Presentation Outline

• Bioethanol Production: An overview

• Sugarcane as feedstock for ethanol production-availability

• GIS on feedstock management and planning

• Potential GIS initiatives in process industries

• Environmental & Social Perspectives
Project Goals

• determination of the exact area planted with sugarcane
• establishment of a computer-supported geographic-based database management system for sugarcane farms
• providing management information to sugar industry stakeholders
Bioethanol Production: An Overview

- Bioethanol – is a light alcohol produced by fermenting carbohydrates, such as starch or sugar and is mixed to gasoline up to 10% blend
- Benefits:
  - Clean fuel
  - Boosts octane level help the car run smoothly
  - Biodegradable and has few harmful effect with the environment
- \(~20.7\ M\) liters produced in the Philippines = 0.032% (65, 621.21 M liters) of the total world’s production
Policy Support from the Government

- Republic Act 9637 – Biofuels Act of 2006
  - Mandates the blending of 1% biodiesel in PetroDiesel and 5% of bioethanol in gasoline for the first 4 years.
Feedstock for Ethanol Production within The Philippines

<table>
<thead>
<tr>
<th>FEEDSTOCK</th>
<th>MT/HA</th>
<th>Li/MT</th>
<th>Croppings</th>
<th>Li/Ha/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugarcane</td>
<td>65</td>
<td>70</td>
<td>1</td>
<td>4,550</td>
</tr>
<tr>
<td>Cassava</td>
<td>8</td>
<td>180</td>
<td>1</td>
<td>1,440</td>
</tr>
<tr>
<td>Sweet Sorghum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Stalk</td>
<td>50</td>
<td>50</td>
<td>2</td>
<td>5,000</td>
</tr>
<tr>
<td>• Grain</td>
<td>3</td>
<td>375</td>
<td>2</td>
<td>2,250</td>
</tr>
</tbody>
</table>

Source: Bureau of Agricultural Research, Department of Agriculture (www.bar.gov.ph)
SCBI: 1st Integrated Bioethanol and Co-generation Power Plant

- Situated in San Carlos City, Negros Occidental
- Requires 450,000 tonnes of cane spread over 10 months
BIOETHANOL PRODUCTION PROCESS FLOW

1. **Sugar Cane** → **Mill**
   - Juice
   - Bagasse
   - Biogas

2. **Mill** → **Syrup House**
   - Syrup
   - Mud Press

3. **Syrup House** → **Boiler**
   - Steam

4. **Boiler** → **Powerhouse**
   - Electricity

5. **Powerhouse** → **Wastewater Treatment**
   - Recycled Water
   - Wastewater
   - Compost
   - Irrigation Water

6. **Wastewater Treatment** → **Fermentation**
   - Mash

7. **Fermentation** → **CO2 Plant**
   - CO2 Gas

8. **CO2 Plant** → **Distillation**
   - Fuel Alcohol

Source: San Carlos Bioenergy, Inc
Overview of Methodology

1. Data Collection
   - GPS Survey
   - Key Informant Interviews

2. GIS Data-Building and Validation

3. Spatial Analysis

4. Production of Maps
GIS on Feedstock Management & Planning

- District wide validation & mapping of sugarcane areas
  - Assess total available cane & allocation for ethanol production
  - Helps in the assessment & determination of the size of bioethanol facility
GIS on Feedstock Management & Planning

- District wide validation & mapping of sugarcane areas
  - Determines suitable sources based on distance to the plant
  - Assess areas that are productive and areas that would need assistance in increasing productivity level
CURRENT CANE HARVEST PRACTICE

- Excessive supply during dry months
- Deficit supply during wet months
  - Need to: REPROGRAM/RESCHEDULING of farm operations from planting, ratooning, cultivation and other farm practices with the choice of appropriate variety
GIS on Feedstock Management & Planning

- Determine market competition
  - Assist in market strategies & Pricing
- Instrumental in logistic planning
  - Determine farm distance to the plant and assess road types
  - Determine truck requirements per area
• ≈ 10,000 hectares planted with sugarcane or 2.51% of the country’s total sugarcane plantation
• ≈ 467 total number of planters - surveyed
• ≈ 650,000 Mtons – cane yield or 3% of the country’s total cane production
GIS on Farm Planning & Operations
Gamboa Multi-purpose Farm-Workers Cooperative

PAGWEING DISTRIBUTION PLAN
GIS on Farm Planning & Operations

- Annual record of variety planted and its performance
- Assess productivity level of each field
- Records amount of fertilizer application and water level intake, in the case of irrigated fields
Potential GIS initiatives in Process Industries

• Raw Material Inventory

• Design Mass Balances

• Optimization of Equipment and Plant capacity

• Production Schedules
Conclusions

• **Bioethanol is:**
  ▫ supported by the Philippine Government policy
  ▫ Clean and environmental friendly
  ▫ Reducing pollution but not the global warming

• **GIS is:**
  ▫ Helpful in bioethanol production monitoring through its ability of:
    • Recording the variety and area planted
    • Assessing the productivity per field
    • Elaborating scenarios for the future