

Editorial

The global connection

The world is getting smaller each day and is increasingly turning into a true "global village". As in any village, the actions of your community neighbours can have serious effects on yourself as well as on the village as a whole. On a world scale this interdependence is clearly present in both the global marketplace, the economic development and the sustainability of our way of living and the planet. This implies that it is no longer acceptable that a nation will only look after its own well-being, thus ignoring its economic and environmental relations with its neighbours. Consequently, for a sustainable economic growth of the "global village" as a whole it makes more sense to make available technological know-how and best practices on sustainability issues to (rapidly) developing countries rather than to focus on small steps close at home.

This was in my opinion very well put by the Dutch Prime Minister Jan-Peter Balkenende in his address to the United Nations General Assembly on September 27 in New York. I quote: *"The industrialised countries - and that means all of them - should take the lead. But the countries that are now enjoying rapid economic growth are also being asked to develop more sustainably. The future lies with those countries that excel in energy conservation and the use of cleaner technologies. We are not yet making sufficient use of the scope that innovation offers us."*

For us, working in the booming field of bio-based business, this offers great commercial opportunities. Not only in international trade of biomass and renewable resource-based added-value products, but also in exporting technology and know-how. Already many companies, and not only the big ones, are looking abroad towards rapidly developing countries, to establishing relationships and alliances, opening representation offices and facilities, in order to get a foothold in these markets. Besides being beneficial for one's own company, this will also help developing countries to adopt state-of-the-art sustainable technologies as per Balkenende's request.

In this light it is timely that the next Bio-based Business symposium in The Netherlands, focuses on "Crossing Borders" (Dutch spoken). On November 13th, SMEs with experiences in import and export as well as governmental and business advisors will give insight in opportunities and best practices to other SMEs. Sharing experiences will lead the way to joining the global village community.

Prof.dr. Hans Derksen
President Platform Bio-based business.

Content

- ✓ Editorial p.1
- ✓ Biofuels: an explosive expansion, 6th European Motor BioFuels Forum p.2
- ✓ Current and prospective markets for industrial bioproducts and biofuels in France p.3
- ✓ Calendar of events p.8



Biofuels: an explosive expansion

6th European Motor BioFuels Forum a perfect opportunity to share ideas and views on the biofuels industry

The use of biofuels is increasing substantially practically all over the world. A large industry is being built up at present worldwide. The limits to the availability of fossil resources and higher energy needs in countries like China and India have a price increasing effect on fuels. Moreover the consequences of global warming force the world to look for alternative fuels with lower CO₂ emissions. Arable land traditionally used for food crops now has to compete with fuel crops. New technologies for fuel production and more efficient engines are being developed. These are among the issues at stake at the 6th European Motor BioFuels Forum. This 6th edition follows very successful previous ones; it will be held in Rotterdam on 9-10 January 2008. This major event is being organized for the sixth time by Europoint Conferences & Exhibitions in cooperation with Rotterdam Climate Initiative and under patronage of three Dutch ministries: the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Transport, Public Works and Water Management.

The Port of Rotterdam has been chosen as the place to be. This second largest port in the world has become one of the most important distribution centers for feedstock and finished products, but also Amsterdam is taking its share. The BioFuels Forum in 2008 will bring together several hundreds of participants from an international audience representing manufacture, science, technology, business and government. It will attract a wide range of participants to debate the challenges ahead. Questions like: what are the market drivers, what technology to develop, how to optimize feedstock etc. will be answered by biofuel experts from several countries. An advisory committee composed of experts from all over the world is now working on the programme.

The two-day Forum will focus on the following topics and sessions:

- Policy/strategy
- Sustainability
- Product/Process Technology
- International Trade
- Vehicle technology
- Financing and commercialization

This forum is a perfect opportunity to meet business colleagues and to share ideas and views. "We have created a platform where delegates from all sectors will discuss the development of biofuels on an international scale", Dr. Jeremy Tomkinson, CEO of NNFFCC and member of the Advisory Committee says. "This Forum aims to address how challenges might be met with regard to current European production capability and how demand could develop, not just within the context of road transport fuels, but also from an expanding requirement for more sustainable fuels to serve the maritime, rail and aviation sectors".

Concurrently with the Forum there will be sessions and speeches of the International Energy Agency Bioenergy.

For further information please contact:

Europoint b.v.

