Biofuel Technology Options
a primer

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Sources: renewables global status report 2009 update;
FACT data

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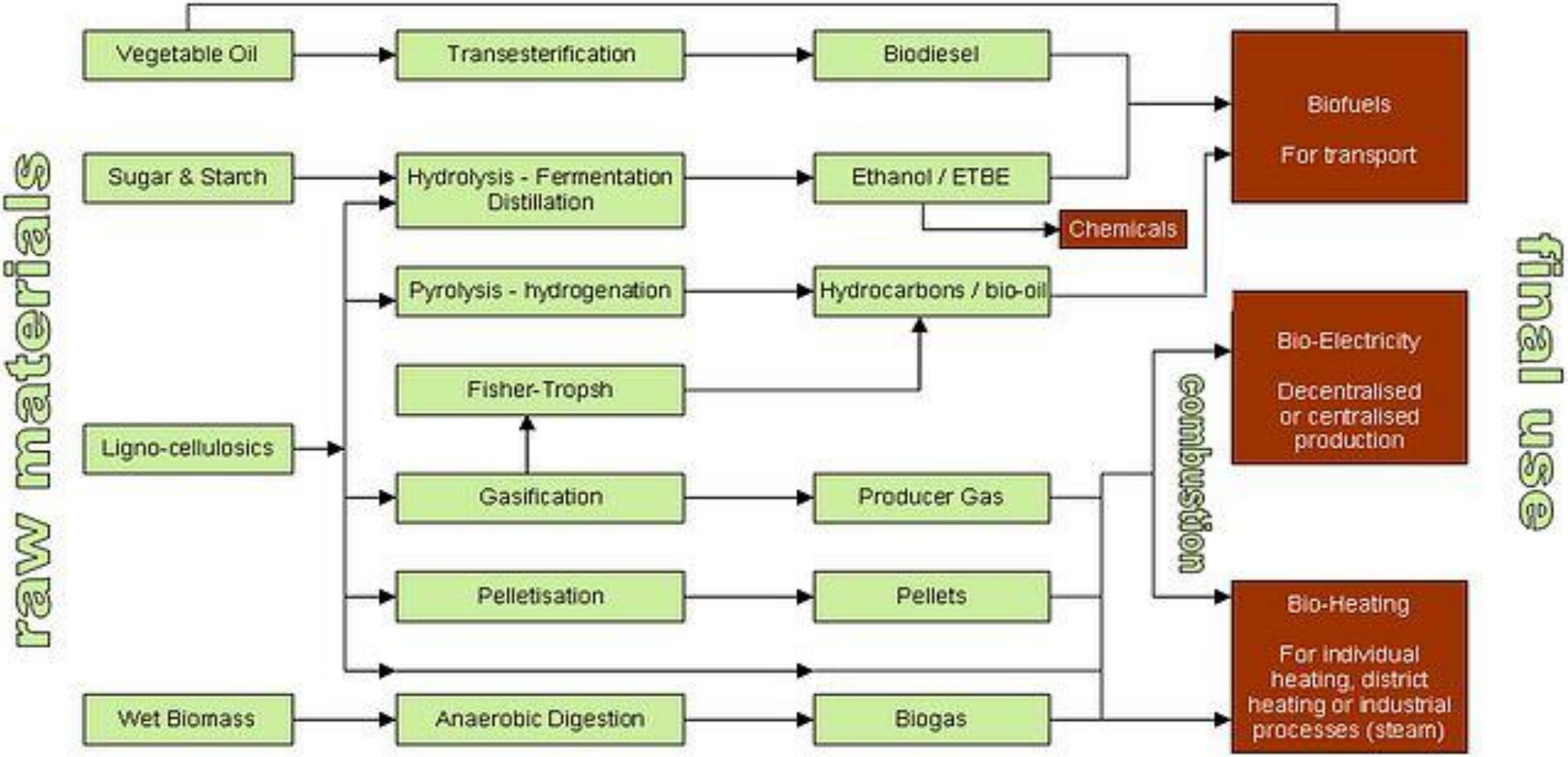
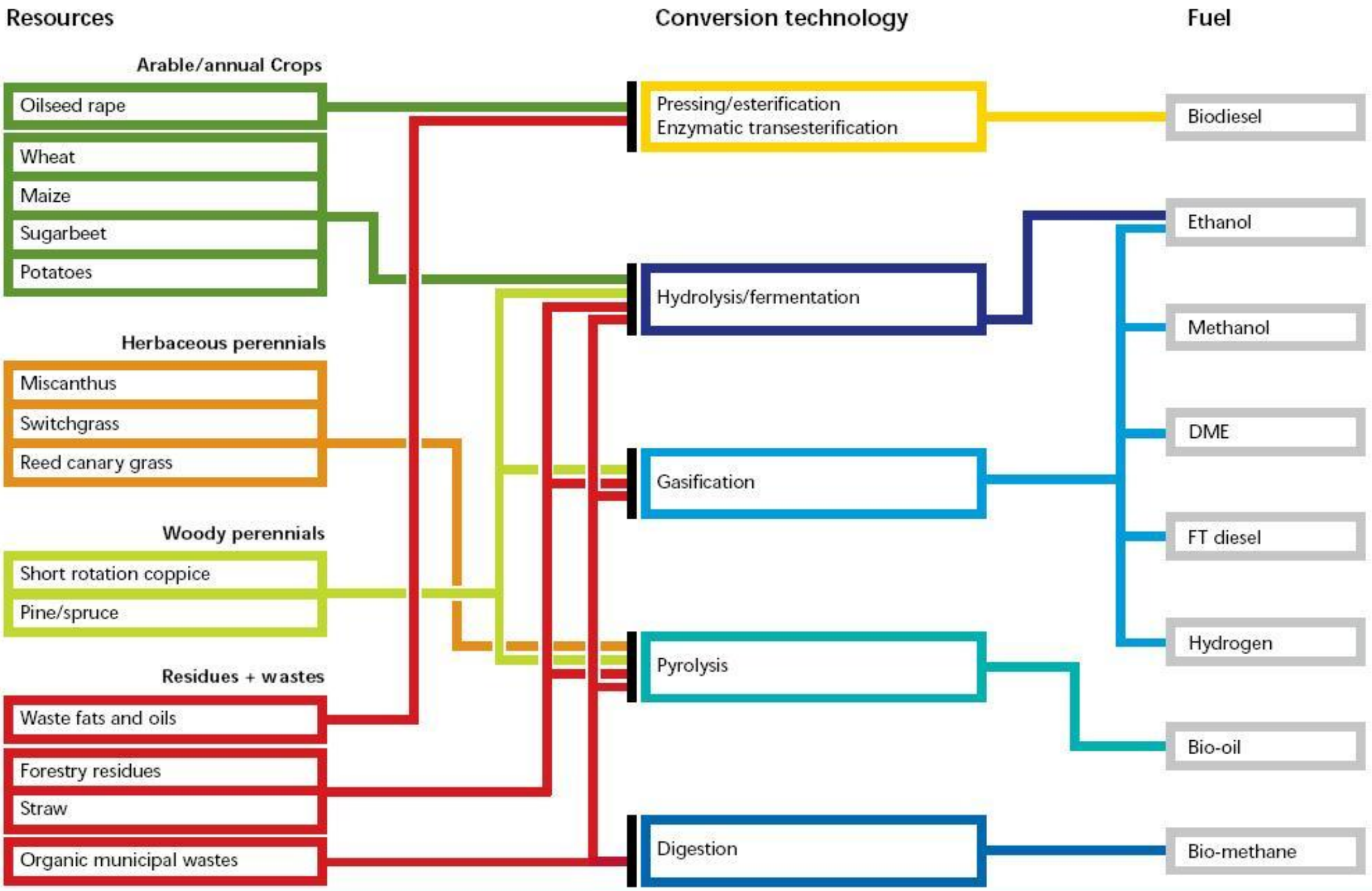
Conversion Processes to biofuels



