
5. Conflicting demands resulting from bioenergy, ecological sustainability, energy, and food security

by Dr. Hans-Jürgen Froese
Counsellor for agricultural and environmental issues
German Embassy, Buenos Aires
Villanueva 1055 Capital Federal - CP (C1426BMC)
Phone: (5411) 4778-2500
Fax: (5411) 4778-2550
Web Page: www.buenos-aires.diplo.de



Deutsche Botschaft
Buenos Aires

Embajada de Alemania
Buenos Aires

Dwindling fossil energy sources and high international oil and gas prices are turning the increasing employment of renewable energy sources even more attractive. This is not only a matter of simple restructuring and substitution processes in favor of renewable raw materials as this seems to be opportune in economic terms and because of finite fossil energy sources. It concerns also the struggle against the climate change, in particular the worldwide reduction of greenhouse gas emissions and its consequences for the ecological balance on Earth. If and to what extent the growing of energy plants or other kinds of renewable raw materials will prove to be earnestly sustainable, is to be examined case by case in the context of other ecological, social and economic factors.

It should be clear at this point that not each bioenergetic product is automatically to be regarded as sustainable or ecologically positive, only because it has been branded as "bio". If for example a soybean grower in Latin America or elsewhere farms land, which has recently been stripped of its natural forest cover to be converted into arable land, in order to obtain biofuel from soybean oil, then you really have to ask if this is ecologically sustainable. Ecological sustainability is not only defined by simply balancing the capturing and releasing of CO₂. Being complex environments for flora and fauna, water reservoirs and oxygen providers, natural forests fulfill numerous functions. A more nature-orientated exploitation, such as extensive cattle grazing, selective harvesting, beekeeping, etc. would ensure a sustainable forest management and besides that, forests can be used – at least partially – as leisure and recreation areas. This way, various social and economic factors of sustainability would be considered.

Against this background bioenergy production finds itself in a conflict area involving global energy and food security and the need to observe sustainable development, as it was set in the so called Rio Declaration of 1992 as politically binding aim of the United Nations. Important principles, as the struggle against the climate change, reduction of biological diversity, expansion of deserts and destruction of forests have been agreed at that time.

As the global environmental situation has rather worsened since 1992, the civil society increasingly calls for peremptory action against:

- air- and water pollution,
- the extinction of endangered animal- and plant species,
- the logging of natural forests,

in order to maintain the natural resources of the world for coming generations.

Regarding possible consequences of bioenergy production, the Food and Agriculture Organization of the United Nations (FAO) refers to the following set of problems in its current report (2007, page 36):

„Bioenergy Development in G8 + 5 Countries (2007; S. 36)

Bioenergy can provide dramatic environmental gains but also has the potential to cause great harm if not produced in an appropriate way. ... One of the greatest threats posed by expanding cultivation is the conversion of natural ecosystems. Increased pressure on forests is also a key concern. Clearing forest areas for agricultural purposes causes the obliteration of species and their natural habitats, and leads to the irreversible loss of species, ecosystem functions and services. It also has a dramatic GHG impact. Wide-scale destructions of wildlands can additionally affect the hydrologic cycle and impact the climate by reducing regional rainfall and increasing local temperatures."

Due to various development trends and determinant factors there is in fact reason for concern that the extension of bioenergy production will cause further destruction of natural resources in many countries, including South American ones, in case no decisive political counteraction is taken in due course.

If only the global deforestation trend from 1990 to 2005 is regarded in this context (that means, before the beginning of the current bioenergy boom) there is clear evidence that forest destruction has further increased in South America. The annual net deforestation rate moved from -0.44% in 1990 – 2000 to -0.50% in 2000 – 2005 in South America. At the same time it was reduced marginally from -0.22% in 1990 – 2000 to -0.18% in 2000 – 2005 worldwide. All in all South America has deforested a net area of about 4.25 million hectares between 2000 and 2005. That means, only in these five years about 12 % more forests were destroyed than in all of the preceding decade.

Although this trend itself is alarming enough, it is being exacerbated by the fact that the CO₂ share in the atmosphere is increasing. While most areas are being deforested for agronomic and livestock rearing purposes, most of the resulting biomass is simply burned instead of being used in the timber industry or for energy production. About 20 % of global greenhouse gas emissions are being generated by current deforestation.

In the last 10 years – that means, long before the beginning of the bioenergy boom in 2006/7 in Argentina – this country has expanded its arable land mostly at the expense of pastures and naturally forested areas. Between 1996 and 2006 the area of arable land has grown from 23 million to 33 million hectares. According to roughly estimated informal figures from INTA, the Argentine Agricultural Research Institute, 2 million hectares of natural forestry and 8 million hectares of pastures were converted into arable land. At the beginning of 2007 the total area of 279 million hectares of Argentina was utilized as follows, according to rough estimations:

- 97 Mio. ha pasture/grasslands,
- 53 Mio. ha other forestry land
- 45 Mio. ha land not usable for agricultural or forestry purposes
- 33 Mio. ha arable land
- 32 Mio. ha natural forests and naturally kept forests
- 19 Mio. ha protected areas (national parks, provincial nature reserves, etc.)

