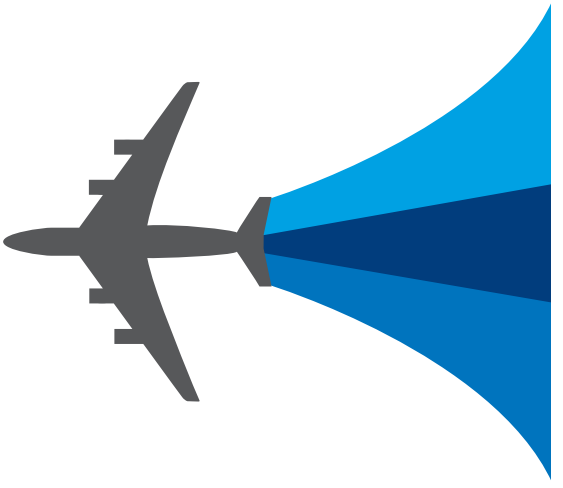

PART III

TECHNOLOGY DEVELOPMENT STRATEGY

12 INSTITUTIONAL ISSUES ON AVIATION BIOFUELS

Augusto Barbosa Cortez [et al.]. "Institutional issues on aviation biofuels", p.213-216. In: Luís Augusto Barbosa Cortez (Editor). **Roadmap for sustainable aviation biofuels for Brazil — A Flightpath to Aviation Biofuels in Brazil**, São Paulo: Editora Edgard Blücher, 2014. http://dx.doi.org/10.5151/BlucherOA-Roadmap-012

RECOMMENDED POLICIES

12 INSTITUTIONAL ISSUES ON AVIATION BIOFUELS

Similar to other innovative technologies, the development of aviation biofuels depends strongly on support mechanisms and proper public policies. As an immediate example, the adoption of ethanol and biodiesel in many countries required specific and active policies, in order to reduce uncertainties and risk perception among producers and promote investments, as well to protect consumers and environment.

The basic reasons behind these measures are the differential advantages and externalities of using a renewable energy, in comparison with the conventional fossil fuels. In fact, when produced and used sustainably, a biofuel is able to foster environmental benefits, jobs generation, economic activation and energy security, as main positive impacts. It is important to stress that these potential advantages of biofuels are intrinsically dependent on the production route adopted, including the feedstock productive system and the agro-industrial conversion process, which should be properly assessed by sustainability indicators. In fact, every production route should be carefully evaluated in order to determine its relative sustainability and allow justifying or not its promotion and support. In this direction several certification schemes have been put forward, involving themes such as land and water use, impact in food availability and biodiversity, among other aspects. This subject is clearly relevant and is the central theme of a workshop in the *Sustainable Aviation Biofuels for Brazil Project*.

Two basic governmental measures to support the development of sustainable biofuels are the promotion of R&D activities and the definition of a fuel specification. Regarding the first one, in the agriculture, forestry, processing and refining contexts, there are many gaps to fill, open questions to explore and processes to improve. Some feedstock proposed for aviation biofuel production, such as jatropha and algae are relatively unstudied, requiring more assessment. Several refining processes are still in bench or even in conceptual level. Venture capital can play a complementary role in R&D, but which may be especially relevant in the cases where a relatively small public research infrastructure is available and there is private interest and funds for R&D. However, clearly it is a government responsibility to organize the scientific and technological development, stimulating basic studies, promoting demonstration projects and, as an essential matter, preparing and motivating researchers. Just with proper resources, in a broad sense, is possible to screen the large number of options for aviation biofuels production systems and choose wisely the most promising ones. That R&D effort should be permanent; in order to optimize the biofuel chain. In the next topic of this chapter a preliminary agenda for R&D aiming to develop sustainable aviation biofuels is presented.

After recognizing that there are a group of few production routes that effectively deserve support, the government action towards to assist and promote biofuels development can be done essentially in two complementary ways. The first group of measures is developed in the regulatory sphere, where a clear biofuel specification must be defined and, if convenient, a mandatory blending program can be implemented, possibly following an initial demonstration and voluntary programs. The second group comprises the economic incentives that can be adopted to promote the production and use of a biofuel.

a. Biofuel selection specification

The biofuel selection must attend simultaneously the environment, engine and producer's requirements, which are in conflict in many cases, and impose a judicious analysis before the final decision. In the case of aviation biofuel, as observed, the globalization of demand and stringent conditions of use and safety standards imposes the "drop-in" concept. A widely accepted procedure for biofuel approval process is already available (ASTM D4054, *Standard Practice for Qualification and Approval of New Aviation Turbine Fuels and Fuel Additives*); feedstock plus conversion process, according to a specific standard (ASTM D7566, *Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbon*) and its annexes. In 2014 was approved by ASTM the use of SIP (Synthesized Iso-Paraffins produced from Hydroprocessed Fermented Sugars) as aviation fuel in blends up to 50%.

