Sustainable Energy and Biofuel Strategies for Colombia

BIOFUELS MARKET STUDY
Outline of Biofuel Market Study

STEP 1: Diagnosis national situation
Overview the situation of the biofuels in Colombia,
Analyze the short, medium and long-term national targets

STEP 2: Diagnosis international situation
Review the international market of ethanol and biodiesel trends
Finding the driving forces and risk factors

STEP 3: SWOT analysis
SWOT analysis for positioning Colombia

STEP 4: Scenario
Set strategic scenarios

STEP 5: International trends of biofuels
Quality
Cost competitiveness
Sustainability
Guarantee of supply

Main targets markets
Main competitors

STEP 6: Strategy
1: INCREASE THE DOMESTIC MARKET
2: PROMOTING THE EARLY EXPORT AND GRADUALLY EXPAND THE VOLUME
3: PROMOTE THE DEVELOPMENT OF NEW PRODUCTS
4: SUPPORT PROGRAMS FOR CONQUERING NEW MARKETS

Toolkit for the export of biofuels
INTERNATIONAL TRENDS ON BIOFUELS PRODUCTION

**International demand**
- The international demand for biofuels will continue increasing over the next years due to a series of policy decisions that are being made in the main markets creating an opportunity for biofuels producers around the world, including Colombia.

**Main markets & supplier**
- The main biofuels markets over the next decade will be the US, EU, Canada and Japan for ethanol and the EU and Canada for biodiesel. Brazil will maintain its status as main supplier of ethanol while Argentina and Malaysia will continue as the main biodiesel exporters.

**Opportunity**
- However, recent EPA studies on sustainability are threatening the position of Malaysia and Indonesia as the studies conclude that biofuels from palm oil do not meet the minimum 20% GHG performance threshold to qualify as renewable fuel under the RFS program. This situation could also represent a threat for Colombian palm biofuels, but it can turn into a market opportunity if the country is able to demonstrate that its palm oil based biofuels meets or exceeds RFS2 sustainability requirements.
Characteristics of Biofuel - global context-

**Benefits**

Create an opportunity for the use of natural resources
- GHG reduction
- Attract foreign and domestic investments
- Increase energy security
- Promote economic development
- Job creation and poverty alleviation, especially in rural areas.

**Negative Impacts**

Biofuel production may also have significant implications
- Food security
- Biodiversity
- Social impact

**Markets are largely policy driven**

Biofuels policy are part of agriculture, rural development, energy security, reducing GHG emissions policy.

**Sustainability criteria**

Both social, & environmental aspects
Net trade of Bioethanol

The trade balance analysis for the next ten years indicates that it will be an increasing demand of ethanol in the U.S, the European Union (EU), Canada, and Japan.

The main suppliers for these markets will continue to be Brazil.
The UE and Canada will exhibit an increasing demand that will be covered mainly by Argentina and Malaysia.

Argentina will position itself as the main exporter, almost doubling its production.

Malaysia exports are expected to slightly increase, while the US will produce mainly for its internal market.
Demmand Drivers

**US.** The adoption of the 2007 Energy Independence and Security Act (EISA), which increases the volume of renewable fuel required to be blended into gasoline from 9 billion gallons in 2008 to 36 billion gallons by 2022.

**Europe.** The implementation of the Directives 2003/30/EC and 2009/28/EC, which adopted an EU-wide binding target of 10% from renewable sources in the transport sector by 2020.

**Japan.** The commitment of the Petroleum Association of Japan to consume 840 million liters per year of ETBE-blended gasoline, and a new government regulation aimed to increase the use of biofuels by oil and gas companies with a target of 500 million liters (oil equivalent = about 824,000 million liters of bioethanol) in 2017.

**Canada.** The Renewable Fuels Regulations (RFS), which requires 5% of renewable fuel content in gasoline, and 2% of renewable fuel content in diesel fuel.
BIOFUELS PRODUCTION IN COLOMBIA

• Colombia is one of the largest producers of biofuels in Central and South America with a current installed production capacity of 1.27 million liters per day (103.6 MGal/year) of ethanol and 506,000 ton/year (153.7 MGal/year) of biodiesel. All the current biofuels production is consumed in the internal market.

• Regarding ethanol, there is a project under construction of 39 MGal/year and three projects (not under construction) of 73 MGal/year (total).

