

Agriculture products – food for living being or for machinery

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Biofuel is a crime against humanity.

Jean Ziegler, UN independent expert

BBC, 27 October 2007

Summary

The spark for this paper about biofuel and bioplastics was stimulated by a newspaper article from January 2007. The news said: *prices of corn on the Chicago stock exchange have reached their record level, and the corn stocks fell to their lowest level in the last ten years.* The reason for the growing prices of corn and the falling stocks was the decision made by the President G. W. Bush that 10% of fuel is to be insured on the basis of ethanol. This was just the finalisation idea of one of the most important trends in past several decades, to transform the product from soil instead into food for living being to food for machinery, biofuel. And put the prices of food for living being as high as possible, with argumentation that this have a positive influence on effect of greenhouse gases. But in smaller amount, also agriculture products should be according big producers of polymers used also for production of plastics via biorefinery. This is the part of trend, *make all from Nature*, but this is not truth. Agriculture products are not a product of Nature, this product as the result of human knowledge and efforts. Pure natural products are: natural gas, crude oil or coal or natural rubber from the plants in rainforest of Arizona. We analysed the concept *everything from the grown matter* using from us developed culturological analysis, containing technical, economical, social criterions but the influence on spirit culture. We put the question how to reduce the generation of greenhouse gases, especially CO₂, and to utilise this gas? Some of answers we got from papers of G. Menges. Two concepts of production plastics from growing matter, the DuPont *concept of sustainability* and *sustainable polymers* GE Plastics (now SABIC) are described in details. The conclusion is everything that is waste, such as waste biomass, needs to be used in all the available ways. At the same time, the concept *everything from the grown matter*: plastics, fuel, textile, leather, etc., is socially absolutely unacceptable.

Introduction

More than ever we are exposed to ever stronger manipulations. Often one does not know what something is for, why precisely at that moment. Few understand that for the humanity at present the most dangerous scientific field is the one of cognitive sciences. Cloning and similar scientific and *scientific* ventures blur the image of what is being performed daily through different media on the biggest possible sample, that is, the basic set, the globalised humanity.

Some such manipulations of the nineties of the last century included: everything is to be recycled, usage of Freon should be banned urgently, PVC is dangerous. At the beginning of the 21st century two such big manipulations are biofuel, bioplastics and biodegradable plastics.

This text is an announcement of *everything from the grown matter* or more popular from *agriculture products* in order to improve the lives of all, with a symbol of *biorefineries*, and the purpose are to answer whether this standpoint is really sincere.

The article is the author's view on biofuel and bioplastics. These need to be produced, as stipulated by strict regulations, from the *natural*, which means from what has been grown, e.g. from corn, oil rape, and similar agricultural products. Products that had once, and should still today serve primarily for human consumption.

It is rarely from the scientific and technical journals that one finds out about the actual problems of the humanity

This idea was expressed at a round table organized by the *Society for Plastics and Rubber* under the title *Green Chemistry and Plastics*, on 15 November 2007 as part of the traditional Conference *Polymeric Materials and Polymer Additives*.

The author's interest in biofuel and bioplastics was stimulated by a newspaper article from January 2007. The news said: *prices of corn on the Chicago stock exchange have reached their record level, and the corn stocks fell to their lowest level in the last ten years*. Only a few months ago we could read that the stocks fell to their lowest level in the last 34 years. The reason for the growing prices of corn and the falling stocks was the decision made by the President G. W. Bush that 10% of fuel is to be insured on the basis of ethanol.

The reaction was immediate and the following text was written: *Everybody needs votes and support of the Green*¹. The text was published with a certain delay and was then supplemented by similar thoughts by Heinz Gupta, the editor-in-chief of the Journal *GAK*.² Not without reason is H. Gupta considered today the most involved editorial writer in the journals in the field of polymers. The conclusion of the original text and the editorial by H. Gupta were identical.

The original sentence said: *The reduction of the stocks surplus of US corn in combination with the strong demand for this cereal in the Chinese fast-growing economy have caused the doubling of the forward prices of corn in the last year to the highest level since July 1996, sounds frightening. The price of food is growing, fewer people can afford it, and more and more people are starving*.¹

Here is H. Gupta's thought: *I can imagine that for a substantial production of biofuel such as biodiesel or ethanol large arable areas will be required. This will mean loss of areas for the production of human food and animal feed. The consequence will be the explosion of prices, even starvation*.² This speaks for itself.