Conferences & Exhibitions

Mr. Jerry Visser (Project Manager)
P.O. Box 822, 3700 AV, Zeist, The Netherlands

T : +31 (0)30 6981800
F : +31 (0)30 6917394
E : jvisser@europoint.eu
I : www.biofuels2008.eu

Europoint are professional congress and exhibition organisers based in Zeist, the Netherlands. They have had over 10 years of experience in organising national and international congresses and exhibitions in mainly the renewable raw materials, the agricultural and rail infrastructure sectors.

Europoint are also organisers of the following events on renewable raw materials:

- **Renewable Raw Materials for Industry: Contribution to Sustainable Chemistry**
17 -18 October 2007, Thon Hotel Brussels, Belgium, www.greentech.eu
- **Symposiums on Bio-based Business**
Symposiums (in the Dutch language) held two times a year. The next one will be "Bio-based Business: passing boarders" on 13th of November 2007. These Symposiums are being organised on behalf of the Ministry of Agriculture, Nature and Food Quality in the Netherlands.



Current and prospective markets for industrial bioproducts and biofuels in France

Hilaire BEWA and Maurice DOHY
ADEME Département Bioressources

Arnaud GABENISCH and Céline SCHIFF
ALCIMED

1. BACKGROUND

Agricultural and forest resources, or bioresources, already a significant sector, are poised to play a leading role in the years to come, with significant benefits for the economy and the environment. The development of non-food uses of bioresources is part of a global sustainable development policy, and addresses a number of issues: ensure energy independence for France, with respect to fossil resources (oil, gas, uranium) that are produced in potentially unstable geographical areas, generating a positive impact on the balance of the French economy; help mitigate climate warming due to the accumulation of greenhouse gases, and preserve air, water and soil quality, and biodiversity; foster economic growth, particularly in rural areas, by creating new markets, i) by giving farmers new opportunities in the form of industrial outlets, and avoiding abandonment and desertification of farmlands ii) by taking advantage of the wide range of associated economic development opportunities (new processing industries, distribution, services, etc.)

Many studies of bioproduct markets have been conducted in Europe and in France. These studies, although scattered and targeting specific products, and primarily focused on marketing issues, have measured market penetration for these products and uncovered the technological, sociological and economic bottlenecks that hamper their development. They do not supply all required data, however, and do not provide an overview of this market. Their forward-looking approach remains limited, and does not sufficiently integrate parameters related to economic and political contexts, the situation of agriculture and forestry, substitutability for fossil commodities, evolution of technological processes, in particular biotechnologies, the emergence of new bioenergy supply chains that open the path to the biorefineries of the future, etc.

To anticipate the coming transformations of industries in this sector ADEME-AGRICE commissioned the firm ALCIMED to carry out a study of the current and prospective markets for industrial bioproducts and biofuels in France.

2. METHODOLOGY

In its first phase this study characterised today's market for industrial bioproducts and biofuels in France, setting it in a European context to ensure a broad overview of the market as a whole, including parameters pertaining to the economy, agricultural and forestry policy, substitution for fossil commodities, technological trends, European and national regulations, and competing markets in the energy and organic chemicals sectors. In a second phase the perspectives for the evolution of these markets in the time frame 2015/2030 were identified and analysed, taking into account study and knowledge of factors governing market trends. Scenarios were drawn up for the evolution of agri-industrial supply chains, so as

to identify pivotal chains that will enable us to significantly reduce greenhouse gas emissions and energy dependence.

Four scenarios were outlined, and used as the basis for elaborating our model. In the scenarios a rank was assigned to each component governing future development (economic, societal and technological), on a scale of 1 to 3. The scenarios provide a general framework of analysis for all the agri-industrial supply chains considered.

- **Scenario I: continuity in a stable context.** This scenario posits stable oil prices, perhaps falling back slightly to the 50-60\$ range, according to a hypothesis of reduced international geopolitical tension, and in the absence of natural disasters; ongoing societal demand for bioproducts without any major change; bioproduct research also continuing at today's level.
- **Scenario II: changing context without an awakening of societal awareness.** Scenario II supposes a rather higher degree of geopolitical conflict, with oil prices adjusted on an *ad hoc* basis, but without increased societal awareness related to bioproducts; research work is developed, with a greater focus on bioproducts.
- **Scenario III: the emergence of bioproducts.** Scenario III is based on a rather higher level of geopolitical conflict, with oil prices adjusted on an *ad hoc* basis; increased societal awareness related to bioproducts; research work is developed, with a greater focus on bioproducts.
- **Scenario IV: counting on strong development.** This scenario assumes strong geopolitical conflict that pushes oil prices over \$200 a barrel in 2030; pragmatic pressure from society, clearly demanding bioproducts; intense research efforts giving high priority to bioproducts.

