

Biowaste Biorefinery for the integrated chemical and energy production from organic waste and byproducts

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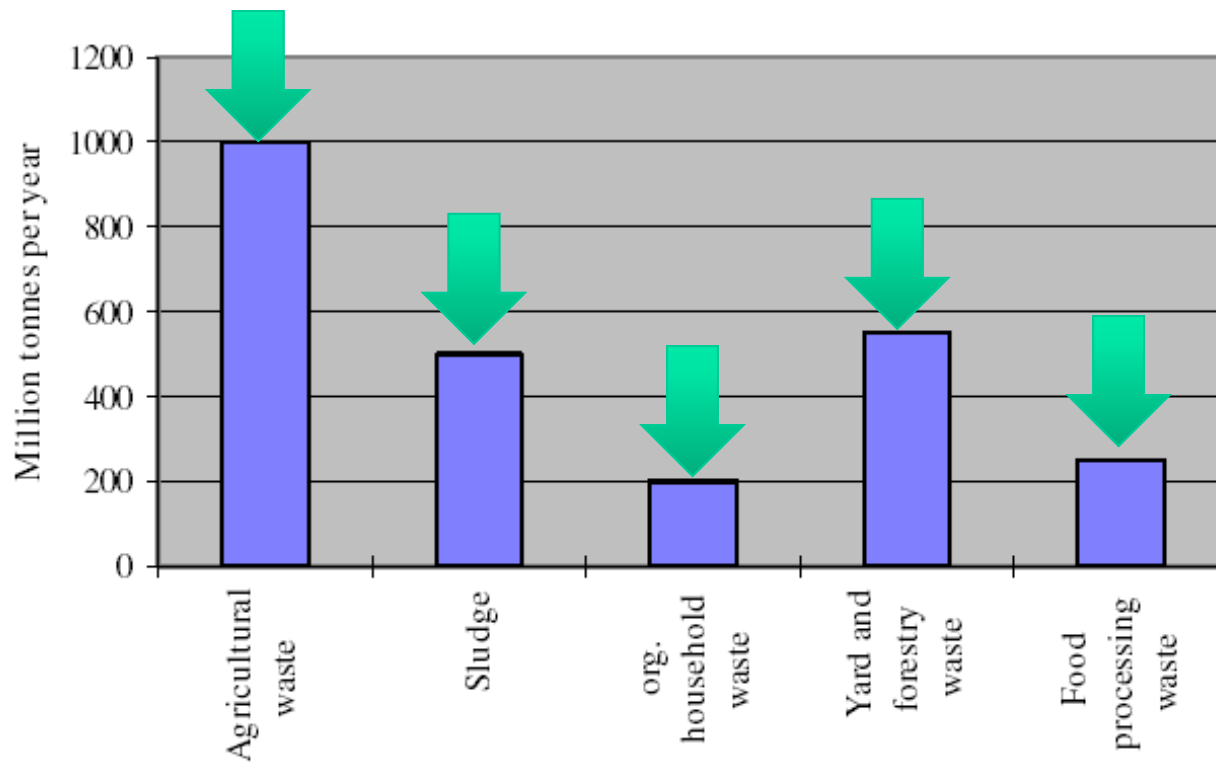
Presentation outline

- ❑ Biowaste production in Europe;
- ❑ Biowaste biorefinery concept;
- ❑ Integrated biorefinery for agro-food byproducts and waste;
- ❑ Advanced integrated biorefinery for food processing by-products and waste;
- ❑ Biowaste biorefinery at Ecomondo;
- ❑ Conclusions.



