

**Current and prospective market for  
industrial bio-products and biofuels  
in France by 2015 / 2030**

*– June 10, 2008 –*

**Arnaud GABENISCH**

*Responsible for “sustainability” expertise pole*

*Manager in “Biotechnologies & Innovation” Business Unit*

# Anticipate the transformations of agro-industrial activities

## Helping to analyze most promising markets

2

### Context

- Ü Determine the current and prospective markets of energy and industrial bioproducts in France
- Ü Give an overall vision of the market: parameters of economic context, agricultural and forest policy, substitution of the fossil resources, technological developments, ...
- Ü Anticipate the industrial transformations to come

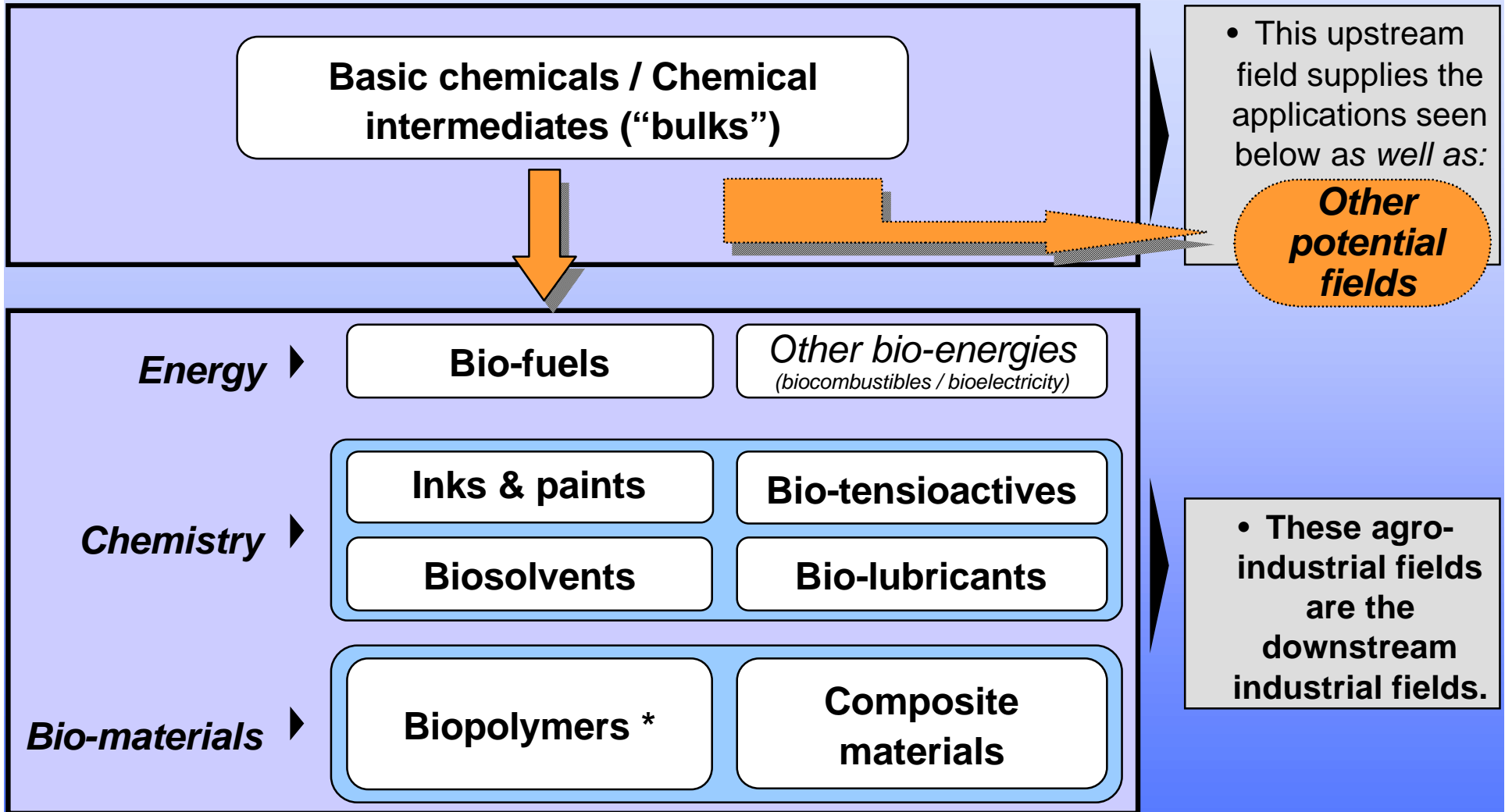
### Objectives

- Ü **Giving a coherent frame** for the analysis of potential markets.
- Ü Establish **different scenarios** in order to give interpretations and strategic recommendations for the building of plans
- Ü Identify the **most promising markets** in order to select the priority agro-industrial fields, as well as the key actions for their development.

### Methodology

- Ü Build a **simple prospective model**, in spite of the great number of agro-industrial fields, the multitude of criteria and the many existing bonds between the different fields.

# Nine agro-industrial fields in energy, chemistry and biomaterial markets



\* : currently obtained from three raw materials: i) **cereal starch** which can be incorporated in more than 70% within plastic materials, ii) **derivatives of glucose** with many ways of transformation, in particular those leading to PLA and PHA and iii) **the transformation of whole plants.**

# Three main groups of evolution for bioproducts markets

4

