Biodiesel for rural development: lessons from Guatemala on how to increase livelihoods for the poor

ECOSOC – 2008 High level segment

July 3rd , 2008

TECHNOSERVE IS AN INSTITUTION WITH GLOBAL PRESENCE

TechnoServe 's offices:

- El Salvador
- Honduras
- Nicaragua
- Guatemala
- Perú
- Ghana
- Kenia
- Mozambique
- Sur África
- Tanzania
- Swaziland
- India

WHO WE ARE

Our mission: TechnoServe helps entrepreneurial men and women in poor rural areas of the developing world to build businesses that create income, opportunity and economic growth for their families, their communities and their countries.

- A U.S.-based, nonprofit economic development organization.
- Philosophy: Private enterprise can drive economic growth and positive social change; a hand up is better than a handout.
- History: Founded in 1968 by businessman Ed Bullard, who pioneered the private-enterprise approach to solving poverty.
- Staff: Talented business advisors, many of them former management consultants or industry experts.
- Partners: Leverage the expertise of strategic corporate, non-profit and government partners.
- Funding Sources: U.S. and foreign government agencies, multi-lateral organizations, corporations, foundations and individuals.

JATROPHA WAS SELECTED DUE TO IT'S ADAPTABILITY AND POTENTIAL FOR ECONOMICAL AND SOCIAL IMPACT

- **Excellent alternative to marginal areas**: low watering need, high adaptability to soils with low nutrient concentrations
- **High oil content**: aprox.1900 l/ha
- **Low implementation costs**, with **long lifespan** (30 – 50 years)
- **Common in Guatemala,** where it is used in **fences**
- **High economical value: biodiesel and Sub-products** (**organic fertilizer, *briquettes*, biogas**)
- **New opportunities for the women in the communities,** who are responsible for the sub products