An increasing number of texts followed, warning of the threat from the production of biofuel from food. For example, *China entering strongly into biofuel production and consequences are – within two years the prices of wheat in that country increased by 34 percent, of corn by 47.4 percent, and of beef by 41 percent*³. *Because of orientation to ethanol, the prices of food in the USA increased by 7.3 percent in three months only. The price of corn flour for tortillas in Mexico increased by 300 percent and caused farmers' riots.*⁴

Special motivation to writing of this text was the presentation by N. Rao from the *DuPont* Company during the Conference for trade reporters held on 30 May 2007 in Prague. He explained the *DuPont* concept of sustainability.

Terminology is always in the function of ranking the terms.
I. Škarić, 1990

1 Terminology

These considerations require precise terminological approach. Everything created by nature is the natural matter, and produced by the will and knowledge of people is the artefact¹. Even agricultural products are in all cases artificial one.

Consequently, fossil fuels: coal, oil and natural gas are the natural matters, which *are gained* from the nature by humans. On the contrary, everything *produced* in the soil (fields, vegetable gardens, forests) by knowledge and will of humans are agricultural products². Agricultural products are the result of tillage, cultivation or growing. Therefore, the term the grown matter (usually called renewable product) was introduced for the needs of the presentation at the round table⁶ for the products from the soil³.

It is absolutely unclear that the products from the soil are called natural, and that what is provided by the nature is called wild, e.g. horse chestnut (or wild chestnut). Therefore, everything has become *green* now. Everything green is an excellent marketing slogan, but far from the truth.

It is necessary here to consider also some other disputable terms. There are no renewable sources of energy (*renewable energy*). The term “to renew” means the return of something (destroyed, obsolete) into its previous condition⁷. It is impossible to return into the original condition the wind, the sea or the solar energy, i.e. of that what grows in the fields. For the grown matter there is a better term in German, *nachwachsende Stoffe*. Beard grows again and thus also that which is in the ground, but never the same. It is not without reason that the agronomists gave the deciding contribution to the planning of experiments. Sowing and reaping are unique and unrepeatable events. Therefore, one should answer as many questions as possible at one time during an experiment in agriculture. It seems, therefore, sensible to use for the mentioned forms of energy the syntagm additional sources of energy or additional energy sources. At the same time there is absolutely no sense in the syntagm energetic efficiency (from energetic or energy technology). It is energy efficiency, dealt with also in the text by M. Znika in the last issue of the journal POLIMERI⁸.

Some of the necessary terms will be explained further in the text.

¹ Every work of art is artefact, but every artefact is not a work of art.

² In the first layer the word culture comes from the Latin word *culter* – (butcher's) knife – tool. In the second layer it is *cultio* – cultivation of e.g. a field. The third meaning is a derived word, *cultus* – idolatry, worshipping, cult, cultivation, planting, education, etc. Finally, the derived word *cultura* means education, educational quality, cultivation.⁵

³ In the project *Implementation of systemic theory in analyzing of general technology* (MZOS, 2007–2009) the soil is considered as batch reactor.

Why biofuel and plastics from the grown matter?

Worried about the global warming and the increase in the effects of greenhouse gases, many companies in the world, including those from the field of plastics, have decided to direct the efforts to the expansion of production based on the grown matter. The first issue is: what is the lifelong balance of this concept. Which is certainly an attention-worthy effort, but this has to be done by somebody independent. Here is a task for our scientists, especially those advocating the protection of environment and nature. Are, namely, precisely the greenhouse gases, especially CO₂, responsible for this warming? A *United Nations* report was published recently entitled *Battle against climate changes; Human solidarity in the divided world*⁹. What is the basis for such dramatic calls? Among others it is also on the conclusions of the *Intergovernmental Panel on Climate Change*. At the beginning of 2007 this international organization concluded: *global warming is the consequence of human activities*. Therefore, e.g., one of the most distinguished corporations in polymer industry, *DuPont* wants to realize its concept of polymer sustainability by the year 2015.

Is that really so? On 13 November 2007 *BBC* published a text written by John Christy, professor for atmospheric sciences at the *University of Alabama*¹⁰. He was introduced as the leading researcher in the field of temperature changes. What did J. Christy say?