► Current and prospective markets in France

3. CURRENT MARKETS FOR INDUSTRIAL BIOPRODUCTS AND BIOFUELS (2005)

This study of the current bioproducts market is segmented to cover all the industrial chains in which bioproducts find applications today. Nine agri-industrial chains are delimited: biofuels, biolubricants, biosurfactants, biosolvents, pigments, inks, paints and varnishes, biopolymers, agri-materials and composites, intermediate chemicals.

4 What is the assessment of today's market (2005) for industrial bioproducts?

Biofuels

The strong European regulatory context is favourable to biofuels (Directives 2003/30/EC and 2003/96/EC). France also has undertaken an ambitious development plan to develop production capacity, going beyond the European objectives (law n° 2005-781 adopted 13 July 2005). Two optimisation tools have been put into place to attain these goals: production facilities are granted partial tax exemptions from fuel excise taxes for biofuel blends and biofuels (since 2005). This exemption applies to fuel distributors and encourages them to sell biofuel blends. Total biofuel production in France amounted to 606 000 tonnes in 2005. The output is heavily dominated by vegetable oil methyl esters (VME), representing 492 000 tonnes, in particular to satisfy growing demand for diesel fuel. Cultivated land area is divided between 343 379 ha of oilseed crops for VME, and 51 734 ha of wheat and beets for ethanol/ETBE.

Biolubricants

The regulatory framework for biolubricants lacks incentives, and biolubricants have not penetrated the market. Consumption of biolubricants in France is estimated at 1 000 tonnes (2005), representing a market share in the order of 0.1%. This low fraction is due to the difference in price, biolubricants being 2 to 5 times more expensive than

mineral lubricants. There is potential for growth in the short term, however. The 2006 framework law on agriculture bans the use of non-biodegradable lubricants in sensitive zones (that could be affected by losses and releases to groundwater and soil, accidental or otherwise) starting in 2008; this should act positively to boost sales. Markets outlets are for hydraulic fluids, chain oils, forming/ stripping and cutting oils.

Biosurfactants

The biosurfactants market is characterised by a regulatory framework essentially defined by biodegradability standards—their vegetal composition (in whole or in part) conferring a distinct advantage to biosurfactants—and by the REACH regulations that apply notably to the class of ethoxylated alkyl phenols. The industrial biosurfactants chain is relatively well structured, with under ten producers of the intermediate chemicals that enter into the composition of biosurfactants (fatty acids, methyl esters, fatty alcohols and fatty amines). Consumption of surfactants is in the vicinity of 100 000 to 120 000 tonnes yearly in France. Biosurfactants hold a market share of between 25 and 30%, with little variation. In two consumer markets the biosurfactant share exceeds 70%: detergents (roughly 42 000 tonnes) and cosmetics (roughly 35 000 tonnes) where the rate of penetration is the highest, between 60% and 80% (20-25% for household detergents).

Biosolvents

Three market outlets have been identified:

- **Oils and wetting agents for plant protection products** that are subject only to regulations governing approval for market and commercialisation of plant protection products (directive 91/414/EC), and not to those concerning the usage of renewable and/or biodegradable products and/or products limiting VOC emissions. Consumption is significant, in particular for biosolvents derived from rapeseed oil, that replace mineral oil

solvents in 40% of cases and amount to 1.5 to 2 million litres of methyl esters produced and consumed each year in France. The difference in price compared to vegetable oils is on the order of 10% to 30%, in a promotional market with low added value and therefore extremely price-sensitive. The price difference between wetting agents is harder to estimate, but it is of less importance, because of higher added value and therefore lower price sensitivity for the product, and because of significant gains in terms of biodegradability, ecotoxicity and user toxicity.

