Development of Biodiesel in Europe :
New demands for agronomic research

André POUZET
CETIOM
12 avenue George V

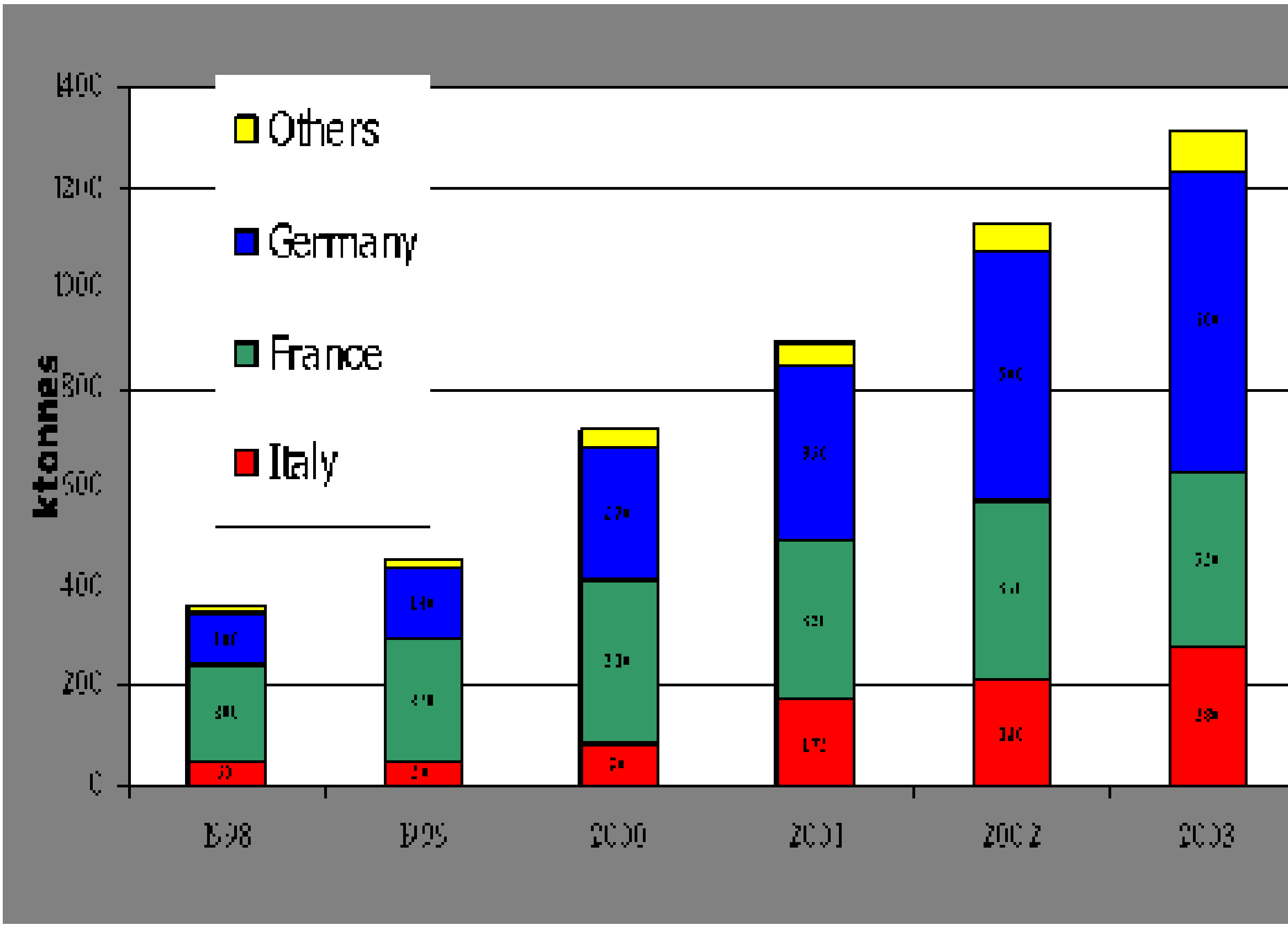
75008 PARIS

pouzet@cetiom.fr

The European Union has approved the Kyoto Protocol with an engagement to reduce CO2 emissions during the next years. The development of renewable energy is an important component of the European policy, and biodiesel use should increase dramatically up to 2010 when 5,75 % of the fuel should come from biofuel. How far will the european production be able to meet the political engagements ? This is the main question that we shall discuss in this presentation, mainly based on the french case.

As we can see in Chart 1, Germany and France are the major players in biofuel production in EU-15. Since 2001, Germany is number one and has increased dramatically its production and utilization of biofuels. Italy has also a significative consumption of biofuel but its production is small.

Chart 1 : Major EU players for Biofuels



Within EU-25, two new member-states have a large potential : Poland and Czech Republic.

