BIOFUELS PRODUCTION IN PORTUGA
an overview

Ana Cristina Oliveira, Maria Fernanda Rosa

Instituto Nacional de Engenharia, Tecnologia e Inovação
Departamento de Energias Renováveis
Lisbon, Portugal

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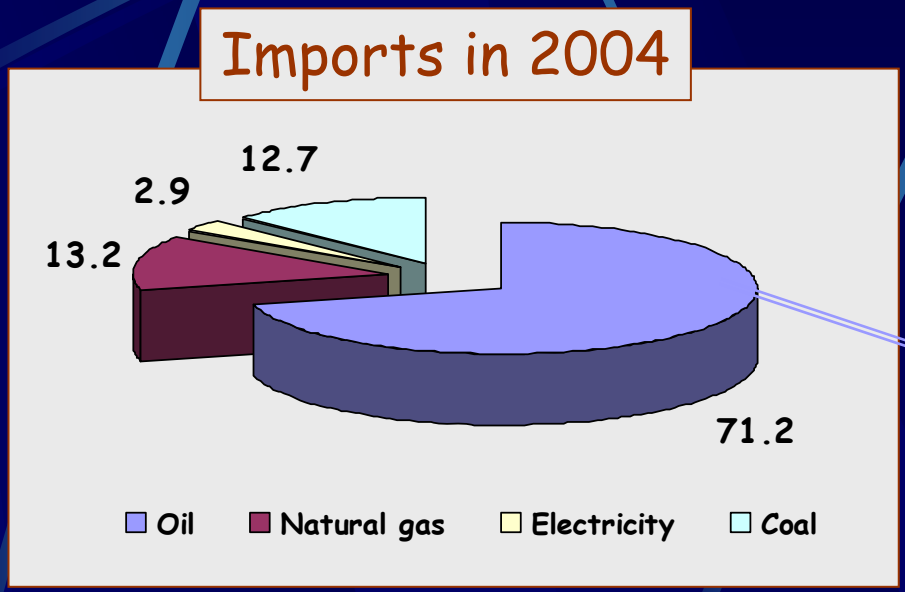
Biofuels production and utilisation – Why?

- Oil problem
  - Decrease of the fossil fuels reserves
  - Increase of the oil price
  - Energetic dependency

- Energetic dependency

Portugal import about 85% of the energy consumed in the country



Oil represents ~ 71% of the imported energy

~ 38% of the imported oil is for use in the transportation sector

Biofuels production and utilisation – Why?

- **Oil problem**
  - Decrease of the fossil fuels reserves
  - Increase of the oil price
  - Energetic dependency
- **Environmental problems**
  - CO_2 emissions / Greenhouse effect

Biofuels production and utilisation – Why?

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  - Energetic dependency
- **Environmental problems**
  - CO_2 emissions / Greenhouse effect
- **International Agreements**

❖ International Agreements

Kyoto protocol (1999)

Global reduction of 5.2% of CO_2 emissions until 2012, in relation to the emissions of 1990

Portugal

till 2008-2012 had been allowed to increase the emissions in **27%**, in relation to 1990

Overcome since 2004

❖ International Agreements

Kyoto protocol (1999)

Global reduction of 5.2% of CO_2 emissions until 2012, in relation to the emissions of 1990

EU Green paper (2000)

Substitution of 20% of the traditional fuels used in transportation sector by alternative fuels by 2020

❖ International Agreements

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Substitution of 20% of the traditional fuels used in transportation sector by alternative fuels by 2020

Directive 2003/30/EU

About the substitution of fossil fuels in the transportation sector by alternative fuels

Directive 2003/30/EU

Year	Biofuel (%)	Natural gas (%)	Hydrogen (%)	Total (%)
2005	2	-	-	2
2010	5.75	2	-	7.75
2015	7	5	2	14
2020	8	10	5	23

Directive 2003/30/EU

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Portugal has already adopted this Directive