Biowaste production in Europa

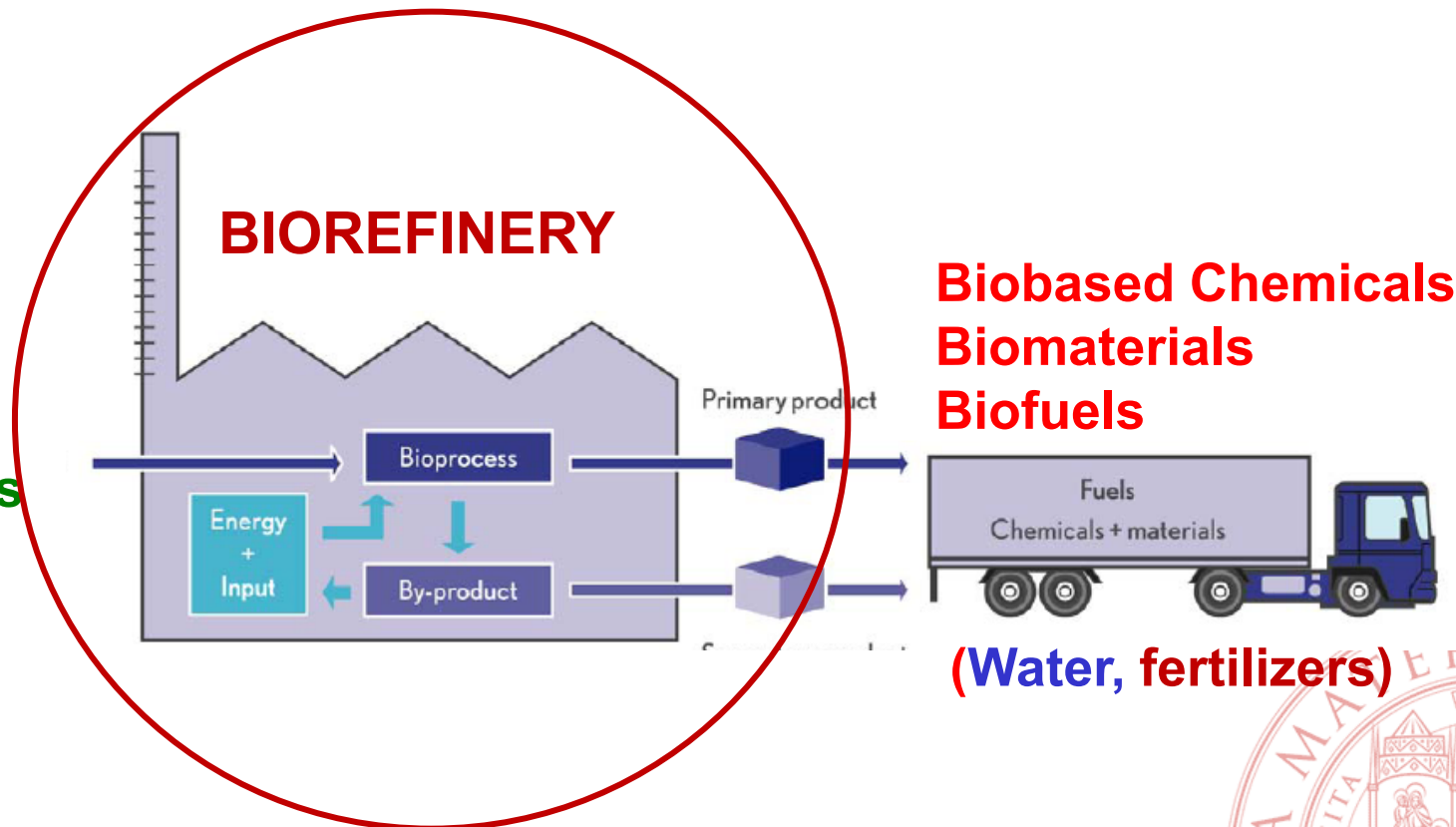
Annual organic waste streams in the EU



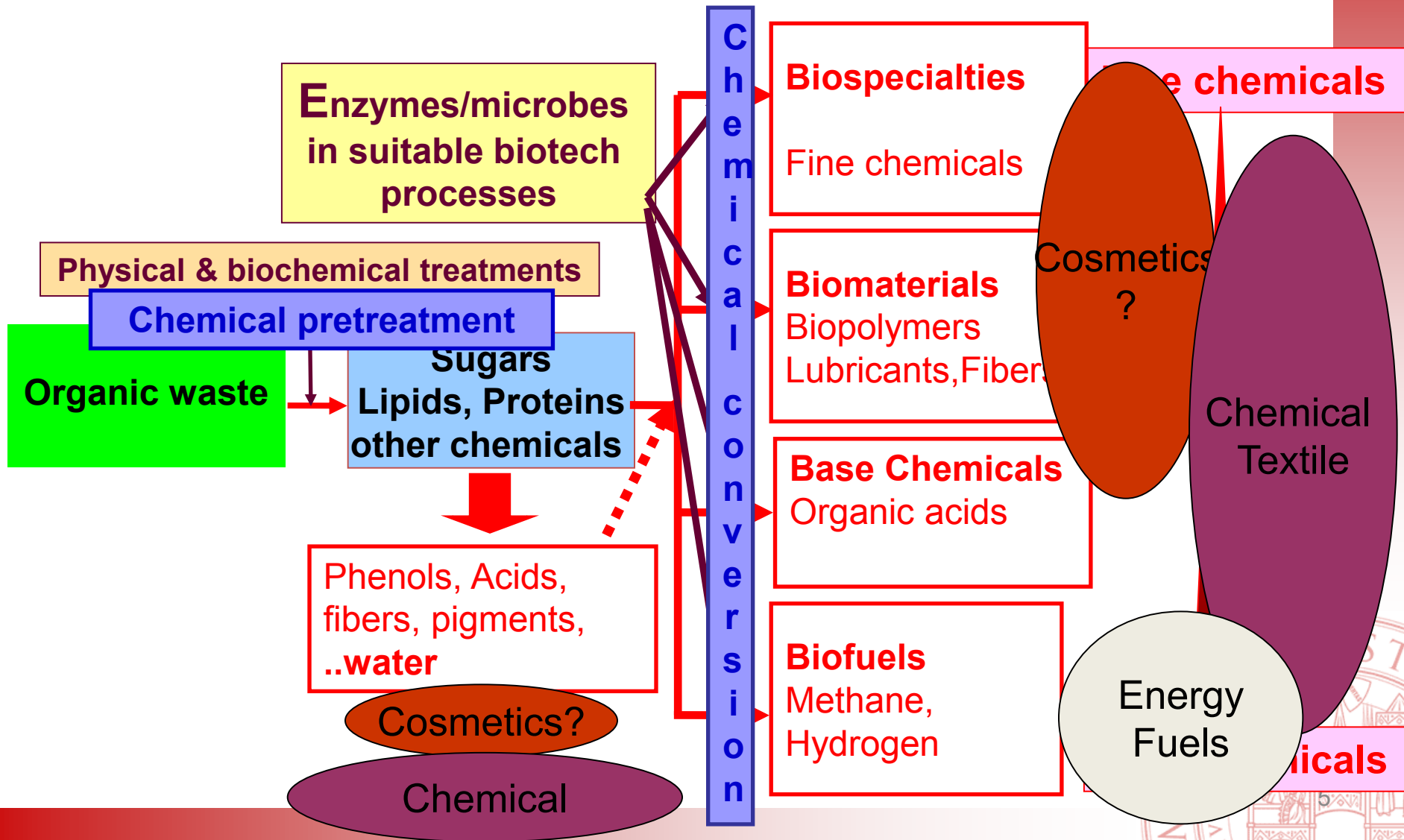
Biowaste biorefinery

Towards a bio-based society: an integrated, multipurpose biorefinery

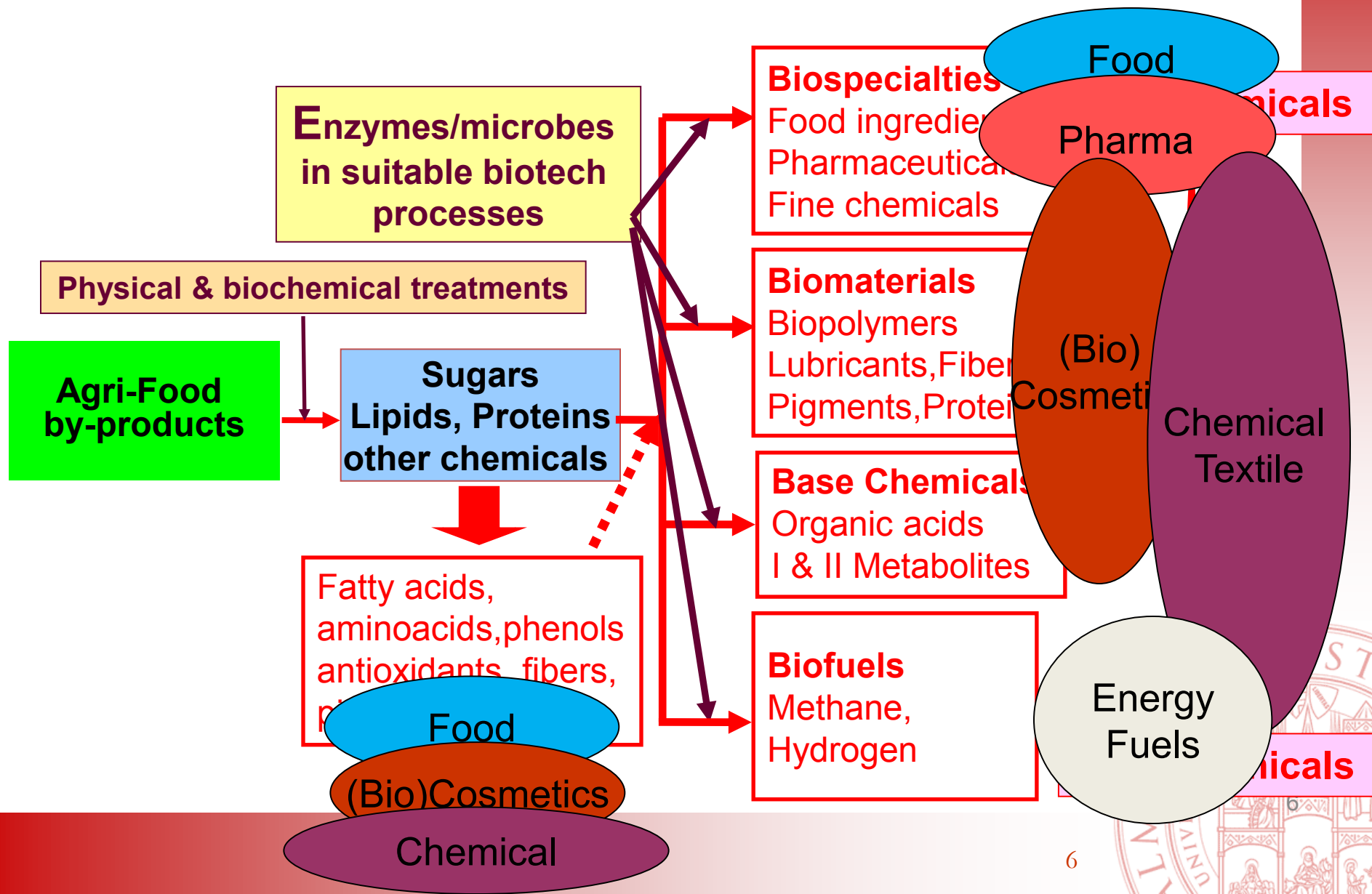
Organic
Byproducts
& waste



Biowaste Biorefinery for the valorization and a more sustainable disposal of organic waste



