



Intermédiaires Biosourcés pour le Développement de Matériaux Innovants

UNAFIC – Paris 24 novembre 2015

Patrick FUERTES
Directeur du Programme BioHub

CHIFFRES CLÉS 2014

Une dimension internationale depuis 80 ans

Ressources naturelles

- 8,3 millions de tonnes
de matières premières végétales
Soit 1 000 000 hectares
- Maïs : 5 Mt
 - Blé : 2,2 Mt
 - Pommes de terre : 1 Mt
 - Pois : 80 000 t
 - Microalgues

NOS ATOUTS

- **21 sites de production** :
Europe (11), Amérique
du Nord (2), Asie /Inde(8)
- Près de **5000 brevets**
- **10% du CA** par an réinvestis
dans le capital industriel et la R&D

3,1
milliards

Ressources humaines

- 8100 personnes
- **25 nationalités et 20 langues parlées**
- Formation : **20h/salarié et par an**
- Ancienneté moyenne :
13 ans pour les hommes
11 ans pour les femmes

NOS CLIENTS

- **2 axes stratégiques** :
80% Alimentation, Nutrition et santé
20% Chimie du Végétal
- **5 000 clients** dans plus de 100 pays
- Co-création avec **un réseau mondial de Centres de Développement Applicatif**

Une société familiale privilégiant le long terme,
l'innovation et la volonté d'entreprendre

Les MARCHÉS

Deux axes stratégiques pour concevoir de nouveaux produits et solutions issus de ressources végétales.

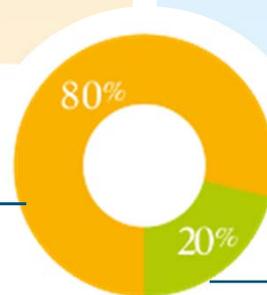
L'ALIMENTATION, LA NUTRITION ET LA SANTÉ

Alimentation infantile,
Confiserie,
Produits céréaliers,
Produits laitiers,
Compléments alimentaires,
Soupes et sauces,
Boissons,
Excipients Pharmaceutiques,
Solutés injectables,
Nutrition animale, Aquaculture...

LA CHIMIE DU VÉGÉTAL

Papiers,
Cartons,
Colles,
Détergence,
Plastiques de performance,
Construction,
Chimie,
Bioindustries...

Alimentation,
Nutrition
et Santé



Chimie du
Végétal

Les MARCHÉS

PHARMACIE & COSMÉTOLOGIE

Pharmacie



Injectables



Cosmétiques



ALIMENTATION, NUTRITION, SANTE

Confiserie



Produits laitiers



Soupes & sauces



Produits céréaliers



Alimentations particulières



Viandes & poissons



NUTRITION ANIMALE

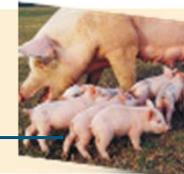
Pet Food



Aquaculture



Aliments pour animaux



PAPIER & CARTON

Papier



Cartons ondulés



Colles papier



CHIMIE & BIOINDUSTRIES

Chimie



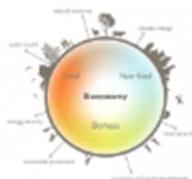
Bioindustries



Industrie



La Bioéconomie et la Chimie du Végétal en France en Chiffres



Bioéconomie en France : **300 milliards d'Euros et 1,8 millions d'emplois** (source Nova Institut 2011)



Chimie du Végétal en France : **10 milliards d'Euros** (Estimation basée sur Nova Institut)



Nombre d'emplois en 2012 : **23 000** (source ADEME)

Objectif :



Doubler d'ici 2020 le volume de matières premières d'origine végétale dans l'industrie chimique en France (source Plan Industriel – Nouvelles Ressources)

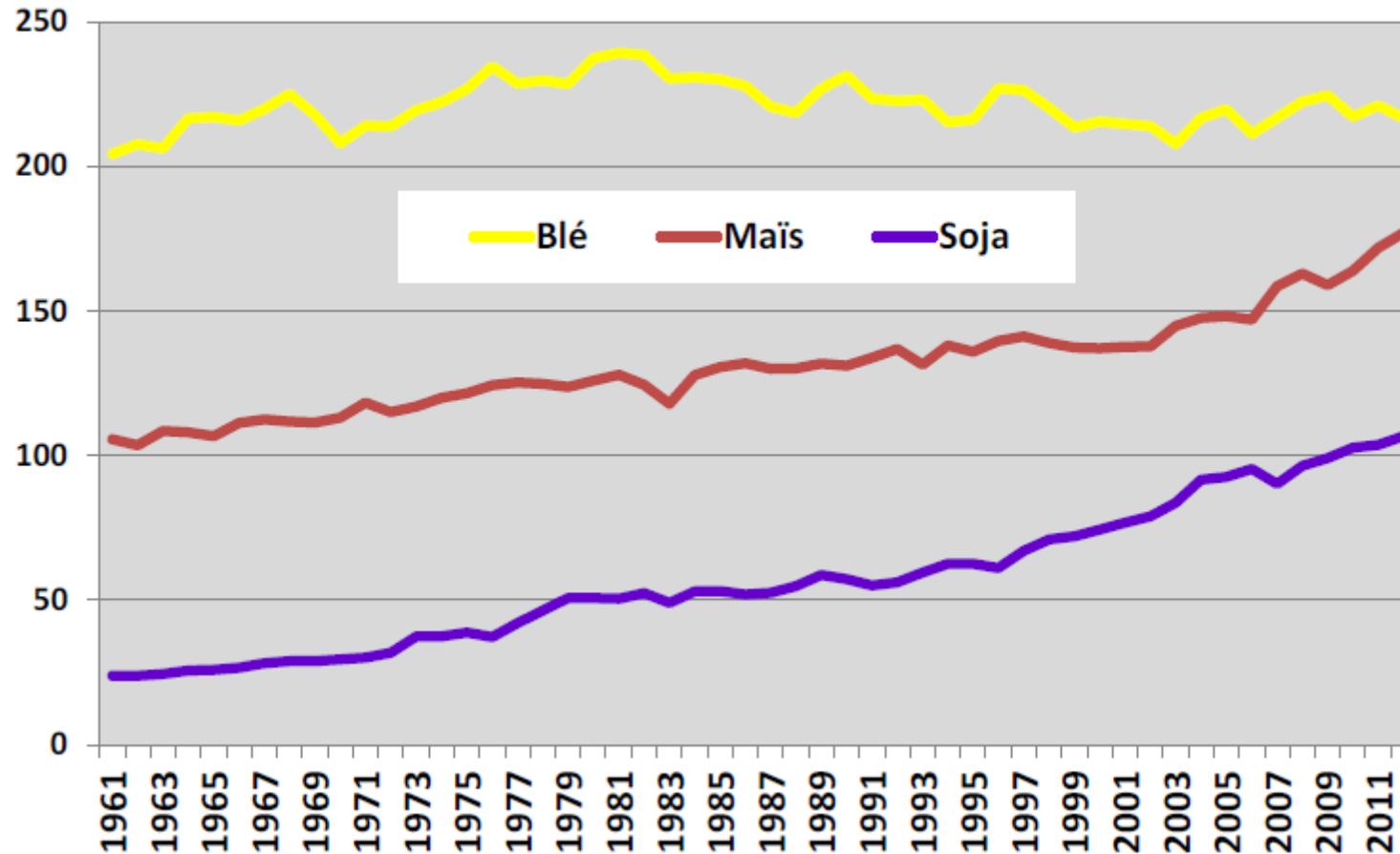
Nombre d'emplois prévu en 2020 : **> 40 000** (source ADEME)



Production et Usages des Ressources

Evolutions des surfaces mondiales de quelques grandes cultures (millions ha)