• The biofuel industry plays an important role in the national economy: it is estimated that biofuels generate 24,000 direct and 48,000 indirect jobs. Not including coffee, each of these industries contributes to approximately 4% of the GDP in the agricultural sector.

• Colombia has initiated a strong action plan to become a biofuels producer, initially for internal consumption but bearing in mind the growing demand in the international market. Since 2001 the government--with support of key stakeholders--has developed a strong regulatory framework to promote the production of biofuels, mainly ethanol from sugar cane and biodiesel from palm oil.
## SWOT Matrix

<table>
<thead>
<tr>
<th>strengths</th>
<th>weaknesses</th>
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<tbody>
<tr>
<td>• Regulations and incentives</td>
<td>• Infrastructure for transportation</td>
</tr>
<tr>
<td>• Studies on sustainability</td>
<td>• Long Distance between production centers and ports</td>
</tr>
<tr>
<td>• Experience and know-how</td>
<td>• Cost competitiveness</td>
</tr>
<tr>
<td>• Land availability</td>
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<table>
<thead>
<tr>
<th>opportunities</th>
<th>threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expanding markets under policy target</td>
<td>• Adapting the sustainability criteria</td>
</tr>
<tr>
<td>Bioethanol: US, EU, Canada, Japan etc., Biodiesel: EU, Canada, etc.</td>
<td>• Compete with advanced biofuels</td>
</tr>
<tr>
<td>• Uncertainty of fossil fuel and agro-feedstock prices</td>
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Three scenarios were proposed during the study: 1) export driven, 2) hybrid: domestic & export, 3) domestic driven. The differences are on the portfolio development and timeline.

**Scenario 1** seeks to position Colombia as a lead exporter of biofuels. It implies a strong government support, leadership and the creation of strategic partnerships.

**Scenario 3** Colombia places more emphasis on promoting rural development and creation of new jobs. The country promotes the expansion of domestic consumption and exports only the surplus.

**Scenario 2** is the intermediate situation: the country expands the domestic consumption by enforcing E15 and B20 mandates and gradually increases the volume of exports. The balance between domestic use and international exports is determined by the market situation (internal and external).
Scenario 1 “Export Driven”, Scenario 2 “hybrid domestic & export” and Scenario 3 “Domestic driven”.

Volume of production

**Scenario 1**
- Seeks to position Colombia as **a lead exporter of biofuels**;
- Implies a strong government support, leadership and the creation of strategic partnerships.
- Key issue is the **enhancement of cost competitiveness in the international markets**.

**Scenario 2**
- Intermediate situation: the country expands the domestic consumption by enforcing E15 and B20 mandates, and gradually increase the volume of exports.
- **Balance between domestic use and international exports** is determined by the market situation (internal and external); the industry cost competitiveness and production potential; and, price trends.
- Key aspect is to **reduce the risk of international biofuel markets**.

**Scenario 3**
- Decides to use the biofuels industry manly for creation of new jobs and place **more emphasis on promote rural development** rather than industry development.
- Promotes the expansion of domestic consumption and **exports only the surplus**.
Scenario 2 is the most promising for Colombia.

- Colombia already introduced mandatory biofuels blends that are among the highest in the world (E8-E10, B10).
- E15, and FFV can create the additional demand for biofuels; however, in the long-term, the internal market will become saturated.
- The international market is growing due to the policies to promote the use of biofuels in EU, US, Canada, and Japan. To take advantage of the growing market is the best choice for Colombia.
- A gradual approach will allow existing biofuel producers consolidate the sector and master new technologies and products while reducing the risks of front runners. However, there is the need to analyze the financial and technological risks of implementing new technologies.

Vision:
“Balance between fosterage an internationally competitive industry and the creation of new jobs, through the promotion of biofuel industries mainly in undeveloped rural areas.”

Strategy:
- Increase the domestic consumption
- Promote the early export of biofuels and gradually expand the exported volumes
- Promote the development of new products
- Support programs to conquer new markets
STRATEGIES FOR DEVELOPMENT OF THE HYBRID DOMESTIC & EXPORT SCENARIO

For a successful development of Scenario 2, Colombia will need to adopt a series of strategies and actions aimed to remove existing barriers, enhance the industry strengths and create conditions to access new markets.