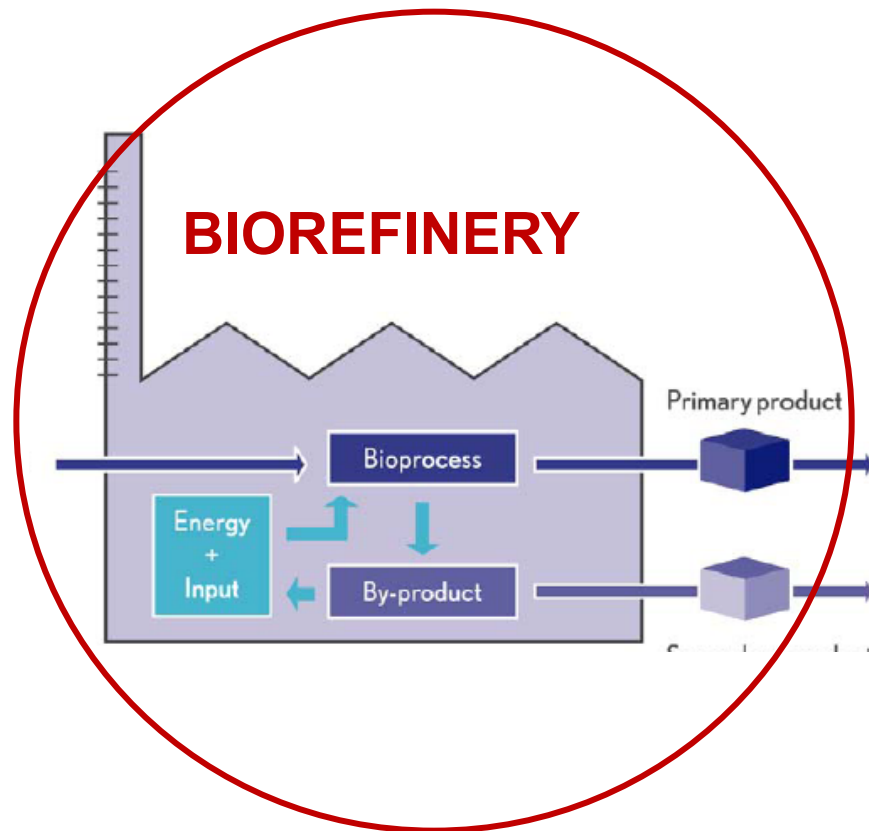
Biorefinery for the integrated valorization of agri-food byproducts



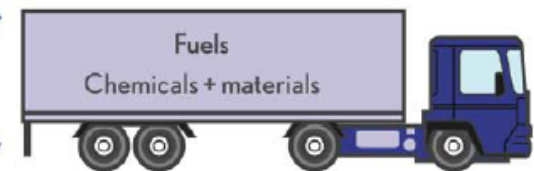
Integrated, multipurpose biorefinery

Towards a bio-based society: an integrated, multipurpose biorefinery

Organic
Byproducts
& waste



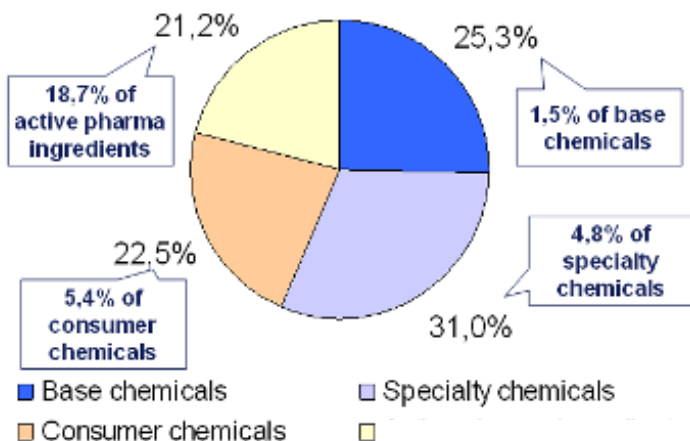
Biobased Chemicals
Biomaterials
Biofuels