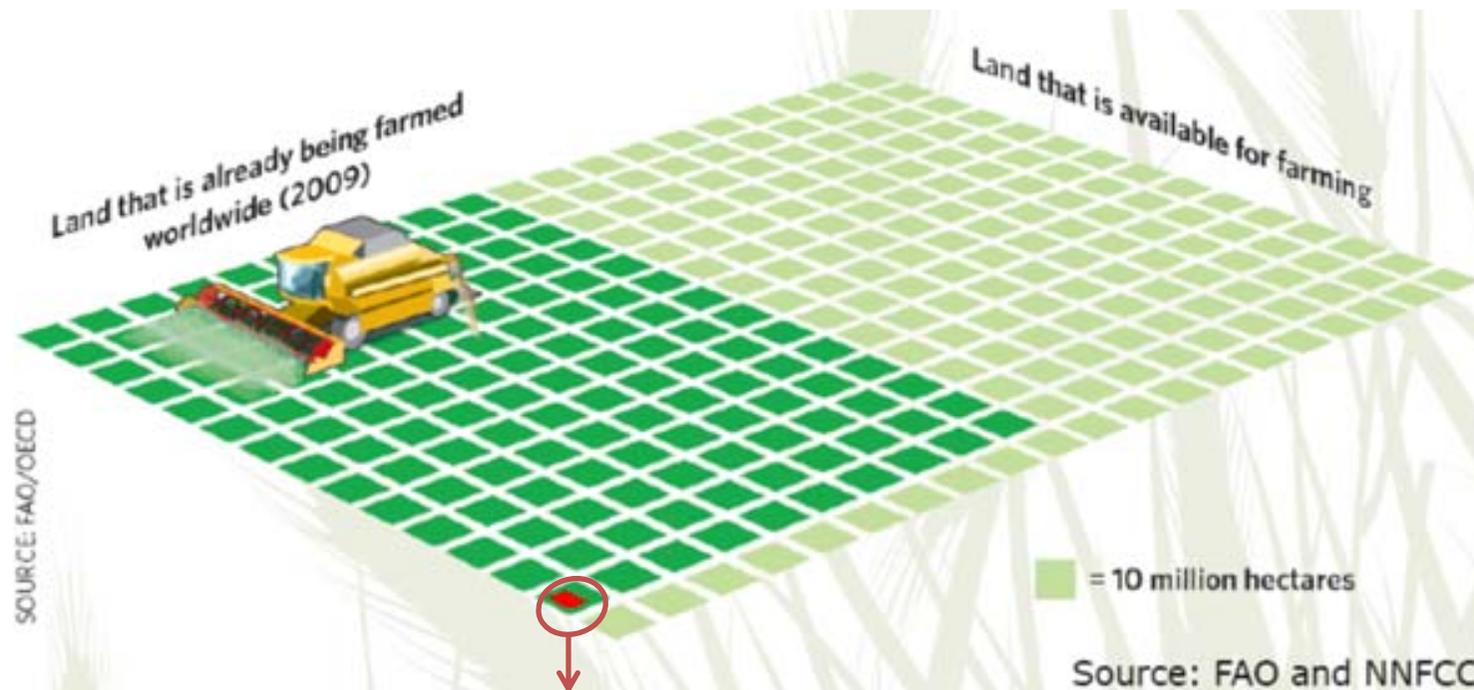
Source : FAO



Stabilité des surfaces de blé sur 50 ans ; maïs : x 1,7 ; soja : x 4

Chimie du Végétal et Terres Arables

- ⇒ La chimie du végétal utilise environ 30 millions de tonnes de cultures **soit 6 millions ha**, c'est-à-dire **moins de 0,5 %** de la totalité des terres arables (estimation Roquette)
- ⇒ Les bioplastiques représentent environ 1 million de tonnes au niveau mondial soit **0,1 %** de la totalité des terres arables



Terres utilisées par la chimie du végétal aujourd'hui

Forte demande du Marché Aval pour des Polymères Biosourcés



Peter Agrejäll –
Group President
and CEO

Sept. 2014 : « the company highlighted a commitment for all plastic material uses in its home furnishing products to be 100% renewable and/or recycled by 2020. We are determined to make sustainability both affordable and attractive to as many people as possible. »



Klaus Stadler, head
of Environmental
Sustainability (EU)

April 2014 : “After introducing its first PlantBottle in 2009, the soda king has been working to improve and expand the technology. Klaus Stadler says that the company's goal for 2020 is for PlantBottle technology to be used for its entire supply of virgin polyethylene terephthalate (PET).”

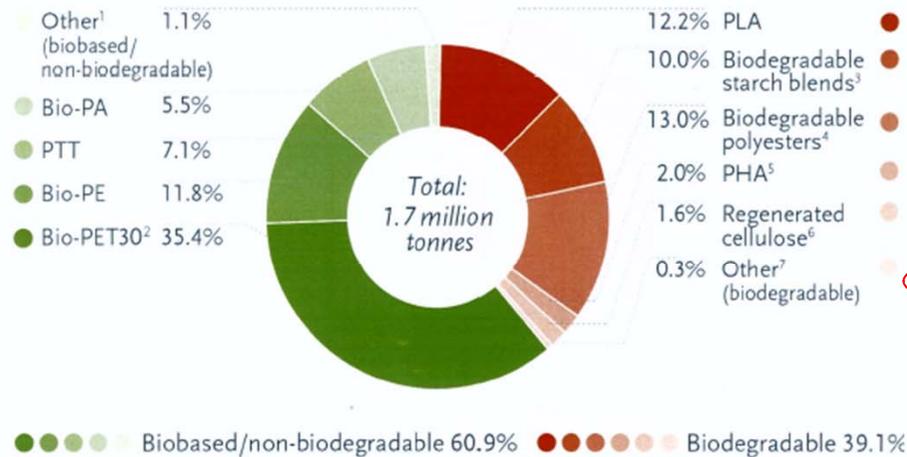


Jørgen Vig
Knudstorp, CEO
and President

June 2015 : “The LEGO Group establishes LEGO Sustainable Materials Centre and expects to recruit more than 100 employees. This is a major step for the LEGO Group on our way towards achieving our 2030 ambition on sustainable materials.”

Evolution des Capacités de Productions des Plastiques Végétaux

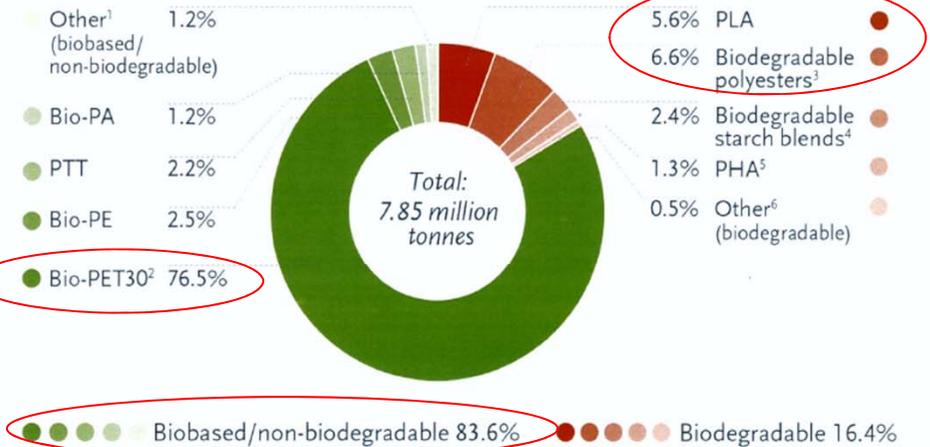
Global production capacities of bioplastics 2014 (by material type)



¹Contains durable starch blends, Bio-PC, Bio-TPE, Bio-PUR (except thermosets); ²Biobased content amounts to 30%; ³Blend components incl. in main materials; ⁴Contains fossil-based PBAT, PBS, PCL; ⁵Incl. Newlight Technologies (CO₂-based); ⁶Compostable hydrated cellulose foils; ⁷Biodegradable cellulose ester

Source: European Bioplastics, Institute for Bioplastics and Biocomposites, nova-Institute (2015).
More information: www.bio-based.eu/markets and www.downloads.ifbb-hannover.de

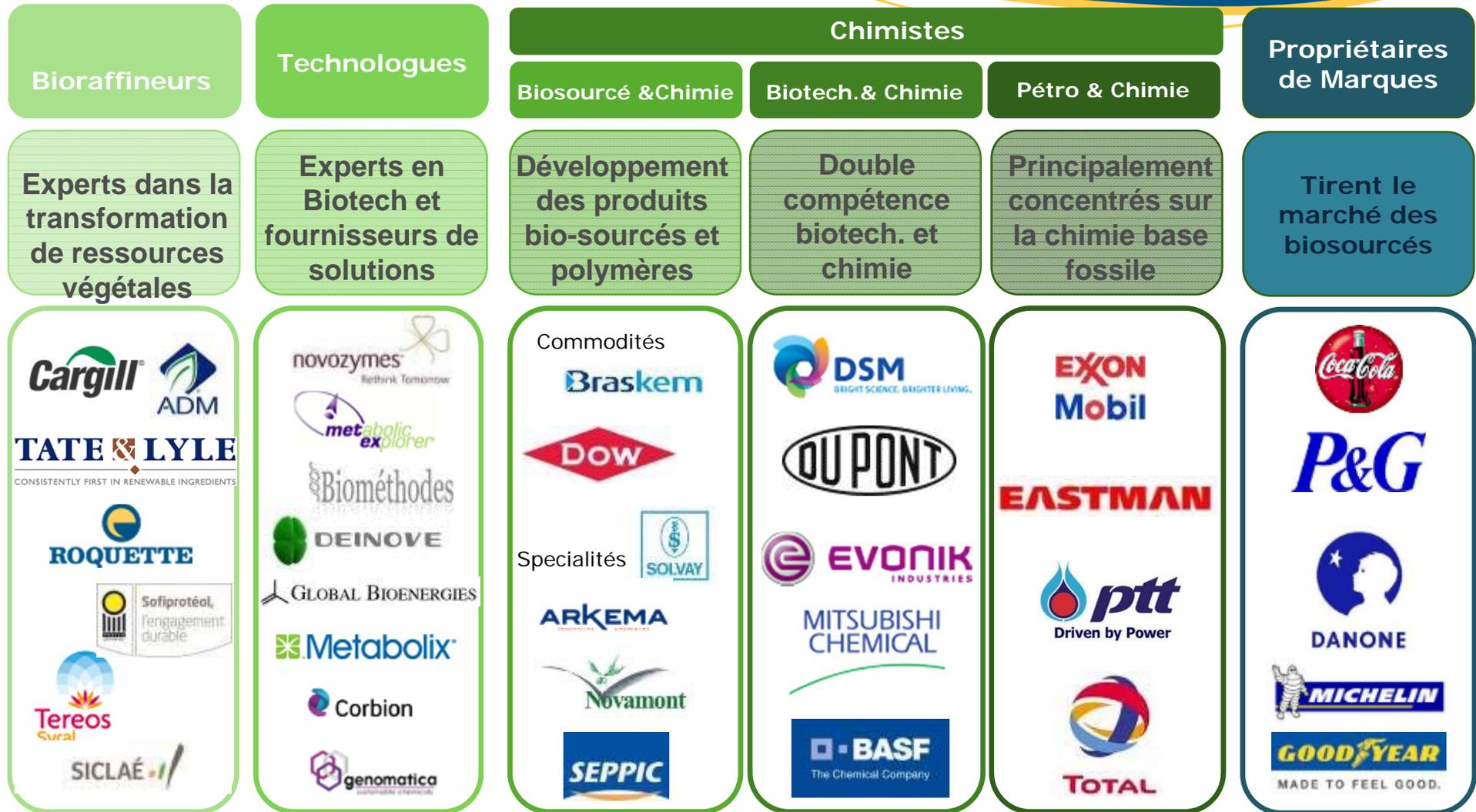
Global production capacities of bioplastics 2019 (by material type)