The main proposed strategies are:

• Expand the domestic consumption of biofuels by gradually enforcing E15, E20, E85 as well as B20 based on the results of local and international studies on fleet performance.
• Promote the early export of biofuels and gradually expand the exported volumes
• Promote the development of new products
• Support programs to conquer new markets
# Product-market matrix

<table>
<thead>
<tr>
<th>New market</th>
<th>Conventional biofuel product</th>
<th>New product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation fuel</td>
<td>FFV</td>
<td>Biobutanol</td>
</tr>
<tr>
<td>International market</td>
<td>Increase the blending content</td>
<td>Pyrolysis, BTL</td>
</tr>
</tbody>
</table>

- Biochemicals
- Biorefinery
- Cellulosic ethanol
- Bio Hydrofined Diesel
- Algae based biofuel

FFV: Flexible-fuel vehicle, BTL: Biomass to liquid
STRATEGY 1
INCREASE THE DOMESTIC CONSUMPTION WITH E15 AND B20 AS MAIN TARGETS

• The recommended strategy for Colombia is to expand the domestic consumption of biofuels by enforcing E15, E20, E85; B20 gradually and based on the results of local and international studies on fleet performance.

• The main barrier to this strategy will be the strong opposition of the international major car manufactures for mixtures higher than E10 and B7, who could put pressure to soften the targets.
STRATEGY 2
PROMOTING THE EARLY EXPORT AND GRADUALLY EXPAND THE VOLUME

• Currently, Colombia has no surplus of ethanol and biodiesel for exports. However, the scenario may change for the ethanol industry with the issuance of Decree 4892 that only allows blends higher than E10 after 2013 through a process that requires consultations with different stakeholders.
• This would be a complex scenario as the existing plants were built basically to satisfy the internal market.
• A second alternative for Colombia to become an exporter of ethanol and biodiesel is to build new plants designed for the export of biofuels—with domestic consumption as secondary market. The target markets will be those with a negative net trade over the next decade:
  Ethanol: US, EU, Canada and Japan
  Biodiesel: EU and Canada
• This option requires a new business model as the industry will need to address the following key factors demanded by the International market: “Quality”, “Cost competitiveness”, “Sustainability”, and “Guarantee of supply”.

Current Business model

Target: “Internal market”

Next-step Business model

Target: “Internal market & international market”

Guarantee of supply

Cost competitiveness
Feed stock production
Fuel production

Sustainability
Building good image for international market

Innovation system

Quality
Quality

• **Quality standards is an important criteria for the competiveness of biofuels in the international market.**

• There are several standards, but the most widely used are ASTM, EN JIS and CA/CGSB. ASTM is used in the US, EN in the EU, JIS in Japan and CA/CGSB in Canada.

• The Colombian standards are issued by ICONTEC as Colombian Technical Norms (NTC ).

• The most likely feedstocks—when considering new biodiesel plants for exports in Colombia—are sugarcane for ethanol and palm oil for biodiesel. Under this scenario, the **ethanol will not have critical quality issues** for export. In contrast, the potential exporters of palm based biodiesel will **need to address the cold flow properties at low temperature and haze formation problems**.
COST COMPETIVENESS

• With the existing infrastructure and the current business model used for the production of biodiesel and ethanol, Colombia is not cost competitive in the international market with its most immediate competitors (e.g.: Brazil in ethanol, and Argentina and Malaysia in biodiesel).

• The most critical disadvantages are the production costs of feedstock and the internal logistics costs.

• Colombia has an advantage in transportation costs from port to port due to its strategic location.

• In order to reduce the gap and promote an export oriented ethanol production, efforts will be needed in changing the business model and building adequate infrastructure.
How to enhance the cost competitiveness

**OPTION 1**

- Cost reduction
- Cost reduction of feedstock cost
- Cost of Land rent
- Cost of Labor

**OPTION 2**

- Value add
- Income of co-products
  - Green electricity by surplus bagasse
  - R&D phase > Pilot phase
    - Biobutanol
    - Pyrolysis, BTL
    - Cellulosic ethanol
    - Bio Hydrofined Diesel
    - Algae based biofuel
    - Biochemicals
    - Biorefinery

New Area for development
Ethanol Production Costs in Colombia and Brazil

- In the international market for ethanol Brazil is the strongest competitor due to its cost competitiveness and potential of supply. On the demand side, the main market is the US, particularly California because of its distance from the main production areas.
- The break-down costs of Colombia and Brazil indicates that in order to be competitive in the international ethanol market the plants that intend to export will need to make efforts in cost reduction in the sugar cane production and conversion (production of ethanol). Additionally it will be necessary to reduce costs in inland transportation and exports.