**Technological factors**

**R&D efforts / investments**

**Economical factors**

**Oil & fossil resources prices**

**Subsidies / taxes**

**Social factors**

**Environmental and social demand**

**Push/mobilization of industrial players**

**Environmental incitatives / regulations** (national / European)

**Healthcare incitatives / regulations** (national / European)

**The prospective model has to take into account :**

â Each agro-industrial field reacts in a different way to these factors. Some are very sensitive to the economic component, whereas others are more sensitive to the social component.

â It is thus necessary to balance their sensitivity by assigning a grade to each group, ranging from 1 to 3.

# Four scenarios : a general framework for the considered agro-industrial fields

5

## Scenario I:

a stable maintain of actual situation

Stable oil price around 70-80\$, in the hypothesis of a geopolitical appeasement and of absence of natural disaster; relatively low social pressure for renewable products; R&D efforts intensity with no major change.

**Factors :**

**Eco. : 1**

**Soc. : 1**

**Techno. : 1**

## Scenario II:

a relatively changing context but without social factors in account

A more conflictual geopolitical context, the oil price increase evolving by *ad hoc* adjustments (around 100\$ by 2015 / 150\$ by 2030) but without social pressure change; R&D efforts more dedicated / centred on bioproducts.

**Factors :**

**Eco. : 2**

**Soc. : 1**

**Techno. : 2**

## Scenario III:

scenario II added with social factor

A more conflictual geopolitical context, the oil price increase moving by *ad hoc* adjustments (around 100\$ by 2015 / 150\$ by 2030) , with a social pressure change; R&D efforts more dedicated / centred on bioproducts.

**Factors :**

**Eco. : 2**

**Soc. : 2**

**Techno. : 2**

## Scenario IV:

the best conditions where all factors are strongly involved

A conflicting geopolitic context leading to the increase of the petrol barrel's price to 150\$ by 2015 and more than 200\$ by 2030; a pragmatic pressure of society clearly expressing itself for bioproducts; a very active research, strongly focused on bioproducts, which has become a priority.