(Water, fertilizers, feed)

Trend of the biobased products market

€ 48 billion, 2007

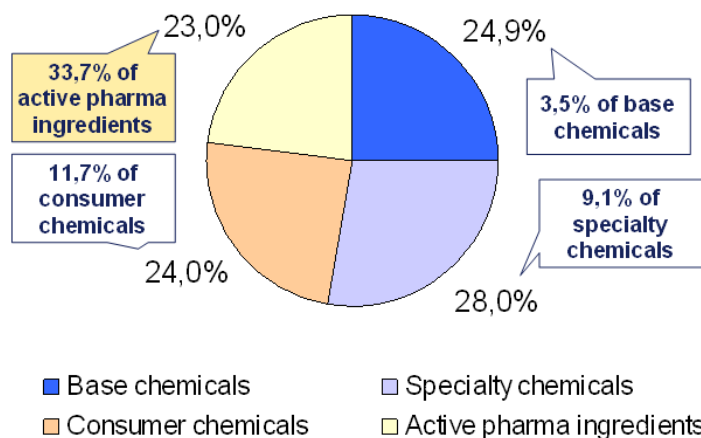


World sales of biotech-made biobased products

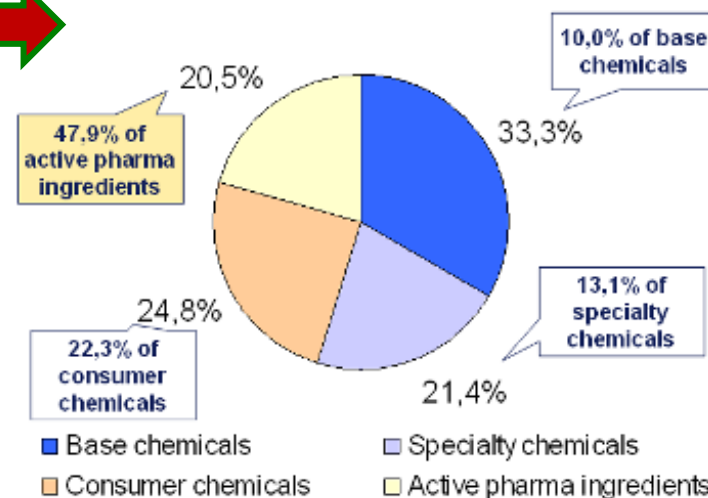
2007: 48 bil € (3,5% of total chemical sales)
 2012: 135 bil € (7,7% of total chemical sales)
 2017: 340 bil € (15,4% of total chemical sales)

G. Festel (EFIB 2009, Lisbon, October 2009; OECD workshop, Vienna, January 2010)

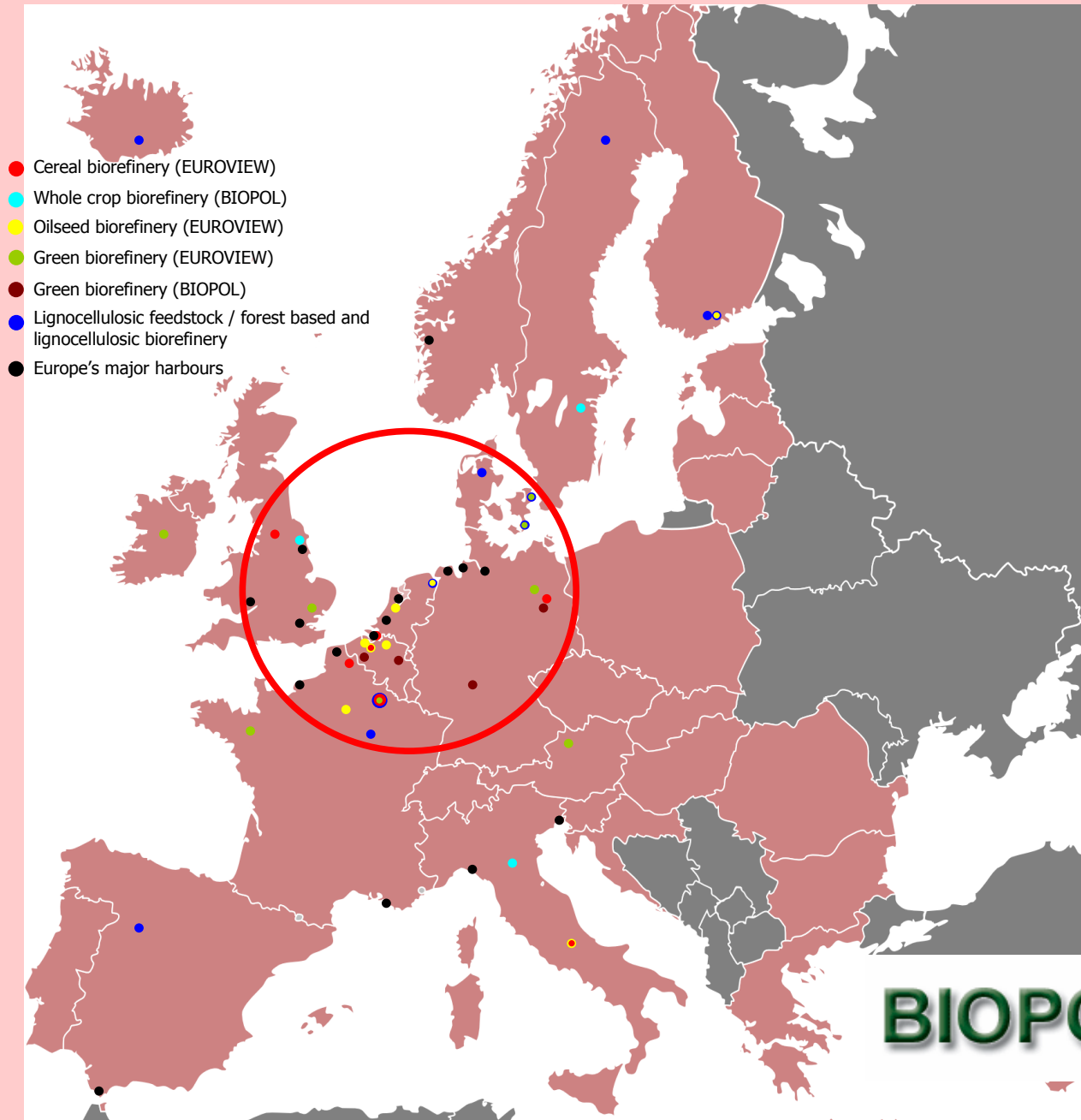
€ 135 billion, 2012



€ 340 billion, 2017



EU existing Biorefineries



- 34 recognised biorefinery (pilot & industrial) sites
- 16 major European sea harbours
- 75% of the biorefinery sites and 70% of the largest sea harbours are located within a circle consisting of France, Germany, Denmark, Belgium, the Netherlands, and the UK.

