Guayule varieties adapted to the region are available

Results of two simulations

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Price /ton/year</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>€ 147</td>
<td>Rubber → 9 % of dry biomass</td>
</tr>
<tr>
<td>Fertilization</td>
<td></td>
<td>Resin → 9 % of dry biomass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bagasse → 75 % of dry biomass</td>
</tr>
</tbody>
</table>

Guayule trials were done under the EU-Pearl project in Montpellier and Cartagena.

Advantages of the Southern Mediterranean regions
- Climatic conditions of the Mediterranean are not very different from those of the Mexican desert;
- Land rental value is half the price of European rental value (in semi-arid region);
- Most farmers have less than 5 ha.
- Labour costs are lower than 20 % compared to European costs.

Interest for Mediterranean countries
- Water availability: South Mediterranean countries suffer with aridity. Water is a limiting factor, but there is groundwater which can be used for irrigation.
- Need for development projects and sustainable farming in the Mediterranean area (Climate Change).
- Low input costs in the south can increase farmers’ revenues.
- Guayule production can be close to European industry.

Why Guayule in the Mediterranean area?

Feasibility of guayule commodity chain in the Mediterranean region

Didier SNOECK, Thierry CHAPUSET, José GARCIA GARCIA, Nisrine SFEIR, Serge PALU

Why Guayule in the Mediterranean area?

Because Mediterranean ecologies are suitable for a crop that:
- Does not require much water (250-600 mm/year),
- Is adapted to semi-arid region.
- Many Mediterranean areas are suitable to grow guayule.

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Simplify model of a Guayule commodity chain

Source of Data
- Cultural and crop management are based on trials in Cartagena and Montpellier.
- Costs of inputs calculated from agricultural costs in Spain and France.

Inputs:
- Cultural practices and crop management used to compute the farmer’s revenue (inputs + labour) were based on trials in Murcia and Montpellier.
- Costs include:
  - Nursery for production of plantlets,
  - Land preparation (ploughing, plastic mulching ...) and planting,
  - Land rental,
  - Drip irrigation, Fertilization, Pesticides (not used, for record only),
  - Labour for annual care.
- Uncertainty on some data were managed to assess the feasibility:
  - Rubber yields,
  - Plant behaviour to irrigation, fertilization,
  - Harvest periodicity: annual & biannual.

Several hypothesis and simulations were done

Simulations were done using a farm simulation software (Olympe™)

Results of simulations

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Guayule is sold at


Conclusion

Our results show that it is possible to grow guayule in the Mediterranean. The farmer and manufacturer accounts are based on following data:
- Planting density: 50,000 plants /ha
- Stem dry biomass yields: 10 tons /ha/year (average for 10-year culture)
- Improved genetic material and management with irrigation and fertilization.
- Shrub rubber content: 8 % of dry rubber (i.e.: 800 kg / ha/year)
- The above mentioned production costs were estimated based on these data and the prices of required inputs.
- Research should go forward to improve the capacity to extract more rubber and promote the by-products.
- In order to show the beneficial effect of guayule plant on the environment and development, more efforts should be given to the development of this plant.

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Based on the current knowledge, guayule cultivation and production is profitable only when both the rubber and resin are marketed, bagasse sale is a bonus.

Southern Mediterranean region can be a field to enlarge the development of guayule, which can be a new agricultural sector in the area. For example, in Morocco, more than 50 % of the none-desert land (Sahara) are unused semi-arid lands.

Compared to Hevea (tropical rubber tree), guayule has the advantage of being a faster producing crop giving its cultivation an advantage. However, every 10 years, guayule shrubs have to be uprooted and replanted, giving advantage to the Hevea cultivation over the longer period.

References
- Technical and economic feasibility of a guayule commodity chain in Mediterranean Europe. Sfeir N., Chapuset, T., Palu, S., Lançon, F.,
- The challenge of Guayule. An alternative source of natural rubber a model of bio-refinery. Palu S., Pasch D., Amer A., Tardant E.,