- **Bio fluxing agents.** These compounds can penetrate the market for roadwork fluxing agents, thanks to an environmental clause in the public procurement code. The market share for bio fluxing agents is in the order of 10% of the 3 000 tonnes of this product produced and consumed each year in France. There are very few actors in this sector, as two large groups have a nearly exclusive monopoly on production. The cost premium for bio fluxing agents is 20% to 30% over the cost of petroleum-based agents and 40% to 50% over carbon-based chemical products. However they possess technical characteristics that compensate for this extra cost, notably a lower rate of incorporation in final formulations, and a high flash point (>160°C) that lessens the risk of explosion and reduces the cost of the related safety investments. Furthermore, they have significant advantages in terms of greenhouse gas and VOC emissions, as well as in terms of working conditions and employee and user safety.
- **Cleaning.** The VOC emissions directive (Directive 2004/42/EC) that prompts industrial users to seek alternative techniques or solutions provides a favourable context for the cold cleaning sector. Use of biosolvents is therefore developing strongly in sectors in which rapid drying is of little or no importance, in particular for paint stripping (facades or automobiles) and cleaning of electronic components. This is a recent industrial activity, with only a few companies that propose formulations, and is not yet well structured. Consumption is in the order of 2 000 tonnes, with a market share of about 1% for biosolvents. Prices for biosolvents are 2 to 3 times higher than for the petrochemical solvents they replace. They have irrefutable environmental advantages, however, with respect to VOC emissions, toxicity and user safety, as these products are not inflammables or classed as CMR (carcinogenic, mutagenic or reprotoxic).

agri-materials and composites as in
The strong European regulatory context
applies to fuel distributors and encourage developing str

Vegetal inks and paints

- **Plant-based inks.** Plant-based inks benefit from a strong European regulatory context, with the directives on VOCs (Directive 1999/13/EC), on hazardous substances (Directives 67/548/EC et 99/45/EC), and printing for food packaging (Directive 2004/19/EC), as well as other incentives such as the NF Environnement standard and the "Imprim'vert®" label. In addition, European ink manufacturers and association industries have voluntarily agreed to a common list of raw materials that are harmful to health and that should be avoided, anticipating application of the REACH programme (CEPE Exclusion List). This regulatory framework has no mechanical effect on the use of vegetal inks, however. The only activities for which vegetal inks are used are sheetfed offset printing (50%) and coldset printing (5%), because of these inks' low volatility. Use of vegetal inks for sheetfed offset and coldset printing stems more from a commitment to renewable resources than from regulatory constraints, because these inks are not covered by VOC directives. In 2005 10 000 tonnes of vegetal inks were consumed in France, an amount at least equal to production. Vegetal inks have cost premium in the order of 10% to 15%, compensated by better performance in terms of colour brightness and intensity, and time saved in alignment and number of spoiled prints.

- **Plant-based paints.** The paint industry is subject to the VOC directive (Directive 1999/13/EC) requiring that emissions be captured and to Directive 2004/42/CE that creates strong pressure to find new products for the construction industry. France also has the NF Environnement Ecolabel, an incentive with a relatively weak impact. Vegetable oils find applications in glycerophthalic alkyd resins and in some aqueous-phase acrylic styrene resins. This sector is undergoing a structuring phase, with a few major actors as well as myriad small and medium-sized companies in France. Annual consumption of fatty chains is in the order of 11 500 to 22 000 tonnes in France; 5 000 to 10 000 tonnes of sunflower oil and 1 000 to 2 000 tonnes of soy oil are produced, the latter being for the most part imported. Alkyl emulsions and next-generation "natural" paints that incorporate vegetable oils, in lieu of glycerophthalic resins are likely to create favourable market dynamics for plant-based paints.



Biopolymers

French regulations are not particularly favourable to the use of biopolymers, excepting the ban on plastic carrier bags to take effect in 2010. The biopolymer supply chain is structured around a great many actors of European and international dimensions, without producers of significant size in France, particularly at the processing level. Consumption in France is in the order of 10 000 tonnes, i.e. 0.16% of the plastics market, mainly for packaging and agricultural mulching films. The price gap with petrochemical polymers is narrowing, approaching 1 to 2 €/kg, the level at which biopolymers can be truly competitive.

Agrimaterials

This market includes only hemp insulation wool for the moment, and is weakly structured (two actors in place). Annual consumption comes to about 5 000 tonnes, representing a market share well below 1% (in a total French market of 2 million tonnes). Hemp insulation is 2 to 2.5 times more expensive than rock wool or fibreglass wool, a cost difference that could be offset by better performance: durability and stability of hemp fibre, 30% to 40% better acoustic properties, ease of installation and recyclability.