Source: Author’s elaboration

Source: FAOSTAT
Biodiesel Production Costs in Colombia, Argentina and Malaysia

Argentina and Malaysia will be Colombia’s main competitors in the international biodiesel market. The EU will be the market with most potential for Colombian exports due to its strong policy on renewable. We estimated costs of the biodiesel considering the port of Rotterdam as final destination. **Colombia -under the existing business model- is not cost competitive in the EU market vs. Argentina, Malaysia, or the EU domestic producers.**

The cost gap for Colombia in the EU market is large due to the high production costs; therefore, when considering exports, long-term cost reduction efforts and improvements in yields are necessary.

One strategy is to create profits from co-products (e.g. empty fruit bunches - EFB). Currently, many projects use EFB to generate electricity in Indonesia, Malaysia, and Thailand. The production of cellulosic biofuel from EFB is also being implemented.

Source: Author’s elaboration

<table>
<thead>
<tr>
<th></th>
<th>Argentina</th>
<th>Colombia</th>
<th>Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax and Tariff</td>
<td>0.02</td>
<td>0.04</td>
<td>0.03</td>
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<tr>
<td>Transport Cost (to EU)</td>
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<td>0.10</td>
</tr>
<tr>
<td>Export Tax</td>
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<td>0.06</td>
</tr>
<tr>
<td>Port Cost, Other</td>
<td>0.03</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Logistic Cost</td>
<td>0.04</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>Conversion Cost</td>
<td>0.04</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>Feed Stock Production Cost</td>
<td>0.06</td>
<td>0.10</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Reference: EU price

EU price ex-works (January 2012)

EU price ex-works (January 2010)
Price Trends

- In the international market the price of biofuels is defined by the international supply/demand and involve many factors, such as the index price of major domestic producers (i.e. Germany for biodiesel), and major exporters (i.e. Brazil for ethanol).
- These index prices in turn are influenced by feed stock cost and crude oil prices.

Source: OECD-FAO, Agricultural Outlook 2010-2019

Ethanol price: Brazil, Sao Paulo (ex-distillery).
Biodiesel price: Producer price Germany net of biodiesel tariff.
Price Trends

- In Colombia the price of biofuels is defined by the MME as the production is intended mainly for the internal market.
- When considering exports, the producer will need to compete with the international prices, which are lower than the current domestic reference price.
SUSTAINABILITY

• **The fulfillment of the sustainability criteria will be a key factor** for potential exporters of biofuels.

• The criteria depend on each particular country, but in general the criteria cover aspects such as: respect to natural resources (e.g.: land and water); protection of human and labor rights; contribution to climate change mitigation by reducing GHG (measured using LCA); contribution to social and economic development; and, respect for food security.

• In Colombia biofuel producers and the government are aware of the relevance of the sustainability criteria to access international markets and have been taking a proactive approach on this subject.

• The general target in this aspect should be **to continue cultivating a positive reputation in the international community**, particularly in the target markets: Ethanol: US, EU, Canada and Japan Biodiesel: EU and Canada
There are two important initiatives in the US: the Renewable Fuels Standard (RFS2) and the CARB standard.

The RFS2 has the following implications on sustainability:

- Impose restrictions on the level of GHG emissions of the biofuels to be used in the US: conventional biofuels must reduce GHG by 20% when compared to gasoline; advanced biomass based diesel and non-cellulosic advanced biofuels by 50%; and, cellulosic biofuels by 60%.

- Companies interested in exporting to the U.S must obtain a registration with the U.S. Environmental Protection Agency (USEPA).

The state of California enforced the Low Carbon Fuel Standard (CARB: California Air Resources Board) in year 2010.

- Its main purpose is to reduce the GHG emission by reducing the full fuel cycle, carbon intensity of the transportation pool by 10% by 2020.

- The CARB standard is a requirement for refineries and other fuel providers before they can sell their products in California. Similar to the Federal Program, CARB also requires registration for biofuel producers.

They are defined as those that generate a clear and net GHG saving of 35% and have no negative impact on biodiversity and land use. This 35% threshold will be increased to 50% in 2017 for existing plants and 60% for new production facilities. GHG savings shall be demonstrated though a life cycle analysis by direct calculation (using methodologies from the Directive), indirect calculations (using default values); or a combination of both. Default values are provided for different types of biofuels and can be adapted to technical and scientific progress.

