Agroils TECHNOLOGIES SpA

REGIONE TOSCANA

Jatropha market and economics

15/11/2013 - Marrakech - Morocco

JatroMed First International Workshop on Energy Crops in the Mediterranean Region (ECMR-1)

Opportunities and challenges Centre de Development de la Region de Tensift (CDRT)

JatroMed

JATROpha in MEDiterraneo

Agenda

- Overview of Jatropha sector
- Jatropha products
- Difficulties and obstacles
- Jatropha market
- Agroils innovation process
- Valorization of co-products
- Economic balance of JC production and transformation
  - Traditional process
  - Innovative process

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Overview of Jatropha sector 1/2

- **Jatropha** is a hardy shrub from Central America, spread all over Sub-Tropics by Portugueses
- Traditionally used as living fence to protect cash crops due to its **toxicity** and for **soap production**
- **Seeds contain approx. 34% of oil suitable for biofuels** (SVO, biodiesel, Bio-jet fuel)
- **In 2006**, cultivations of Jatropha started by **thousands of organizations worldwide**
- **In 2008-2010, Air New Zealand & TAM** performed flight tests on Jatropha bio-jet fuel
- **In 2011, Lufthansa's route Hamburg-Frankfurt, run on a 50:50 Jatropha biofuel-kerosene:** "*Jatropha, best basis for biofuel production*"

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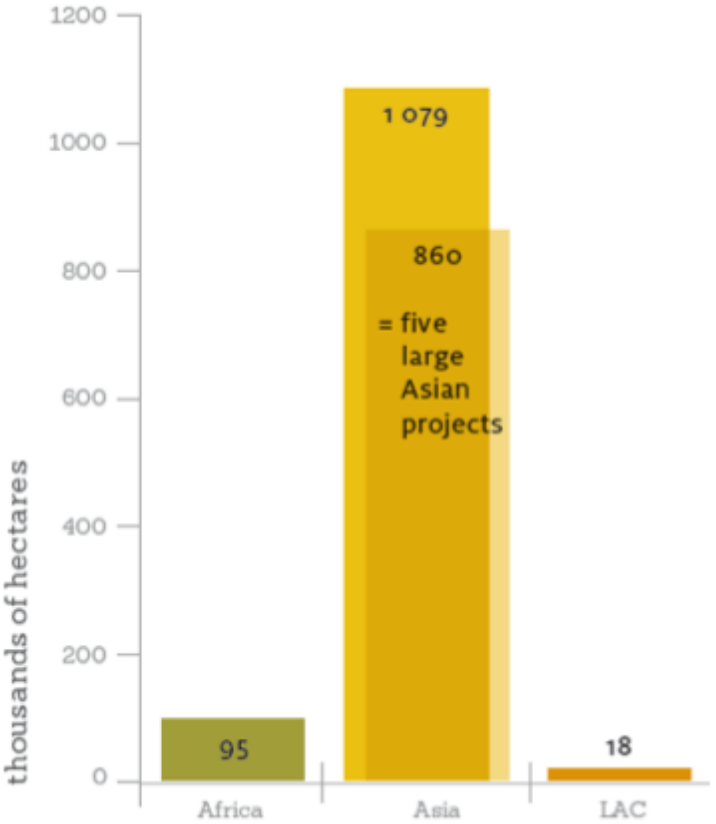
Overview of Jatropha sector 2/2

- **In 2008 GEXSI's report:** 900 kHa under cultivation by 242 projects and forecasted 12 million Ha by 2015
- **In 2011 Luneburg Univ.:** 1,2 mHa by 139 projects
- **Reasons for slow down:**
  - Lower (than expected) yield → Low Revenues per Ha
  - Financial turmoil
  - Lower fossil fuel prices
  - Environmentalist concerns (land grab, land competition)
- **Major projects under development:**
  - China, India, Malaysia, Indonesia: 860 kHa (72% of total cultivated area)



Luneburg Univ.

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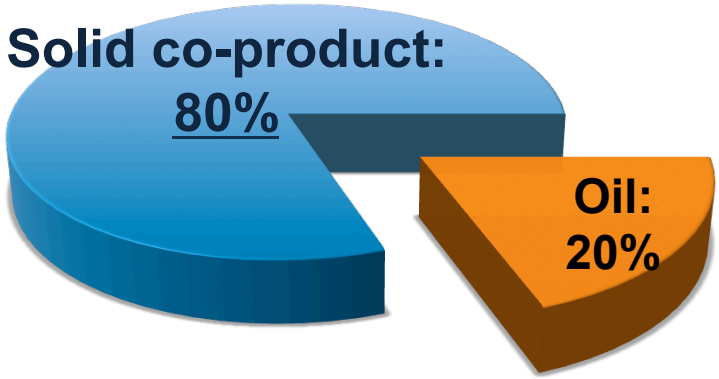
Jatropha products