Composite materials

Several applications have emerged.

- **Construction (hemp concrete: 50% hemp boon + 50% binding agents).** Current regulations hamper the

development of hemp concrete. When trade rules for implementation (currently being drawn up) and a regulatory framework for insuring these materials are established, access to the construction market should be easier for these materials. The structuring of the industry is underway, without the large companies, who have adopted a wait-and-see attitude. Consumption of hemp concrete is approximately 4 000 tonnes in France. Production is equivalent to the amounts consumed. The main advantages of these materials are their lightness, and higher insulation value than tradition concrete.

- **Construction (50% PVC composites + 50% wood meal).** This is a new market, and not a market of substitution, with two main segments: decking (flooring for terraces, patios; exterior structural sections and elements) and siding (shingles, swimming pool surrounds, etc.). These composite materials could potentially compete with 100% PVC products. They must be improved, to lower production costs and enhance properties, notably in terms of durability over time.
- **Packaging/handling (80-90% polyethylene or polypropylene composite pellets, reinforced with hemp fibre content of 10-20%).** The target market is substitution of thermoplastic materials for wood, particularly in pallets used in circumstances requiring

► Current and prospective markets in France

innocuousness (absence of bacteria). The market for pallets is expanding in Europe, with volumes reaching some 600 000 tonnes of wood; composite materials come to 1 000 tonnes in Europe (representing 100 to 200 tonnes of hemp fibre), of which between 200 and 500 tonnes are used in France. There are few industrial actors (just one in France). Composite materials have better performance characteristics, with greater stiffness, smoothness and lighter weight than pure polyethylene. The other advantages are the absence of health risks associated with toxic substances used to treat wood.

- **Automobiles/transport.** Two types of products are involved: The "historical" market of non-woven felts: 50% polypropylene composites and 50% natural fibre (the latter are flax tow in 80% of cases and hemp fibre in the remaining 20%) and the emerging market for technical components (fan parts, etc.) made of polypropylene composites including 20% to 30% hemp fibre. There is no specific regulatory or incentive framework (other than regulations concerning end-of-life vehicles), but a strong driving force: the push by auto makers and parts manufacturers to reduce vehicle weight and thereby lower fuel consumption. The overall target market in France represents 900 000 tonnes of plastics for the automobile industry, plus 900 000 tonnes of plastics (500 000 tonne of felt + 400 000 tonnes of technical parts) for transport. There are few industrial actors in the sector for the time being.

4. THE MARKET OUTLOOK FOR INDUSTRIAL BIOPRODUCTS AND BIOFUELS FOR THE PERIOD 2015 / 2030

Scenarios, a forward-looking model and priority agri-industrial production and supply chains

The prospective study for the 2015 / 2030 timeframe employed a forward-looking model based on seven factors affecting future trends, grouped into three main component categories:

- **An economic component** including the price of fossil raw materials, and the application of fiscal incentives (bonuses and/or tax exemptions).
- **An environmental component** comprising societal demands in relation to the environment, mobilisation of actors in the relevant industrial chains, regulatory aspects concerning the environment and health issues.
- **A technological component** covering public and private-sector research and development work.

Using this model market data (tonnage and percentages of bioproducts), quantities of biomass and land area (hectares) mobilised were quantified for each scenario and each agri-industrial chain. This model was applied to all supply chains in the scope of our study, excepting biofuels and intermediate chemicals. Given the fuel blend proportions stipulated for the short and medium term by European directives and domestic decrees, it was not necessary to run through all the model stages for biofuels. The prospective study relied on two studies of reference for the intermediate chemicals sector; *Top Value-Added Chemicals From Biomass*, T. Werpy and G. Peterson, for the U.S. Department of Energy, Energy Efficiency and Renewable Energy, August 2004; *Medium and Long-term Opportunities and Risks of the Biotechnological Production of Bulk Chemicals from Renewable Resources*, the BREW Project, commissioned by DG Research, European Commission, GROWTH Programme, September 2006. Prospective data for 2015/2030 are given in tables 1 and 2 annexed to this study.

