Rural Social Bio-refineries - RUSBI
Production and local use of hydrated ethanol to promote energy self-sufficiency, agricultural development and food security in Latin America and the Caribbean

“How to make integrated-energy systems work for both small-scale farmers and rural communities in a climate-friendly way”
Technical Consultation
FAO headquarters, Rome. 14-15 July 2010
RUSBI
Technological components

1. Competitive and sustainable production technologies for three energy crops: cassava, sweet sorghum and sweet potato

2. Technologies platforms to obtain fermentable biomass

3. Technology platform for production of hydrated ethanol

4. Local uses for hydrated ethanol

5. Technologies platforms for sustainable management of wastes and effluents

- Agricultural Development
- Food Safety
- Energy Self-Sufficiency

- 500 – 1000 liters/day
- 10 – 20 farmers families
- US$ 100,000
WHY RUSBI???? WHAT FOR?????

Hydrated ethanol (96% GL)
  Flex-fuel technology
  20% more consumption per kilometer
  20-30% cheaper
  CO2 reduction

Clean-cooking stoves
  1 liter hydrated ethanol = 4 hours cooking
  Low cost stoves
  Households health; deforestation

Bio-electricity
  4 liters hydrated ethanol = 1 hour electricity
  110-220 v ; 8.5 kwa
  400 light bulbs
  Crops processing at village level
  Improved quality of life in poor rural households
Component 1. Competitive and sustainable production technologies for three energy crops: cassava, sweet sorghum and sweet potato

What did work?
- Varieties
- Production technology

Why?
- Solid scientific base (CGIAR Research)

What did not work?
- Easy access of farmers to improved varieties (sweet potato and sweet sorghum)

Why not?
- “Restrictions”
  (Sweet potato, sweet sorghum)
Component 2. Technologies platforms to obtain fermentable biomass

What did work?
- Technology platform (chipping, grating, drying, milling)

Why?
- Solid scientific base (CGIAR Research)

What did not work?
- Artificial drying system

Why not?
- More sophisticated technology
- More expensive
Component 3. Technology platform for production of hydrated ethanol

What did work?
- Prototype
- Conversion process
- Process efficiency
- Quality

Why?
- Good Community of practice
- Good partners
  (USI-Brasil, UFRGS-Brasil, Ministry of Agriculture-Colombia, SoilNet-USA, Colombian Universities and others)

What did not work?
- Processing costs
- Energy balance

Why not?
- Still high
- Need to reduce dependency on imported inputs (enzymes, yeast)
- Neutral net energy balance
Component 4. Local uses for hydrated ethanol

What did work?
- Uses as fuel, bioelectricity, clean cooking stove
  - Good market potential

Why?
- Good quality of the hydrated ethanol for use as biofuel
  - Equipments available (cars, stationary engines, clean cooking stoves)

What did not work?
- Bioelectricity Station Engine

Why not?
- Functioning problems
  - Difficult maintenance
Component 5. Technology platform for sustainable management of wastes and effluents

What did work?
- Efficient flocculation technology
- Animal feed products (design, fabrication, and consumption)

Why?
- Solid Scientific base (polymers)
- Good Results in bio-economic trials (good conversion rates)

What did not work?
- Variability in the processing of animal feed products

Why not?
- Quality of raw material coming from bio-refinery is not uniform
## Component 1

Competitive and sustainable production technologies for three energy crops: cassava, sweet sorghum and sweet potato

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Potential solutions</th>
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<tbody>
<tr>
<td><strong>Concept of growing bio-energy crops is new for small-scale farmers groups (sweet potato, sweet sorghum)</strong></td>
<td><strong>Need to promote scaling-up, grass-roots validation and adjustment of promising approaches based on tropical, easy to produce, bio-energy crops (cassava, sweet potato, sweet sorghum)</strong></td>
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</tbody>
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| | |
| Difficult for small-scale farmers to have access to improved germplasm (sweet potato, sweet sorghum) with potential to be used as bioenergy crops. | Unlock the wealth of genetic resources available at CGIAR Centers (CIAT, CIP, ICRISAT) and other non-CGIAR Centers (Embrapa, CATAS) |

| | |
| Lack of institutional support (financing, technical assistance, market information, IFES oriented policies) | Promote incentives and support to small-scale scale agriculture and bioenergy production as two strategic policies at country level |
## Component 2

