INTRODUCTION

Biofuel boom is worldwide known phenomenon and at the same time a main issue of environmental and energy policies at international level which take part of superpower agendas. Nevertheless, putting together a formal program in order to turn those initiatives into national targets, demand continuing efforts in resources, time, coordination and mainly on overcoming established paradigms linked to a way of thinking that doesn’t allow to foresee new opportunities.

The main purpose of this paper is to explain in a general manner, Colombia’s experience on the biofuel implementation program throughout a series of processes based on principles that we will explained below and the achievements and proposed goals within our national biofuel project vision.

I. PARADIGMS

Human being is bringing up within a structure way of thinking, called paradigm. Those paradigms sometimes lead to preconceptions that prevent to see other opportunities. Furthermore, they could create obstacles. For example, the Alcohol fuel Bill, went trough a lot of trouble at the Congress, starting from attempts to include the using of oxygenates of fossil origin, on the basis of private economic freedom, until unfounded technical arguments that feed fears and doubts. All of this on the purpose to discourage its using. Even now, there are oppositors resisting this new option and calling it a meaningless utopia. Nevertheless, there are some serious arguments and issues that still are not analyzed enough such as environment gains measuring (life fuel cycle and energetic balance of biofuels) food security, increasing demand of input production, impact on social relations, prizing evolution, trend to great scale projects, biodiversity impact, increasing on water demand.

In the case of biodiesel we have an important item. We had to overcome many obstacles but it in the end it was easier putting together.

Once this first obstacles were overcome and after a long consensus process, alcohol and biodiesel programs were backed up by the Government, and other agents. Then, it was conformed a working team, including investors, Government, Academy, Non Governmental Organizations all aiming to handle implementation programs.

II. COLOMBIAN ENVIRONMENT

Production and massification of biofuels in Colombia is a national policy linked with responsible decisions based on conscious studies and framed on sustainable development philosophy.

It has several aims, the main of them are securing national energetic supply, reducing dependency on fossil combustibles, trying to achieve social environment and economic benefits by means of generating permanent jobs, investing on agriculture sector and
enhancing regional economies and agribusiness, improving air quality and working on substitution of illegal growings.

Finally, the target will be to generate a truly social revolution regarding employment as well as delivering a better quality of life.

Due to the relevance of the subject it appeared possible to generate a substantial stimulus for the agriculture sector, in the first place for sugar cane farming, taking into account its high efficiency level that yields 8.7 times the amount of energy produced for each unit of energy used. Its production reaches at 9.000 liters of alcohol per hectare. Furthermore, cassava, sugar beet, sweet cane, sorghum, yam, etc. are being considered in some regions with favourable conditions to these products.

The use of alcohol mixed with gasoline is being encouraged, as oxygenate of biological origin. Since 2001 when Law 693 was set up, the use of alcohol fuel was regulated, and in addition, some stimulus were established for production, commercialization and consuming.

So far, the alcohol fuel program has being evolving satisfactorily in the regions where it was established and the accumulated experience has been very useful in order to improve the efficiency and sustainability.

At present, Colombia consumes 89.000 b/d of diesel and there is enough room to switch to biodiesel. The country has big advantages to producing this sort of products and to increase the substitution rate.

Within the biodiesel program it has been set up a palm agribusiness development. In order to enhance the mixing of biodiesel and diesel of fossil origin, Colombian Congress promulgated the Law 139 “To stimulate production and commercialization of biofuel of vegetal and animal origin for using on diesel engines”. Furthermore, the Ministry of Mines and Energy considered sending specific messages aimed to promote the development of the market, trough some Decrees establishing prizing structure for diesel of fossil origin, which is going to mix with biofuel for using on diesel engines.

Regarding the conservation of natural resources of the country, there is enough room to widen the area dedicated to biofuel, because we could switch more than 3 million hectares without affecting the feeding needs and natural woods of the country. The aim is to dedicate 2 million hectares to crops for biodiesel production.

