Jatropha *curcas* *L.*
Current development and potentialities in Europe

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CIRAD
Jatropha curcas L.

- Wild Euphorbiaceae
- Shrub of some meters high and planted for some tens years
- Drought resistant
- Fears water logging and frost
- Not photosensitive
- Flowering as long as the environmental conditions are good
- Production beginning from 3\textsuperscript{rd}-4\textsuperscript{th} year old
- All the parts are toxic: there is one "less toxic" ecotype
- Harvest is made by hand
- Realistic productivity
  - 800-1500 kg seeds/ha
- Seeds contain 25-38\% of oil
Generalities

- Native from Mexico. Fossil traces in Peru
- Importation by the Portuguese in Cape Verde islands, then in Africa and Asia (→ low genetic variability in these regions)
- Medicinal plant (ιατρόν=medicine, φαγώ= I eat)
- Plant mainly used for live fences (plot boundary marker and against animals)
- Oil is used for traditional production of soap (women)
- First tests of bio fuel in Office of Niger in Mali in 1941, after 2nd world war, systematic experimentation in France
- At beginning of the eighties, Special Energy Programme is set up in Mali by GTZ in Mali
- Opening of Indian project of Nashick in 1986, closed in 2003 because of the to low productivity (1250 kg/ha of seeds)
- In 1990, in Nicaragua, the beginning of the Tempate project with Austrian cooperation. 1000 ha planted. Gave up in 2000 because of many technical and management problems.
In term of surfaces

- General position by GEXSI in 2008
  - In the world: 900,000 ha
  - Objectives 2010: 5 million of ha; 2015: 13 million

- Today, difficulties to obtain information
  - Private projects: standby or stopped
  - Publics project, mainly axed to local development, in progression
  - Methodology for carbon credit in the process to be solved
Ecology

- Present in arid regions to humid tropics (25°N, 30°S)
- Rainfall 750-3000 mm. Stand long dry season of many months (succulent plant with falling leaves)
- Altitude 0-1800 m. Sensible to frost
- Can grow on poor but drained soils
- Fears hydromorphy
- Important interactions with climate and soil environment
Agronomy

- Installation from seedling (1000-2000 plants /ha)
- Importance of good installation (soil)
- Fertilization needed in case of economical production (good yield)
- Presence of predators and diseases
- Necessity of pruning
- Flowering spread out

- Marginal production in marginal soils
Harvest

- Harvests
  - Painful operations with a risk of sensitization
  - Several operations are necessary
  - Important working time 60 men*day/ha for a productivity of 1500 kg/ha (cotton 35 men*day/ha)
  - Actually, priority to harvest feed crops
  - Dehusking: by hand. 200 men*day/ha for 1500 kg/ha harvest. With hand powered machine: 15 men*day/ha
Oil used as fuel

- Pure oil or blend
  In old engines technology and with some precautions
  Problem of minority components (Phospholipids gums and waxes)
    - Oil pressing conditions

- With biodiesel production
  Equivalent to diesel
  Problem of level of free fatty acids
    FFA < 3% (base etherification)
    - Storage conditions
    - Extraction conditions

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<th>JC</th>
<th>RS</th>
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<td>Trouble point</td>
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<td>Calorific value</td>
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What production?

- Valuation of production in term of bio fuel
  - Local market: short circuit: use in pure oil
    - Local interest, either in substitution of diesel, or/and for creation of new economic activities
  - National market (bio diesel in a centralize unit)
    - Price set by the government
- International market?
- Carbon credits bonus
- Valuation of co products and by products?
Co products, by products

- **Co products**
  - Biocides (insecticide, larvicide, molluscicide…)
  - Bio products (coagulant et anti-coagulant, anti-tumoral, anti-inflammatory, abortive…)

- **By products**
  - Press cake 2/3 of the seeds : toxic
    - Fertiliser? (equivalent to a poultry manure).
    - Possible compost
    - Combustible
    - Animal feeding (Phytotoxicity ?)

- **Carbon credits**
  - Reforestation  5 t of C/ha for a 3,5 years old crop
  - Fuel substitution 0,7 t of C/ha/y
Interest for Europe?

- No possibility of cultivation in the main part (to frost)
- Low productivity (low yield and hand made operations)
- Production in tropical countries for Europe:
  - Agro industrial model, not adapted to the actual cropping system and ethic problems about soil monopolization
  - Small scale model: possibility for jatropha as a cash crop if price interesting for farmer and buyer. Evaluation in Mali of cost of jatropha seeds: 0.15 €/kg or 0.60 € of seeds/oil litre but....
  - Bio fuel needed also in these countries not only to limit oil bill but to participate to rural development.
Conclusion

- Jatropha is a badly known plant
- Studies started rather recently
- “Excitation” in 2007-2008 ….
- Awakening on behalf of the protagonists
- Scientific works especially targeted on varietal improvement, increase in the output & detoxification
- Sure interest of valorization in short circuit
- Insertion in the current systems of production?
- Production of biocarburant on an international scale??
- Persistence of the interest for in this plant?
THANK YOU