EUBIA 2007

Figure 1: Biofuels pathways



How to analyze the previous

- Distinguish between feedstock, conversion path and application
- Two ways to approach:
  - look at the resource and convenient path
  - Look at the application: what is the demand of the target group (the village population or farmers association, etc)
- Consider both for success:
- Aspects to consider:
  - Social/organizational/managerial;
  - Technology environment;
  - Financial/economic;
  - Institutional/legal/policy.

Biofuels feedstocks

- Pure Plant oils
  - eg sunflower, soy, peanuts, jatropha
- Sugar starch
  - sugar cane, cassava, potatoes
- Lignocellusic
  - Wood, cotton stalks, corn cobs
- Wet protein rich
  - Press cake; vegatable leaves; weed

FACT finding on the resource

- Assessment of resource volume, quality and specification; availability over time of year;
- Expected growth or decline of the resource volume, quality and availability;
- Current and expected uses of the resource (% of the total available)
- Uses of the resource by social group;
- Current and expected prices per use of the resource.
- Locations of the resource availability: spread, or concentrated;

Some advice

1. See to that the resource or feedstock can deliver the required energy product (e.g. PPO for sale, electricity)
2. If resource is expected to be available/the current uses allow the use of the **non used** part;
3. Risk analysis on the resource volumes; prices and quality issues;
4. See to that the whole chain is competitive with other land uses and activities
5. If no resources from existing agri or forest resources are available, then the first idea is to look at use of underutilized lands, waters, etc, and only if that is not available combine with food lands, where an improvement on food production might be a second spin-off.
6. Take care of biodiversity aspects
7. Soil carbon issues
8. Added benefits of resource use (clearing up waste streams, providing organic manure, sanitation, biochar)

Exercise

- Make a decision chart or flow chart in which you logically sequence the decisions?