Regarding land use the Directive impose restrictions on lands with high carbon stock (wetlands, continuously forested areas, peatlands) and lands with high biodiversity value (primary forest, biodiverse grassland, nature protection areas).
The Japanese government – through METI and the Agency for Natural Resources and Energy (ANRE) – has introduced a proposal on sustainability criteria for biofuels.

Contribution to CO2 emission reductions identified by a LCA

- Setting the default value of LCA data (e.g. Brazilian sugarcane)
- Set the reduction standards on an LCA basis at 50%. (similar to EU and UK)
- Address the issue of competition with food.
International organization

- Global Bioenergy Partnership (GBEP)

Voluntary activities

- Roundtable on Sustainable Biofuels (RSB)
- Roundtable on Sustainable Palm Oil (RSPO)
- BONSUCRO18 (Previously known as “Better Sugar Cane Initiative”)
GUARANTEE OF SUPPLY

• For Colombia to have a meaningful participation in the international market of biofuels, the country will need to build new plants and on a larger scale than the existing ones to take advantages of economies of scale.

• This is particularly more important for ethanol plants. The land availability is a key factor for an effective supply of feedstock and this is one of the strengths of Colombia. The transportation costs will need to be carefully considered in the cost structure of potential plants for export.
STRATEGY 3
PROMOTE THE DEVELOPMENT OF NEW PRODUCTS

- One attractive alternative to position Colombia as biofuel exporter is to promote the implementation of technologies that are in the early commercial phase such as HVO, biobutanol, and cellulosic ethanol. The production of Renewable Jet or bio-jet could be the immediate step.

Example of strategies to add valued in advanced biofuels

One option, volume is limited

Great opportunity, competitive market

Product-market matrix

- Aviation fuel
- FFV
- Increase the blending content

Conventional biofuel product

- Biochemicals
- Biobutanol
- Pyrolysis, BTL
- Cellulosic ethanol
- Bio Hydrofined Diesel
- Algae based biofuel

New product

Future Business “Blue ocean”

Great opportunity, innovative product market

New market

Biofuel market

One option, volume is limited, soon saturated
STRATEGY 4
SUPPORT PROGRAMS FOR CONQUERING NEW MARKETS

• The FTAs tariff structure constitutes an opportunity for beginning an export process of biofuels from Colombia to big importers like EU, US and Canada, because they offer duty free rates and there are not quantity restrictions, which no added cost to Colombian biofuels. On the other hand, the Colombian efforts on sustainability (participation on RSPO, RSB, BONSUCRO) allows positioning Colombia as an attractive supplier in these countries.

• Moreover, the FTAs promote the establishment of strategic partnerships with countries that have reached important developments on biofuels based on investment on R&D. For Colombia this constitutes an opportunity for key knowledge acquisition in order to improve the quality of the first generation biofuels and to promote the second generation biofuels production. The FTAs can be also instrumental in promoting foreign investment in feedstock and biofuels production.
FINAL REMARKS 1/3

“Colombia biofuel industry stands in a critical turning point.”

• The biofuel industry in Colombia is growing successfully thanks to strong cooperation between government and industrial sectors. The government created an attractive business environment for the biofuels industry, such as mandate of supply, and the private sector has responded accordingly to this policy. These efforts by both government and private sectors bear fruit such as job creation in rural areas, reduction of fossil energy consumption and reduction of CO2 emission. The Colombia biofuels industry is one of the successful pioneers in the world.

• The future of the Colombian biofuels industry stands at a critical turning point. The country has a great potential for development considering the land availability for feedstocks, and the opportunities for expanding in the global biofuels market. Both bioethanol and biodiesel are wildly used across the country; therefore, the domestic market will mature in the near future. Expanding towards new biofuels - internal and external market - is the best direction and should be the next step for Colombian biofuels industry.
FINAL REMARKS 2/3

• In the internal market, expanding the domestic consumption of biofuels with E15 and B20 would be the first option. An additional alternative is the production of renewable diesel where the country is already working in the development of quality standards. A third option is the promotion of production of biofuels for aviation.