Deforestation in Argentina, as in other Latin American countries, is motivated almost exclusively by agricultural purposes. According to reports from the foundation "Vida Silvestre", about 250,000 hectares of natural forests are destroyed annually in Argentina, whereby most of this deforestation takes place in the northern provinces of Salta, Formosa, Santiago del Estero, Chaco and Misiones. This means, not only many important habitats of endangered species are being lost, but also very fragile land in semiarid zones is put under cultivation, with yields that were only possible because of above average rainfalls. If these rainfalls fall back to historical averages, most probably such classic crops as soybeans and sunflower seeds in these semiarid border areas will fail. This could cause an abandonment of these areas and leave them exposed to wind and water erosion, sweeping away irreversibly the fertile top soil layers.

The pressure to develop arable land is due to the fact that, through introduction of instant cultivation with genetically modified crops in the second half of the 1990s and a high degree of specialization and mechanisation in Argentine farming, Argentina is able to produce with low costs and has become highly competitive after the massive devaluation of the peso at the beginning of 2002. The growing demand of food and agricultural commodities, especially by Asian emerging countries, which is notorious since 2003/04, has given this evolution a further impulse. But up to date this has nothing to do with production of biofuels.

Pressure to increase arable areas will grow compulsorily even further, as demand for biofuels increases because of the various requirements to mix them with conventional fuels set up by the main consuming regions of the world. For example, the target of the European Union to reach a 10 % biofuel share in overall fuel consumption by 2020, can hardly be met with own production. It will be necessary to additionally import biofuels or commodities to produce it. If in this context no relevant technical progress is achieved (like development of synthetic fuels or yield increases per hectare) and bioenergy production is no longer obliged to meet to sustainability criteria, the current bioenergy boom could backfire. Instead of achieving desirable positive effects (like reduction of dependence of fossil fuels, reduction of greenhouse gases), the overall growing demand for nature areas and cultivation areas for food and energy crops could turn negative for the environment and food production.

According to existing investments and intended investment projects Argentina will easily be able to produce up to 2.2 million metric tons of biodiesel for export in 2010. Local demand will also have to be met as by law it is planned to add 5 % of biofuel

to conventional fuel as of 2010 (this means, additional 680,000 to 800,000 tonnes of biodiesel and about 200,000 tonnes of bioethanol will be required). For the biodiesel-component this requires a cultivation area of about 6.4 million hectares, assuming soybean average yields of 2.7 metric tons/hectare and a biodiesel production yield of 467 kg/ha. We have to remark at this point, that soybeans have by far the lowest oil yield compared with other oilseed crops, but at the same time they are a provider of valuable protein for the animal food industry. Because of this we cannot solely concentrate on the oil yield some crops may provide, but have to consider the overall applications to calculate the crop profitability. Certainly there is still a lot of research to be done in order to analyse other oil crops like rapeseed (canola), castor-oil plants or jatropha verifying their cost efficiency, agro-climatic applicability and dispose of utilizable by-products to be grown in Argentina.

One may speculate about the reaction in Argentina regarding areas to grow energy crops to meet the demand of biofuels, without forgetting the bioethanol element. Taking into account the ambitious targets regarding biofuels of the main consuming regions, pressure to increase arable areas in Argentina may amount to additional 6/7 million hectares by 2020 on a conservative estimate. And where will these areas come from?

Greater area substitutions favouring agriculture, particularly growing of soybeans, have accelerated since broad introduction of direct sowing using transgenic seeds (mainly RR-soybeans) since the second half of the 1990s, resulting in the displacement of cattle breeding to marginal areas. At present only the Northern regions with major natural forests and a few regions in the West are left to breed and fatten cattle, otherwise only increasing cattle production in feedlots may be an alternative. On the other hand the evolution of worldwide demand on agricultural commodities and food¹ is hinting that there is further market potential, so prices may remain at high level in the middle and long term. Against this background following effects can be anticipated for Argentina:

- ◆ There will be a strong competition in regard of land being used to grow food or energy crops, extensive livestock production will be transferred to marginal areas and intensive livestock breeding will concentrate mainly in the traditional agronomic regions of the Pampa.
- ◆ There will be a further expansion of arable land at expense of forest covered areas and this will depend on soil quality and regional deforestation rules and control.
- ◆ Price increases in fats and oils.
- ◆ Price decreases in soy and rapeseed meals.
- ◆ Arable land will further increase in value.
- ◆ There will be a growing trend in establishing monocultures.
- ◆ There will be a higher risk for biodiversity.