»The forecasts by the *Panel* on the influence of CO₂ on the climate changes are based only with 90 percent probability on simulation models in the period of the last fifty years. However, no measurements were carried out. Thus, something is assumed without measurable evidence. It should be added, of the foundation of all natural sciences«. In his conversation with T. Rudež, V. Pravdić said: *Nobody knows whether CO₂ affects the climate changes at all*.¹¹

Why is only carbon dioxide mentioned? What do greenhouse gases consist of? There are four basic greenhouse gases. These are carbon dioxide (64%), methane (20%), chlorinated hydrocarbons, e.g. CFC refrigerants (10%), and nitrogen oxides (6%).⁴

At the Conference of 6th *Bioethical Days* in June 2007, in her brilliant lecture, S. Marjanović pointed out among other things: *In his latest book An Inconvenient Truth the well-known Al Gore did not explain more explicitly one very inconvenient truth. Even the production of food both of plant and animal origin, namely, contributes to the greenhouse effect with full 25 percent. Most of all the cattle breeding and in Europe 17 percent of methane emissions result from cattle breeding. Every adult cow generates about 60 litres of methane daily*⁴. It should be noted that methane is a much more influencing greenhouse gas than the continuously held accountable carbon dioxide⁴. According to new knowledge of the ecological damage due to nitrogen dioxide which is produced during the usage of biodiesel from oil rape, this greenhouse gas is 296 times more dangerous than CO₂¹². It therefore logically follows that the disadvantages of biofuels of usable grown matter for human consumption often exceed by far the potential benefits of this energy source¹². Finally, the trees are constantly cut down and forests are burned down because of the production of the grown matter, and the burning down accounts for 24 percent of the total amount of greenhouse gases¹³. N. Marčec Rahelić points out very well the advantages and drawbacks in his editorial in the latest issue of the Journal *Goriva i maziva (Fuels and Lubricants)*, entitled *Biofuels – the top topic*¹⁴.

It should be concluded, in spite of the dramatic appeals by the *Panel* and the followers, with a thought by C. Monckton, former councillor of the British Prime Minister, M. Thatcher. He warned recently in an interview about the 38 untruths in the well-known film by Al Gore *An inconvenient truth*¹⁵. Thus, it should be concluded that the sources are very different and interpret the same phenomena in very different ways.

Culturological analysis of the concept *everything from the grown matter*

Paraphrasing the subtitle of the book written by the well-known Croatian economist Slavko Kulić *Neoliberalism as social-darwinism – War for domination or for a better world*, this subtitle should be: *War for the domination over human culture or for a better world*. The concept *everything from the grown matter* is a special form of a war in the function of the domination over the poor.

At a recent conference *Humans and culture* an attempt was made to define culture in the light of the latest knowledge¹⁶. Culture is a common name for the cultures of plants, animals and humans. The man's, human culture consists at the first level of two cultures: animal-human and human-human culture. For our considerations here the human-human culture is of interest and this culture is based on the material culture, and its upgrade is the spiritual culture.

Journal *POLIMERI* was the first in this area that published the concept of the technological approach to the product development¹⁷. Simplified, it results from this concept that the technical objectives (e.g. raw materials for petrochemistry from the grown matter) and the economic objectives (e.g. increase in the prices of the grown matter, e.g. corn) are always in the function of social objectives (e.g. violence over the weaker and the poorer). Here the social objectives are: safety, health, quality of the environment and development of personality and quality of society. The objectives of the personality development include among other things education, spiritual culture of the individual and the society, ethics and politics. It is precisely the policy which eventually determines which are the social, and thus also all the other objectives. The example of the objectives of the modern policy of power and desire for domination over the material and spiritual culture is the political decision made by the President G. W. Bush that the USA has to insure sufficient ethanol from corn so that 10 percent of the natural matter, fossil fuels, would be substituted by biofuel. In these regions, I. Čatić and M. Rujnić-Sokele were the first to warn about the unsustainability of such policy, as well as about the attempt to impose lower quality packaging solutions, replacement of classical polyolefin bags by bio-degradable ones¹⁸. During the several months following the publishing of these texts, first of which was reported in a Slovak scientific-technical journal, showed that the alarm was justified. Biofuel and bags made of the grown matter, as a rule, are no technically justified solution. However, in the name of *environmental protection*, the biofuels and bio-degradable bags are used to dominate the poor. In this way, for instance, the concepts of the *DuPont* and *GE Plastics* corporations will be assessed. It should be emphasised again that the matter that is obtained from the soil, the grown matter, are not *natural* products, directly offered in the nature as the result of the laws of natural techniques. These are grown, cultivated products, agricultural products and they are the result of the knowledge and will of humans. Their production requires the consumption of energy, fertilization, etc.