- Currently 80% of Jatropha fruits considered a WASTE due to anti-nutrients
- The oil extracted, about 20-25%, is the principal product and it is used often to produce biodiesel
- Solid co-product contains > 50% proteins
- The seeds can be de-hulled before oil extraction, the hulls are about 45% and can be used as solid biomass
- Today the only product which creates revenues is the oil with a prices of 550-650 €/ ton



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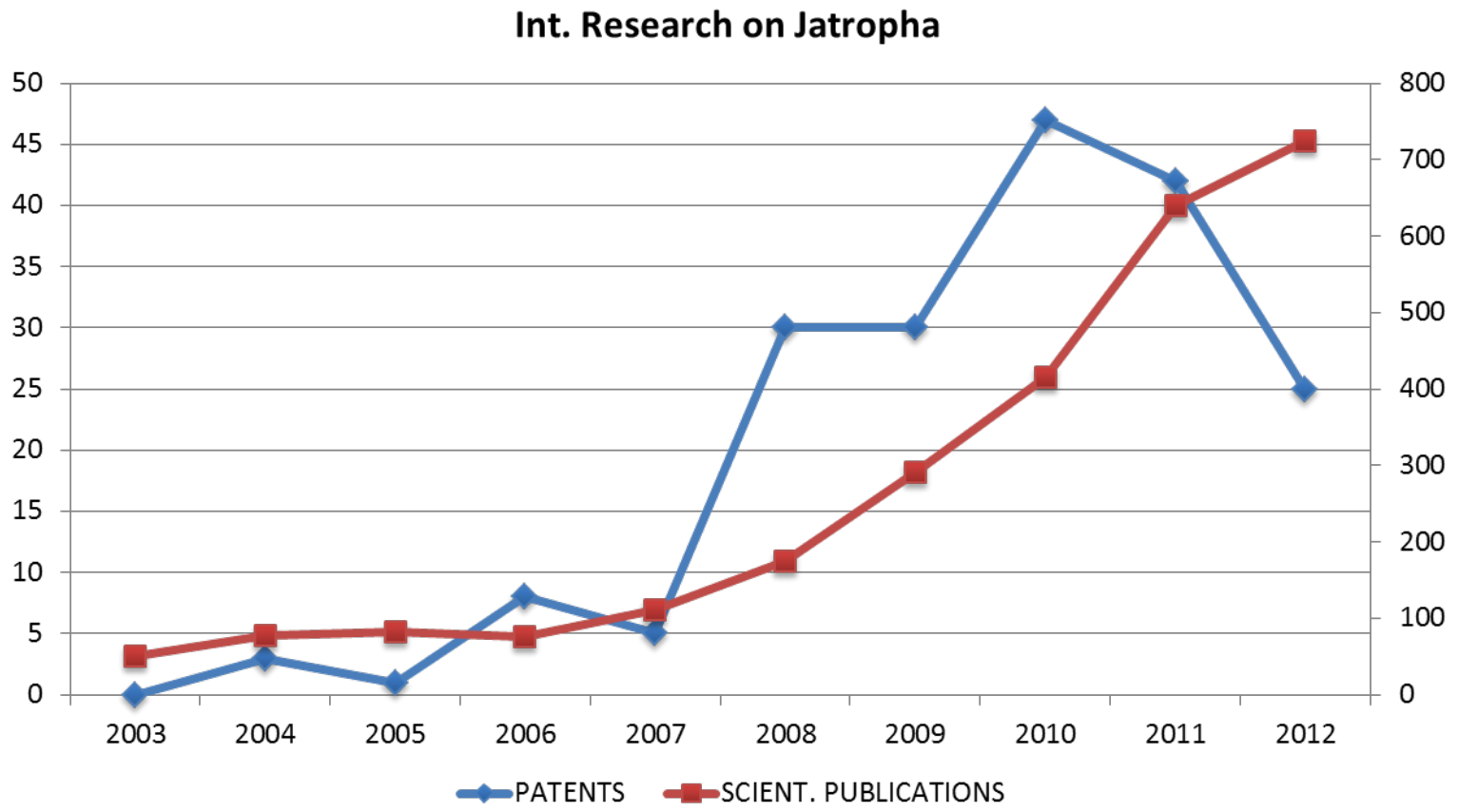
Difficulties and obstacles 1/2

- **Partial disaffection by Private sector, growing interest by Scientific Community**



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Difficulties and obstacles 2/2

After a period of high attention and development, now Jatropha sector is in a stand-by phase.