BIOFUELS

BIOETHANOL

obtained from energy crops

Cereals

Barley

Corn

Wheat

Rye

Tubers

Sugar beet

Jerusalem artichoke

Sweet cassava

Sweet potato

Sweet sorghum

Sugar cane

BIOFUELS

BIOETHANOL

obtained from energy crops and agricultural and forest residues

- 100% or in mixture with gasoline, usually 5-10% of bioethanol, or used as bio-ETBE

BIODIESEL

methyl esters obtained from materials with high glyceride content


Sunflower


Rapeseed


Soybean

BIOFUELS

BIOETHANOL

obtained from energy crops and agricultural and forest residues

- 100% or in mixture with gasoline, usually 5-10% of bioethanol, or used as bio-ETBE

BIODIESEL

methyl esters obtained from materials with high glyceride content

- Palm
- Jatropha
- Castor

BIOFUELS

BIOETHANOL

obtained from energy crops and agricultural and forest residues

- 100% or in mixture with gasoline, usually 5-10% of bioethanol, or used as bio-ETBE

BIODIESEL

methyl esters obtained from materials with high glyceride content

- Used frying oils
- Waste animal fats

BIOFUELS

BIOETHANOL

obtained from energy crops and agricultural and forest residues

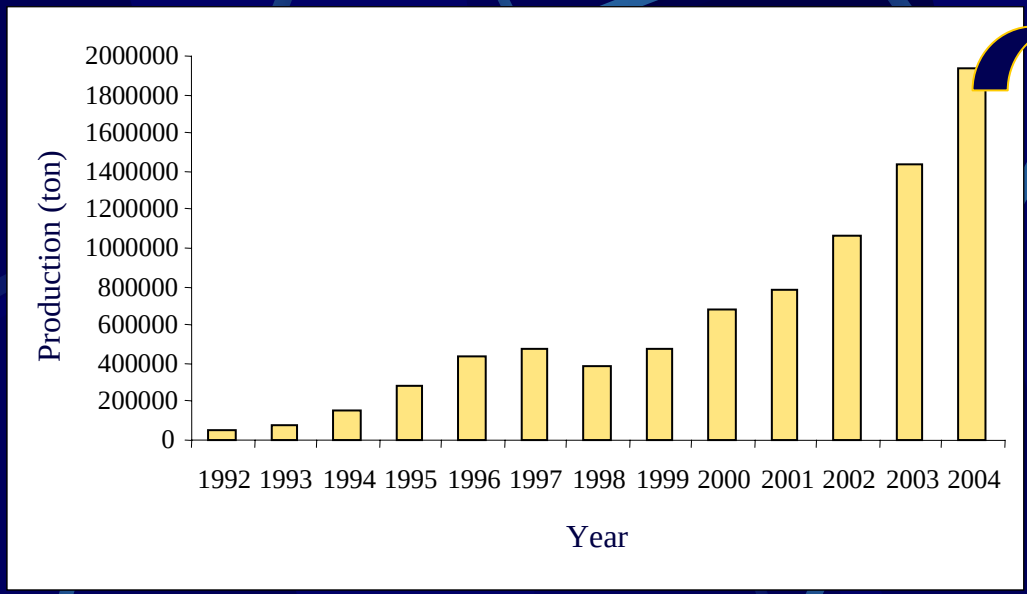
➡ 100% or in mixture with gasoline, usually 5-10% of bioethanol, or used as bio-ETBE