At present, the Biodiesel Program has yielded some results, such as logistic regulation of alcohol fuel, laboratories tests of alcohol produced, etc. Furthermore, the Government decreed a package of tax stimulus for alcohol projects.

Both alcohol fuel and biodiesel program face big challenges such as to increase the supply to meet the demand of the country, to push vehicles updating and to impulse competitiveness at international markets.

But there are still deep concerns about ecological consequences following destroying of tropical forest and affecting environmental balance. We have to remember that tropical forest is an invaluable resource which has to be preserved.
These policies have been compiled in CONPES 203510, a document of Colombia’s Planning Department which main aims are to expand biomass crops and to diversify the energetic basket within a efficient and sustainable production in the economic, social and environmental fields. Additionally to enhance the possibility to compete in foreign markets.

III. SOME CONSIDERATIONS ABOUT DEVELOPMENT OF BIOFUEL PROGRAM

The next considerations were taken into account for the Colombian Biofuel Program:

- Energy auto-sufficiency; on this subject Colombia has huge coal reserves, most of them unexploited
- Oil reserves had been declining but due the raising exploration activity this trend has been reversed and began to grow slightly at present; It is expected this will continue steadily
- There is big possibilities on removable energy, including biofuel which are been exploring
- Additionally the country has some other valuable advantages, such as geographic location, an updated regulatory framework, engineering capabilities, capital sources, land availability, etc.

IV. MEASURES TO IMPULSE THE BIOFUEL PROGRAM

This program began with Law 693 September 19 2001 which stated a regulatory framework; some of the main measures are:

- Gasoline used on cities of 500.000 inhabitants or more should have oxygenated compounds such as alcohol fuel from September 2006 at least
- A timetable for Ministry of Minas and Energy and Ministry for Environment was set to the technical and environmental regulations
- Private investment could take part in production, value chain of alcohol fuel; regional state monopolies for alcohol production were abolished

The Colombian Congress approved 788/2002 and 939/2004 Laws which established value added tax (VAT) exemption for alcohol fuel used to mixing with gasoline. Two other regional overpricing charges were abolished (global tax and overcharge). Biofuel used for mixing with diesel in engines produced nationally were exempted from sale tax and global tax as well.

There are some other fiscal stimulus for long term crops, palm oil included. This stimulus will last for ten years since the first harvest began.

Furthermore, the Government created Free Trade Zone for agribusiness projects aimed to biodiesel which lower Income Tax from 37.5% to 15%; import tax has been deductible of capital goods all of this for projects which invest more than US$18 million or produce 500 employs.

Finally up to 40% of the investment could be used as tributary credit for the next years.
V. RISKS OF THE BIOFUEL PROGRAM

In the process of setting up the program, there were noticed several risks and consequently it was outlined alternatives for these eventual problems. The issues are:

- Quality control
- Rules about wrongdoings
- Information inside fuel chain
- Environment managing

1. QUALITY CONTROL

A lack of quality control can put the whole program at risk and create a loss of credibility along with negative environment and economic impacts and the delivery of product out of specifications.

To prevent this to happen it has been implementing a Quality Control System which covers the whole chain beginning from wholesale plant until the gasoline station. In doing so, the product quality can be traced. A Quality Certification issued by an independent institution is compulsory. When the product is distributed it is mandatory to be sealed to prevent its diversion and keep it secure.

Stocking facilities and gasoline stations need to be certificated as well. At present there are 3700 service station all certified.

Quality standards of biofuel has been set, so samples will be tested periodically. There has been established terms to install private laboratories to test the product.

2. RULES FOR INFRINGEMENT CONTROL

A lack of regulations leads to a lack of confidence and can put the whole program at risk. Furthermore an unclear regulatory framework could provoke informality and in addition illicit markets. On the other hand, the expected benefits for social, economic and environmental fields could be loosed.

