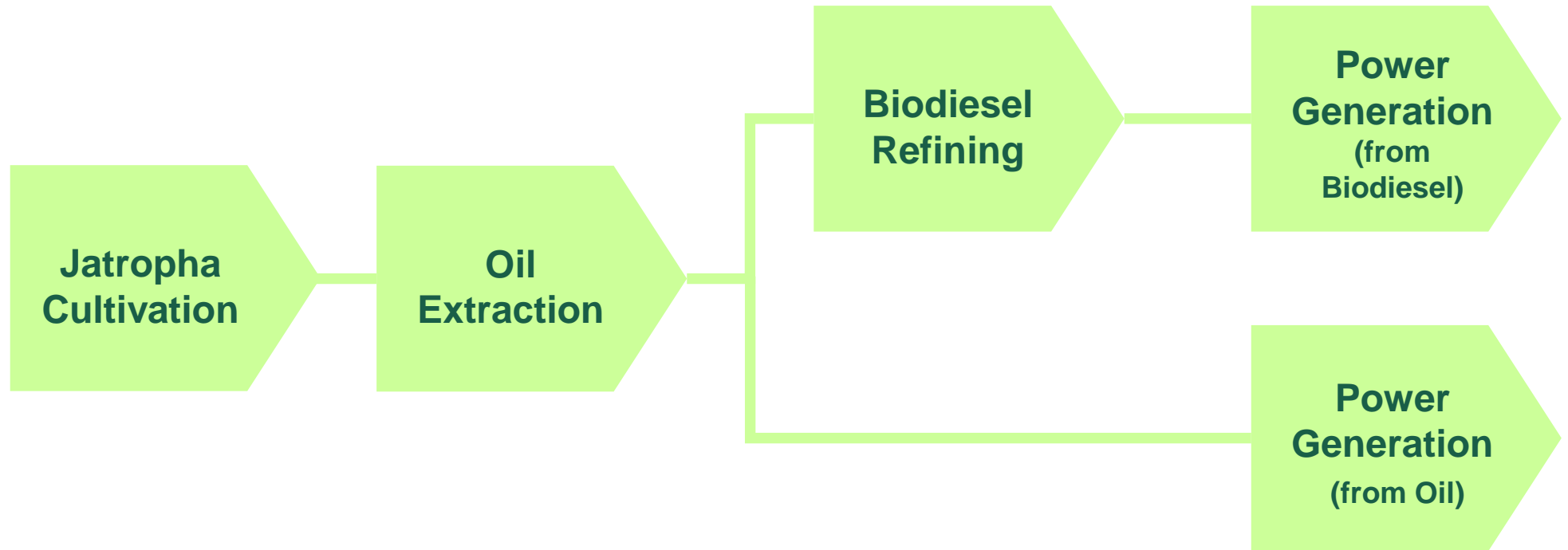
Background To Sun Biofuels

Core Business Model



Extending The Supply Chain

A Commercial Perspective



Biomass \$5-9/GJ	Oil \$18/GJ	Biodiesel \$24-26/GJ	Electricity \$40-90/GJ
	↓	↓	↓
Primary product:	\$700-725/T	\$925-1,000/T	14-32\$cts/KWh
By-product:	Seedcake \$100/T		