IP ERASMUS 2014 : EFFICIENCY AND EQUITY TRADE-OFF IN EUROPEAN AGRO-ENERGY DISTRICT

EFFICIENCY AND EQUITY TRADE-OFF IN AGRO-BIOGAS SUPPLY CHAIN

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BIOGAS: GASEOUS FUEL PRODUCED BY THE FERMENTATION OF ORGANIC MATTER
EUROPEAN DIRECTIVE 2009/28/CE (RED)

- SUPPORTS LITTLE PLANTS THAT USE BY-PRODUCTS
- PROMOTES INNOVATIONS THAT HELPS THE ENVIRONMENT
- INTRODUCES COMPREHENSIVE RATE OF 0.28 €/KW
INNOVATION NICHE

LA QUERCIA AS A SUPPORTER OF THE NEW TECHNOLOGY

Source: Geels and Schot (2007, p. 401)
PRODUCTION OF BIOGAS
PRODUCTION OF BIOGAS: INPUT
INPUT

1. Domestic organic waste  4. Liquid or solid manure
2. Green and plant wastes  5. Energy crops
3. Communal sewage sludge  6. Industrial food waste

Raw materials used by the plant “La Quercia”:

• zootechnical effluentes (sewage and manure) from their buffalo breeding;
• energy crops (maize silage and triticale);
• by-products (fine bran);
• industrial residues (serum);
• food-industry waste (tomatoes and onions taken seasonelly).
SWOT ANALYSIS
IN BIOGAS PRODUCTION

- Strengths
- Weakness
- Opportunities
- Threats
STRENGTHS

- Renewable Energy
- Solution for organic waste disposal problem
- Reduction of global warming & carbon footprint
WEAKNESS

- Biogas generated will be at atmospheric pressure
- Animal husbandry – high climate change impacts
- Climate change has overall negative impacts on livestock farming
OPPORTUNITIES

- Attraction of facilitating factors to area
- Use of biogas as biofuel for transportation
- Value creation cycle promotes sustainable biogas production
THREATS

- Competition with fossil fuel and other energy alternatives

- No increase in facilitating factors (economic resources, political support, knowledge capital)

- Investments in biogas production and energy infrastructure not becoming profitable
SUBSTRATE MIXING
DIGESTOR

55°C
WATER SCRUBBING SYSTEM
CHP UNIT

1 MWe
0.987 MWt
WATER SEPARATION AND DRY COMPOST
**DAILY AMOUNTS**

- **Substrate**
  - Anaerobic digestion system
    - Air: 1200 m³
    - Biogas: 11040 m³
    - Digestate: 110 m³
- Component fractions separation
  - Liquid: 76,97 m³
  - Solid: 32,4 m³
- Digestate liquid fraction storage tank
  - Land farming
  - Fertigation: 15,394 m³
- Digestate Liquid fraction storage tank
  - Digester: 61,576 m³
- Digestion chamber: 9948,96 kW
- Self consumption: 2400 kW
- Input to grid: 21600 kW
- Waste: 12317,76 kW
- In-air emission
- Desulphurization treatment
  - Purified biogas: 12000 m³
  - Waste water: 3,6 m³
  - Nutrients: 10,226 l
- Purified biogas: 12000 m³
  - Cogeneration
    - Electricity: 24000 kW
    - Heat: 23688 kW
  - Digestate liquid fraction storage tank
    - Waste water: 3,6 m³
  - In-air emission
  - Water: 3,6 m³
Simplified flow diagram of a generic anaerobic digestion plant based on organic feedstocks.
DECISION MAKING SIMULATION GAME

Workshop → Stakeholders/Groups

A → Farmers
B → Biogas Producers
C → Electricity Distribution Company
D → Local Community
E → National Government
F → Bankers

Decision making criteria
- Return on Investment
- Annual revenues
- National economy
- Regional/Local Economy
- Application of New/Innovative Technologies
- Employment
- Environment
- Political and institutional benefits
- Other criteria (local acceptability)

Information/Workshop:
1. Members of the team
2. Different information from literature
3. A workshop in biomass plant
4. Colleagues
## ASSESSING OVERALL PROPERTIES

### Decision Making Criteria

<table>
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<tr>
<th>Decision Making Criteria</th>
<th>Sum of Stakeholder Rank</th>
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<th>Decision Making Criteria</th>
<th>Rank of Each Interest Group/Stakeholder for the Decision Criteria</th>
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<th>Overall Ranking of Importance</th>
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## ASSESSING POTENTIAL ALLIANCES AND COMPETITION

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DECISION MAKING SIMULATION GAME – CONCLUSIONS & SUGGESTION

Conclusions

Biggest Problem → Local Community

Case study → Biogas Plant “La Quercia”

Real Results:
1. Local Acceptance (In general)
2. Some complains
3. Continuous check from NGO’s
GENERAL CONCLUSIONS & SUGGESTION

1. GIS → Position of plant
2. DEA → Max efficiency
3. Analysis of the Stakeholders & the direct & indirect benefits of each one → Importance → Take measures → Balance everyone's need
MAKING SUGGESTIONS FOR THE FUTURE

- Challenge for the land use in next years
- More efficient use of food waste
Thank you for your attention!
Grazie per la vostra attenzione!
Va multumesc pentru atentie!