What is the essence of the problem? Those who can, the politicians, they make decisions which are in favour of the corporations and their profit, and to the disadvantage of the weaker and the poorer ones, expanding thus their supremacy, and not fighting for a better world. All the means are allowed, even taking advantage of the public sympathy towards environmental protection. It is of little importance that already the concept *everything from the grown matter* has proven to be unjustified and socially unacceptable. Moreover, all the researches claim that it will be difficult anyway to achieve the foreseen quotas.

How to reduce the generation of greenhouse gases, especially CO₂, and to utilise this gas?

Assuming that greenhouse gases, especially CO₂, have decisive influence on the climate changes, the question is raised how to reduce the creation of this gas which is otherwise necessary for human lives.

Plastic insulations

According to the data by *PlasticsEurope*, plastics are green materials. Among other foam plastic materials which serves as insulation in building constructions. A classically built house consumes 19 litres of oil per square metre and produces 7700kg of CO₂ annually, whereas a house insulated by foam polystyrene panels consume only 4.5 litres of fuel per square metre producing 1800kg of CO₂. Thus an annual saving of 1900 litres of fuel is achieved, with 75 percent reduction of CO₂ emissions¹⁹.

Photosynthesis, precondition of life – thermoplastics made of carbon dioxide from air

During his visit to the exhibition of plastics and rubber *K'07* in Düsseldorf at the end of October 2007, the author talked to the honorary member of the *Society of Plastics and Rubber* and a member of the *International editorial board of the Journal POLIMERI*, Mr. G. Menges about this topic. After the talk, he made available the text in which he mentioned this issue²⁰. Here are some of his thoughts.

Everyone who has studied biology knows that organic nature, or the living matter, is built of carbon dioxide. Therefore, that plants, animals and people are built from what is today called biomass. This biomass is created in the plants by the action of light energy from water and carbon dioxide taken from the air. Apart from biomass, oxygen is also produced. The process is known as photosynthesis. Photosynthesis is very well-known as a process, but has not found any major application yet in the industrial production of new materials.

What is to be done with carbon dioxide? It should be used more, e.g. by planting forests to create biomass. However, there is one inter-result in the industrial usage of photosynthesis. For quite a number of years now, a big German concern has been developing thermoplastic material similar to polyethylene or polypropylene. A large share of carbon necessary for its production comes from carbon dioxide from the air. The material is relatively cheap, with a wide scope of application, it is biologically degradable and there are other methods in which it can be recycled. It is a big production potential. About 110 million tons of polyolefin are, namely, produced at present. Can you imagine producing a material using photosynthesis, without being dependent on oil, natural gas, or arable land?

Why that is even the technical public knows so little about this material. The development of this material has its price, hundreds of millions of euro, and the producer expects support from public funds. However, for strategic reasons public funds prefer to invest into the lower quality biofuel produced from wheat or corn.

Double benefit of carbon dioxide

The researchers from the *Fraunhofer-Institut für Produktionstechnik und Automatisierung (IPA)* have developed a cleaning agent based on CO₂. It serves to clean the holes from separated particles during drilling, and at the same time as lubricant²¹.

Diesel fuel made of dirty diapers

The quantity of dirty diapers is increasing. They are used not only for the children but increasingly for the elder people as well. What happens with the diapers? An answer has been found in Canada; a facility was constructed in Quebec for their pyrolytic treatment. It is, namely, that about 120 thousand tons of this useful waste can be found there. The waste disposals are out of question, since this waste would remain there for as many as a hundred years and more. For the biodegradation of this waste, a process of pyrolysis, well known in chemistry, has been used. It is a closed process which does not burden the environment. The product of pyrolysis is synthetic gas similar to methane, oil similar to diesel, and carbon-rich coal. The plant operates, but obviously, not without problems either. How to collect these 120 thousand tons in Quebec only and get them to the facility?²²

Equipment for one's own production of biodiesel

A British company sells equipment for one's own production of biodiesel from waste cooking oil. The instrument has a very low price of only about 9000 kuna (~ 1200 Euro). In several hours one can produce about 40 litres of biodiesel. The instrument of a capacity of about 150 litres costs about 20,000 kuna (~ 2700 Euro).²³

Sustainable polymeric industry

The readers of POLIMERI are still primarily interested in how the big world corporations represent their concepts of sustainability. This can be explained on the example of *DuPont* and *GE Plastics*. It will also include knowledge acquired during the visit to the *K'07 fair*.