BIOPOL

Biorefineries in Italy

Private investments: more than €1.0 billion; 1600 people employed.

PIEMONTE

R&D CENTRE BIOPLASTICS AND BIOCHEMICALS FROM RRM (NOVARA)
 R&D CENTRE CHEMISTRY FROM RENEWABLES (NOVARA)
 R&D CENTRE BIOCHEMICALS PROCESSES AND TECHNOLOGIES (RIVALTA SCRIVIA - AL)
 PILOT PLANT FATTY ALCOHOL (RIVALTA SCRIVIA - AL)
 PILOT PLANT BIOMONOMERS (NOVARA)
 DEMO PLANT GREEN GLYCOL (RIVALTA SCRIVIA - AL)
 INDUSTRIAL PLANT LIGNOCELLULOSIC BIOETHANOL (CRESCENTINO - VC)
 FLAGSHIP SUCCINIC ACID (CASSANO SPINOLA - AL)

SARDEGNA

1 FLAGSHIP AZELAIC ACID AND PELARGONIC ACID (PORTO TORRES - SS)
 1 FLAGSHIP BASIS FOR BIOLUBRICANTS AND BIOADDITIVES FOR RUBBER
 R&D CENTRE

LAZIO

INDUSTRIAL PLANT BIODEGRADABLE POLYESTERS (PATRICA - FR)

LOCATION TBD

EXPERIMENTAL CROPS AND DEMO PLANTS FOR EXTRACTION OF NATURAL RUBBER AND OTHER VALUABLE PRODUCTS (RESINS ETC.)

LOMBARDIA

R&D CENTRE GREEN CHEMISTRY PROCESS ENGINEERING AND BIOLUBRICANTS (MANTOVA)
 R&D CENTRE BIOLUBRICANTS (SAN DONATO MILANESE - MI)
 PILOT PLANT FOR BIOBASED BUTADIENE (SAN DONATO MILANESE - MI)

VENETO

FLAGSHIP 1,4 BDO FROM RRM (ADRIA - RO)

EMILIA ROMAGNA

R&D CENTRE BIOELASTOMERS (RAVENNA)

UMBRIA

R&D CENTRE, PILOT AND DEMO PLANTS ON OLEAGINOUS CROPS AND BIOLUBRICANTS FROM LOCAL CROPS (TERNI)
 INDUSTRIAL PLANT BIOPLASTICS BASED ON STARCH AND POLYESTERS FROM VEGETABLE OILS (TERNI)

PUGLIA

FLAGSHIP AVIATION FUEL (MODUGNO - BA)