¹Contains durable starch blends, Bio-PC, Bio-TPE, Bio-PUR (except thermosets), PEF; ²Biobased content amounts to 30%, increase in volume subject to realisation of planned production facilities; ³Contains fossil-based PBAT, PBS, PCL; ⁴Blend components incl. in main materials; ⁵Incl. Newlight Technologies (CO₂-based); ⁶Contains regenerated cellulose (compostable hydrated cellulose foils) and biodegradable cellulose ester

Source: European Bioplastics, Institute for Bioplastics and Biocomposites, nova-Institute (2015).
More information: www.bio-based.eu/markets and www.downloads.ifbb-hannover.de

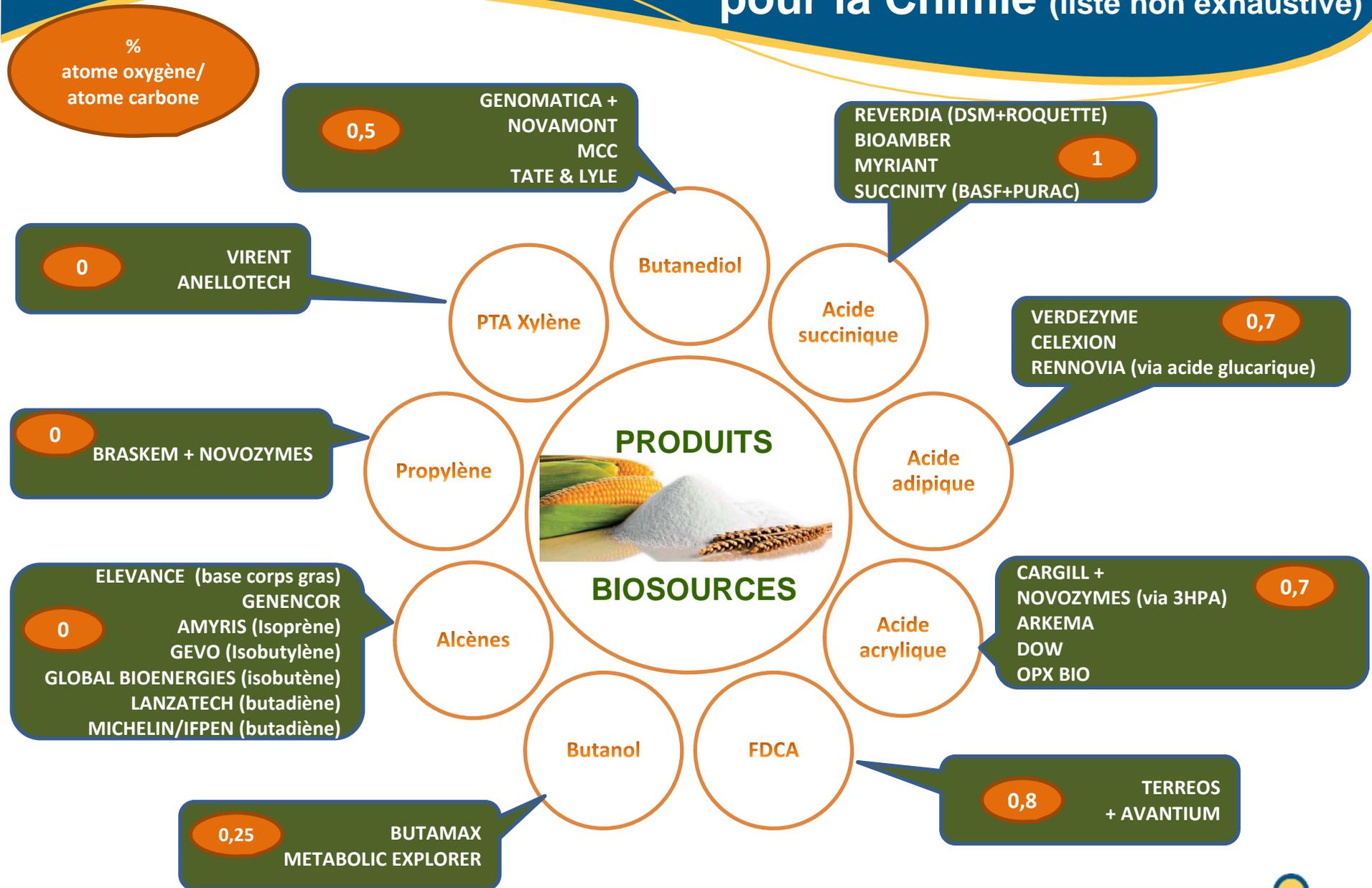
La Chaîne de Valeur de la Chimie du Végétal



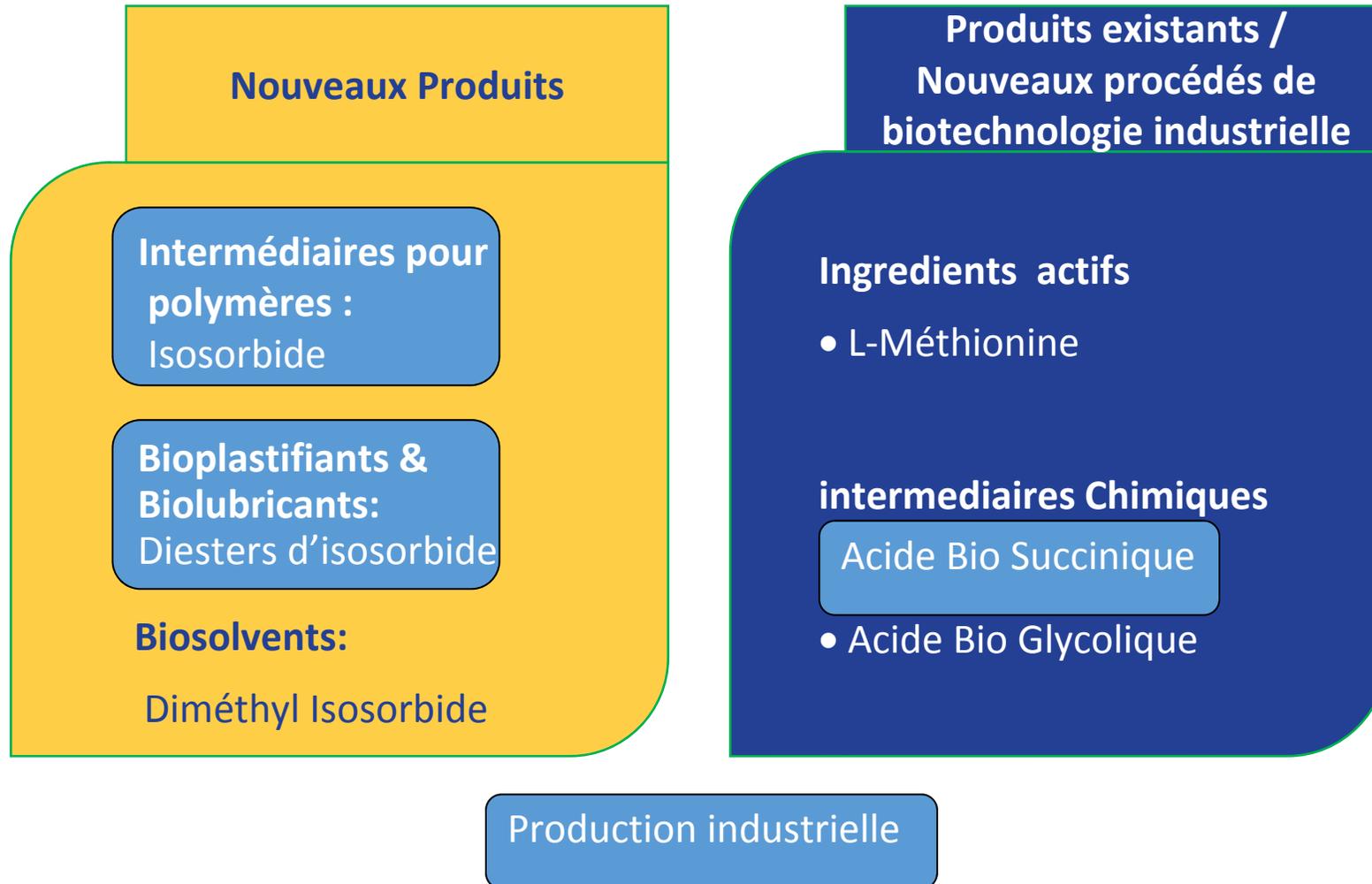
→ Développement collaboratif et/ou alliances nécessaires:

