Assessing the Feasibility of Cultivating Arundo in the Mid-Columbia River Basin

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Research Questions

- Is Arundo a good choice of bio-energy crop given its highly invasive nature?
- What is of key significance in assuring Arundo cultivation succeeds?
How Green is Oregon

- PGE Boardman
  - Roughly 15% of PGE Electricity Production
  - 585-MW coal-fired electricity generating plant
  - Transferring to biomass by 2020
  - Biomass Crops:
    - Juniper, Pine, Corn Stover, Poplar, etc
    - Arundo
What is Arundo?

- **Arundo donax**
  - Perennial cane
  - Asexual reproduction
  - Native to Mediterranean
  - Similar to bamboo
  - Already in Oregon (Ornamental Plant)

- Why is there an issue?
  - *(Highly) Invasive in U.S.*
  - Highly resilient (CA)
Why Invasion is a non-issue

Average Annual Precipitation (2009)
Land Viable for Production of Arundo

Boardman  
Hemiston
Cultivation & Harvest

- Water
  - Up to 25 in. year/acre

- Nutrients
  - N: 0-60 lbs/acre

- Pesticides
  - Little to none (Round-Up Ready applied at start)

- Man Hours
  - Intensive
  - 1 man-hour/acre
  - Replanting bald spots 20 man-hours per acre

- Tons/acre by year
  - 1\textsuperscript{st}: ~12-14
  - 2\textsuperscript{nd}: ~22
  - 3\textsuperscript{rd}: ~30+

- Price: 65-70 USD/t
  - Coal: ~30 USD/t

- Market: Competitive with Corn but cannot exceed price of wood pellets

- Business Plan:
  - 5 year contracts
  - Easiest for Potato & Onion Farmers, Possible for Wheat
    - PGE potentially helping cover initial startup costs
Energy Production

Sulfur Dioxide Emissions Potentials

Fuel Source

Portland State
Enough Land to Meet Demand?

- Boardman requires 1.8 million tons before the plant fires up
  - Burns 8,000 t/hour

- Viable land near Boardman
  - 495,868.8 acres
  - At lowest 1\textsuperscript{st} year production (12 t/acre) = 5,950,425.6 t/acre
    - Theoretical maximum of over 30 t/acre
    - 35\% loss in mass with torrefaction
    - Still Enough
    - Only requires 62,000 acres

- Energy Production
  - Only 6 months/year
    - Off-time spent on torrefaction and maintenance
Boardman without Arundo?

- While feasible, not economically lucrative
- Other sources of biomass
  - Use rail to transport timber from other states
- Downside
  - Dependency
  - Not supporting local economy
    - Unemployment rate in Morrow and Umatilla
Why this project matters

- Oregon state law
  - 10 Year Plan
- Climate Change
- Renewable energy
  - Cost-efficient competitor to coal
- International Scale
  - Creates global opportunity to harness Arundo biomass and convert from coal

EXTENSION
- Works with all stakeholders
- Collaboration between Farmers, Land Grant University, and Private Owned Utility
Conclusions

Limitations
- Unfinished Enterprise Budget
- Conflicting work schedules
- Estimated prices of Arundo

Results
- Arundo is a good and viable bioenergy crop
- Chances of invasion are very slim when following strict guidelines for cultivation
- In order for this plan to work, PGE must convince farmers to grow Arundo
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Sources


Thank you

Questions?