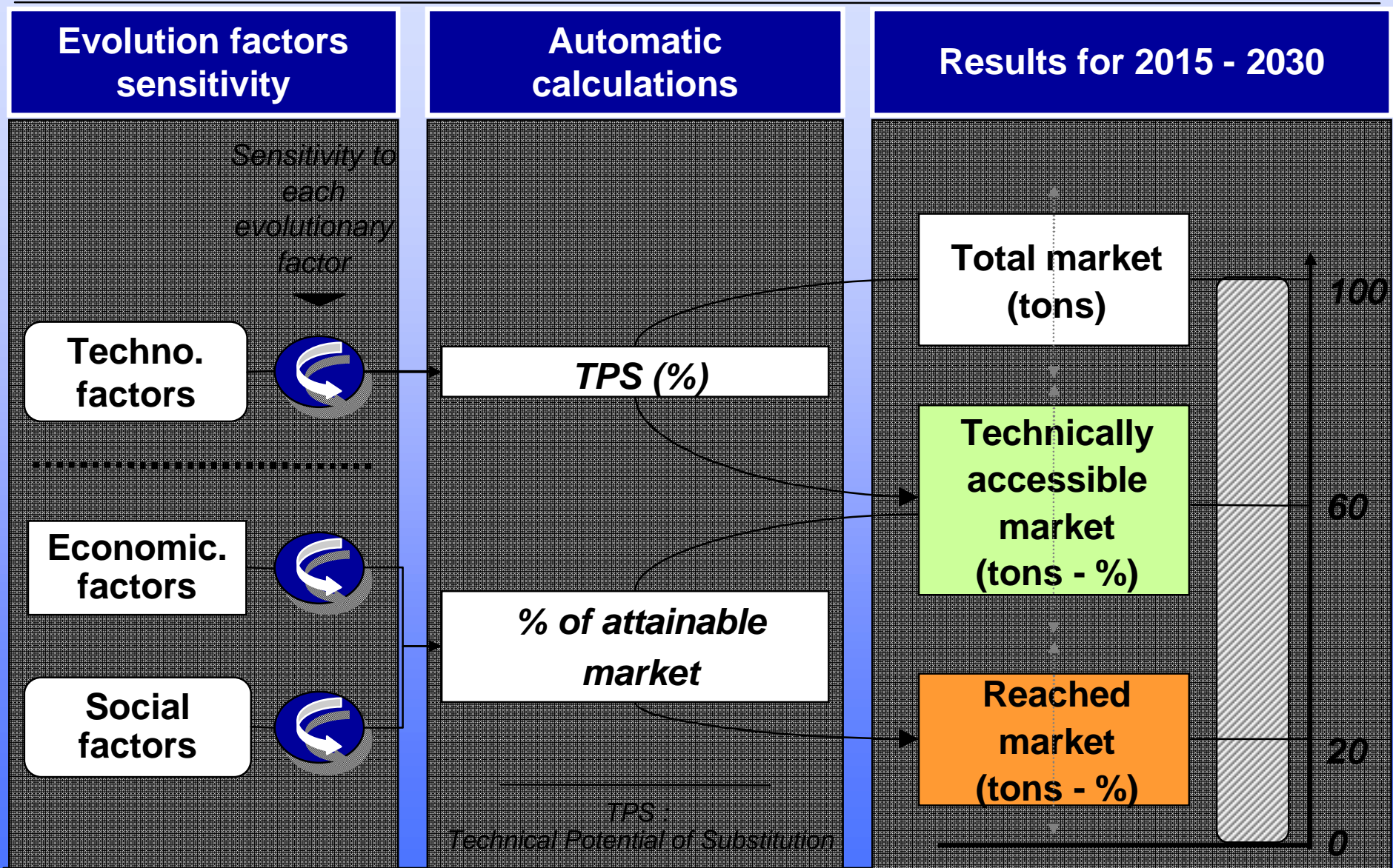
**Factors :**

**Eco. : 3**

**Soc. : 3**

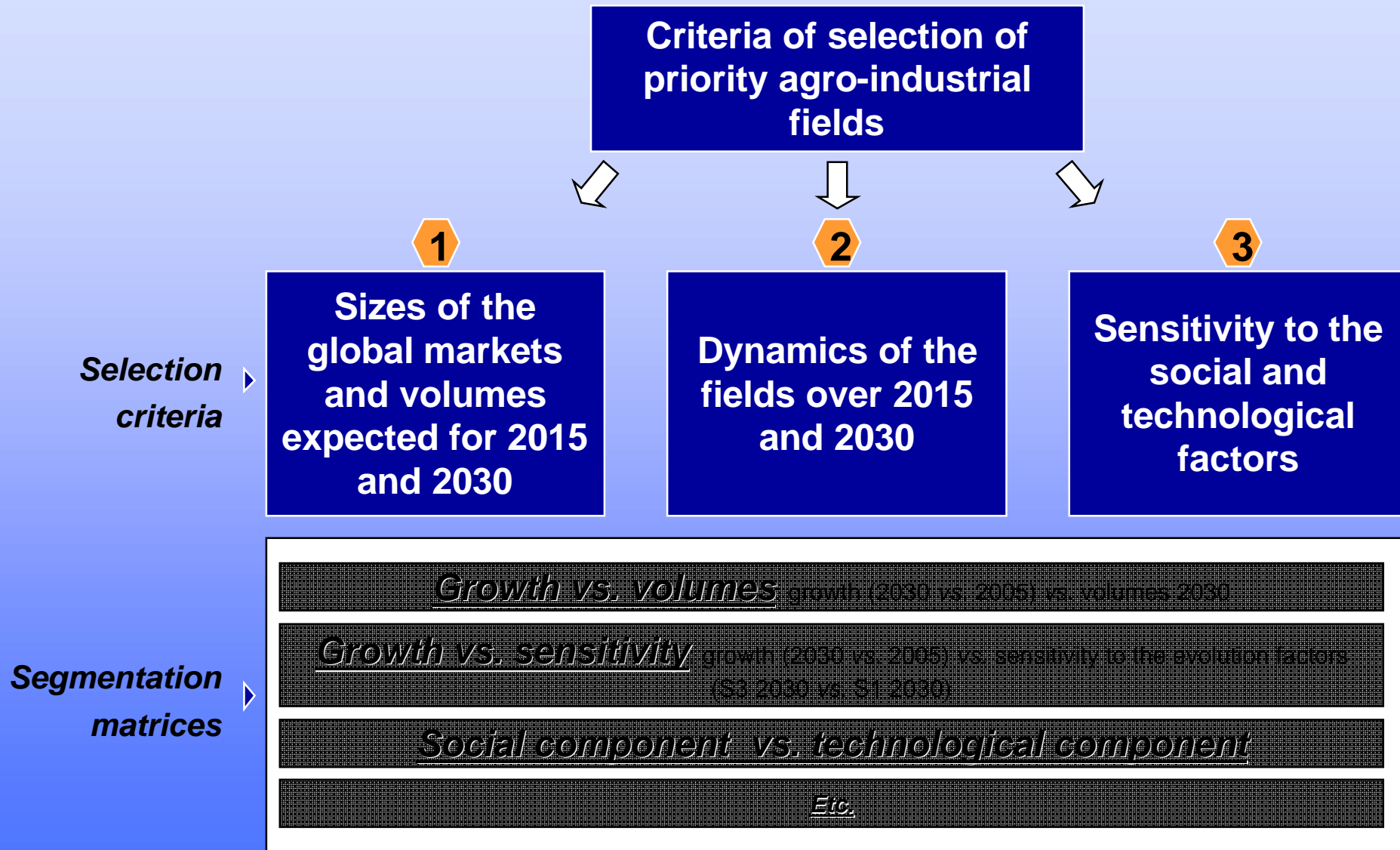
**Technol. : 3**

# Prospective model construction

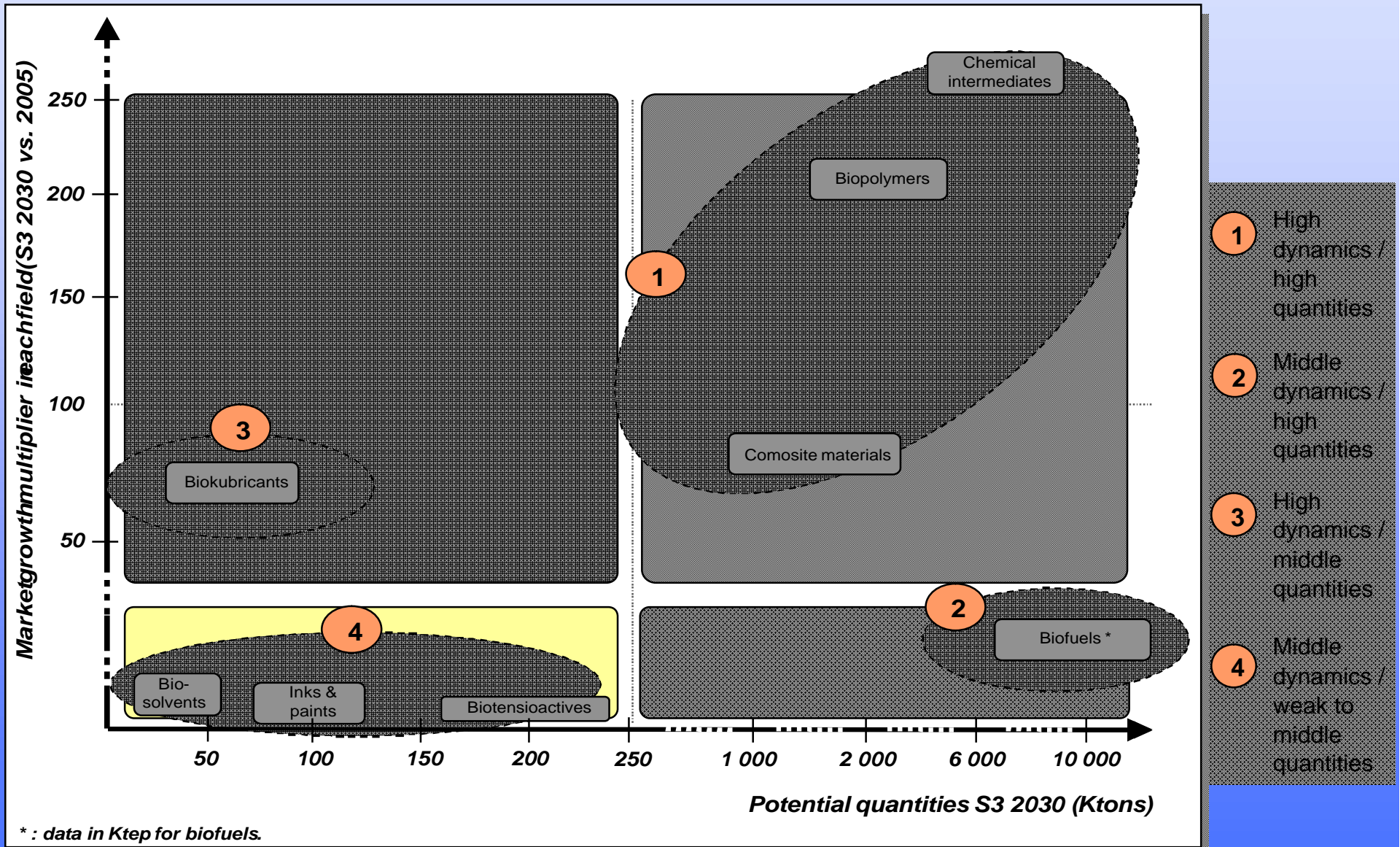


# Selection of priority fields which will make it possible to achieve environmental and economic goals

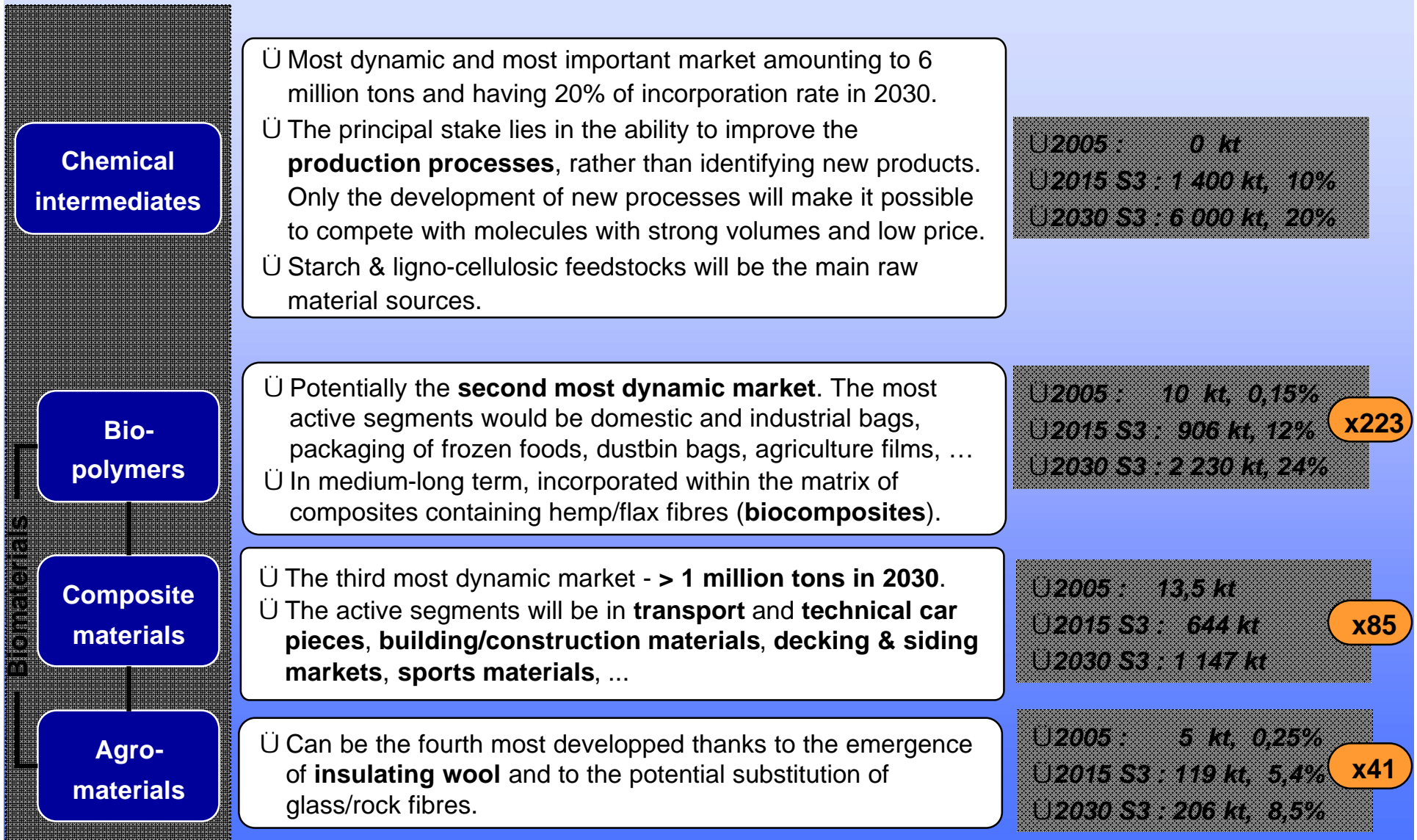
7



# Growth dynamics / potential quantities – matrix



# Group 1: the 4 most potential dynamic agro-industries