### Technologies platforms to obtain fermentable biomass

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<tr>
<td><strong>Lack of infrastructure, especially in rural, marginal areas (roads, electric energy)</strong></td>
<td><strong>Promoting policies and strategies that identify and select areas of unique interest for development of IFES approaches</strong></td>
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<tr>
<td>High cost of equipments for conditioning the bioenergy crops into fermentable biomass (washing, peeling, grating, drying, refining)</td>
<td><strong>Integrate IFES development into existing rural development policies and programmes</strong></td>
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<tr>
<td>Lack of know-how by farmers groups and technical personnel</td>
<td>Establish specific types of support for small-scale, poor farmers-based IFES approaches <em>Brazil example: credit lines for investment in bioenergy infrastructure (10 years, 3 years free, interest rates of 2% per year).</em></td>
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<td><strong>Promote transfer of technologies, expertise and experiences about IFES approaches, within and between countries</strong></td>
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## Component 3  
**Technology platform for production of hydrated ethanol**

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<tr>
<td>High cost of equipments</td>
<td>Establish specific financing programs for establishment of bioenergy infrastructure (subsidised credits, income tax reduction, cash subsidies linked to production levels)</td>
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<tr>
<td>Lack of technical and specialized support (technical know how, maintenance, spare parts)</td>
<td>Build capacity of technical personnel on technical, and managerial skills</td>
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<tr>
<td>Lack of know-how by farmers groups</td>
<td>Build capacity and educate farmers groups (technical, managerial and administrative skills)</td>
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### Component 4  Local uses for hydrated ethanol

#### Constraints
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<tr>
<td>![Checkmark]</td>
<td>Lack of an “official policy” that includes hydrated ethanol as part of the bio-energy portfolio</td>
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<td>![Checkmark]</td>
<td>Small-scale of the process is usually associated with ethanol in traditional fossil fuel with not-competitive price compared</td>
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<tr>
<td>![Checkmark]</td>
<td>Lack of financing opportunities and mechanisms to facilitate access of poorest sectors of rural populations to bioenergy approaches</td>
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<tr>
<td>![Checkmark]</td>
<td>Lack of local know-how and capacity for operation, monitoring and maintenance of conversion system (boilers, engines, stoves, distillery)</td>
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#### Potential solutions
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<tr>
<td>![Checkmark]</td>
<td>Establish a policy framework to promote and support decentralized, local production and uses of hydrated ethanol</td>
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<tr>
<td>![Checkmark]</td>
<td>Promote use of hydrated ethanol in remote, marginal rural areas where fossil fuel prices are high due to transport costs</td>
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<td>![Checkmark]</td>
<td>Implement a “Financing Development Approach” - Subsidies granted for bioenergy production and uses BUT transparent and linked to development policies</td>
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<tr>
<td>![Checkmark]</td>
<td>Implement capacity building programs for helping farmers and agricultural technical assistance and extension officers, to build the know-how required for sustainable bioenergy production</td>
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## Component 5

### Sustainable management of wastes and effluents

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<tr>
<td>High volumes of wastes and effluents produced, with high contamination</td>
<td>Develop conversion processes that help to reduce the amount of effluents generated</td>
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<td>potential 1 liter biofuel = 10-15 liters vinasses</td>
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<tr>
<td>Need for storage infrastructure for management of the effluents generated</td>
<td>Develop alternative uses for non-treated effluents (irrigation, animal feeding, crop fertilization)</td>
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<tr>
<td>High cost of current technologies for sustainable management of wastes and</td>
<td>Develop alternative, cheaper technologies for waste management</td>
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<td>residues (<em>polymer-based solid floculation; Biogas generation</em>)</td>
<td>(i.e. <em>Moringa Oleifera seeds as solid floculant, water clarification technology</em>)</td>
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Video
Summary

2.5 to 3 billion people around the world depend on traditional forms of bioenergy to cook their food (coal, wood, dry animal manure)

1.6 billion people around the world does not have access to electricity

Lack of access to energy is a great barrier for economic development and growth, especially in isolated areas in which the installation of electric grids is very expensive.

The majority of poor people live in rural areas; hunger also concentrates in rural areas. Greater investment and emphasis should be put in agricultural and rural development, if hunger is to be reduced faster.

In countries and regions with limited access to modern forms of energy, governments and development agencies support for small-scale biofuel production can improve access to energy, with positive effects on rural development, poverty and hunger alleviation.
Support Policies

- Blending mandates (compulsory use of biofuels)
- Compulsory production of cars using biofuels
- Tax incentives
- Government purchasing policies
- Support for biofuel compatible infrastructure and policies
- Research and development (bioenergy crops, conversion technology development, wastes and residues handling)
- Subsidies during initial market development
- Stimulate rural activities based on biomass energy
Thank you