Green fruit

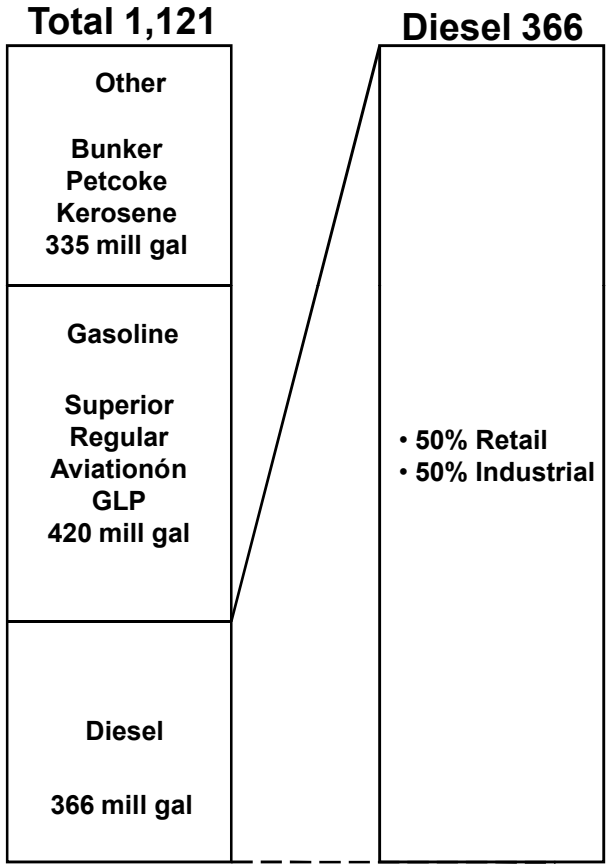
Jatropha fence

Jatropha bush

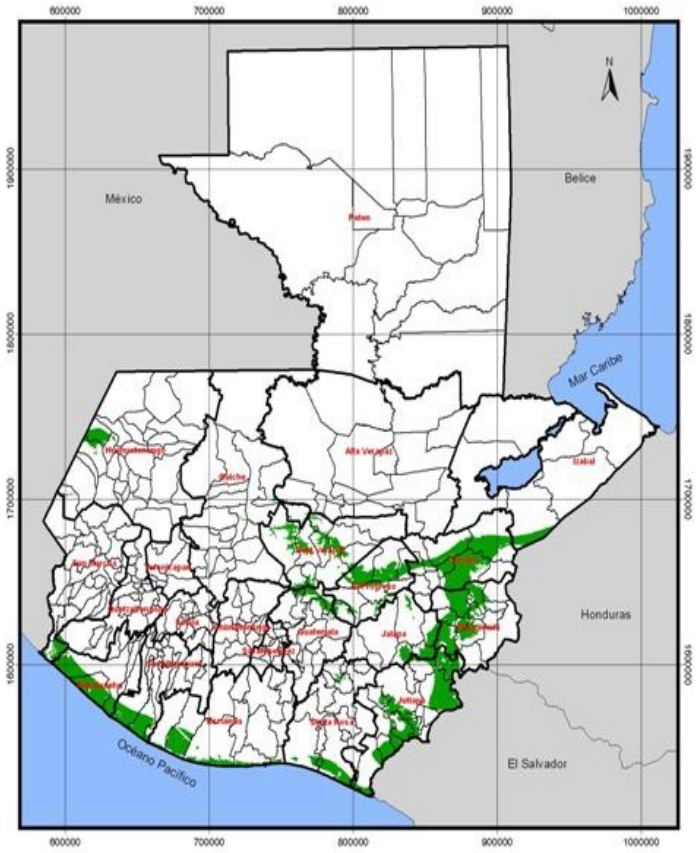
Seed

GUATEMALA IS HIGHLY DEPENDENT ON FOSSILE FUELS; PLANTING JATROPHA MAY BE A VIABLE ALTERNATIVE

Fosil fuels consumption
Millions of Gallons / year (2007)



620,000 ha of unproductive land, suitable for Jatropha production



Potential do produce 260 million gallons (6 million barrels) of biodiesel per year, substituting 80% of the imported diesel

Source: Dirección General de Hidrocarburos, MAGA, TechnoServe

TNS BIOFUEL'S APPROACH: A THREE PILLAR STRATEGY ALONG THE VALUE CHAIN

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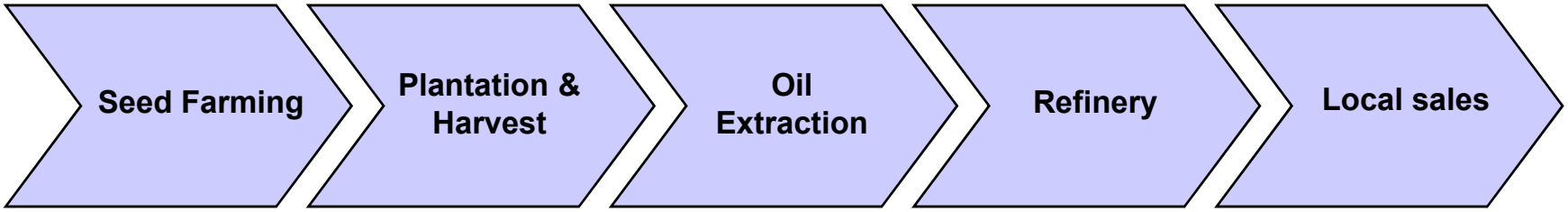


Pillar 1
Small producers

Partners:
•USAID
•AEA
Projects:
•Biodiesel for rural development
•Combined production systems (tilapia + biodiesel)

Partners:
•ICTA
•FAUSAC
•Univ. del Valle
•Bayer
Projects:
•Fodecyt
•Multicyt
•Subproduct development
•Technological packs (agriculture and industrial)

Pillar 2
R&D

Pillar 3
Large scale investors

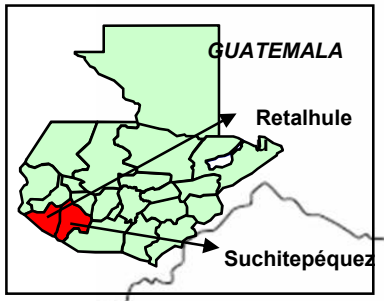
Partners:
•Jatroil
•Other investors
Projects:
•Financial models
•Central America comparison

EXPERIMENTAL R&D FIELD WITH ICTA

INVESTIGATION

-2 Jatropha varieties
-Densities: 2x2, 3x3, 4x2
- Propagation Method: seed, cuttings, “pilon”
- Fertilizacion: 7 different levels

FOUR COMMUNITIES ALREADY INTEGRATED TO THE PROGRAM



SUCHITEPÉQUEZ

Municipalidades Objetivo
E: Cuyotenango
F: Mazatenango
G: Santo Domingo

RETALHULEU

Municipalidades Objetivo
A: Retalhuley
B: Champerico
C: Santa Cruz Muluá
D: San Andrés Villaseca

Socio industrial comprará aceite bajo convenio

3 Comunidades bajo convenio

Extractora comprada en India y a instalar en Agosto 08

Área total de influencia en la cosecha de los cercos

EXECUTIVE SUMMARY

- The Guatemalan biofuels program can have a significant impact in the country's development, by reducing poverty, providing opportunities to strengthen gender equality, diversifying the country's energy matrix into sustainable alternatives and creating a base to propel development in other areas through the reduction of imports.