**Chemical intermediates**

- ü Most dynamic and most important market amounting to 6 million tons and having 20% of incorporation rate in 2030.
- ü The principal stake lies in the ability to improve the **production processes**, rather than identifying new products. Only the development of new processes will make it possible to compete with molecules with strong volumes and low price.
- ü Starch & ligno-cellulosic feedstocks will be the main raw material sources.

ü 2005 : 0 kt  
 ü 2015 S3 : 1 400 kt, 10%  
 ü 2030 S3 : 6 000 kt, 20%

**Bio-polymers**

- ü Potentially the **second most dynamic market**. The most active segments would be domestic and industrial bags, packaging of frozen foods, dustbin bags, agriculture films, ...
- ü In medium-long term, incorporated within the matrix of composites containing hemp/flax fibres (**biocomposites**).

ü 2005 : 10 kt, 0,15%  
 ü 2015 S3 : 906 kt, 12% **x223**  
 ü 2030 S3 : 2 230 kt, 24%

**Composite materials**

- ü The third most dynamic market - > **1 million tons in 2030**.
- ü The active segments will be in **transport and technical car pieces, building/construction materials, decking & siding markets, sports materials, ...**

ü 2005 : 13,5 kt  
 ü 2015 S3 : 644 kt **x85**  
 ü 2030 S3 : 1 147 kt

**Agro-materials**

- ü Can be the fourth most developed thanks to the emergence of **insulating wool** and to the potential substitution of glass/rock fibres.

