Identifying ‘2nd-generation’ biofuel crops and their capacity for invasiveness in Hawaii

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Outline

• Agronomic development – biofuel crops
• ‘2nd generation’ biofuel crops
• ‘2nd generation’ invasives?
• Early data on jatropha in managed conditions
• Responsible R&D for sustainable biofuel production
Agronomic vs. Invasive Characteristics

• Easily propagated
• Environmentally adaptable
• Heavy seed and/or biomass yield
• Rapid growth
• Low-input (drought tolerant, low fertility requirements)
• Perennial vs. Annual
Biofuel Crop Options

• Sugar/Lignocellulosic
  – Corn
  – Sugarcane
  – Switchgrass
  – Sorghum
  – Banagrass
  – Giant Reed
  – Guineagrass
  – Albizia
  – Luecaena

• Oils
  – African oil palm
  – Coconut
  – Soybean
  – Canola
  – Algae
  – Jatropha curcas
  – Kukui
  – Moringa oleifera
  – Camelina
  – Castor
‘2nd Generation’ Crops

- ‘2nd generation’ basically implies experimental crops
  - Little commercial development in place internationally
  - Further efforts at domestication needed
  - Lessened inputs w/ greater potential yields often cited
- Are these crops potentially invasive???
Hawaii’s potential ‘2nd generation’ crops

• Fast-growing ‘energy grasses’
  – Banagrass, switchgrass, guineagrass

• Fast-growing tree species
  – *Albizia*, *Luecaena*, poplars?

• Perennial oilseed-bearing species
  – Kukui, *Jatropha curcas*, *Moringa oleifera*

• Algae
Possible invasive biofuel crops in Hawaii

- Guineagrass
- Chinese tallow tree
- *Jatropha curcas*
- Haole koa (*Luecaena* sp.)
- Kukui
- Castor
- Algae
Agronomic case study: Jatropha

Totals extrapolated from data taken in Kunia (Central Oahu) from field planted in Sept. 07. Numbers represent a per acre basis for 1,000 trees/acre. Assume 2.68 seeds per nut.

<table>
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<th>Flow Rate</th>
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Agronomic case study: *Jatropha*

- *Jatropha* sp. Includes over 180 species
- *J. gossypifolia* is highly invasive and toxic
- *J. curcas* often given invasive label due to toxicity and presence of invasive members within genus
  - Some worrisome char. ➔ vegetative prop.
Agronomic case study: Jatropha

• Attempting to develop a system for automated production

• Direct-seeding, drip irrigation, minimum tillage

• Removal of fruits from soil surface, tree branches, or both
Balancing production with potential degradation

• Research in crop development must address ecological impacts
  – Focus programs to incorporate data collection on invasive nature of species

• Long-term cropping systems vs. short rotation systems
  – Questions of sustainable production

• Non-food vs. Food crops
Responsibility of research community

• Agriculturalists coordinate with weed ecologists

• Advocacy groups given input and updates on work with ‘2nd generation’ crops

• Encourage public officials and agencies to establish protocol for new commercial operations where potential invasives are utilized

• Keep communities abreast of activities