Biofuels Conversion Pathways

- Transesterification
- Hydrolysis, fermentation, distilation
- Pelletization
- Carbonisation
- Pyrolisis
- Gasification Fischer Tropsch
- Hydrolysis, Digestion


HOPPER

FACT finding on the conversion path (1)

- Is the conversion suitable for desired resource use and final product;
- Is the conversion technology and practical knowledge and expertise available in the country;
- Availability of the technology for the scale required;
- Assessment on the operational aspects and backing of the specific technology (spares, overhauls);
- Assessment of conversion technologies in sub technologies and competitiveness;

FACT finding on the conversion path (2)

- Current and expected prices per conversion technologies;
- Locations of the resource availability and consequences for the conversion path;
- Side products o the availability and viability (e.g. market for Biogas digester slurry, for solid waste, for char , for charcoal, heat use, etc..
- Assess smart combinations in the conversion system : first ethanol production, then biogas; or biogas from the press cake of Jatropha?)

Some advice on conversion path (1)

1. Only apply conversion technologies that are scalable and do not require high sophistication;

2. Ensure the target group has ownership , but has all management info to operate or contract others to operate the system (extension ,training)

3. Ensure that the right and skilled people are in place and maintain their skills;

4. Risk analysis on the technologies: conversion efficiency lower than expected, installation, life , replacement and consumables, prices and quality issues;

Some advice on conversion path (1)

5. See to that the whole chain is competitive with other systems in using the biomass, but also in the final product.

6. Ensure that technologies of the kind are already installed in similar conditions in the country;

7. Added benefits of resource use (cleaing up waste streams, providing organic manure, sanitation, biochar)

Exercise

- Make a decision chart or flow chart in which you logically sequence the decisions?

Energy applications

- The outputs of the conversion path can be multiple:
  - Liquid fuels
  - Solid fuels
  - Gaseous fuels
  - Electricity
  - Heat/steam
  - Mechanical power


CHARGER
GS
NATIONAL

Non energy applications

- It is good to realize that energy is normally a low paid commodity, but clearly with high volume needs;
  - Non energy products as example
  - Medical applications
  - Special food ingredients (Omega 3 in algae)
  - Regular food
  - Fodder for animals (from fish to cattle)
  - Industrial input material (timber, paper, fibers, etc..)
  - Organic manure

FACT finding on the applications (1)

- Is the application based on the demand of the target group/market perspectives/ both;
- Current and expected volumes of bioenergy or biofuels the that are required for the target group or market;
- What alternatives are competitive with the bioenergy option both conventional and renewable energy (wind, solar): current and short term future

- Is there sufficient practical knowledge and expertise available in the country on the application;
- Per desired application the assess the features: such as storability and implications; availability of the application;

FACT finding on the applications (2)

- Risk assessment for desired application (volume, quality, price and availability considerations);
- Environmental aspects of the desired application (cooking on e.g. Jatropha residues);
- Location of the applications' availability and consequences for the marketing;
- Side products o the availability and viability (e.g. market for Biogas digester slurry, for solid waste, for char , for charcoal, heat use, etc..)
- Assess smart combinations in the application system: e.g. combination of biorefinery, own use of residues and marketable products (cash) first e.g. omega 3 extraction, PPO production, then biogas for electricity in the community;

Some advice

1. Ensure that the application volume/quality and availability can be delivered for the current and future expectations of growth;
2. Risk analysis on the applications: prices and quality issues;
3. See to that the whole chain is competitive with other alternatives either conventional as with renewable energy systems;
4. Added benefits of non energy applications (medical, food industrial raw material, etc)

Exercise

- Make a decision chart or flow chart in which you logically sequence the decisions?

Conclusions and recommendations

- Technology options decided upon on 3 areas:
- Looking at the whole chain:
  - Feedsstock/resouce;
  - Conversion Path;
  - Application.
- Based on demand of the target group:
  - own or market
- Looking at context including:
  - social/organisational; financial/economic
  - technology scale and applicability
  - communication/training
  - environmental (Air/water/soil emissions, CC, Biodiversity, invasiveness, etc.._
  - country Policy and legal issues

Further reading

- FACT document on energy and non energy aspects of biomass
- Wiki for definitions and general
- Studies: Mali Garalo project; Honduras project GOTA VERDE, Mozambique project, Cameroun study;
- Jatropha handbook, coconut handbook (FACT)
- Project
- China inner mongolia Resource study Anshan

Thank you for your attention.

Questions?

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