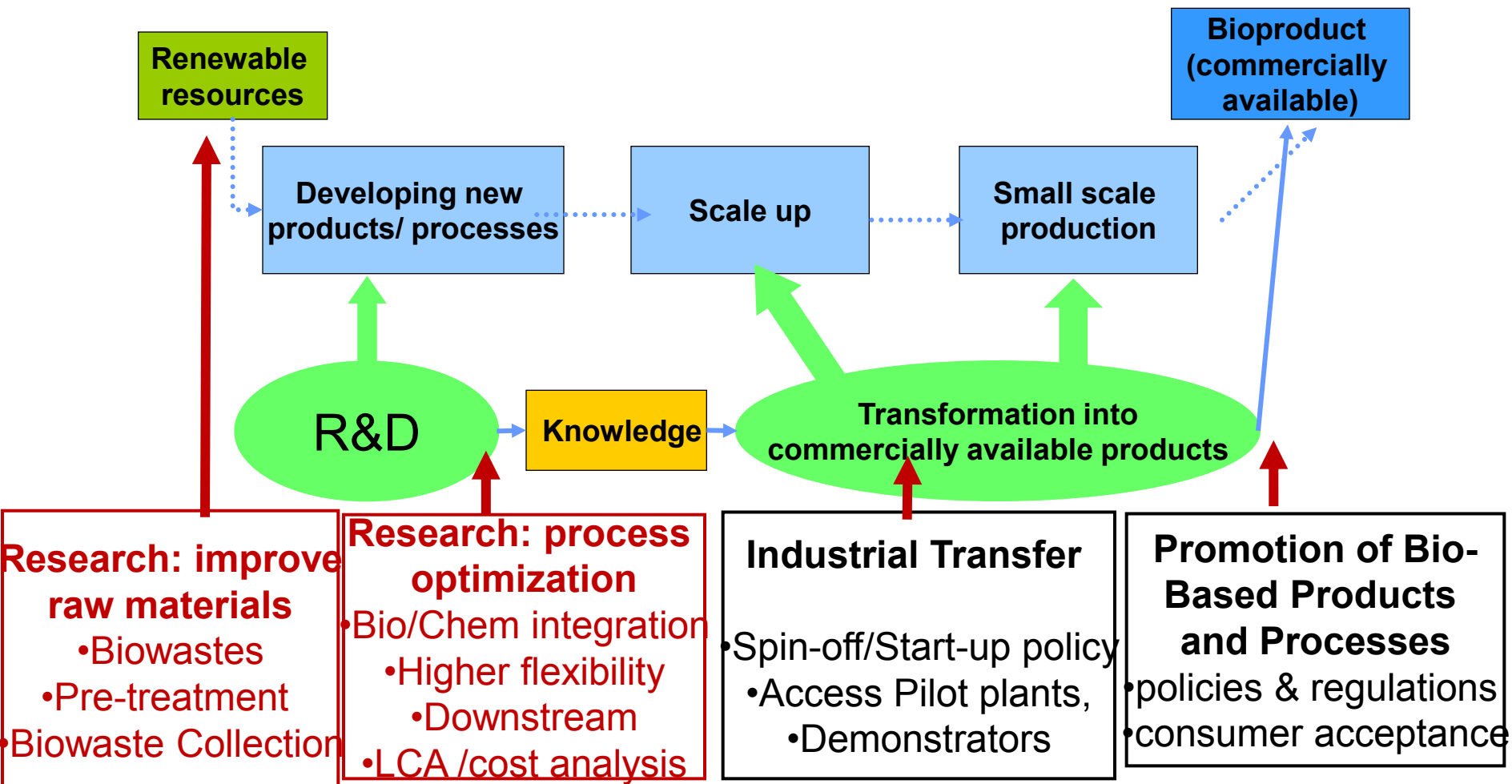
CAMPANIA

BIOTECHNOLOGICAL R&D CENTRE (PIANA DI MONTE VERNA - CE)
 (courtesy of C. Bastioli)

(courtesy of C. Bastioli)

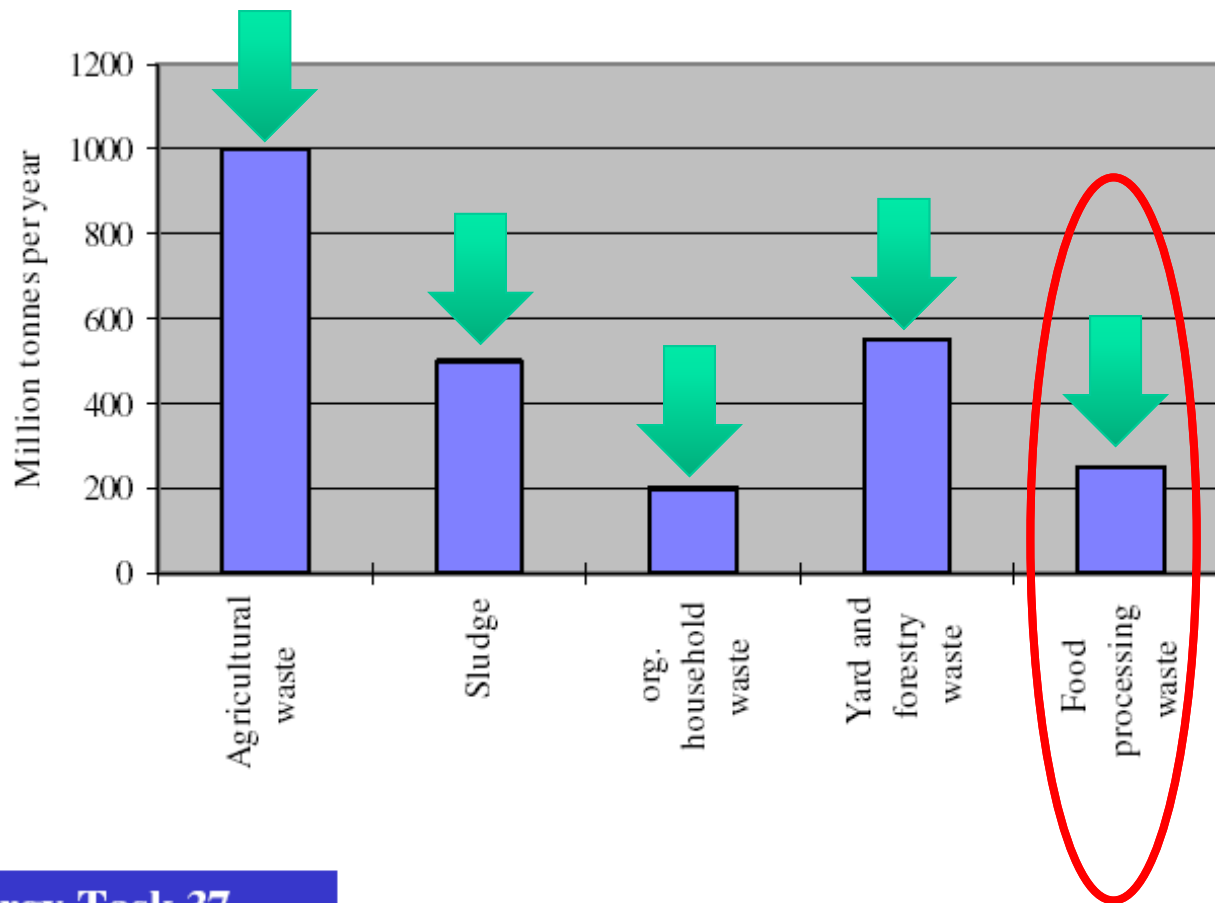
-  EXPERIMENTAL FIELDS (8)
-  R&D CENTRES (9)
-  PILOT PLANTS (4)
-  DEMO PLANTS (2)
-  INDUSTRIAL SITES (3)
-  FLAGSHIPS (5)

Biorefinery: R&D and other needs



Food processing byproducts (a)