The ASTM standards for fuels have been endorsed by ANP, the regulatory agency with legal mandate for setting fuel specifications in Brazil. In the case of jet fuel, ANP Order 37/2009 (Jet Fuel Specification) endorses the D7566 (Specification for Aviation Turbine Fuels). In 2012 ANP initiated the discussion to amend this order allowing the use of aviation biofuels accordingly the ASTM Standards. As a recent relevant action in this context and a decisive step towards the introduction of biofuels in the commercial aviation, in June 2013 the ANP launched the Brazilian Specification and rules for distribution and use of Aviation Biofuels (Resolução ANP Nr. 20/2013), issued after a regular process of consults and discussion with stakeholders of aviation industry, biofuel producers and governmental agencies. In the preamble of this order, it is mentioned the Law Nr. 12.490/2011, which sets aviation biokerosene as a "substance derived from renewable biomass that can be used in turbojets and turboprops aircraft or, as regulated in another type of application that can replace partially or totally the fuel of fossil origin". Thus, the quality aspect of aviation biofuel is enough well defined and put forward. Some improvements are needed in the regulations to make explicit the role of jet biofuel producers in the country, anticipating and promoting the expected aviation biofuel industry.

b. Mandatory blending

Creating an assured demand, a mandatory blending of a biofuel in a conventional fuel is certainly a powerful measure to promote its adoption and production. This approach was used to introduce biofuels in Brazilian market, applied to ethanol in 1931 and to biodiesel in 2003. However, the particular conditions of aviation demand, with an international and domestic fleet dividing the same infrastructure and the fuel consumption distributed over all national territory, create difficulties that should be previously considered, deeply discussed and solved before any action towards the compulsory use of biofuels.

Learning from the lessons of succeeded experiences of implementing biofuel introduction as vehicular fuel in some countries, its worth to plan carefully before any action and consider a phased and progressive introduction, initiated with a period of voluntary blends. Unexpected and diversified problems in biofuel production and distribution can occur, requiring adjusts, improving and orientating the next steps. Another crucial aspect to take into account is the respect to the stakeholder's perception, which requires promoting a permanent and fluid exchange of information and dialog with all agents interested in the process. Even when adopting a mandatory blending, determined by legal procedures, the introduction of a biofuel should be the result of convergence, not force.

Besides those considerations, and because jet biofuels probably will use the same or similar feedstocks as the biofuels already utilized for road transportation in Brazil, it is fundamental to establish a program for integrated use of biofuels in all transportation modes in the country.

c. Incentives and financing

As initially stated, the government commitment, expressed not only in proper regulation, but also in economic incentives and related supporting mechanisms, is essential to biofuel development in sound bases. Different economic supporting schemes have been implemented in order to make feasible and attractive the biofuel production and use, which can be classified as:

1. basic and applied research direct funding, covering scholarships, equipment and operational costs financing, support for technical missions and events, and other similar;
2. financing of bench studies and scale-up of production units, up to demonstration plants level;
3. financing of implementation of economic scale production plants, involving feedstock supply systems, processing units, logistics, etc;
4. financing or other economic mechanism to promote biofuel use, reducing the initial cost associated to its introduction, as quality control systems, storage tanks, etc;
5. differential and balanced tax regime, specific to capital expenditures and other items related to biofuel production.

Of course that, in this situation, risks and uncertainties increase with the investment level, imposing careful analysis to avoid undesirable losses and financial difficulties. Good and detailed planning are crucial elements in this context.

Finally, it is important to mention that, in any country, the development of a sustainable aviation biofuels market only can be done based on a clear national strategy towards its introduction, recognizing its relevance for the society and the environment. This strategy should be implemented by an action plan, joining and coordinating the government bodies and stakeholders, with well-defined targets and advance indicators. As an excellent example of integrated and coordinated effort towards to develop aviation biofuels, the US program is briefly commented in **Box 4**.

Box 4: The American Aviation Biofuels Program: an example to Brazil?

Aviation biofuels are explicitly present in the agenda of several American institutions, mainly at Federal level, and a well-organized set of programs and activities was put forward and currently are in development in several fronts. Even considering the possibility that Federal budget constraints may impact negatively this objective, the studies and assessments already done have established relevant references and basic objectives were defined, with the involvement of public and private stakeholders, motivating potential producers and users. The guiding questions are related to resource assessment, techno-economic analysis and sustainability evaluation.

The fundamental drives to introduce aviation biofuels in the United States market are:

1. to develop a renewable sustainable alternative to a fossil fuel strategically relevant, largely imported, presenting worrying price volatility and the most important component of operational cost for airlines, and,
2. the global concern with GHG emissions, as recognized by international organisms such as ICAO and IATA, and reason for additional taxes for airlines, in the framework of carbon emission taxation such as the European Tax S, in discussion for implementation.

The interest in energy security is clear in this context, at least from the perspective of Navy, as can be noted in its call for proposals (Advanced Drop-In Biofuels Production Project, Navy Funding Opportunity Announcement 12-15-PKM), which presents as the first requirement for such biofuel to "be produced domestically". The environmental concerns are always mentioned and associated to the compliance with the Energy Independence and Security Act (EISA) Section 526, which states that biofuels should observe the Renewable Fuel Standard, issued by the Environment Protection Agency in 2011, restricting the use of biofuels on the basis of their life-cycle GHG emissions.

A convincing signal of the American governmental involvement and compromise towards aviation biofuels is the Defense Production Act Funding. By this instrument, the Department of Agriculture, Department of Navy, and the Department of Energy have committed to fund $510 million to assist the development and commercialization of a sustainable industry for aviation and marine biofuels, and to foster mutual cooperation among the federal agencies and across the public and private sectors.

From the American experience it was possible to learn that it is highly desirable to have good institutional coordination, with clear responsibilities for the agencies and personnel involved (USDA: feedstock production; DOE: technologies development, FAA: conditions for using, etc.). It is decisive as well to have a foreseeable program for future acquisition and blending, in order to reduce risk perception and create effective pushers for potential aviation biofuel producers.