BIODIESEL

methyl esters obtained from materials with high glyceride content

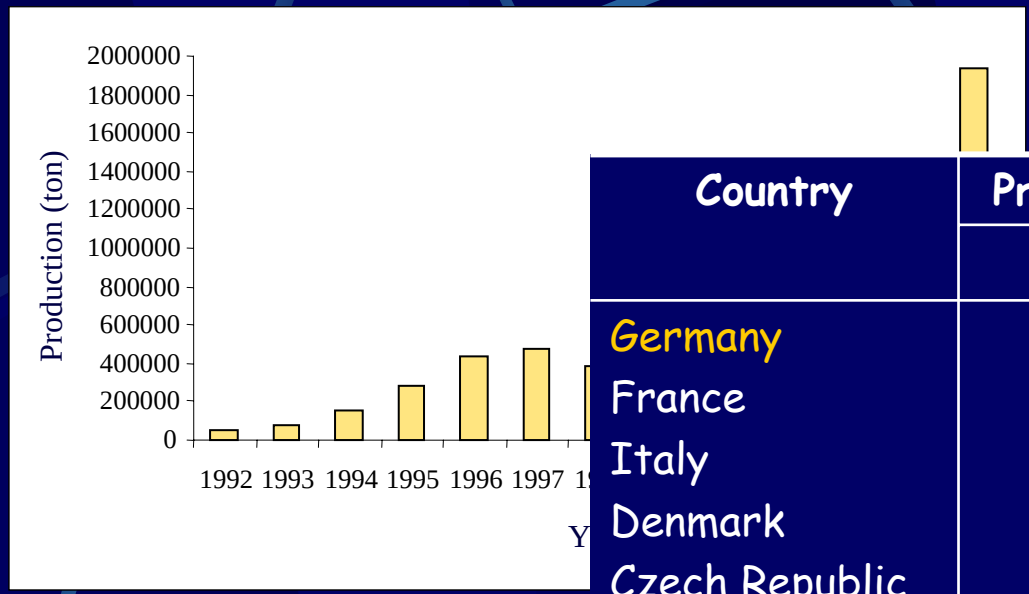
➡ 100% or in mixture with diesel (5-30% of biodiesel)

Biodiesel Production in EU



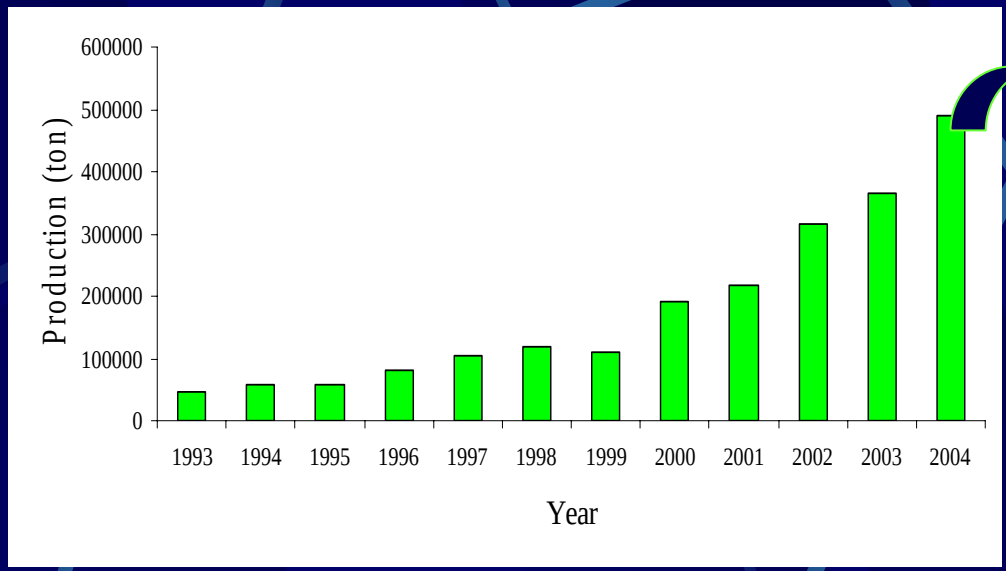
1 933 400 ton

Biodiesel Production in EU



Country	Production (ton) 2003	Production (ton) 2004
Germany	715 000	1 035 000
France	357 000	348 000
Italy	273 000	320 000
Denmark	41 000	70 000
Czech Republic	70 000	60 000
Austria	32 000	57 000
Slovakia	0	15 000
Spain	6 000	13 000
United Kingdom	9 000	9 000
Lithuania	0	5 000
Sweden	1 000	1 400
Total EU_{25}	**1 504 000**	**1 933 400**