Ex ADM / Rennovia (acide adipique) , Genomica / Novamont (1,4 BDO)

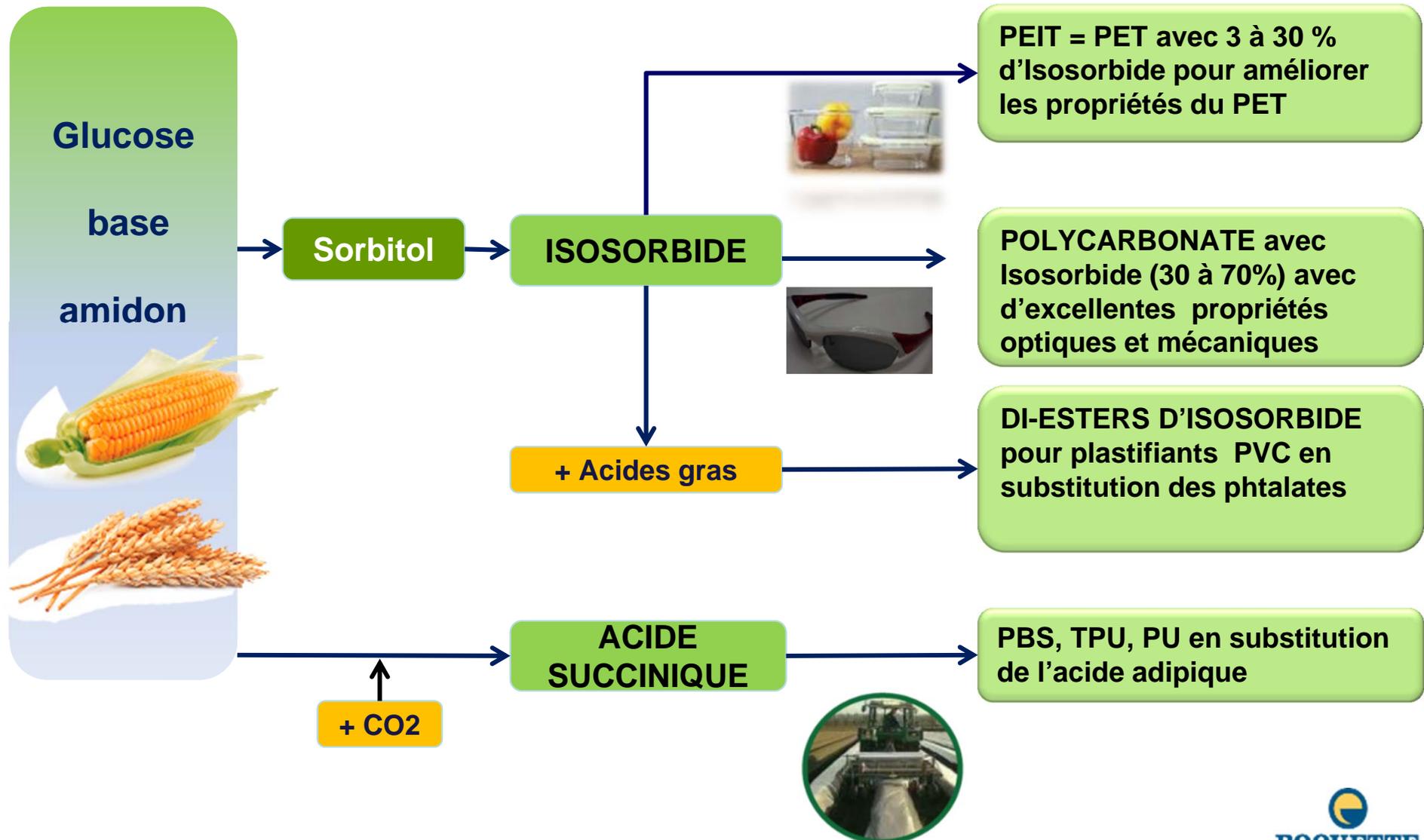
Bio-Productions en Développement pour la Chimie (liste non exhaustive)



Le Programme BIOHUB Substituts de la Pétrochimie



Exemples Roquette d'Intermédiaires pour Matériaux de Performance





Production d'Acide Succinique par la JV DSM/ROQUETTE

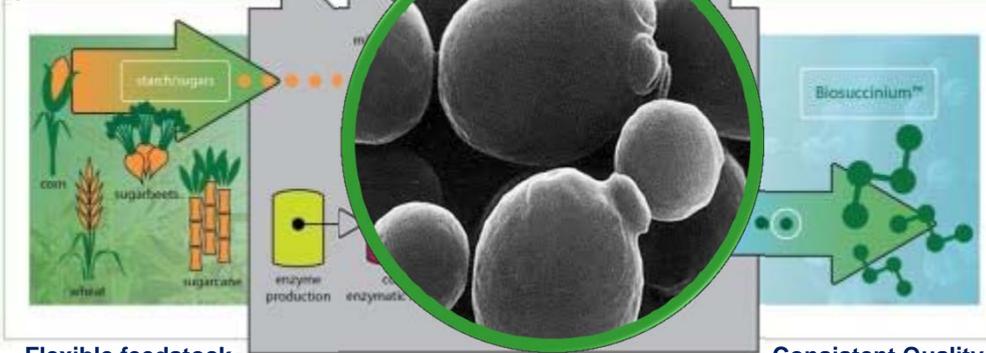


Biosuccinicum™ par Reverdia

- Proven Superior Low Cost Technology
- Biosuccinicum™ Supply Chain is Established
- Provide consistent supply with growing production capacity
- Biosuccinicum™ plant operational in Cassano, Italy since Dec 2012



Simple & robust process



Flexible feedstock (1st and 2nd generation)