Considering market size and potential quantities, the dynamics of each chain and their sensitivity to levers of societal and

technological impulsion, three chains have been identified as areas for a priority focus to achieve strong and steady growth that will create value in agri-industrial production. These chains are biofuels, intermediate chemicals and biomaterials made of biopolymers, agri-materials and composite materials. Other industrial chains are not excluded, however, and the development work that has been undertaken, in R&D, regulation and communication, must be given ongoing support.

Main conclusions for the three designated agri-industrial chains

From our study we conclude that France should seize the opportunity embodied by biofuels and bioproducts, to diminish the environmental impact of human activities and found a new economy with a greater emphasis on the country's agricultural and forestry potential. These resources are the abundant biomass provided by agriculture, large volumes of which are currently exported (this is the case for grain crops), the potential of set-aside farmlands, and also forest cultivation, which today represents 15 million hectares, with a natural rate of expansion of 40% that is not exploited.

Although France has a sizeable potential in terms of plant resources, industrial exploitation lags more than 20 years behind the United States, and 5 to 10 years behind the most advanced European countries, e.g. Germany. A concerted national effort to focus development on priority areas is needed to make up for this delay, coordinated and integrated by the actors in these sectors. The emergence of a new "bio-economy" must be a national priority, in terms of commitment to technology, investment and regulatory incentives.

- Biofuels

France is lagging behind European leaders like Germany and Spain, in terms of biofuels investment and development. Despite a positive trend in biofuel blends observed since 2005, and domestic targets that are higher than those set by the European Union, France will have to take vigorous action to make up for its late start. The profit margin of biofuels must be improved and production projected on a larger scale; second-generation biofuels must be developed to compensate for the land area restrictions that will confront first-generation biofuel crops, starting as early as 2008/2009 for oilseed rape for VME fuels. Action must focus on the elaboration of major national investment programmes to

mobilise the several hundred million Euros needed to develop truly industrial-scale sites for production of second-generation biofuels by 2015; strategic partnerships must be reinforced with the most advanced countries, particularly Germany; lignocellulosic supply chains must be organised, and cooperation strengthened between agricultural actors upstream and user sectors such as biotechnology companies, automobile manufacturers and equipment suppliers.

- Intermediate chemicals

This industry is poised to develop major groups of plant-based molecules with the multifunctional properties needed to enter the market of bulk petrochemicals, either by direct substitution or creation of new molecules. These molecules can then be converted into secondary compounds or families of derivatives with applications in many areas. Development of these molecules is still in the very early stages, and must measure up to the performance of petrochemical compounds that have been perfected over 50 years. The role of "white" biotechnology is crucial. These techniques are in the forefront for the production of pharmaceuticals and speciality chemicals, and should continue to flourish in these sectors in the short and medium term. It is more difficult to foresee the evolution of biotechnology in production of intermediate chemicals. Production challenges are significant: intermediate chemicals must be manufactured in large quantities of consistent quality, at competitive prices, using continuous processes. A long-term strategy must be devised for the production of intermediate chemicals from biomass, because the potential for environmental gains is significant. The economic challenge for production of intermediate chemicals is above all a technological issue. A framework is needed for exchange between the different actors who could be implicated in this sector (agricultural cooperatives, initial processing companies, research and chemicals industry groups). Secondary processing that is nearly non-existent today must be put into place within this chain. "White" biotechnology societies must be encouraged, and cooperation initiated with similar societies in other countries. Funding must be found for investment and industrial sites.

- Biomaterials

Biomaterials are in an emerging phase, with 0.15% of the market. As for the preceding industrial supply chains, there is must room for economic development and environmental gains with biomaterials. Although demand

has been rising tangibly, development of biomaterials is not at the level it should be. The regulatory framework is not adequately defined and established; processing capacity, in particular for biopolymers, is nearly non-existent; and waste handling and management is insufficient in terms of capacity and degree of structure. Industrial sites must improve their economic competitiveness and progressively cut production costs. While there are many public research laboratories and centres working on new biomaterials in France, this work seems to be insufficiently exploited to create value. Key actions to be undertaken: establishment of a more favourable regulatory and incentive framework to stimulate market development (more definitive decrees and bans, greater clarity of rules, particularly regarding fragmentable materials); structuring of downstream activities for management of waste streams, more effective communication, especially for agri-materials and composite materials. It will also be necessary to intervene to ensure industrial investment (including steps to attract foreign investment), to stimulate creation of large-capacity secondary processing sites for biopolymers in the short term, with strong ties to upstream agricultural producers. As early as 2010 primary processing sites for agri-materials and composite materials must be established, for today they are not sufficient to support the potential market. Innovative SMEs must also be nurtured, in coordination with research bodies and agricultural producers. Lastly, work must be pursued on biocomposites and the opportunities of nanotechnology, to encourage development of a broader range of synthons and acquire greater knowledge of components that will ensure the evolution of biomaterials.