• In the external market the path forward is to promote the early export of biofuels (currently produced and new ones) and gradually expand the volume of exports. In order to compete in the international market, “Quality”, “Cost competitiveness”, “Sustainability”, and “Guarantee of supply” are key items.
FINAL REMARKS 3/3

“Change the business model to strength the export industry”

• Regarding quality, adapting the products to the standards of each target country is required. In the case of bioethanol, for Colombia this is not a critical obstacle. In the case of biodiesel, palm based biodiesel has relatively poor cold flow properties at low temperature; this needs to be addressed to compete in export market such as the EU. There are several options for improving the poor cold flow properties; such as hydroisomerization technologies.

• In cost competitiveness all costs of the supply chain from feed stock production to export market must be considered. The cost of feedstock is the most relevant. In the case of bioethanol from sugarcane Colombia has higher production costs than Brazil. One of the best alternatives for Colombia would be to develop the new business model based on large scale production and mechanization in new rural areas such as Meta and Cesar. This model would also create jobs in rural area and would be a win-win model for the biofuel industry and rural communities.
RECOMMENDATIONS 1/4

• Colombia has achieved, in relatively short time, the development of an internal market for biofuels.
• This has been done by means of legal mechanisms such as mandatorily blends, tax incentives for the production of biofuels’ raw materials and price schemes to drastically reduce the investor’s risk.
• This approach has been adequate to establish a market that covers the internal demand satisfactorily. From this perspective, it is considered that no additional incentives are required to further develop the local market of traditional biofuels.

• There is however a concern from the biofuels investors on the stability of those rules in the long-term.
• A potential solution is the definition of mechanisms that guarantee the existing conditions as long as it is necessary, such as agreements with the government on tax stability (previously used in other productive sectors).
RECOMMENDATIONS 2/4

• The scenario proposed in this report promotes the creation of a market for advanced biofuels and new products in Colombia – such as hydrogenated FAME and biobuthanol - that can be gradually expanded to the international market. Currently, the MME is working to promote the use of renewable diesel in Colombia.

• From the international perspective the most relevant instrument to promote the export of both traditional and new biofuels, is the FTAs that Colombia is in the process of implementing with the US, EU and Canada, which are the main markets for biofuels.

• One of the key characteristics of the biofuels industry is its cross-industrial nature (agriculture sector, industry sector, and energy sector) and the fact that it involves many stakeholders (public company, farmers, central government, regional government, and NGO). Considering this aspect, cooperation and partnerships are important.
RECOMMENDATIONS 3/4

Immediate top priority: Enhancing sustainability

• Colombia *enhances the activities on sustainability* in order to build a good reputation for Colombian biofuels, for example by adapting the national standards on sustainability of biofuels to the international trends, especially in the target markets (EU and USA). Appropriate sustainability activities in the whole supply chain are required as well as capacity building. Minor deviations of the sustainability criteria will damage the reputation and credibility.

**For government**
Leading the sustainability initiatives by
- Making national standards on sustainability of biofuels
- Making guidelines on suitable areas for biofuel feedstock (e.g.: ecological zoning)
- Promoting the Colombian sustainability initiatives in the international community (e.g.: GBEP)
- Supporting the transformation towards best sustainable practices
- Supporting capacity building on sustainability in the biofuel industry and within feedstock producers (farmer)

**For industry**
In close cooperation with the government, promote farmer’s capacity building on sustainability by means of: Workshops, Best practice guidelines
RECOMMENDATIONS 4/4

Next priority: Enhancing the cost competitiveness by adopting a new business model

For government
✓ Promoting foreign investments in biofuel projects
✓ Supporting export oriented projects and infrastructure development
✓ Supporting advanced biofuels and biorefineries
✓ Trade policy: bilateral agreement on investment and trade with target countries (EU, US, Canada, and Japan)

For industry
Enhancing the cooperation with foreign companies
✓ Joint project on biofuels (for export)
✓ Joint R&D on advanced biofuels and biorefinery projects
New business (entrepreneurial chance)

Investment

Industry

Agriculture

Knowledge

Coordination

Government

Association

University Institution

Investment

Information knowledge

Land infrastructure

Human resources

Financial resources

Mechanization

Technology

Crop management (adapting production site)

Incentive

Risk sharing

Information

Knowledge

Coordination

Policy

Green field development

Organizing / spurting farmers

Foreign countries

Land infrastructure

Government

Association
Toolkit for the export of biofuels

The study also develop an on-line tool that summarize the results of the BMS and key aspects of the biofuels market
Gracias
Thank you