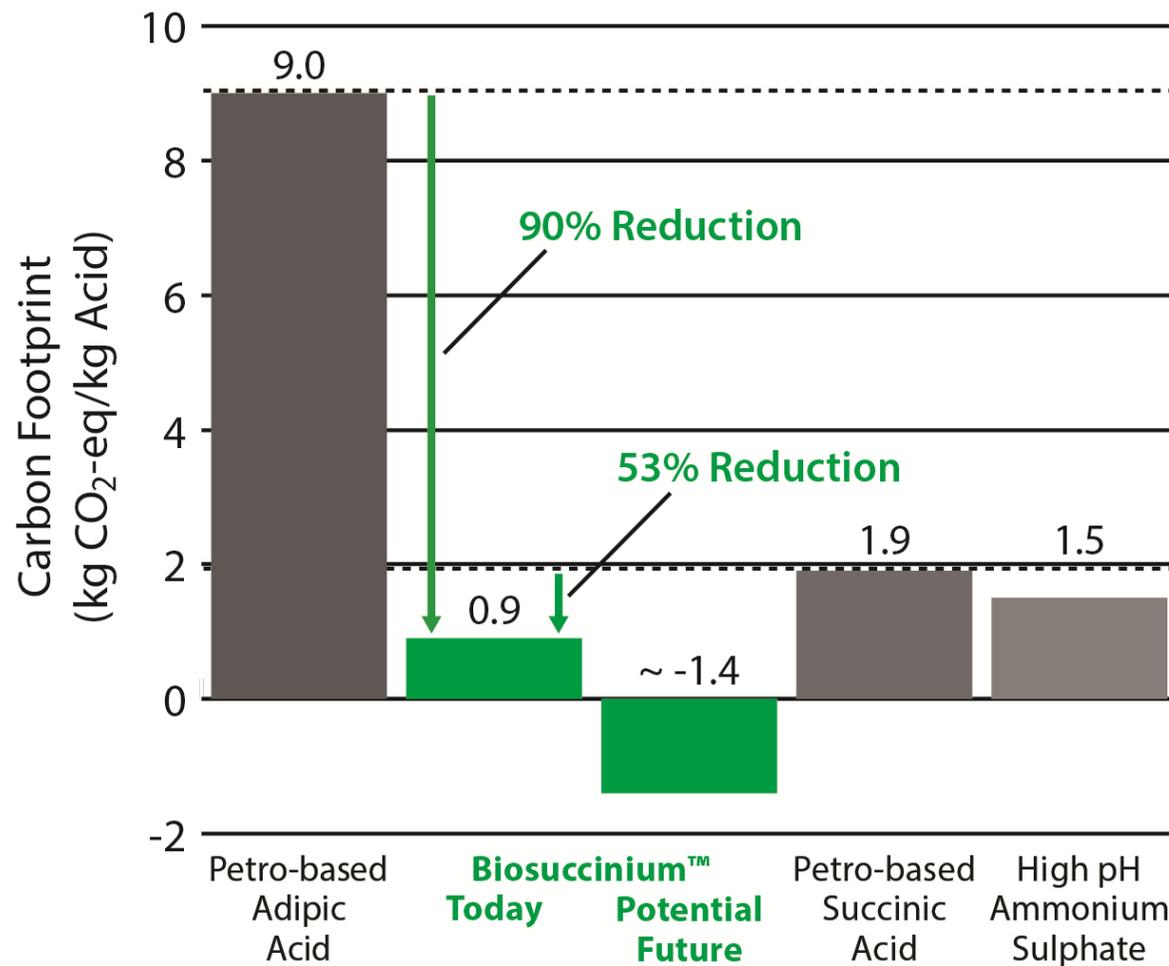
Low-pH yeast technology

Consistent Quality Best economics



Biosuccinicum™ Footprint Benchmarks

Large CO₂ reduction potential with Biosuccinicum™



- Executed by the Copernicus Institute at Utrecht University, the Netherlands
- The adipic acid data is for a best in class plant with 98% N₂O abatement.
- Data is published in the Wiley Online Library (August 2013)

Biosuccinium™ agréé pour de multiples applications

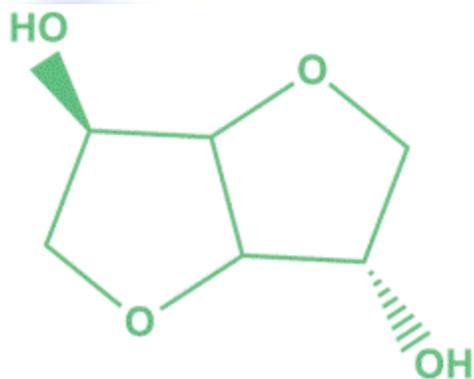


Emballage	Industries	Sports et Chaussures
 <ul style="list-style-type: none"> • PBS <ul style="list-style-type: none"> – Food packaging – Cutlery and utensils – Disposable cups and lids – Shopping bags 	 <ul style="list-style-type: none"> • PU foams <ul style="list-style-type: none"> – Insulation • TPU <ul style="list-style-type: none"> – Building and construction – Mining equipment • Plasticizers • Pigments • Resins <ul style="list-style-type: none"> – Coatings – Composites 	 <ul style="list-style-type: none"> • TPU and PU <ul style="list-style-type: none"> – Footwear – Outdoor garment • Spandex / Elastane <ul style="list-style-type: none"> – Apparel • PBS <ul style="list-style-type: none"> – Packaging – Buttons – Plastic parts
Non-tissés et Fibres	Automobile	Agriculture
 <ul style="list-style-type: none"> • PBS <ul style="list-style-type: none"> – Diapers – Hygiene products – Fishing lines and nets 	 <ul style="list-style-type: none"> • PU foams <ul style="list-style-type: none"> – Seats • TPU <ul style="list-style-type: none"> – Interior and sealing • PBS <ul style="list-style-type: none"> – Interior 	 <ul style="list-style-type: none"> • PBS <ul style="list-style-type: none"> – Mulch films – Plant pots

TPU = thermoplastic polyurethane; PU = polyurethanes; PBS = polybutylene succinate: new biopolymer; Spandex / Elastane = elastic fibers



Polymères base isosorbide La performance d'abord !



Développement de nouveaux co-polyesters



Rigid packaging

Hot fill container



Heat resistant packaging

Value creation

- Heat resistance
- Increased glass temperature
- Good chemical and mechanical resistance
- Optical properties