Biethanol Production in EU



Bioethanol and ETBE Production in EU

Country	Production in 2003 (ton)		Production in 2004 (ton)	
	Bioethanol	ETBE	Bioethanol	ETBE
Spain	160 000	340 800	194 000	413 200
France	82 000	164 250	102 000	170 600
Sweden	52 000	0	52 000	0
Poland	60 430	67 000	35 840	no data
Germany	0	0	20 000	42 500
Bioethanol from wine alcohol	70 320	no data	20 000	no data
Total EU_{25}	**424 750**	**572 050**	**491 040**	**626 300**

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Cereals

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70% sweet beet
30% wheat

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In Portugal

during the nineties, litte interest was demonstrated by any of the biofuel stakeholders

- **agriculture sector** – no interest in the use of the set-aside areas for energy cultures
- **industrials** – not motivated
- **political level** – no strategy for the development of the biofuels sector

The situation began to change with the 30/2003 Directive

Portuguese situation

- Biodiesel and/or bioethanol production from national raw materials
- Biodiesel and/or bioethanol production from imported raw materials
- Biodiesel and/or bioethanol import

Portuguese situation

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Portuguese situation

Agricultural sector and production of raw materials

- Available area for energy cultures is scarce

Total area of arable land → 3.9 million ha (about half of the EU average)

↓

only 44% are used for agricultural purposes

Portuguese situation

Agricultural sector and production of raw materials

- Available area for energy cultures is scarce

✓Oleaginous crops, namely sunflower, don't occupy more than 6% of the totality of the cultivated area and represent only 11% of the food needs

✓Cereals, namely corn and wheat, represent not more than 45% and 9% of the food needs, respectively

Portuguese situation

Agricultural sector and production of raw materials

- Available area for energy cultures is scarce
- The yields obtained for energy crops, namely in unirrigated lands, are limited by edaphic and climatic conditions

Portuguese situation

Agricultural sector and production of raw materials

- Available area for energy cultures is scarce
- The yields obtained for energy crops, namely in unirrigated lands, are limited by edaphic and climatic conditions
- Use the set-aside areas ➡ 75 000 ha

Portuguese situation

Agricultural sector and production of raw materials

- Use the set-aside areas ⇒ 75 000 ha

	Sunflower	Rapeseed
Production on 75 000 ha	60 000 ton	75 000 ton
Biodiesel production	24 000 ton	30 300 ton
Diesel substitution	0.58 %	0.74 %

Portuguese situation

Agricultural sector and production of raw materials

- Use the set-aside areas ⇒ 75 000 ha

	Wheat
Production on 75 000 ha	210 000 ton
Anydro bioethanol production	27 653 ton
ETBE production	58 834 ton
Gasoline substitution	**1.9 % or 3.9 % (ETBE)**

Portuguese situation

Agricultural sector and production of raw materials

- Available area for energy cultures is scarce
- The yields obtained for energy crops, namely in unirrigated lands, are limited to the edaphic and climatic conditions
- Use the set-aside areas ➡ 75 000 ha
- Use the irrigated land of Alqueva dam ➡ 110 000 ha

Portuguese situation

Agricultural sector and production of raw materials

- Use the irrigated land of Alqueva dam ➡ 110 000 ha

Production of oleagineous	220 000 ton
Biodiesel production	88 000 ton
Diesel substitution	2.12 %

Production of sugar beet	7 480 000 ton
Anhydro bioethanol production	321 862 ton
ETBE production	684 814 ton
Gasoline substitution	21.3% or 45.3% (ETBE)

Portuguese situation

Agricultural sector and production of raw materials

- Use irrigated lands that tradicionally bear cultures like tobacco, corn and sugar beet