ü 2005 : 5 kt, 0,25%  
 ü 2015 S3 : 119 kt, 5,4% **x41**  
 ü 2030 S3 : 206 kt, 8,5%

# Groups 2 & 3: good dynamics

## Group 2

### Bio-fuels

- ∅ This market is different by its **strongest development during last several years thanks to European and national regulations.**
- ∅ The challenge to mid/long term will be to **improve profitability and environmental impacts** and to place biofuels in a large scale production to reach more than 5 million tons from 2015.
- ∅ The **exploitation of ligno-cellulosic feedstock's** (2<sup>nd</sup> generation) will be of major importance to achieve these goals and **avoid competition between uses.**

∅2005 :	403 ktep, 1,4%	x29
∅2015 S3 :	5 0282 ktep, 12%	
∅2030 S3 :	11 5620 ktep, 25%	

## Group 3

### Bio-lubricants

- ∅ The market would probably have strong dynamics but **its volume will be relatively minor compared to the others**, less than a hundred kttons.
- ∅ In spite of important R&D efforts, this agro-industrial field did not develop in France **contrary with other countries, in particular Germany.**

∅2005 :	1 kt, 0,1%	x64
∅2015 S3 :	42 kt, 5,3%	
∅2030 S3 :	64 kt, 8,9%	

## Group 4: low priority “niche” fields due to their small/saturated market development

11

### Bio-tensioactives

- Ü Its higher maturity (market share of 27,5% in 2005 ; current rate of penetration in cosmetics near to 80%).
- Ü Nevertheless, this field still shows possibilities of development, in particular within the **detergency** sectors (penetration rate of 20%), or within other markets, such as those of **oil drillings** (current rate of penetration around 15%).
- Ü The main factor of evolution is the increase of the petrochemical resources price, except for cosmetics market.

Ü 2005 : 110 kt, 27,5%  
Ü 2015 S3 : 173 kt, 40,2% **x1,9**  
Ü 2030 S3 : 208 kt, 45,1%

### Inks & paints

- Ü **Inks**: the evolving markets are those of offset sheetfed inks, the press rotatives and food packing.
- Ü **Paints**: the current market of alkydes in solvent phase tends to narrow because of the regulations in force. An evolution is possible towards the use of vegetable oils within **alkydes in emulsion** and towards a new generation of paintings.

