

Hawaii Crop Production Opportunities:
what grows, what flows, what burns

Biodiesel potential and production

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[Biodiesel]

- Fuel derived from biological sources, typically vegetable oils or animal fats, used as a substitute for diesel
 - Can be used straight (B100) or in mixes (B5, B20, B50, etc.)
 - Eliminates almost all sulfur emissions
 - Significantly reduces hydrocarbon, CO, and particulate matter emissions; CO₂ neutral
 - Energy content similar to #1 oil, about 8% less than #2 heating oils
- HI derives all of its current biodiesel from WVO

[Potential Oilcrops in Hawaii]

■ Annuals?

- Soybean
- Sunflower
- Peanut
- Flax (linseed)
- Rapeseed
- Mustard
- Cottonseed

■ Perennials?

- *Jatropha curcas*
- Oil palm
- Coconut
- Castorbean
- *Moringa spp.*
- *Aleurites spp.*
- *Euphorbia lathyris*
- Gorse
- Algae

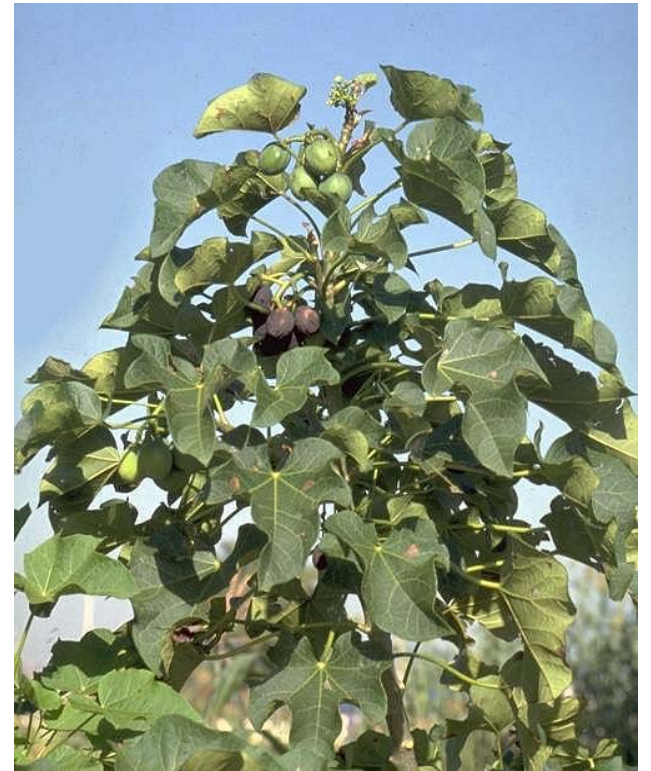
[Differing crops and climates]



Sunflower



Oil palm



Jatropha

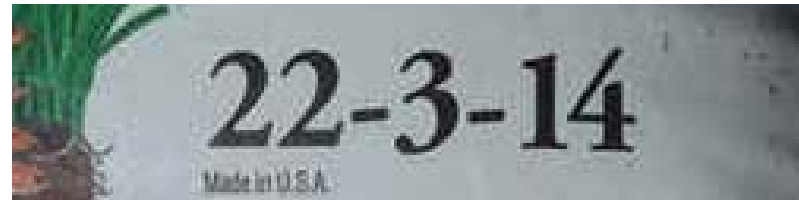
Possible yields

| Crop | Oil content | US gal ac ⁻¹ | Yrs. To production |
|---------------------------|---------------|-------------------------|--------------------|
| Soybean | 18-20% | 48 | 0.33 |
| Peanut | 40-55% | 113 | 0.33 |
| Sunflower | 25-45% | 102 | 0.33 |
| Oil palm | 40-70% | 760 | 3-8 |
| Kukui | 45-65% | 380 | 6-10 |
| Coconut | 60-80% | 287 | 5-10 |
| <i>J. curcas</i> | 40-59% | 300 | 2-3 |
| Avocado | 10-30% | 282 | 1-3 |
| <i>E. lathyris</i> | 40-48% | 315 | 0.4? |
| Algae | 10-85% | 10,000? | <1 |

Taken from: Poteet, 2006

[Agronomics of production]

- Need to isolate low-input crops with high oil yields
- Identifying crops for HI's microclimates and soil types
- Testing for production potentials



[Harvesting and Infrastructure]

- Variable crops mean variable methods of harvesting
 - What do we have that we can utilize?
- Infrastructure has weakened since disappearance of plantations
 - How to work with what we have (land, water, facilities, etc.)?

[Processing oils]

- Extraction:
 - Mechanical – screw, hydraulic, ram presses
 - Solvent – using *n*-hexane
- Conversion:
 - Alcohol (ethanol, methanol, butanol, etc.) with caustic catalyst (Na-OH or K-OH) – known as ‘transesterification’
 - Co-products – glycerin, biomass, organic fertilizers, livestock feed

[Unknowns & Bottlenecks]

- No (promising) experience with any of the possible crops
- Development of complete agronomic requirements for any crops selected, establishment of breeding programs for such crops
- Land and water constraints
- Slight adaptations to engines (seals) necessary to use fuel
- Economic feasibility of large-scale production
- Engineering of equipment for new farming and agro-forestry operations
- Market development of co-products
- Field-to-fuel tank processing unknowns

[Announcement]

**Biodiesel Crop Implementation in Hawaii
Michael Poteet – HARC**

Prepared under contract by HDOA

Posted on HDOA website:

www.hawaiiag.org/HDOA