Technical polymers

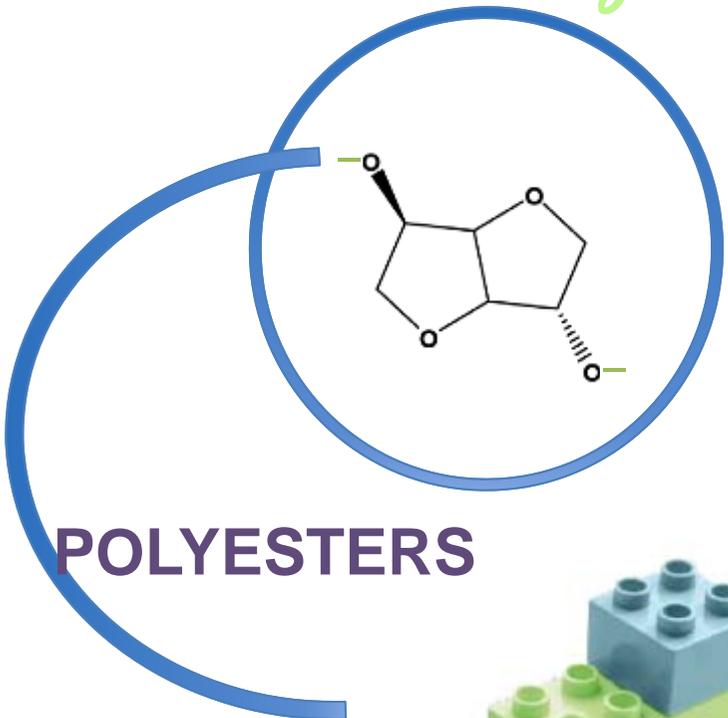


Food contact



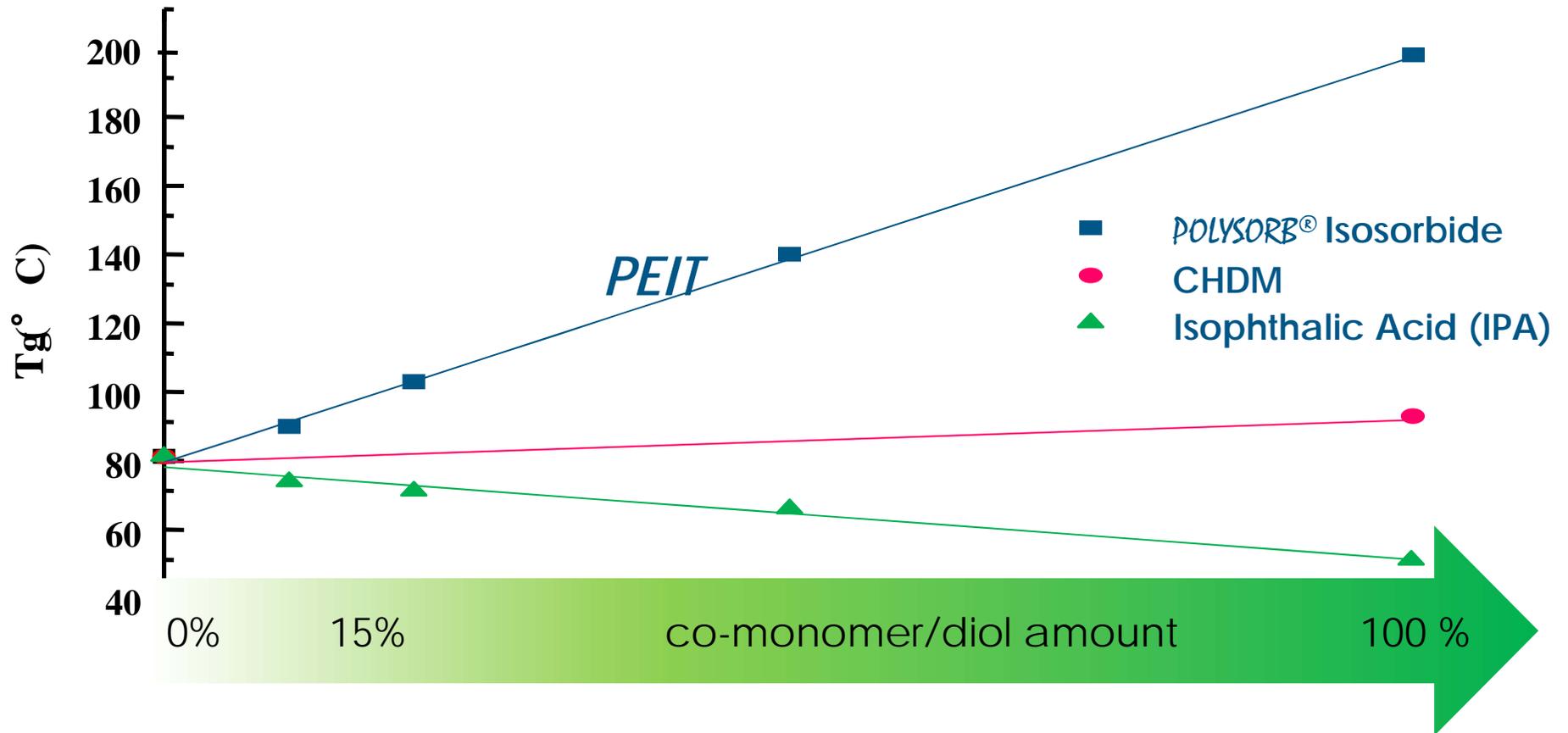
POLYSORB®

Isosorbide building block



Augmentation de la résistance à la température des polyesters

Co-monomer Effect on Glass Transition Temperature (T_g)



ECOZEN: Polyester développé par SK Chemicals

Applications

ECOZEN

www.Skecozen.com

Food Contact



Water / Sports Bottle



5 gallon Bottle



Food Container



Food Mixer

its core
for the future
**Healthcare,
Earthcare**

Développement de nouveaux polycarbonates

Optical lenses



Outside furniture



Value creation

- Chemical & UV resistance
- High temperature resistance
- High impact polymer
- Good surface hardness
- Optical properties

Optical films

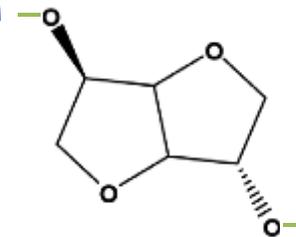


Cars interior

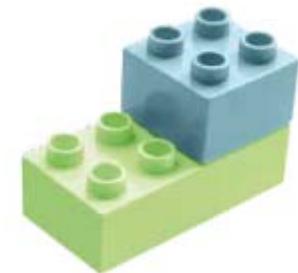


POLYSORB®

Isosorbide building block

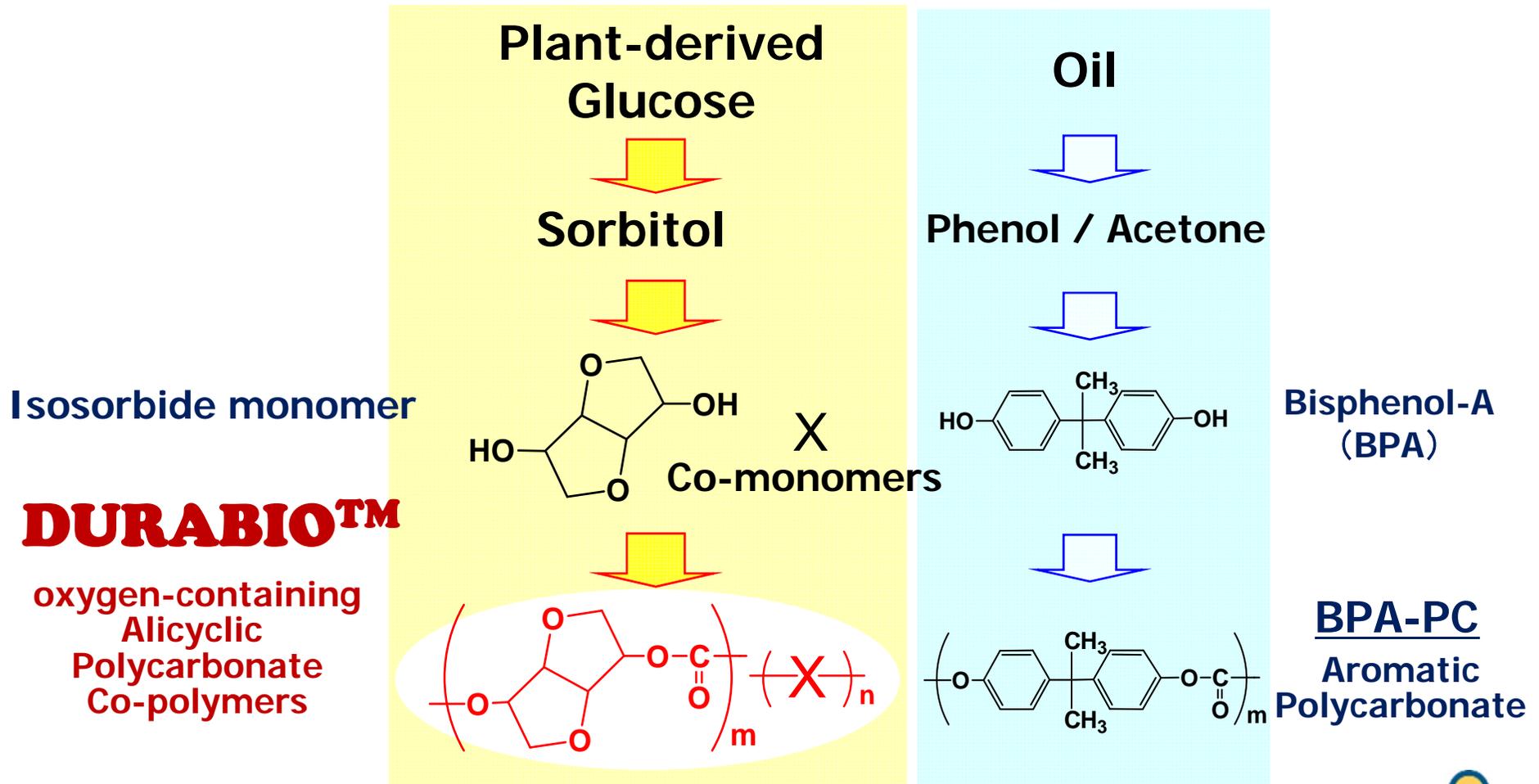


POLYCARBONATES



Exemple de polycarbonate base isosorbide DURABIO™ de Mitsubishi

DURABIO™ is a transparent bio-based engineering plastic which shows high functionality and performance



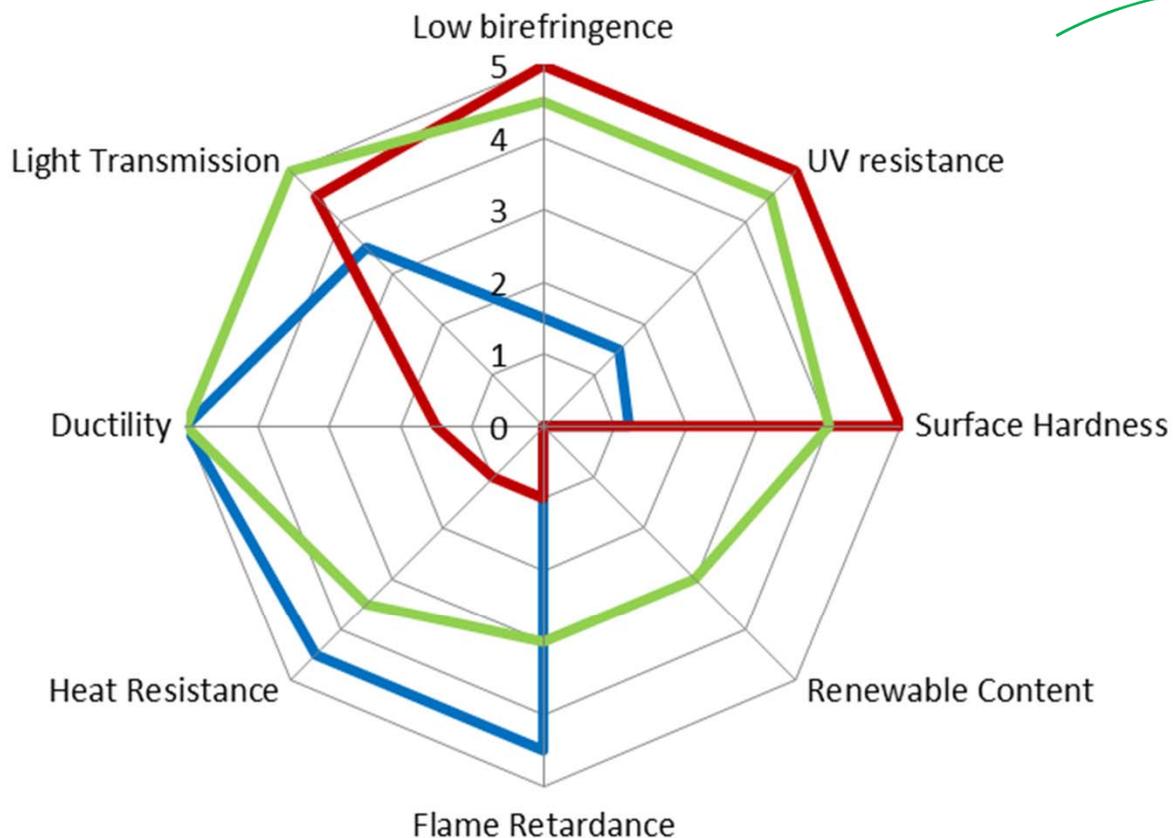
Exemple de polycarbonate base isosorbide DURABIO™ de Mitsubishi

