**European Natural Rubber Production with Guayule as alternative source to hevea rubber (EUNARS-G)**

World Natural Rubber (NR) consumption is expected to be 17 million tons by 2025. More than 1 million tons of NR is used in EU but no one gram is produced in the EU. The global rubber shortage of natural rubber (NR) may widen to over one million tons by 2020, as demand from tyre makers in emerging markets will boost consumption. NR is mainly produced in Asia (93%). Hevea, a native tree from South America, is the only commercial source of NR rubber. NR is a strategic raw material, on which the European automotive industry has a complete dependency. Alternative sources of natural rubber to Hevea exist. Guayule or *Parthenium argentatum*, is one of them. It can grow in European Mediterranean countries.

**WHY GUAYULE?**

- Guayule is a bush, native from North of Mexico (Chihuahua desert), a perennial crop of the Asteraceae family. It is well adapted to semi-arid and Mediterranean areas, growing well under temperature from -9°C to 40°C with 350-640 mm of rainfall/year. Hevea grows only in tropical climate. These climatic conditions are encountered in Greece, south of Spain, France, and Italy. Guayule has been grown on commercial scale (Emergency rubber project during WWII, Sacaton Firestone project in the 80s, Yulex and Bridgestone in Arizona, USA presently). Guayule plants are harvested 2 years after planting (Hevea 7 years) by cutting mechanically the plants at 5cm of the soil, then each year during 10-12 years depending on irrigation applied. Rubber content in a plant depending on area of cultivation, soil, season, irrigation is from 5 to 12% in Europe. Resins content also available in the plant are in the same range of content. Potential yield reported is 500kg to 1 tonne/ha/year (Hevea 1200 kg/ha/year average for smallholders). Europe with CIRAD (France) and Wageningen University (The Netherlands) has the knowledge gained during the EU-PEARLS project (2008-2012) on the genomic and agronomy of guayule in France and Spain, on the extraction process of rubber and resins, rubber quantity and quality measurement. For the extraction of rubber, Guayule polysisoprene particles (P) are in closed cells of the bark, not in laticifer tubes as for Hevea (fig 1). The partners of the EU-PEARLS project were able to produce rubber good prototypes (gloves and tyres). Guayule latex is also known to be non-allergic (hypersensibility type I) as it contains less proteins than the allergic hevea latex.

**TOWARDS A BIOREFINERY CONCEPT**

- Guayule will not only produce rubber, but also bioproducts according to biorefinery concept and green chemistry. The project will be an example of the development of a biorefinery process which represents the key for the access to an integrated, economically feasible production of chemicals, and biomaterials of the future (fig 2). With growing sustainable development consciousness, polymers or chemicals based on guayule renewable material will replace gradually polymers and molecules of the petrochemistry in this century.

**Objectives of the RMC**

- Set the basis to develop commercial guayule cultivation (available land, not competing with food) for more renewable raw materials, availability and security of supply of NR to the EU rubber industry leading to more European jobs.
- Continue research activities on genomics to develop EU-guayule lines (yield of 1 tonne/ha/year, on the agronomy of guayule (planting, irrigation, harvest technology), rubber control in the field).
- Improve existing EU “green” process for high quality rubber, and additives for rubber from guayule by-products; build a 5 Tonne/day plant to produce latex and dry rubber for large scale testing, mainly tyre; to assess quality according to processing options, and turn guayule as a workable alternative or complement to Hevea rubber.
- By 2019, partners will transfer their knowledge and technology to investors, farmers and processors for larger scale cultivation in appropriate areas in Mediterranean Europe with a target of 25,000 ha by 2022 (2-3% of EU consumption), then allowing fast large scale expansion according to demand.

**Countries and potential partners of the RMC**

- Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), France
- Wageningen university and research centre Stichting (SDLO), The Netherlands
- Centre de transfert de technologie (CTTM), France
- European tyre & rubber manufacturers’ association (ETRMA), Belgium
- Mediterranean agronomic Institute of Chania (MAIICCHEAM), Greece
- A3I Innovation (France) as builder of the biomass extraction plant

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**Notes:**

- **Priority area:** Substitution of raw materials
- **Action:** Research, production of biomass on plantations, pilot plant, production of natural rubber to be tested by the EU rubber industry

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**Summary:**

- Guayule is a potential alternative source of natural rubber for Europe. It is a native bush from North of Mexico, adapted to semi-arid and Mediterranean areas, and can be cultivated in Europe with the help of European partners.
- The project will focus on the development of a biorefinery process, aiming to produce not only rubber but also bioproducts.
- Objectives include setting the basis for commercial guayule cultivation, continuing research activities on genomics, and improving the existing EU “green” process for high quality rubber.
- By 2019, partners aim to transfer their knowledge and technology to investors, farmers, and processors for larger scale cultivation in Europe, targeting 25,000 ha by 2022.