5. GENERAL CONCLUSION

Use and management of plant biomass will be at the heart of high-stakes international competition in coming years. The proactive French policy that is required must be aimed at ambitious targets, following the lead of the United States where the goal is to bring plant-based products up to 50% market share by 2050, and 80% by the end of the century. This dynamic process has commenced in the United States, but it remains to be instigated in France and in Europe. This process must implicate priority supply chains, of sufficient size to give significant new direction to our economy. It is already certain that agriculture will play an essential role upstream, and will be a locus for innovation, exchange, integrated production and major investment. For example, the concept of biorefineries designed

to meet a range of complex industrial needs and create value can be developed only in conjunction with the agricultural sector. In liaison with biorefineries, the links between different industrial production chains must be bolstered, to ensure multiple product yields and industrial outlets. These biorefineries must also aim to operate without emitting CO₂. Other cross-sectoral aspects must also be taken into consideration. These include development and deployment of transparent data accessible to the general public, illustrating the advantages of bioproducts and stimulating awareness of issues. Public procurement and purchasing strategies must be promoted, notably in buildings and construction work. Specific programmes for bringing products to market must be developed, and regulatory and incentive "toolboxes" for each supply chain. The emergence of French biotechnology champions and strong industrial capacity must be fostered.

Prospective data 2015 / 2030

Preliminary remarks

1. Reminders and caveats

The following data are:

- consumption data
- based on hypotheses; they are not forecasts and must not be interpreted as such.

2. Biofuels:

- Quantities are expressed in ktoe.
- Overall fuel consumption figures are based on the following data and hypotheses:
 - For gasoline (petrol): 11 000 Mt in 2005, 8 200 Mt in 2010, and then a 10% reduction in consumption every 5 years up to 2030.
 - For diesel fuel: 31 050 Mt in 2005, 35 000 Mt in 2010, and then a 10% increase in consumption every 5 years up to 2030.
 - We chose not to examine other alternative hypotheses for the different scenarios, as they involve many highly uncertain factors, in particular fiscal measures for gasoline and diesel fuel.
- Insofar as the overall consumption figures mentioned above also include the amounts of biofuels blended with conventional fuels, the total figure cannot simply be multiplied by the biofuel proportion. The biofuel proportion is integrated into the following formula: $Q_{\text{biofuel}} = (x \times Q_{\text{total fuel}}) / (1 + x)$ where x is the biofuel proportion in decimal form and Q is the amount in toe.

		SCENARIO 1		SCENARIO 2		SCENARIO 3		SCENARIO 4	
2005	2010*	2015	2030	2015	2030	2015	2030	2015	2030

Biofuel	1 st generation	VME	Quantities (ktoe)	333,1	2 860	3 070	5 255	4 270	7 540	5 030	11 560	6 120	13 340
		Ethanol	Quantities (ktoe)	73,3	700								
	2 nd generation	BTL (Biomass to Liquids)	Quantities (ktoe)	0	0								
		Lignocellulosic ethanol	Quantities (ktoe)	0	0								
	TOTAL		Quantities (ktoe)	406,4	3 560								
% incorporated		% incorporated	0,96%	7%	7%	10%	10%	15%	12%	25%	15%	30%	

* : The data correspond to amounts eligible for excise tax exemptions. The data for 2010 obtained using the the model in this study are respectively 880kt (563 ktoe) of ethanol and 2 579 kt (2 321 ktoe) of VME, leaving a 20% margin for tax exemptions.