Mitsubishi is commercializing DURABIO®
(Isosorbide-based engineering plastic)

DURABIO® has combined properties of PMMA and PC

MITSUBISHI
CHEMICAL

- Polycarbonate
- PMMA
- Isosorbide-based Polycarbonate



Acoustical wall



Automotive industry



Quelques développements récents de DURABIO™

July 6, 2015

DURABIO™ was adopted for the colored interior panels of HUSTLER, the new model compact car launched by Suzuki Motor Corporation on December 24, 2013



World-First — DURABIO™, Bio-based Engineering Plastic from Mitsubishi Chemical, used on the Front Panel of Sharp's New AQUOS CRYSTAL 2 Smartphone

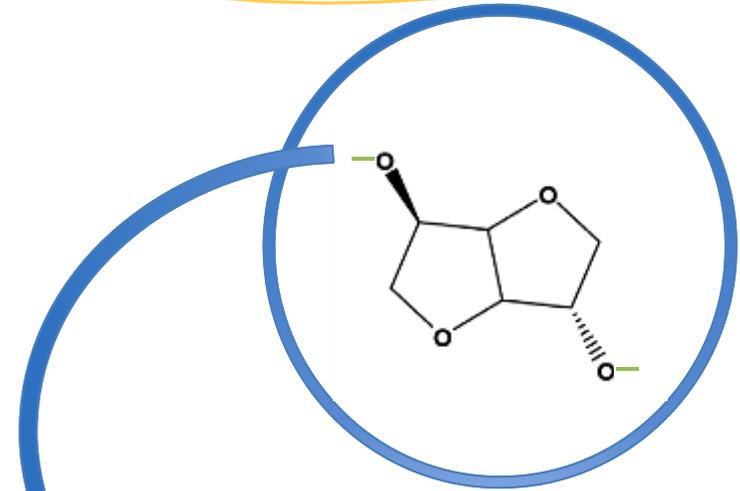
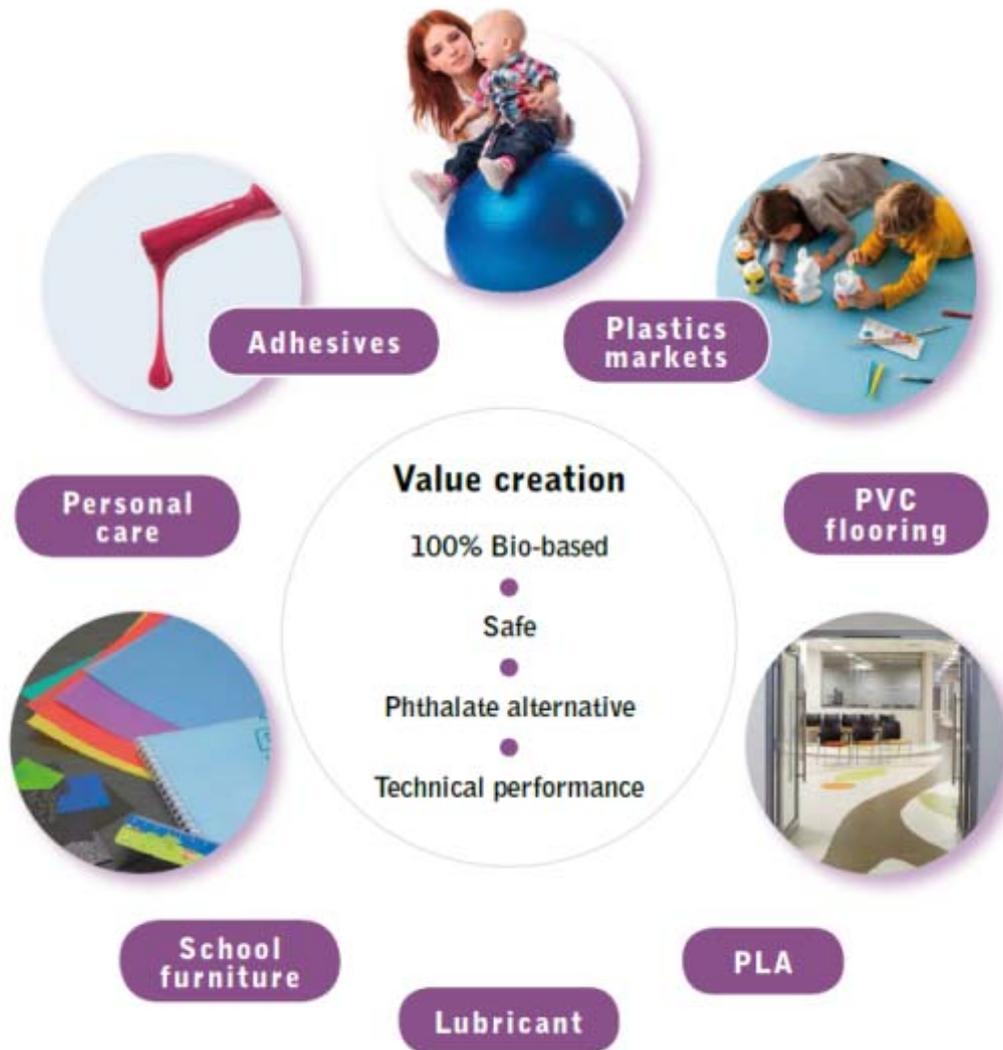
Mitsubishi Chemical Corporation

A bio-engineering plastic jointly developed by Mitsubishi Chemical and Mazda will be used in the new MX-5 sports car debuting in 2015.



AQUOS CRYSTAL 2
(Photo by Sharp Corporation)

Développement de nouveaux plastifiants



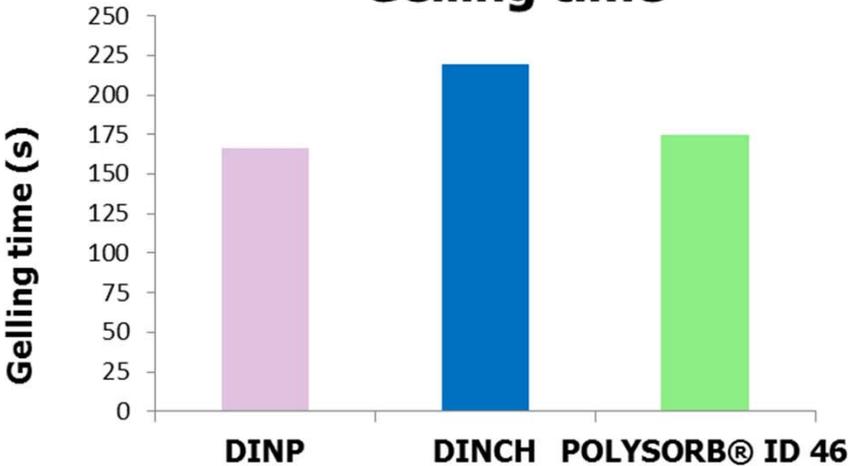
PLASTICIZERS



POLYSORB® ID
Bio-based plasticizer

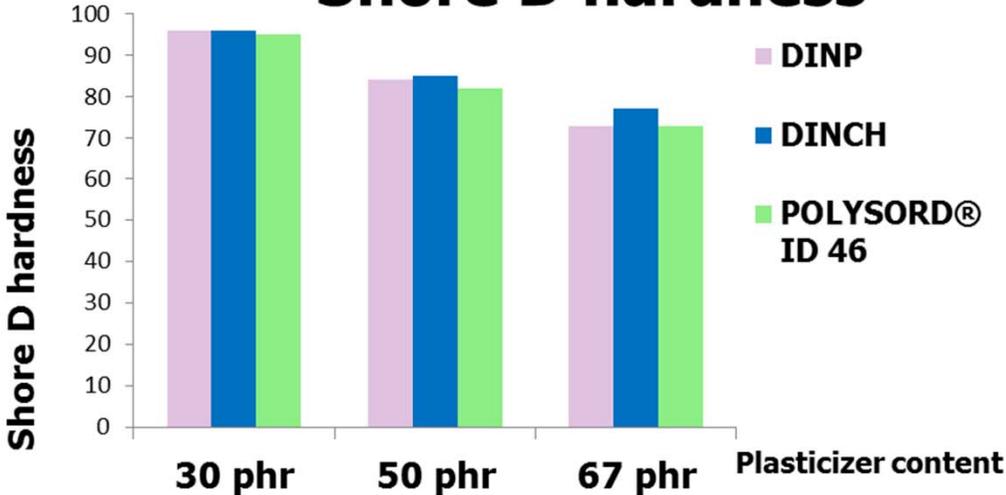
POLYSORB® ID : 100% efficace

Gelling time



As efficient as standard plasticizers...