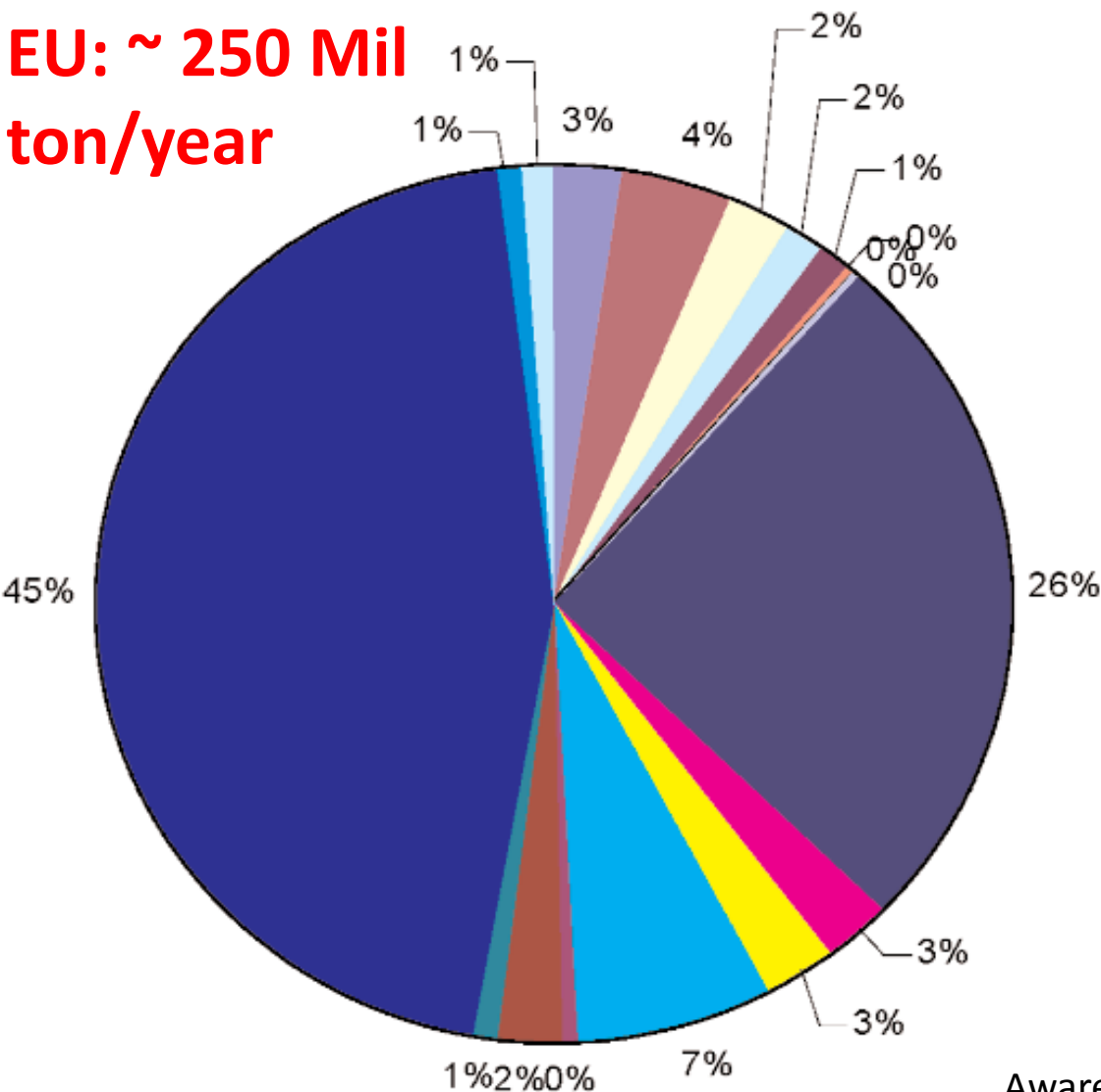
Annual organic waste streams in the EU



- Homogeneous streams, rich of highly valuable compounds;
- If properly handled, they can be converted into food ingredients and other high-value natural products;
- They are adversely affecting the environmental sustainability of the food industry (the first industrial sector in EU with 1000 bil €/y of turnover)

Food processing byproducts (b)