The new reform of CAP limits strongly the economic income from these cultures

Portuguese situation

Available residues for bioethanol production

- ✓ Agricultural residues: straw, etc.
- ✓ Forest residues

Cellulosic material

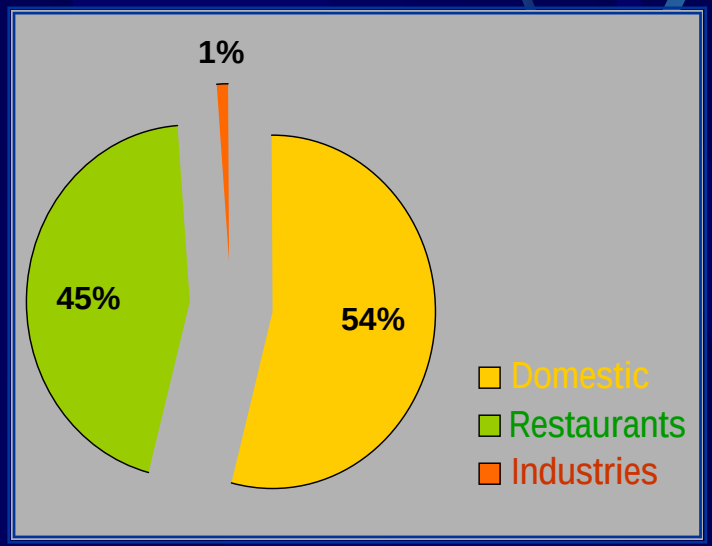
- \+ Available in high quantities; low cost
- – Recovery and transport
- – Technological process more complex
- – Higher processing cost

- ✓ Wine alcohol

Portuguese situation

Available residues for biodiesel production

✓ Used frying oils ➡ Estimated availability ~ 88 000 ton/year



48 288 ton

39 508 ton

540 ton

Portuguese situation

Biodiesel production from used frying oils

Municipalities and Regional Energy Agencies

Sintra – first biodiesel station

Oeiras – Óleo Valor and Oilprodiesel projects

- Collection of UFO from domestic sector through an innovative process and its transformation into biodiesel with subsequent use in the municipal fleet

Portuguese situation

Industries for biodiesel production

Biodiesel production from used frying oils

Company	Place	Production	Remarks
Dieselbase	Setúbal	3 000 L/day	Operating
Socipole	Porto	15-30 ton/day	Operating
Space	Vila Nova de Famalicão	3 000 ton/year	Operating
Ares Lusitani	Torres Vedras	1 000 L/day	Build-up
AMALGA	Alentejo	500 L/day	Design stage

Portuguese situation

Industries for biodiesel production

Biodiesel production from used frying oils

- Consumed in private fleets
- Benefits from a total tax exemption

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Portuguese situation

Available residues for biodiesel production

- ✓ Waste animal fats

Residue source	Industrial facilities	Material processed
Mammalian	10	110 000 ton/year
Poultry	14	150 000 ton/year

Portuguese situation

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Residue source	Industrial facilities	Material processed
Mammalian	10	110 000 ton/year
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16 100 ton extracted fat /year

Portuguese situation

- Biodiesel or bioethanol production from national raw materials
- Biodiesel or bioethanol production from imported raw materials
- Biodiesel or bioethanol import

Portuguese situation

Industries for biodiesel production

Biodiesel production from imported oleagineous seeds

Company	Place	Production	Remarks
Iberol	Alhandra	20 000 ton/year 100 000 ton/year	Operating Final build-up
Fábrica Torrejana de Biocombustíveis	Riachos	40 000 ton/year	Starting operation
Enersis	Sines	25 000 ton/year (?)	Design stage
Biovegetal	Porto	100 000 ton/year (?)	Design stage
Ares Lusitani	Torres Vedras	1 000 L/day	Build-up

Portuguese situation

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Sell to the fuel distribution companies for blending with diesel

Conclusions

- In a first stage, biofuels production will only be possible with imported raw material.
- Biofuels production in Portugal can be decisive to the future of the Portuguese agriculture.
- Biofuels production from residues can also contribute for the total volume of biofuels produced in the country.