Shore D hardness



... the bio-content in addition !

Capacité de production de l'isosorbide

First Commercial Plant
(1000 T)



2007

Extension of the Commercial plant
(5000 T)



2011

Largest Isosorbide Unit
20 000 T



Opening in April 2015

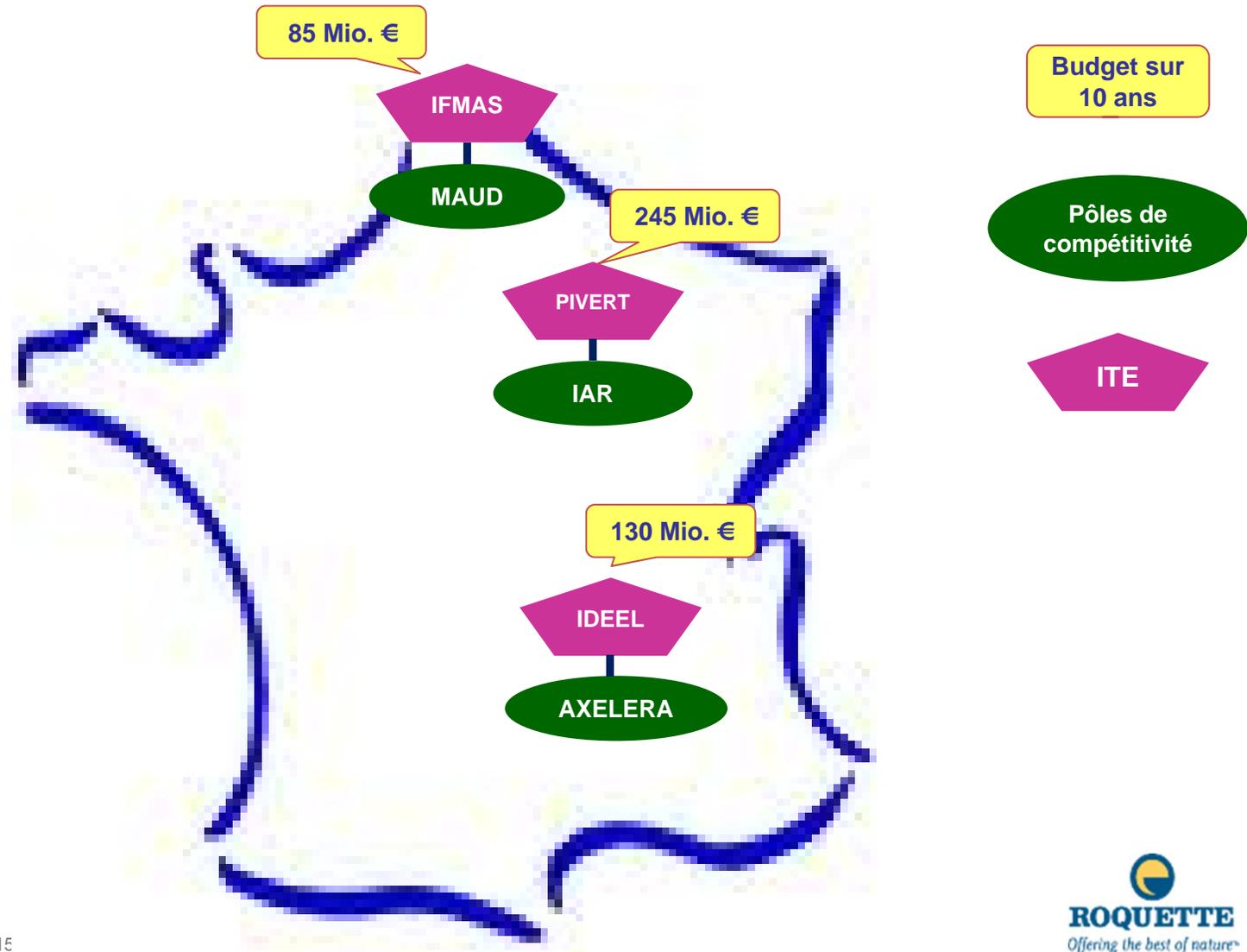


World's largest ISOSORBIDE production unit at the
ROQUETTE Lestrem site

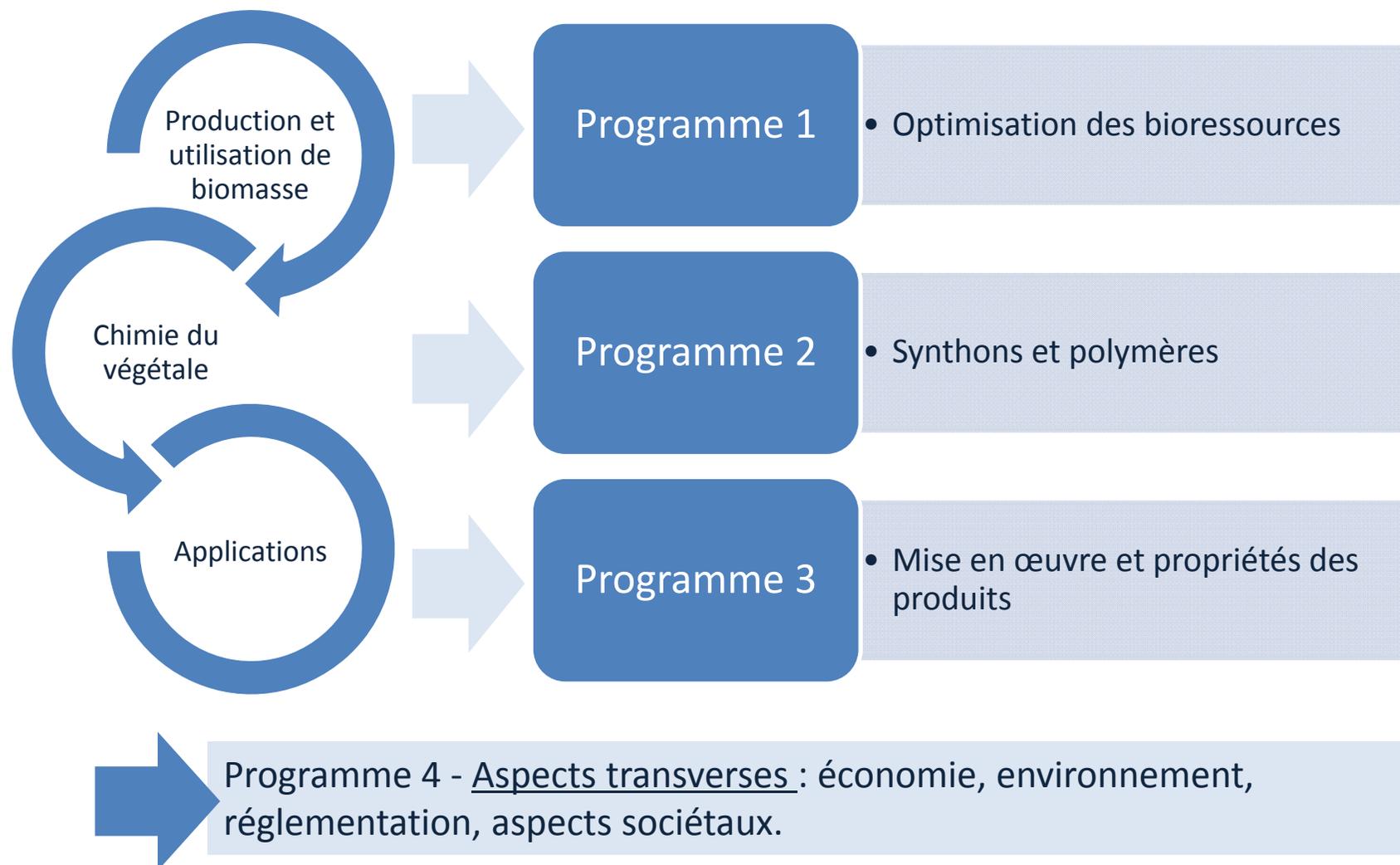
Initiatives Régionales d'Innovations Industrielles en 2013 pour la Chimie Durable



3 Instituts de Transition Energétique (ITE) avec un budget global de plus de 460 millions Euros sur 10 ans.



4 programmes de recherche



Création de l'ACDV



- Association de loi 1901
- Créée en 2008 suite au Grenelle de l'environnement
- 5 membres fondateurs : Solvay, Roquette, UIC, USIPA, IAR





MERCI DE VOTRE ATTENTION