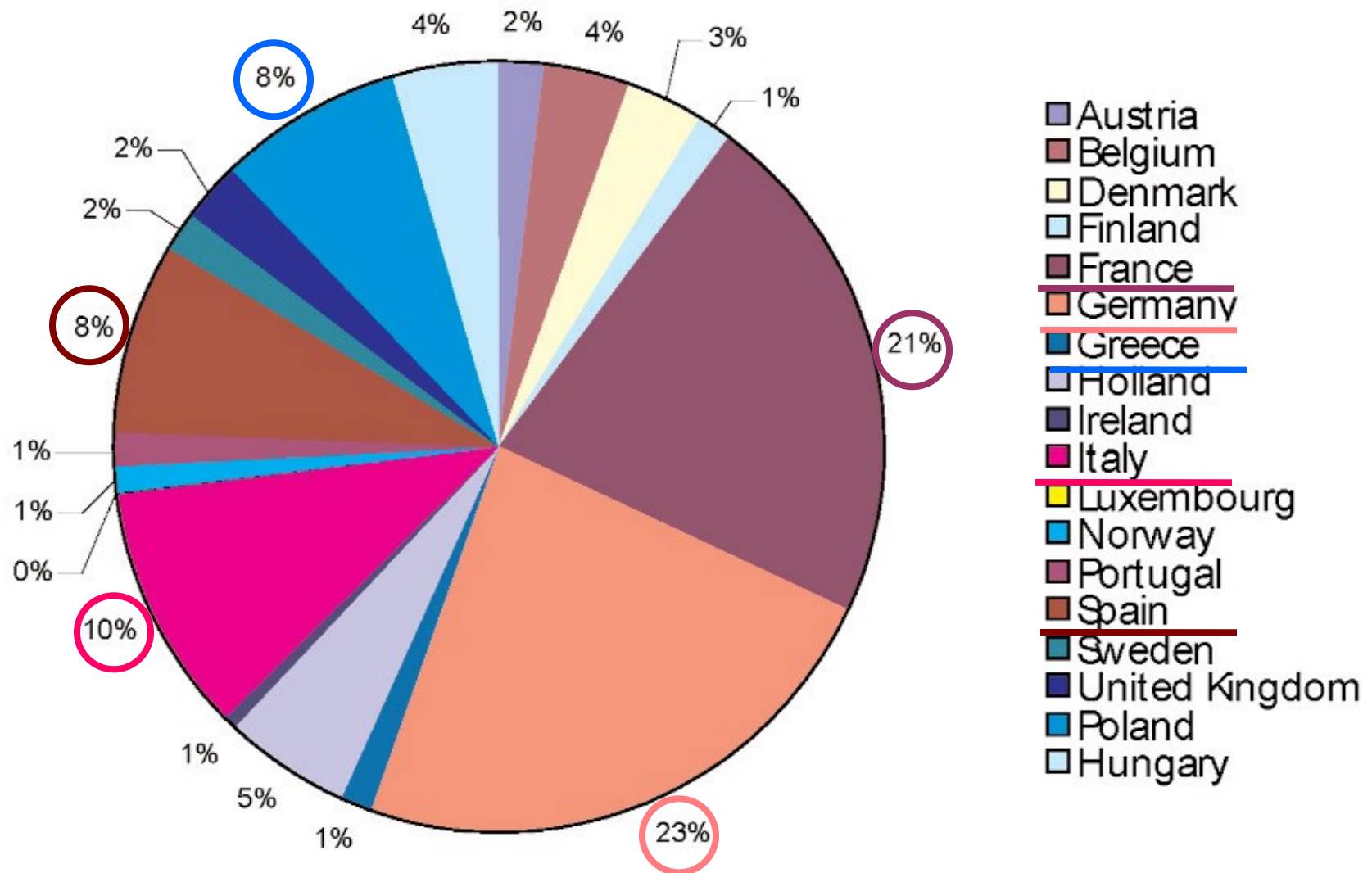
Production in
EU: ~ 250 Mil
ton/year



- Beef Slaughterhouse (Bovine)
- Pig Slaughterhouse
- Poultry Slaughterhouse
- Fish filleting, curing, salting and smoking
- Fish Canning
- Preserved crustacean and mollusc
- Fresh, frozen, dried salted or in brine crustacean and mollusc
- Yoghurt Production
- Fresh, soft and cooked Cheese production
- Fruit and vegetables Processing and preservation
- Fruit and vegetables Juice production
- Vegetable oil production
- Corn Starch production
- Potato Starch production
- Wheat Starch production
- Sugar production
- White wine
- Red wine

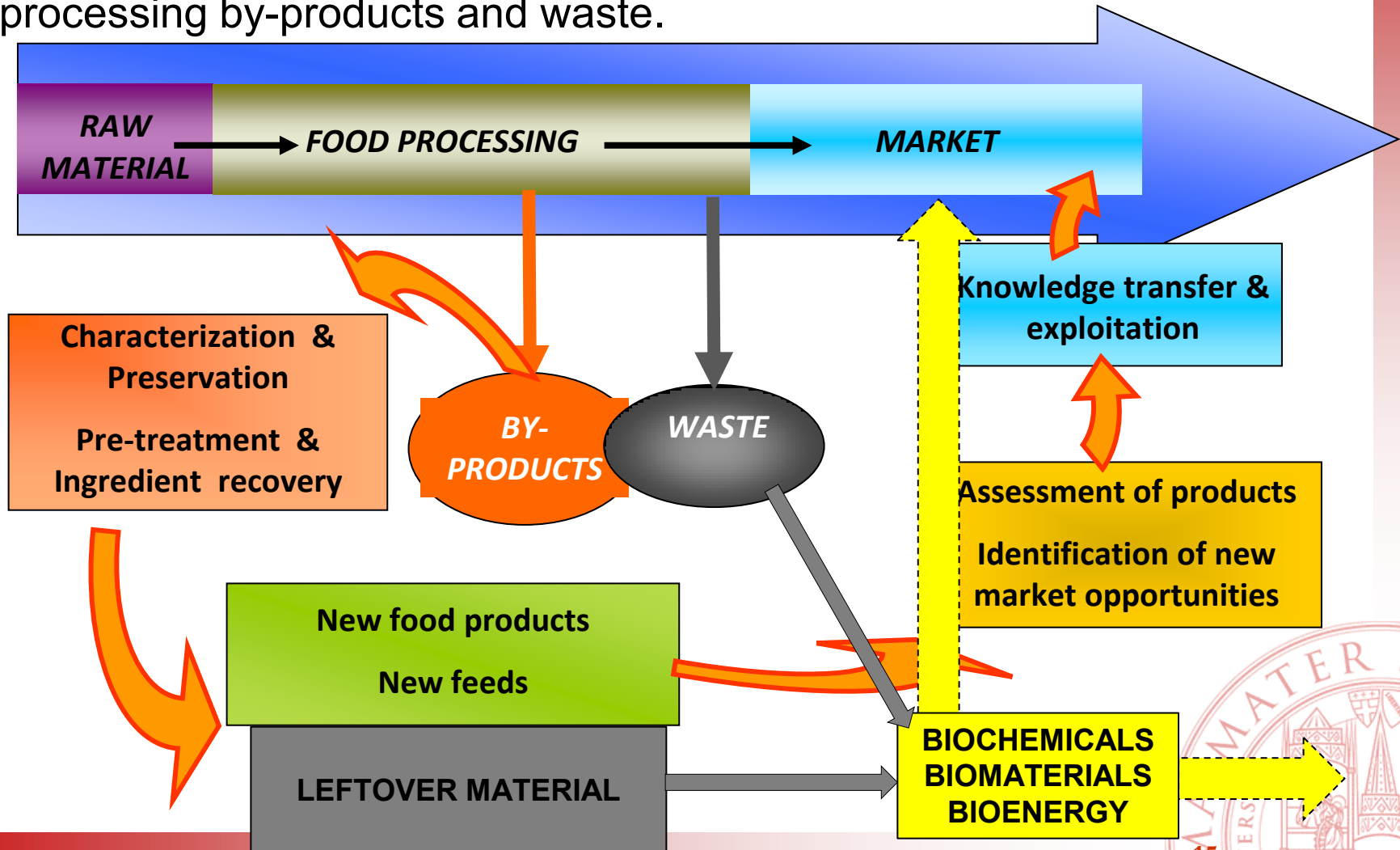
Awarenet (2004). Deposito BI-223-04.

Food processing byproducts (c)



Advanced/integrated biorefineries for food processing by-products and waste

Improve resource efficiency, environmental sustainability and competitiveness of the food industry via the integrated valorization of processing by-products and waste.



ECOMONDO

a platform for the sustainable growth

05.08
NOVEMBRE 2014
RIMINI - ITALY

18ª Fiera Internazionale
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ed Energia e dello
Sviluppo Sostenibile

Attendance:

93,000

**Delegates from
20 different
Countries**

**Exhibition with
1,200
Enterprises**

**THE 3RD LARGEST
EUROPEAN EXHIBITION ON
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SUSTAINABLE
DEVELOPMENT.**

<http://en.ecomondo.com/>

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key energy

www.keyenergy.it



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Organizzato da



Con il patrocinio di



MINISTERO DELL'AMBIENTE
EDILTA' TUTELA DEL TERRITORIO E DEL MARE



Ministero dello Sviluppo Economico



Main industrial/scientific domains represented at Ecomondo

110
Conferences,
1,200
Speakers,
8,000
attendees,
180 papers
published



Biorefineries for a more sustainable and competitive European Industry & Economy

**Haute couture
From Biomass,
BIO 2006
Chicago, April 9-12**

www.suschem.org
www.europabio.org
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Thank You!