- Currently, small rural producers focus on planting corn, and farming cattle, both directed to subsistence consumption. The productive areas are not enough to generate income to lift families out of poverty. However, by introducing Jatropha in marginal areas, not substituting food production, these new cash crop can generate additional income for the rural families.

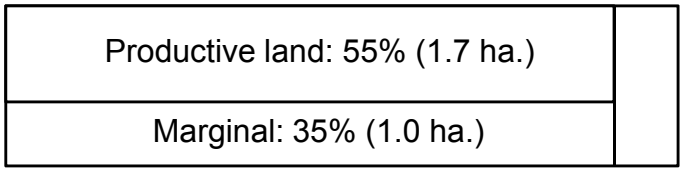
- A sustainable industry can be built on marginal areas, when based in a vegetable oil production clusters. In this model, producers are organized to generate scale for the industrial process, without utilizing areas previously allocated to food crops.

- Policy makers interest in fostering a biofuels program should, among others, foster smart incentive programs distributed over several steps of implementation, including scalable vegetable oil production in marginal lands by communities, re-forestation programs utilizing Jathropha (fixes Nitrogen), Sub-products production and commercialization (fertilizer, Brickets) and combined closed loop systems. Special care needs to be taken on environmental impact at each step of implementation

- Early taxation of this nascent industry will avoid growth

CURRENTLY, SMALL PRODUCERS ARE TRAPPED IN SUBSITANCE MODE. HOWEVER, JATROPHA CAN PROVIDE ADITIONAL INCOME

Representative land distribution for small producer (total 3 ha.)



Corn economics in Guatemala:
small producer on 1.7 ha.

Production:	6.000 kg (40% for own consumption)
(x) Sales:	$ 0.18 / kq
(=) Income:	**$ 1.100** (60% of production)
(-)Material costs:	$ 520
(-)Labor costs:	$ 0
(-)Land costs:	$ 0
Total costs:	**$ 520**
Net benefit:	$ **580**

Additional income (cattle, construction work, ect.) brings total income to $ 1,500 / year, or approx. $0.7 per person per day*.

Jatropha opportunity on marginal lands (1 ha.), including sales of organic fertilizer

Oil Production:	385 gl.
(x) Oil Sales:	$ 2.40 / gl
(=) Oil Income:	**$ 930**
Fert. Production:	4.100 kq
(x) Fert. Sales:	$ 0.15 / kq
(=) Fert. Income:	**$ 620**
Total income:	**$ 1550**
(-)Material costs:	$ 135
(-)Labor costs:	$ 0
(-)Land costs:	$ 0
(-) Extraction costs:	**$** 150
Total costs:	**$ 285**
Net benefit:	**$ 1265**

Total income, including jatropha on marginal areas, comes to $ 2765 / year, or approx. $ 1.25 per person per day*.