DuPont concept of sustainability

Technology Director for DuPont Performance Materials N. Rao explained in detail the concept of the new technological platform *Forming of the Future of Plastics* (Figure 1).²⁴

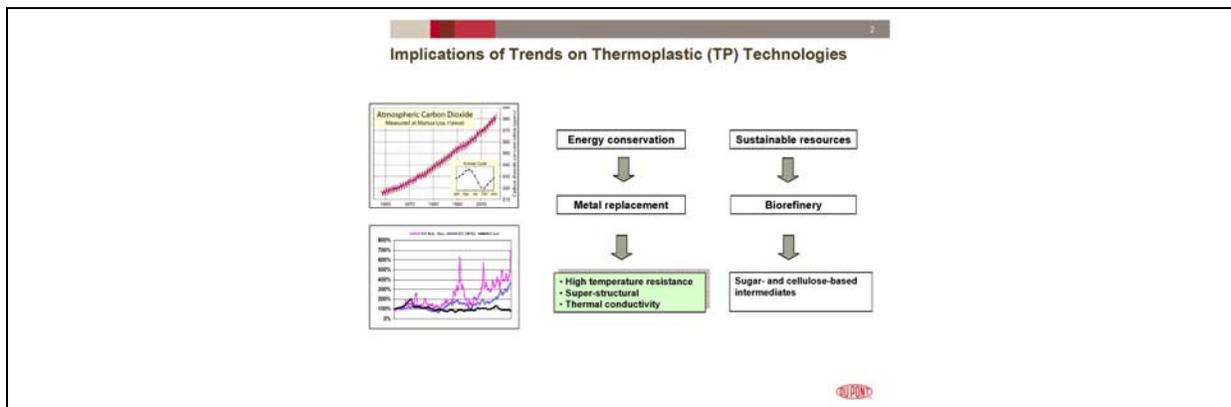


FIGURE 1: *DuPont* technological platform: a – atmospheric carbon dioxide, b – sustainable sources²⁴

Worried about the global warming and increase in the effect of greenhouse gases and wishing to gain support of the *green public*, the *DuPont* Corporation decided to direct the efforts to expansion of production based on the products from the soil. The first question is: what is the lifelong balance of this concept? A part of the answer was already given. However, regardless of the possible complaints, *DuPont* wants to realize by the year 2015 its concept of sustainability of polymers based on the conclusions of the *Intergovernmental Panel on Climate Change*.

The sustainability concept by means of *biorefineries* has been presented. It is necessary here to emphasise. *POLIMERI* is not just a scientific journal or information carrier, which is the characteristic of magazines. It also has an educational function, therefore some definitions.

What are biorefinery and biomass according to *Wikipedia*?²⁵ Biorefinery is an integrated facility for the conversion of biomass into energy (fuel, other forms of energy) or chemicals. It is in fact a concept which matches the one of refineries that converts oil into fuel and other oil derivatives. Biomass refers to living or recently dead biological material that can be used as fuel or for industrial production. Most commonly, the term biomass refers to plant matter grown for use as biofuel, but it also includes plant or animal matter used for the production of fibres, chemicals or heat. Biomass also includes biodegradable waste that can be burnt as fuel. Its value is determined according to the share of dry matter and total mass of living matter. Biorefineries can produce high-value products in small quantities or those with low added value in large quantities, with simultaneous production of electrical energy to be sold. High-value products enable profit, and widely used cover national energy requirements.

There are two concepts of using biorefineries, as implemented in practice by the *National Renewable Energy Laboratory* in the USA. One concept has been called *sugar platform*, which is based on biochemical procedures and focuses on fermentation of sugar extracted from biomass. The second group of procedures is also possible, *gas platform*, thermo-chemical conversion of biomass into synthetic gas and other gasification products.²⁴

DuPont has opted for biorefinery based on the conversion of cellulose content of corn into inter-products based on fermented sugar. Here the corn grain and corn stover are used. The corn stover means the entire biomaterial which remains after the harvest. The *DuPont* concept is based on corn as input in the process, but one can imagine in a similar way also the usage of other plants that contain sugar.