Regarding the aim of the European Union and Germany to increase biofuel production in order to ensure at the same time energy supplies and climate protection, the Federal Ministry for Environment and the Federal Ministry for Food, Agriculture and Consumer Protection, jointly with the German automotive and oil industries, have presented a roadmap for biofuels on November 21st 2007 in Berlin. Central points of this roadmap, which are also relevant for third biofuel supplying countries, such as Argentina (mainly biodiesel) and Brazil (mainly bioethanol), are as follows:

- a) Increased employment of biogenic fuel and blending of biodiesel with fuel oil and bioethanol and bio-ETBE² to gasoline;
- b) Boost of the bioenergy targets;
- c) Safeguarding of the sustainability of biofuels and gradual increase of the greenhouse gas efficiency;
- d) Promotion of biofuels of the second generation.

a) In order to reach the blending targets aimed by the EU of 8 % biofuel by 2015 and 10 % by 2020 (relating to the energy equivalent, respectively), in Germany it will be tried to increase the blending limits within the technical possibilities as soon as possible. Blending gasoline from 5 to 10 % vol. is relatively unproblematic. The automotive industry has assured to enable the E10 application on the basis of a national (German) rule. It is aimed to change the EU regulations accordingly. Old vehicles, which do not comply with E10, will be offered a premium brand Super Plus with a blending of maximum 5 % vol. bioethanol or 15 % ETBE (which corresponds to 7 % vol. ethanol). This brand of gasoline should be available at at least 1,000 special petrol stations by 2016. In regard of diesel fuel, the automotive industry will release all cars for B7 (7 % biodiesel) in the short term. Complementary to this there is the aim to allow fulfillment of the rate at the soonest by adding hydrogenated vegetal oils to mineral oil, to achieve a 10 % blending of biofuels composed of 7 % biodiesel and 3 % hydrogenated vegetal oils in the refining process.

b) Up to date the EU Biofuel Directive provides member countries with indicative (not yet obligatory) targets in regard of increasing the biofuel proportion in the total volume of sales, namely from 2 % in 2005 to 5.75 % in 2010 (in each case relating to the energy equivalent). Within the energy package of the EU Commission of January 10th 2007 it was announced that a mandatory target of a 10 % employment of biodiesel by 2020 would be proposed. This demand was endorsed by the European Council on March 9th 2007, but at the same time it was stated that the commitment would depend on

- the safeguarding of the sustainability of the biofuel production and
- the fact that biofuels of the second generation will be available to the public.

The EU Fuel Directive will have to be modified, to allow according blends and furthermore to allow the employment of synthetic fuels. Gasoline accepts higher bioethanol blends and also E85 is to be considered. To reach an increase of up to 20 % vol. biofuel (instead of 10 %) in the composition of diesel fuel, necessary technical details have to be defined. The Federal Government intends to shape a joint strategy after having heard the concerned parties.

c) The Federal Government intends to honor commitments on behalf of biofuels or to allow tax deductions at the soonest only if it is proven that certain standards regarding sustainable management of arable land while producing the necessary biomass have been accomplished or if certain standards to protect natural habitats have been fulfilled or if energy production has effectively reduced the potential of greenhouse gas emissions. This includes regulations preventing destruction or inhibition of natural habitats which are worth protecting, in order to produce biomass. To ensure that these minimum standards will be honored, national, EU-wide or international certification systems – still to be created – will be applied.

d) Biofuels of the second generation show more advantages regarding environment protection and availability, because much more raw material can be used for their production, as for example straw, chip wood, etc. than in biofuels of the first generation. Tax deductiveness for biofuels of the second generation while honoring commitments to fulfill quotas up to 2015 is a strong incentive to invest in this area. To create more incentives and long-lasting perspectives after 2015, it is planned to evaluate biofuels on behalf of the reduction of greenhouse gas emissions. This means, that biofuels with an important balance in gas reduction will enjoy a more favourable weighting factor than other biofuels.

While evaluating these trends it becomes apparent that Germany and other EU nations will orient themselves to an even stronger protection of ecological resources and sustainability when applying renewable energy sources. Argentina and Brazil, but also other countries with great agricultural potential and considerable land reserves, will have to bear this in mind when planning to increase bioenergy production, particularly biofuels.