Main reasons are:

- Lower than expected yield on a per Ha → poor genetics, lack of proper agronomical practises
- Co-products of oil extraction considered a waste/low added value

Together with financial turmoil, lower fossil prices and environmental concerns

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Necessity to find new solutions to valorize Jatropha value chain

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Jatropha market

SEEDS
100%

Production cost
≈ 120-150 €/ton

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Jatropha market

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Production cost
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OIL
20-25%

Market price
≈ 600 €/ton

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Jatropha market

SEEDS
100%

Production cost
≈ 120-150 €/ton

OIL
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Market price
≈ 600 €/ton

CAKE
75-80%

Market price
≈ 80 €/ton

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Production cost
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Market price
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CAKE
75-80%

FEED

PROTEIN

BIOACTIVE

New possibilities and markets with new revenues + 35%

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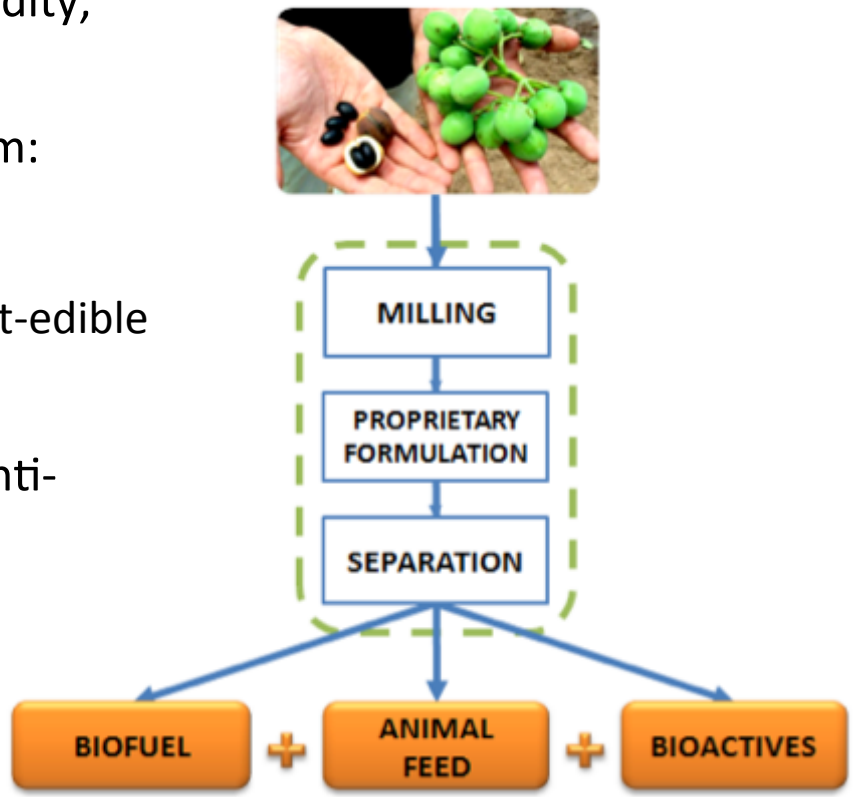
Agroils innovation process

Agroils' process separates anti-nutritionals and <u>simultaneously generates</u>:

- Superior quality vegetable oil (lower acidity, higher stability)
- Detox cake, which can be extracted from:
  - Animal feed in place of fertilizer
  - Proteins which can be used also in not-edible industry
- Valuable bioactives (Curcin, potential anti-tumoral)



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Valorization of co-products

With this innovative process is possible to open jatropha sector towards new markets, thanks to the valorization of the co-products:

CO-PRODUCTS	NEW MARKET	VALUE (€/ton)
Hulls	Solid biomass	90
Detox cake	Animal feed	240
Detox Protein Isolate	Food industry	2000
Protein Isolate	Adhesive industry	1800
Bioactives	Pharmaceutical	?

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Economics - Traditional process

Example of a traditional extracting jatropha oil plant

- **Hypothesis**:
  - 8.000 tons of seeds produced for year → 960.000 €/year
  - Oil net production: 2.000 tons/year (650 €/ton)
  - Cake production: 6.160 tons/year (80 €/ton)

- **CapEX: 600 k€**
- **Annual costs** (seeds, staff, energy, ecc.): **1.600 k€/anno**
- **Revenues: 1.790 k€/year**
  - Oil selling: 1.300 k€/year
  - Cake selling: 490 k€/year

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Economics – Innovative process

Example of the Agroils innovative "JATRO-PRO" plant

- **Hypothesis**:
  - 8.000 tons of seeds produced for year → 960.000 €/year
  - Oil net production: 2.050 tons/year (700 €/ton)
  - Protein isolate production: 950 tons/year (600 €/ton)
  - Residual production: 5.000 tons/year