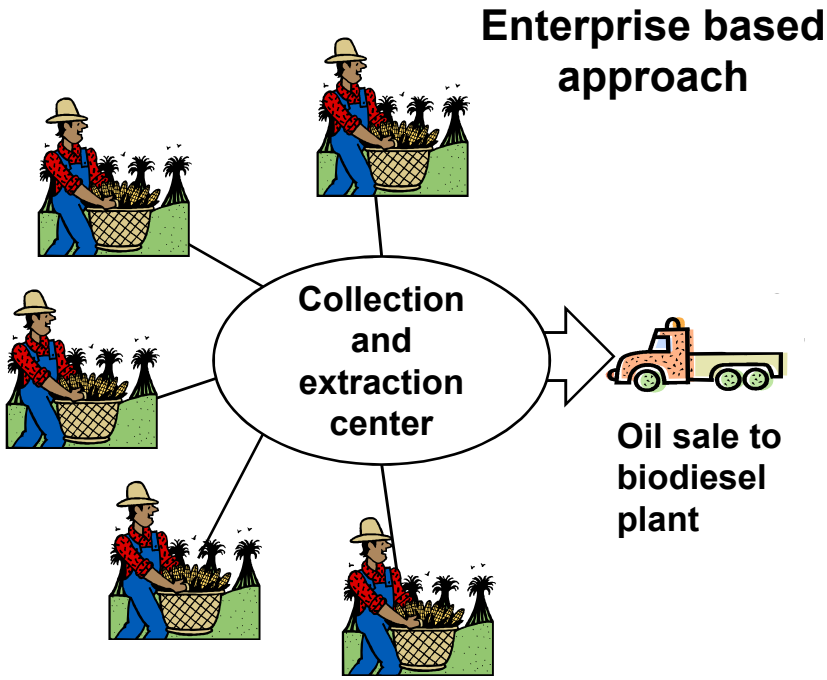
* Considering average family size of 6 members

Source: FAO (Maiz para Guatemala, 2005), Interviews, Technoserve

TO CREATE A MODEL BASED ON MARGINAL LANDS, PRODUCERS MUST BE ORGANIZED TO PROVIDE SCALE

"Communal extraction" Value Chain

•Investment of **$ 10.000** for extractor, with capacity of 3 tons seeds / day
•To produce seeds to operate extractor 270 days / year, **200 ha**. of mature plantations are required
•This implies organization of 200 producers per extraction center



Total economical value

•Total sales of Sales of **$ 310.000** per year ($ 186.00 from oil and 124.000 from fertilizer*), at full capacity
•Agricultural costs of $ 0.35 / gl., extraction costs of $ 0.40 / gl., marginal costs for fertilizer production.
•Investment can be paid in 3 years, by "charging" 5% on sales to repay investment (considering 5 year sales ramp up according to plantation maturity)

Model characteristics

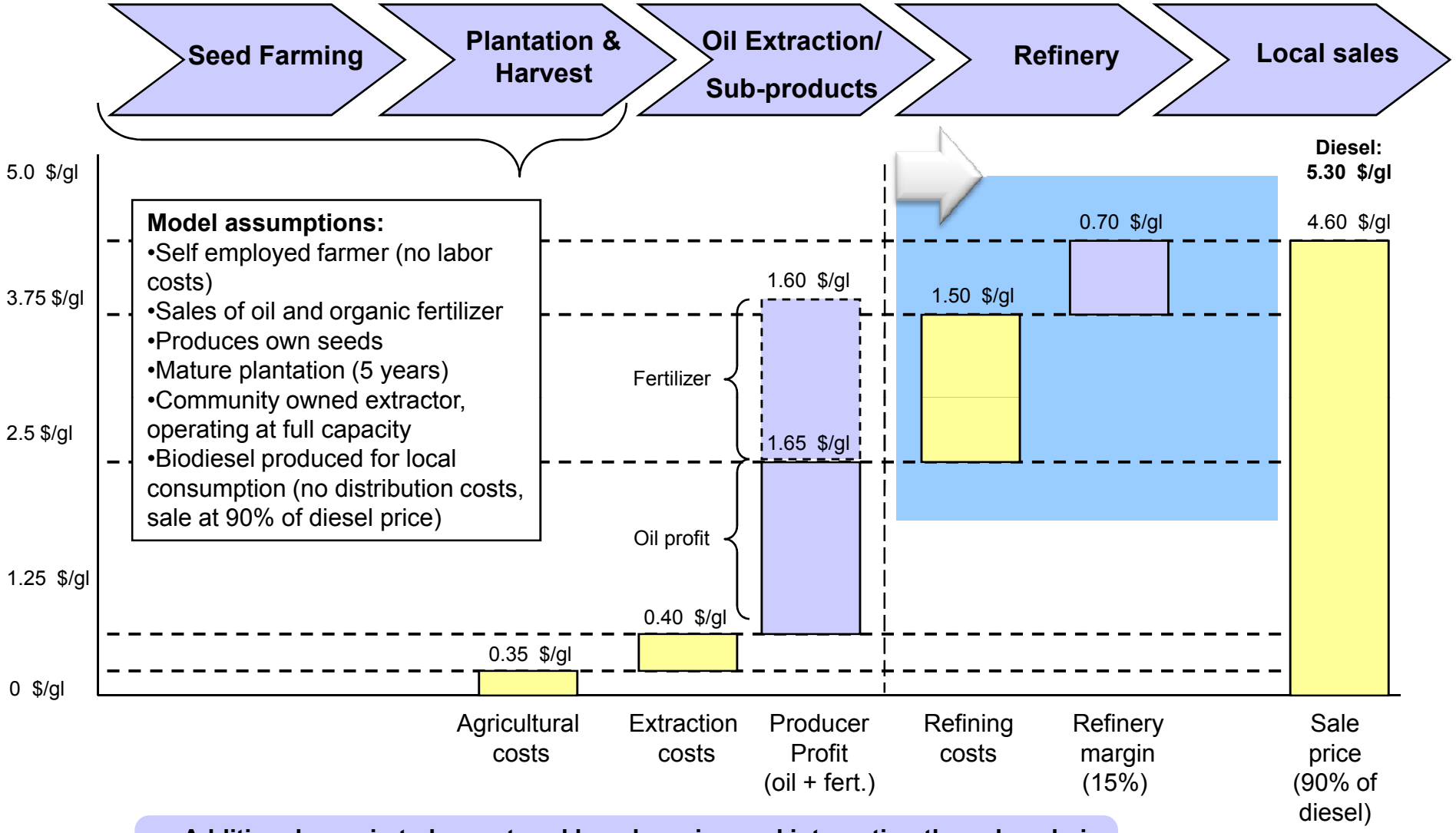
Advantages:
•Producer captures the extraction margin
•Focus on farming
•Sense of community though joint ownership
•Efficient use of extractor
•**Potential for oil export** – scale and single point of pick up