Chart 2 shows the impact of the development of biofuels on the needs for vegetable oils in the case of France. This country has probably the highest demand of diesel fuel, as more than 50 % of private cars have a diesel engine. The French Ministry of Industry (DGEMP) anticipates a further increase of the market share of diesel engines.

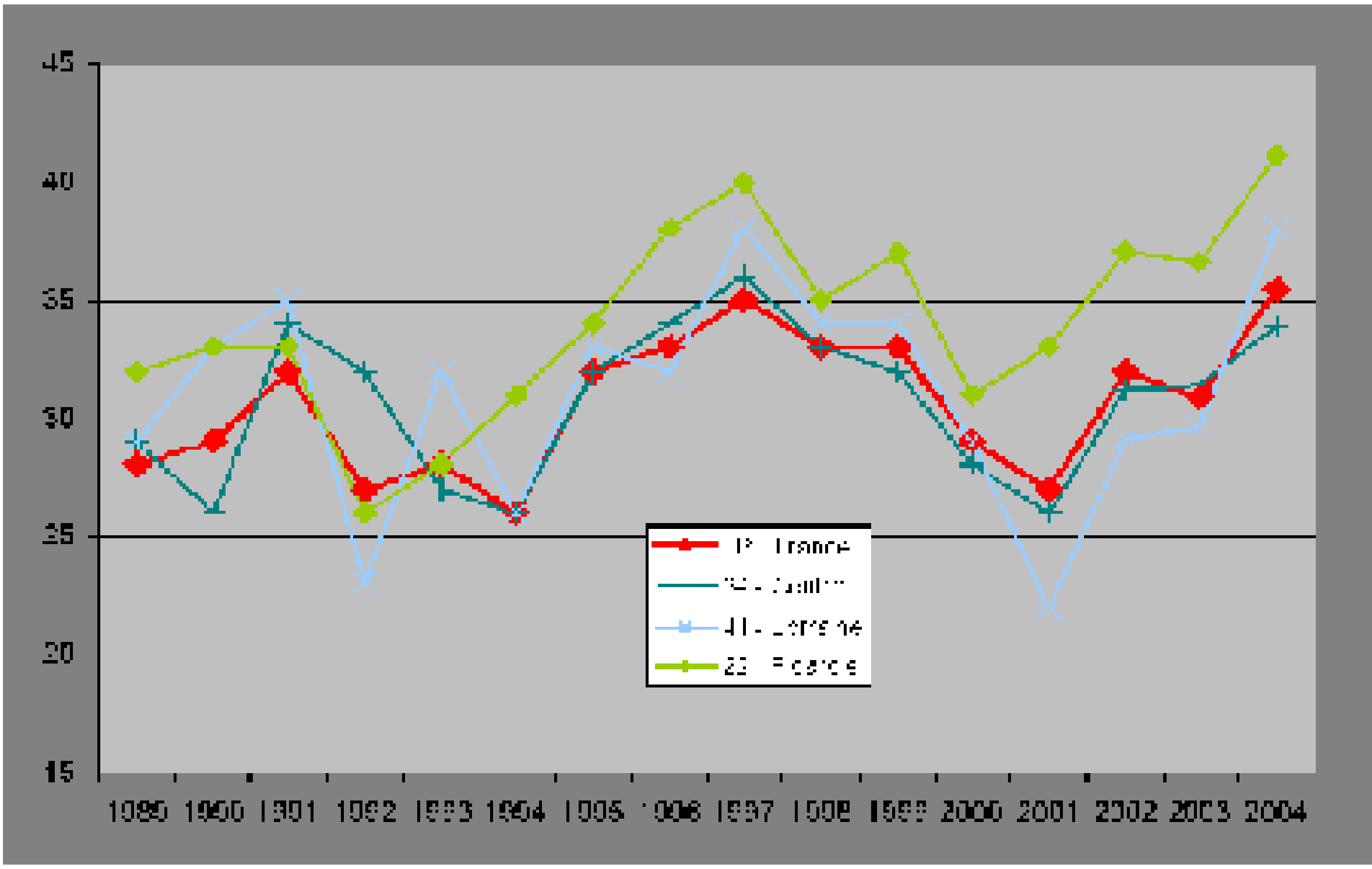
Chart 2 : Quantities of vegetable oils needed to achieve 2 % in 2005 or 5,75 % in 2010 of biofuel incorporation in France.

Year	2005	2010
Fuel consumption MT Source : DGEMP	30	36,5
Fuel consumption MT Equivalent PCI Biofuel	34	41,4
Biofuel Incorporation (% PCI)	2%	5,75%
Biofuel Incorporation ME (MT)	0,68	2,38
Equivalent Veg. Oil (MT)	0,71	2,5

The key-figure is that in 2010, 2.5 million tons of vegetable oil are needed to meet the rate of 5,75 %. With an average yield of 3.5 tons of seeds per hectare and an average oil content of 40 %, the acreage dedicated to biofuel should be 1,8 million hectares. In 2005, the Oilseed Rape (OSR) harvested acreage is slightly higher than 1,2 million hectares (food and biofuel) and the record area is 1,34 million hectares.