Product range

		SCENARIO 1		SCENARIO 2		SCENARIO 3		SCENARIO 4	
2005	2015	2030	2015	2030	2015	2030	2015	2030	

Biomaterials	Biopolymers		Quantities (kt)	10,0	84,9	139,7	275,6	667,3	905,9	2 230,7	2 334,4	4 623,0	
			% incorporated	0,15%	1,10%	1,51%	3,58%	7,22%	11,76%	24,13%	30,30%	50,00%	
	Agri-materials		Quantities (kt)	5,0	14,8	25,0	25,9	82,6	119,3	206,7	289,6	484,0	
			% incorporated	0,25%	0,67%	0,99%	1,18%	3,26%	5,43%	8,54%	13,16%	20,00%	
	Composite materials	Buildings		Quantities (kt)	4,0	11,4	36,8	16,9	60,8	39,1	127,2	67,0	220,3
				% incorporated	4,36%	12,41%	13,38%	18,45%	22,07%	42,59%	46,21%	73,00%	80,00%
		Packaging / handling		Quantities (kt)	0,5	4,1	8,1	10,9	49,0	56,6	110,4	97,0	248,4
				% incorporated	0,04%	0,30%	0,49%	0,80%	2,96%	4,10%	6,66%	7,03%	15,00%
		Automobile / transport		Quantities (kt)	5,0	7,3	10,4	28,8	55,8	43,6	86,8	103,6	225,2
				% incorporated	0,56%	0,78%	1,00%	3,05%	5,37%	4,61%	8,35%	10,96%	21,67%
Construction		Quantities (kt)	4,0	39,9	86,9	123,0	254,6	438,2	689,3	708,5	1 366,2		
			% incorporated	0,15%	1,35%	2,54%	4,14%	7,45%	14,75%	20,18%	23,85%	40,00%	
New markets **		Quantities (kt)	0,0	0,0	0,0	13,3	33,3	66,7	133,3	150,0	300,0		
		% incorporated	/	/	/	/	/	/	/	/	/		
TOTAL		Quantities (kt)	13,5	52,7	142,2	192,9	453,7	644,1	1 147,0	1 126,1	2 360,1		
		% incorporated	/	/	/	/	/	/	/	/	/		

Biosolvents	Cleaning		Quantities (kt)	3,0	3,4	4,0	5,8	10,6	9,9	16,9	20,2	41,6	
			% incorporated	7,50%	8,13%	8,75%	13,85%	23,02%	23,75%	36,56%	48,13%	90,0%	
	Bio fluxing agents		Quantities (kt)	3,0	4,8	6,4	5,4	8,4	9,7	15,7	20,6	34,2	
			% incorporated	10,0%	14,62%	16,92%	16,44%	22,12%	29,42%	41,35%	62,5%	90,0%	
	Plant protection additives	Vegetable oils		Quantities (kt)	1,7	1,7	1,7	1,8	1,9	2,1	2,3	2,9	3,5
				% incorporated	43,75%	44,41%	45,06%	47,21%	51,51%	54,08%	58,70%	73,13%	90,00%
		Vegetal wetting agents		Quantities (kt)	1,0	1,1	1,2	1,3	1,7	1,8	3,4	2,4	4,9
				% incorporated	16,15%	17,51%	20,22%	20,75%	27,51%	29,09%	55,13%	38,60%	80,00%

** : lecithin and terpene alcohols

Calendar of events

2nd Dutch Symposium Platform Bio-based Business in The Netherlands. 13 November 2007 in Cinemec Ede, The Netherlands, theme "Passing Borders". Dutch spoken! www.biobasedbusiness.nl e-mail: tdeboer@europoint.eu Tel. 00 31 30 69 818 00.

More information Ms. Tessa de Boer, T: +31 (0)30 69 818 00 platform@biobasedbusiness.nl www.biobasedbusiness.nl

6th European Motor BioFuels Forum. 9-10 January 2008 at De Doelen Conference Centre in Rotterdam, The Netherlands.

More Information: Mr. Jerry Visser, P.O. Box 822, 3700 AV Zeist, The Netherlands, T: +31 (0)30 69 818 00 F: +31 (0)30 69 17 394 E: jvisser@europoint.eu I: www.biofuels2008.eu

Platform
Bio-based
Business



Publisher and Editor
Platform Bio-based Business
P.O. Box 822
3700 AV Zeist
The Netherlands
T: +31 (0)30 69 818 00
F: +31 (0) 30 6917394

Subscriptions
Subscriptions are for one year and will be extended without notice from the subscriber to terminate the subscription. Termination is possible up to one month before the next subscription period is due without incurring cost.

Design & Lay out
ESENES designed communication
Standerdmolen 8-030, 3995 AA Houten, The Netherlands

Colofon