There are a list of alternatives to face eventualities:

- Audit schemes to all the links of the biofuel value chain. Quality audits could detect the presence of smuggled fuel in the chain.
- Implementation of the Integrated Information System (SICOM) within producers and the other member of combustible chain. The chain allows to take on responsibility for every process of the chain, so any irregularity can be punished. A trustfully centralized information system is basic to exert autocontrol by the members of production chain and the Government own control.
- Research on computability of markers and additives on biofuel
- Transportation mechanisms, seals, GPS and a Central of Information to another users
- Control of movements and transactions
3. INFORMATION MECHANISMS STRATEGIES

Taking advantage of the value chain, it will launch some schemes to divulgate the whole programs.

The main targets are:

- To enhance trustfulness and knowledge within users of biofuels
- To send specific information to gasoline stations, advisors and workers of mechanic workshops, trades, taxi drivers Control Institutions, and the whole citizenship
- To consolidate a comprehensive and trustful information about biofuel subjects and its applications

4. WARRANTY OF RAW MATERIAL AND BIOFUEL SUPPLY

A dependable source of raw materials is crucial for the smooth-running and credibility of the biofuel program.

The Government has developed a strategic to support biofuel projects, as it was stated above, and in any case, imports can replace local supply.

5. ENVIRONMENTAL REGARDS

As it was said above, there are great expectations about biofuel programs but at the same time huge doubts about potential environmental damages. Government policy on this respect is no only the pursue of economic profits, but to guarantee the preservation of environment as the Constitution states. Taking into account the fragility of local ecosystems, this strategic is an uphill task.

In the case of alcohol it appeared the problem of the waste product or molasses. This demanded a series of studies to reach the conclusion that alcohol producers should use a state of the art technology to cope to the problem.

In the case of biodiesel there is no much negative effects on environment, but there has been a lot of arguments and opposition about the use of land for this purpose aside from slashing of forest for this activity.

6. SECURING SUPPLY AND DISTRIBUTION

The main risk to minimize is the guaranteed supply of biofuel. However, this supply is determined by the raw material offer which is affected by crops, markets, transportation, geographic conditions. These conditions are different for each sort of biofuel.

For these reasons biofuel production involves a responsibility to prevent any disruption within the value chain. At the moment alcohol fuel production is concentrated on sugar cane refineries of Valle del Cauca and ‘coffee grower axis’. In addition operates three biodiesel plants at coastal Atlantic region and one in Bogota nearby.
On the other hand, the value chain of liquid fuels conformed by wholesale distributors and retailers have the responsibility for the maintenance of their facilities the secure handling and the clients capacitation.

The integration of the value chain with the National Government has been adequate allowing the above mentioned targets.

**VI. CHALLENGES**

The planned strategic permit to set some targets. The terms for these targets depend on local and foreign conditions.

1. **ALCOHOL FUEL**
   - To reach the whole country with the mixture gasoline 90%- alcohol 10%
   - To maintain and increase the alcohol fuel supply in spite of international prizing of raw materials
   - To brake ground of new projects which involve new employment and rural development
   - To increase the mixture percentage (20% from 5 to 10 years time)
   - To update local vehicles
   - Openness to new markets. To work on Free Trade Treaties

2. **BIOFUEL**
   - To fulfill the date set to introduce the 5% mixture on the whole country
   - To carry out further studies about mixtures on different percentages
   - Trustfulness on supply –fuel sector demands 24 hour a day and 365 days a year
   - Dependability on raw materials to reach 10% of the mixture
   - To consolidate the regulatory framework
   - To set the biodiesel transport fares in non-regulated areas
   - To get the biodiesel program sustainable on low-prices scenarios of fuels and raw materials as happens at present.
   - To enhance the product-image within its users.
   - To go forward beyond set percentage targets on B-100 vehicles, freedom of mixture vs product prizing, and enhancing the fuel value chain.
   - To consolidate the biofuel quality seal
   - To access to foreign markets

**CONCLUSIONS**

So far the program has delivered some relevant experiences, beginning from the overcoming of the “we can not do it” paradigm and a widespread skepticism which gave way to the acceptation of the program. As the logistics and operativeness broke ground, the level of acceptance grew within all sectors (Government, producers and consumers). Nevertheless the program faces new challenges related with its sustainability and the pursue of the proposed targets.