The flowchart of obtaining intermediates for plastics is presented in Figure 2.²⁴

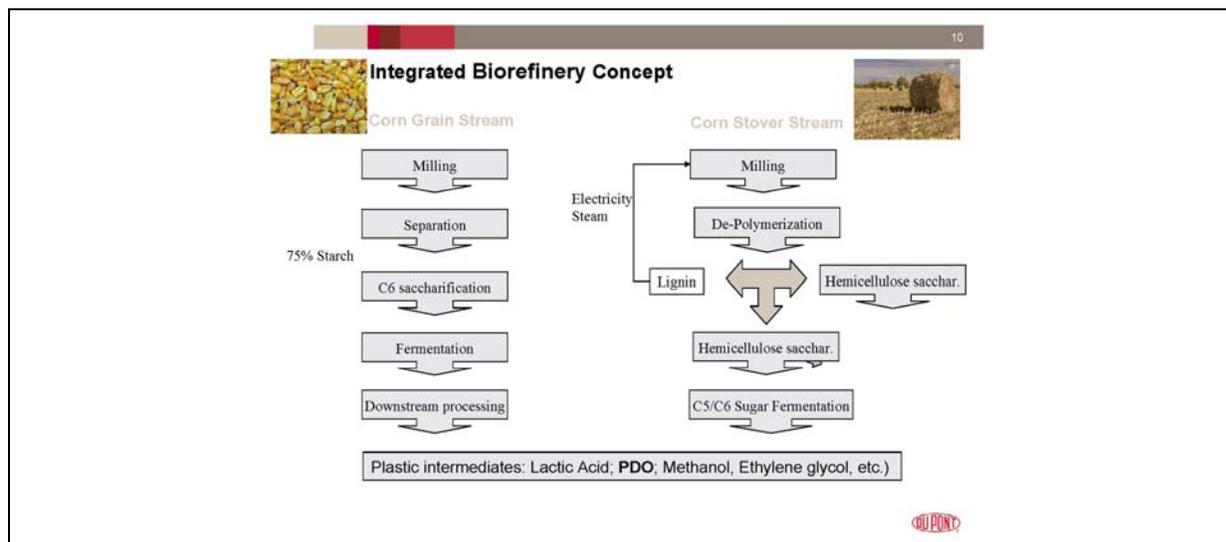


FIGURE 2: Integrated biorefinery concept²⁴

As a rule, until now only corn grain had been used (Figure 2 - left), and now it is possible to use also the corn stover (Figure 2 - right). The following is obtained: lactic acid, PDO (homopolymers and copolymers p-dioxanone), methanol, ethylene glycol etc. The mentioned intermediate products

are of high added value. It is also possible to use the corn stover for the production of electrical energy and steam, and the rest is also usable lignin, treatable e.g. by injection moulding.

Based on the past presentations, only the right side of the Figure is socially acceptable, which means the usage of the corn stover.

Sustainable polymers according to the concept by GE Plastics²⁶

At the pre-exhibition conference of several companies, which was reported by Đ. Španiček in the previous issue, the *GE Plastics* Company explained the concept called *sustainable polymers*. This concept is based on the material recycling of PET and engineering polymers (recyclable) and the use of the grown matter. It is explained in the following way.

Some *GE Plastics* materials are suitable for the common procedures of chemical recycling, such as PET polymers. Others are obtained from the grown matter. In this way biopolymers are made and they are obtained by fermentation (PLA – lactic acid and polymers and the mixtures on bio-base), as well as biological processes with thermo-chemical processes (Figure 3).