Ü 2005 : 30 kt  
Ü 2015 S3 : 63 kt **x3**  
Ü 2030 S3 : 95 kt

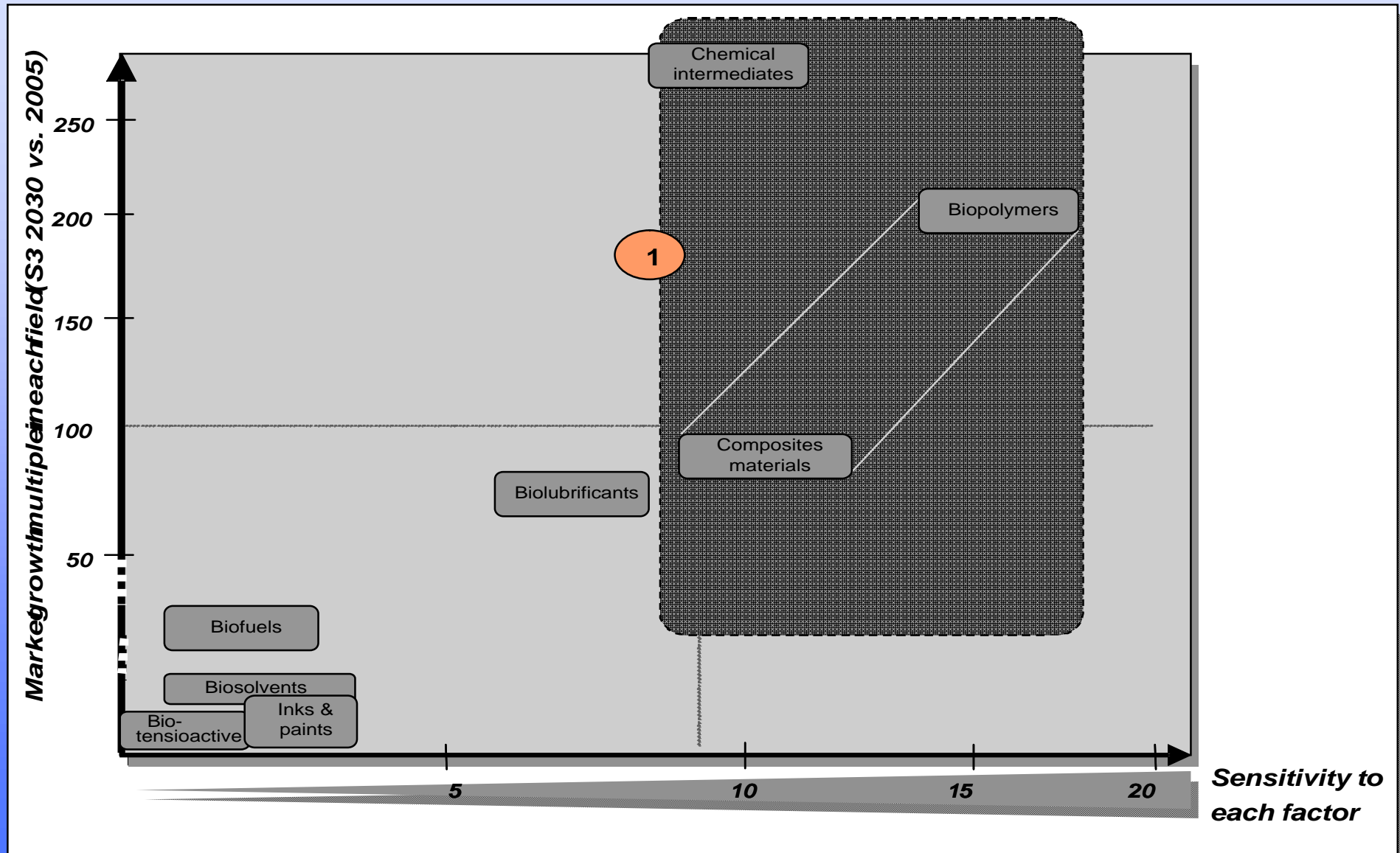
### Bio-solvents

- Ü **“Cleaning” market**: niche market with low potential volumes and very important R&D efforts.
- Ü **Biofluxants**: in spite of their technical advantages, they are not addressing a dynamic market.
- Ü **Phytosanitary treatments (oils)** : the oils represent the most significant development, but the potential market is low.

Ü 2005 : 9 kt  
Ü 2015 S3 : 24 kt **x4**  
Ü 2030 S3 : 39 kt

# Chemical intermediates and biomaterials: the most dynamic and ***SENSITIVE*** to evolutionary factors

12



# Three priority fields to be “encouraged” in order to reach ambitious environmental and economic goals

13

- Ü Although France has a important potential in terms of plant resources, industrial exploitation lags more than 10/20 years behind USA, and 5 to 10 years behind most advanced European countries.
- Ü Theses resources are the abundant biomass provided by agriculture, large volumes being currently exported (this is the case for grain crops) and the potential of set-aside farmlands and also forest cultivation: represents today 15 millions hectares, with a natural rate of expansion of 20% that is not exploited.
- Ü A concerted national efforts to focus development on priority areas is needed to make up for this delay, coordinated and integrated by the actors in these sectors.

This French dynamics must be encouraged around priority agro-industrial fields:

**Chemical  
intermediates**

**Biofuels**

**Biomaterials**

**Bio-polymers**

**Composite  
materials**

## Biofuels

- â Ensure transition between 1<sup>st</sup> and 2<sup>nd</sup> generation.
- â Invest at the national level several hundreds of million euros to develop industrial plants for the 2<sup>nd</sup> generation and intensify strategic partnerships with the most advanced countries, in particular Germany.
- â Allow a strong bond between the “agricultural upstream” and the industrial players to be involved.
- â Establish the French/European lignocellulosic map.

## Chemical intermediates

- â Create a new framework of interaction between co-operatives and actors of first transformation, research organizations and French/European chemical industry.
- â Allow a strong collaboration with the foreign biotechnology companies.
- â Recreate each value chain, as well as the optimization of the production costs.
- â Develop new processes and the second transformation inside the industrial chain; improve the financing of investments and factory sites; develop new processes from lignocellulose.

## Biomaterials

- â Encourage a more favourable and clear regulatory framework.
- â Engage a better communication/visibility, particularly for agro-materials and composite materials.
- â Create in the next years new sites of second transformation for biopolymers and from 2010, new sites of first transformation for composite materials.
- â Intervene in the financing of the industrial investments, in particular by attracting foreign investors; allow the rise of innovating SME.
- â Incite the development of a broader range of “synthons” and for a better knowledge of raw materials