- **CapEX: 850 k€**
- **Annual costs** (seeds, staff, energy, chemicals, ecc.): **1.920 k€/anno**
- **Revenues: 2.400 k€/year**
  - Oil selling: 1.430 k€/year
  - Protein selling: 570 k€/year
  - Cake residual selling: 400 k€/year

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Economics – Resume

	TRADITIONAL PROCESS	AGROILS PROCESS
CapEX (k€)	**600**	**850**
Annual Cost (k€/year)	**1.600**	**1.920**
Oil selling (k€/year)	*1.300*	*1.430*
Cake selling (k€/year)	*490*	*400*
Protein selling (k€/year)	*-*	*570*
Total revenues (k€/year)	**1.790**	**2.400**
IRR	**14%**	**50%**

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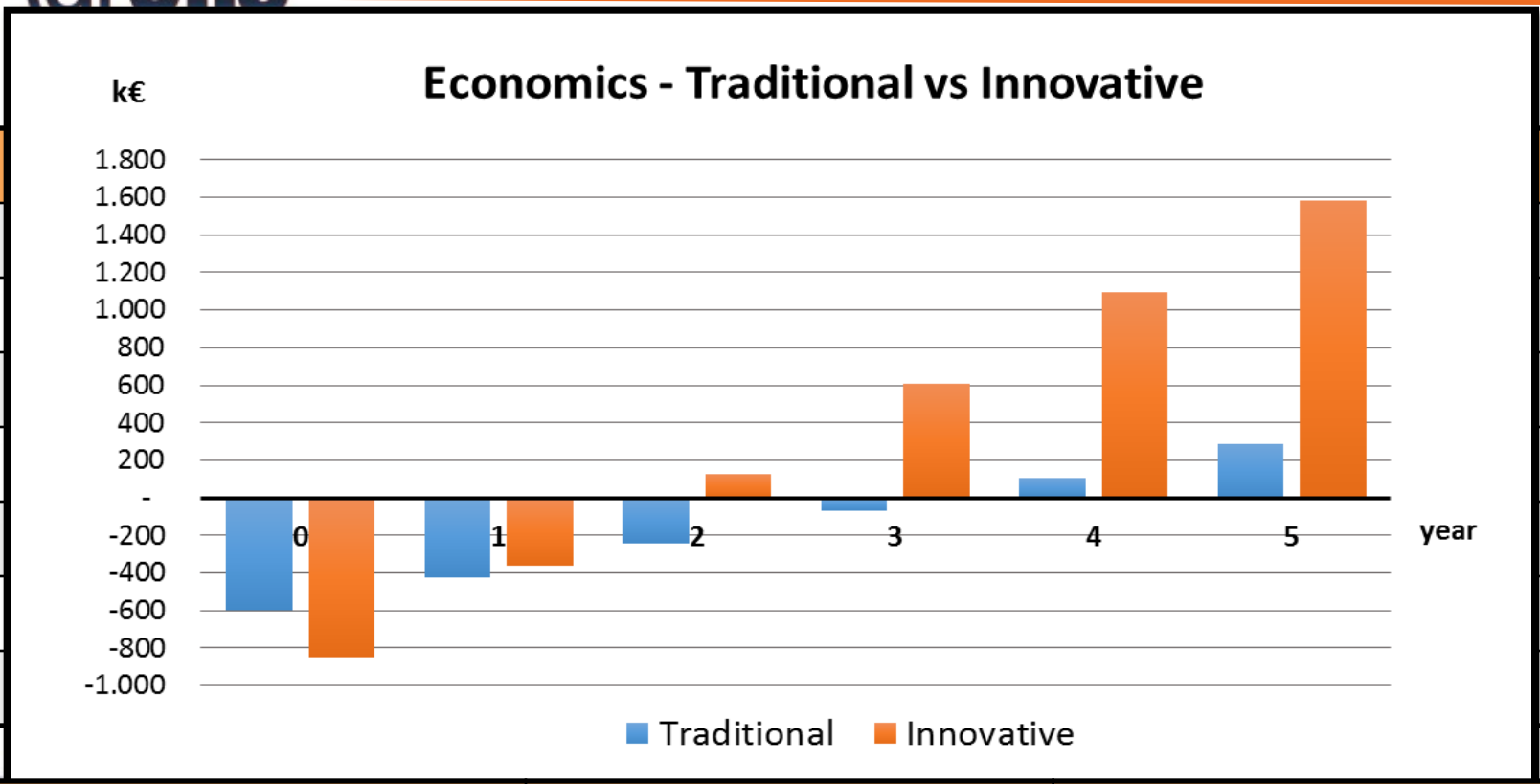

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THANK YOU!

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