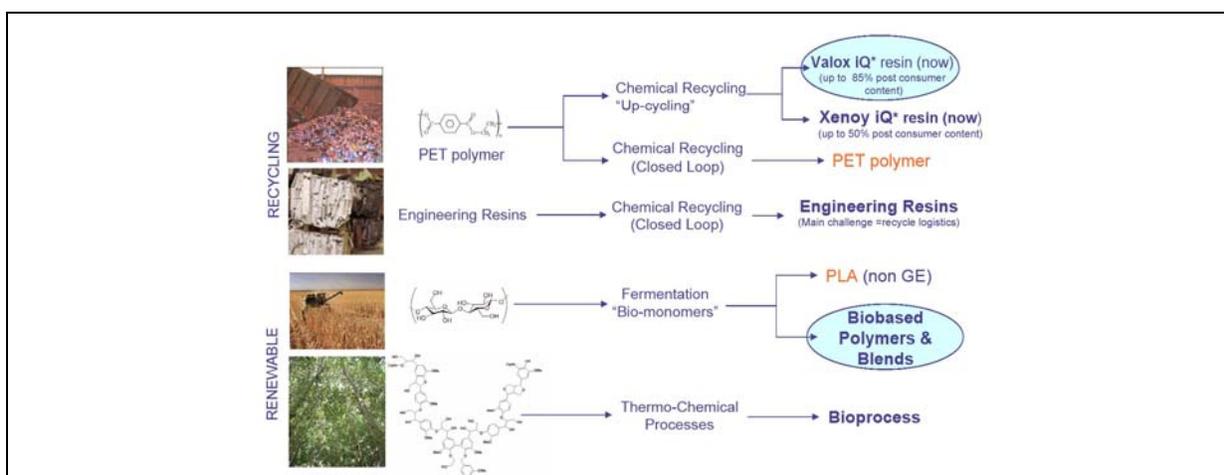


FIGURE 3: Concept by *GE Plastics* on sustainable polymers – recyclable and renewable²⁶

What is positive is certainly the tendency of this producer of polymers to make the materials have minimal influence on the environment. There is intensive work on adopting new productions of biopolymers, although for the moment the bio-degradability understands the biodegradation with action of enzymes. Understandably, all the companies such as *DuPont* and *GE Plastics* pay special attention to the application of the omnipresent *REACH*, which is used to control all the chemicals in use.

Knowledge acquired during the visit to the K'07 exhibition in Düsseldorf

The said was also repeated after the exhibition of plastics and rubber in October 2007. In the forty years of visiting this fair, the worst memory is of the one in 1992. Under the pressure of the *green* everybody talked only of recycling, recycling, and recycling. How to make a product was of no interest for anybody. It is known today, mechanical recycling has sense for about 15 to maximally 25 percent of polymeric waste. The rest needs to be disposed of as energy. It is difficult to expect such a long-term review of this exhibition. Therefore a forecast, the 2007 Fair was fantastic. But it was overcast by the campaign *everything from the soil, everything from the grown matter*. It was not just the mentioned corporations that had been speaking about it. One Brazilian company advertised their *green polyethylene*. They say that in Brazil they can afford producing anything and

everything from the grown matter, in the concrete case from sugar-cane. This trend will also go flat just like the recycling balloon. Every fair needs attractive slogans, the same as this one. Unfortunately, the experience teaches us that some author's forecasts have come true, as the ones about the threat of nanoparticles. The latest, e.g., of those related to laser printers²⁷. It is very significant that one of the biggest producers of plastics did not want to take a standpoint on the production of the grown matter.

It should be clearly said now. The products based on the grown matter will be always only specialties in plastics. According to the forecasts of a representative of a big company, the potential is about 1%, which means about 2.5 to 3 million tons annually in the world.

Conclusion

Technically and economically the objectives are always in the function of social objectives. This includes humans as well. Recycling is justified to a certain degree; the rest needs to be used as powerful energy source since plastics is frozen energy.

Everything that is waste, such as waste biomass, needs to be used in all the available ways. However, the concept *everything from the grown matter*: plastics, fuel, textile, leather, etc., is socially absolutely unacceptable. The grown matter is divided into food and waste. Food contains a part for human consumption and a part for cattle consumption²⁷. Yes to stover of corn and waste biomass for most diverse purposes.²⁸ But, no to corn grain, oil rape or sugar-cane, soya, saffron, CANOLA (abbr. of CANadian Oil, Low Acid) oils: castor, palm and fish-liver, everything that can serve as food.²⁹ Especially if this means, that we for planting of agriculture products must to destruct of forests and converting them into arable land, e.g. for growing of oil rape.

Mildly put, the concept *everything from the grown matter*, especially for the production of biofuel, is in the function of profit of only some, and not of all.

The original version of this text was finished at the end of 2007. Since than a lot of texts from prominent people from science and politics support the main idea of this paper: fruits from earth should be food for people and not for machinery.

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