Disadvantages:
•Requires good communal organization
•200 producers must be in reasonable radius to facilitate seed transport

* Besides fertilizer, other viable subproducts that could be sold include wood *briquetts* and natural insecticides

Source:TechnoServe

INCREMENTAL PROFIT OPPORTUNITIES FOR ORGANIZED COMMUNITIES WITH SCALE



- **Additional margin to be captured by advancing and integrating the value chain**
- **Profitable operation of extractor and refinery requires minimum scale**

Source: TechnoServe

ADITIONAL OPTIONS BEING DEVELOPED TO INCREASE INCOME DIVERSIFICATION AND LEVERADGE BIOFUELS

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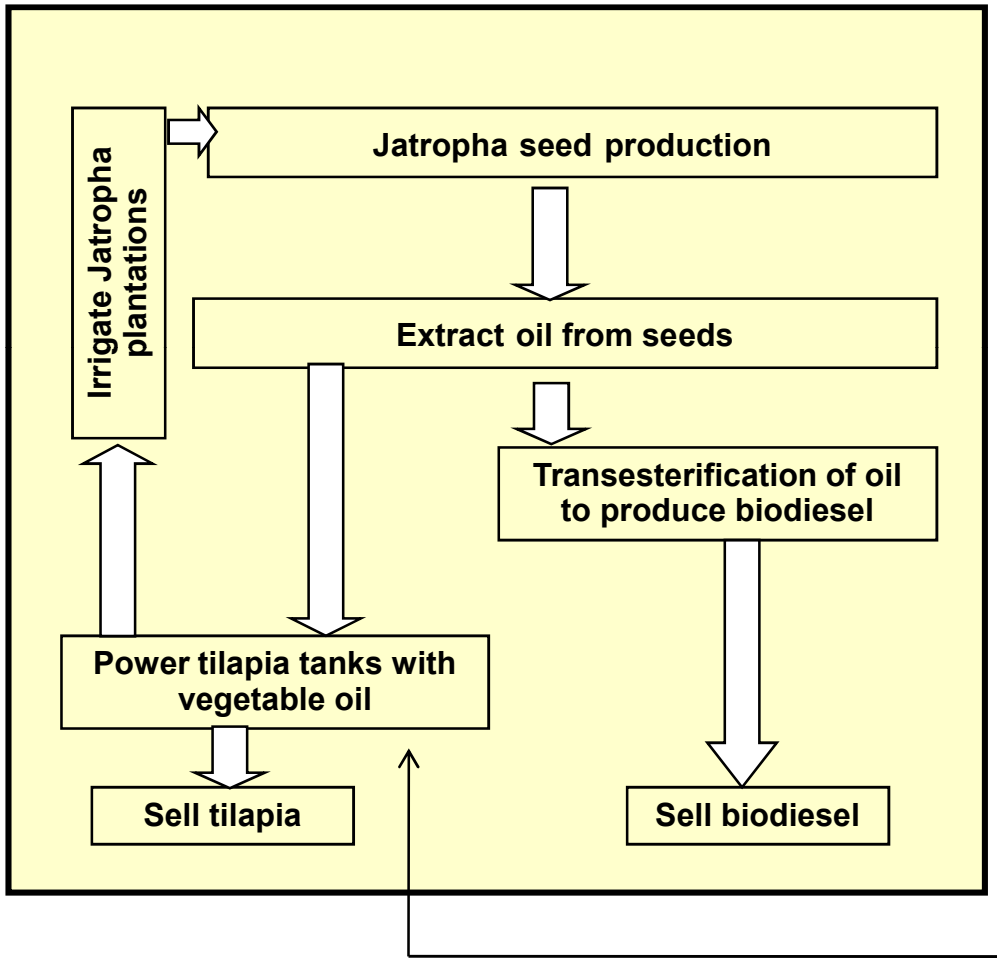
Example: combined jatropha and fish (tilapia) production