Under Western European conditions, yield has been very unstable from one year to the other, and even though the trend for yield evolution is positive (Chart 3), it is not possible to rely only on yield increase to meet the objective, specially in the areas where OSR has been grown during decades (Lorraine and Centre). Other areas, like Picardie have a higher potential, but up to now, OSR has not been widely grown there.

Chart 3 : Yield evolution (dT/ha) in France and in three French regions.



Consequently, an increased acreage is necessary to meet the demand with biofuels. Of course, OSR will not be the only contributor, and sunflower (specially high oleic sunflower) will also be used in southern Europe. Generally, experts think that OSR will provide two thirds of the biofuels, which means around 1,2 million hectares for biofuel uses. If we add 650 000 hectares of OSR for food uses (750 000 in 2004) and 50.000 for other no-food uses, the total OSR acreage should be as large as1,9 million hectares by 2010.

To appreciate the feasability of this objective, one has to discuss the weight of OSR in cropping systems. If we accept an upper limit at 20 % of arable crops, the agronomic potential of OSR is 2,4 million hectares in France, 1,8 million hectares in Germany, 1,9 million hectares in Poland and a total of 8,3 million hectares in the EU-25. So, the objective of incorporating 5,75 % of biofuels seems achievable. In fact, the average national or European value smoothes different values from one region to the other. For example, in Lorraine, OSR accounts for 25 % of the total "Cereals+Oilseeds+Pulses" while this ratio is under 10 % in most of French regions. Such a diversity can be found at the local level and even at the farm level : according to soil types or rotation constraints (for example, sugar beet and OSR are seldom cultivated in the same fields because of nematodes or OSR volunteers), you can have several cropping systems within one farm and different proportions of OSR from one farm to the other.

If we want to achieve the political objectives, we have to define agronomic priorities at the regional level or at a higher scale. Generally speaking, in OSR traditional areas, the challenge is to stabilize and increase OSR yield ("absolute" competitiveness), whereas in new regions, "relative" competitiveness towards other crops will be essential.

In western European traditional regions, research should be strenghtened on the following topics :

1. Weed research : At that time in the EU, GM crops are not allowed and we depend on old active ingredients for weed control.. Gradually, new weeds have been selected. Mechanical weeding is attracting new interest from farmers, and weed management (including the effect of cropping systems) is an important area for research, both for industry and for public research institutes.
2. *Phoma lingam* management : Recent research has been very efficient, and the imprtance of races is acknowledged. Biosurveys and models are now needed to improve information and decision by farmers.
3. *Sclerotinia* research : In Western Europe, some *Sclerotinia* strains have become resistant to benzimidazoles during the last five years. There is a need for new fungicides and efficient decision making systems for farmers.

4. Hybrids : Hybrids have become very popular in Germany (more than 60 % of the OSR acreage) while their market share is limited to 20 % in France. Their development in the coming years could help in achieving biofuel objectives.
5. Oil content : breeding is focussing on this feature, as indicated in other speeches during the GCIRC-Technical Meeting, and yellow seeds could certainly be an asset for OSR. Another way to improve oil content is to improve the efficiency of nitrogen management : an excess of N fertilization can lead to a decrease in oil content and a decrease in oil yield. Studies on nitrogen management through satellite data are going on and seem very promissing.

6 . Life cycle improvement : as far as biofuels are concerned, their environmental efficiency is questionable specially by environmentalists. Plant protection ingredients have to be reasonably managed and again, Nitrogen is a major concern, because of

   a. its energy cost for the synthesis of ammonia
   b. the impact on air quality through N2O
   c. the impact on water quality through nitrate leaching.

In new areas, yield and oil content take benefit of improvements for traditional areas, and specific researc areas can be identified :

1. Management of cropping systems : relations between OSR and other crops have to be argumented, for example the effect of OSR on wheat (including allelopathy), the impact on nematodes population in sugar beet areas, alternance of winter and summer crops to improve weed management, etc…

2. Meal uses : with the increase of meal availability, it is important to improve the competitiveness of OSR meal compared to that of soybean meal. Decreasing sugars, glucosinolates and polyphenols will be useful, and again, yellow seeds could improve incorporation rates of OSR for poultry and pigs. In areas where animal production is large and OSR is low, a lot of questions come from farmers who would like to use OSR oil in their farm vehicles and OSR meal for their livestock. Feed references are needed.
   At this point, it is possible to conclude that :
3. biodiesel is a very strong driving force for the development of OSR in the EU in the coming years ;
4. the capacity to meet the market needs on the long term will depend mainly on :
   i. the optimization of agronomic factors in cropping systems, with a regional (and if possible on-farm) approach
   ii. the improvement of the life cycle and specially the energetic efficiency of the global process (production, transformation, transportation, ….)
   iii. innovations from research efforts by public institutes and private companies.