To ensure its own energy supply and the protection of natural resources, it would be desirable that Argentina turns stronger to other bioenergies and miscellaneous renewable energies. Taking into account that there is a structural energy supply shortfall, but also a serious waste disposal problem, production of biogas would be an interesting alternative. Greater biodiesel production facilities, and to a lesser extent bioethanol facilities, would be rather oriented to export production. Biogas could instead be produced from biomass of varied sources and deployed as processed natural gas or be transformed into heating, cooling, steam or electric energy. When solving environmental problems, particularly disposal of waste, land reclamation and sewage water restoration in Greater Buenos Aires, the question arises if these projects shouldn't be linked to energy recovery programs, which would provide revenues, needed to finance the expensive recycling processes. In this scenario there is also a big potential to employ biomass, which combined into intelligent projects could prove positive from an environmental or an energy point of view turning the whole affair into a profitable business. This applies for projects like the restoration of the heavily contaminated Riachuelo-Matanza drainage basin or for the organic waste produced by poultry slaughterhouses and meat packing plants, sugar factories, wine and citrus processing plants, etc. German know-how and German technology could certainly prove helpful in the planning and implementing of this kind of projects.

When thinking about diversification of energy supplies and measures to be taken to reduce greenhouse gas emissions, Argentina's overwhelming potential of wind and solar power generation should not be forgotten. In the south of Buenos Aires province and in Patagonia there are wide uninhabited areas with excellent wind conditions for wind energy production. These areas are not suitable for agronomic production, so no biomass can be produced here. Extensive sheep breeding is the main activity in Patagonia and it would be perfectly compatible with the installation and upgrading of wind farms. At least there will be no competition between food and bioenergy producing areas, as it will most probably happen in Central and Northern Argentina. Impairment of natural open spaces or nature tourism would be kept within narrow limits if greater wind farms are planned with foresight, taking into account that there are very wide areas to work on.

The intensified production of solar power can mainly occur in Northwestern Argentina. This area is one of the world regions with the highest solar radiation intensity. Unfortunately solar power is still –and this applies even for bigger thermal solar facilities – expensive in comparison. There would be additional costs for installation and connection with the power supply system, which may be considerable, if power plants are installed in remote areas like the „Altiplano“.

When stating a final assessment about employment of bioenergy and particularly biofuels, it should be highlighted as main conclusion that expansion of bioenergy production can be carried out consistently with concerns about environment and resource protection and also of regular food supplies. Nevertheless an integral approach is required in order to interlock all ecological, social and economic sustainability aspects on all levels. To stop deforestation in Northern Argentina, induced by pressure for arable lands, at present a natural forest protection law has recently been approved and at the same time a moratorium on deforestation during the transitional stage is tried to be implemented. Still, there is a lack for a coordinated long term land use regulation policy by the Federal Government, which would focus on protection and sustainable employment of natural resources. A definite national strategy and corresponding market conditions to foster renewable energies are also missing. The emphasis shouldn't be put on exporting first generation "biopetrol", but to employ biological remnants and waste material to be recycled as bioenergetic sources and also to exploit other sources of energy, as for example hydrogen, wind and solar power, if a melioration and diversification of the energy supply in the own country is being sought. It seems to be important to elaborate tailor-made solutions for a tangible production and business environment, which would at the same time be ecologically sound and profitable. To jump blindly on the biodiesel or bioethanol train, certainly would be wrong and short-sighted. In the case of bioethanol production, more sophisticated solutions are required. Brazil is at present without doubt the most competitive supplier of bioethanol and in this segment technologically far more advanced than Argentina. But Argentina could nevertheless develop profitable projects after pondering possible energetic applications, environment regulations to be met and commercialization and recovery of by-products.

In the conflict area between growing bioenergy, food and animal feed crops on one side and protection of natural resources on the other one, the clever employment of genetically modified crops could by all means be positive for the environment. For example, by developing genetically modified crops to be cultivated on degraded soils or to be used specifically as bioenergy sources. Just the yield increase through genetic melioration would contribute to reduce the pressure to get lands for agricultural purposes.

Ultimately, the instrument of „Clean Development Mechanism“ stated within the Kyoto protocol could also be applied as a reinforced version for bioenergy projects in Argentina. Permanent reduction of greenhouse gas emissions could be achieved through a glut of renewable energy projects. It is to be seen if and to which extent within the further definition of the Kyoto protocol it will be possible to honour economically the protection of natural forests and the regeneration of degraded forests – in their function of carbon storages – . At least the planned introduction in Germany of sustainability certification of biofuel production (albeit imported goods or national production) will contribute to reorientate on a certain way the need to provide protection of natural resources.

¹ Rise of world population from currently 6 billion people up to 9.2 billion by 2050; strong GDP growth in Asia and in Latin American emerging countries; increasing urbanization processes which will ultimately result in a greater demand of market suitable foods.

² ETBE = Ethyl Tert-Butyl Ether is a high-quality gasoline additive applied mainly to produce gasoline with high octane rating. According to the gasoline DIN EN 228 norm gasolines may contain up to 15 % vol. ETBE.