- High complementary between jatropha and tilapia production systems:
  - Estimation of up to 30% costs reduction, by substituting diesel for straight vegetable oil to operate tilapia tanks
  - Over 40% increase in jatropha seed production by watering with water disposed from ponds (rich in nutrients from fish excrements)
- Pilot being implemented in Baja Verapaz, to validate the economical model

Source: TechnoServe - Guatemala

POLICY MAKING FOR SMALL PRODUCERS CAN BE STRUCTURED IN THREE PHASES OF IMPLEMENTATION

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Phase I:

Straight vegetable oil development

- ❑ Marginal Land criteria
- ❑ Re-forestation incentives via Jatropha
- ❑ Certified seeds for Jatropha reproduction/incentives for nursery propagation
- ❑ Incentives for Sub-products production/scalable combined systems
- ❑ Vegetable oil cluster production incentives/export incentives
- ❑ Strict regulation of transesterification (wet process)
- ❑ Incentives for SVO technology

Phase II:

Biodiesel production and scale up

- ❑ Expansion of producing capacity
- ❑ Incentives for large scale cluster developments, including plantations with private sector
- ❑ Incentive for "dry washing" process in transesterification (e.g. thru the use of resins to substitute water)
- ❑ Large scale seed production, including basic and certified seeds

Phase III

Commercial distribution

- ❑ Development of a demand based system for retail
- ❑ Policy making and regulations for commercial distribution (e.g. taxes, quality assurance)

OVERALL CONCLUTIONS TO CONSIDER WHEN FOSTERING THE CREATION OF A BIOFUELS INDUSTRY

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- A detailed mapping and identification of unproductive arable areas suitable for jatropha crops can ensure that investments are directed toward marginal areas and ensure that no food substitution or deforestation occurs.

- The transesterification process produces as a deject water that should be “cleaned” before it can be reintegrated to the environment. This can be substituted by a “dry washing” method, which should be encouraged. To ensure the correct environmental precautions are taken, transesterification plants should be operated by large players, with incentives to comply with regulators and that can be inspected / certified.

- Additional research opportunities are related to substituting the methanol required in a economical way (currently it is not economical interesting to substitute the methanol for ethanol).

- The taxation of different components of the supply chain can make biodiesel not competitive (price – wise) with petroleum derived diesel, or reduce margins throughout the production chain that would limit the benefit received by small producers. As an example, in Mozambique biodiesel can be produced at a cost of $0,76 / liter. However, after taxation (fuel tax and VAT), the cost of selling is $ 1.09 / liter, while regular diesel is sold for $0.97 / liter (2007).

- Sub-products (organic fertilizers, etc.) are needed to ensure the economical attractiveness of jatropha production, and their use and commercialization should be promoted. Additionally, they provide an opportunity to integrate women into the production chain, thus strengthening their social position.

- The creation of a complete, nation-wide and sustainable industry must be constructed in timed steps, initially assuring that the model is economically validated thru pilots and that sufficient research is done, then scaling up until the industry is stable and demand driven.

Source: TechnoServe