Are Biofuels Socially Accepted in Guayaquil?

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Abstract

We did a survey to 211 persons in the city of Guayaquil-Ecuador in order to examine, measure and assess the social acceptance that the development of the biofuel industry would potentially have in the country. In the first part of this study sets the mean values and standard deviation of 17 indicators which measure perceptions about the possible effects in areas such as economic, social and environmental. The absence of national goals for blend and consumption of biofuels in the country, allows the social acceptance of this new product plays a key role that could even become a barrier for launching this industry. We made an Analysis of Correspondence to study the relations between the indicators related to perceptions, socioeconomic variables and the willingness to pay (WTP). We found that those who possess a high level of education (high income as well) are those who have the lowest WTP and they also have a negative environmental perception, while those who are unaware of the existence and local production of these fuels have the highest WTP. Finally, with regard to the design of public policies we found that respondents consider job creation and reduction greenhouse gases as the most important attributes, but on the other hand, they consider the institutional framework that regulates this industry as the least important one.

Keys Words: Bio-fuels, Perception, Correspondence Analysis

1. Introduction

In most countries, the biofuels industry has developed through regulations which have ensured domestic market niches and it has also enjoyed support among countries with additional protection by implementing tariffs on imports of raw materials. These regulations have resulted as subsidies to production factors, agricultural subsidies, environmental subsidies, tariffs, mandated purchases and national goals for blending biofuels (ethanol and biodiesel) with fossil fuels (regular gasoline and diesel). Undoubtedly, the national goals for the blending are the most important type of regulation and key that determine the consumption of biofuels in the fuel market. These goals allow new investment projects in this industry can be sure that their product will be demanded in the domestic market of the country that imposes these goals through mandates or laws. As shown in Table 1 in the appendixes, the countries considered as the main producers and exporters of biofuels have set national goals for blending. Some of the states of the United States expend E5 or E10 (gasoline blended with ethanol 5-10%) in all stations, that is, even if the consumer does not have complete information on the existence or production of biofuels, these individuals in those states are consuming this alternative fuel. Additionally, in the United States has ruled that government vehicles use E85 (85% ethanol), they has also established incentives for school vehicles in order to use E85 or biodiesel. The EPACT (Energy Policy Act) 2005 imposed the biofuel purchasing by mandate, this arrangement called RFS (Renewable Fuel Standard) established a minimum consumption per year, set at four billion gallons of renewable fuels by 2006 and an increase of 7.5 billion by 2012. In Brazil, mandated blends set between 20 and 25% ethanol and a goal of 3% for biodiesel by 2008 (this goal is expected to be extended to 5% at least). On the other hand, Europe set a goal of 5.75% biofuels consumption in the transportation sector by 2010. Latin American countries like Guatemala allowed a blend up to 25%, El Salvador has a minimum blend which is between the range of 8-10% ethanol, Argentina has a minimum blend of 5% for both ethanol and biodiesel, Colombia imposed a minimum 5% for biodiesel.

It is clear that in those countries where there has been a clear public policy with emphasis on setting blend national goals, the biofuel industry has experienced a takeoff and a sustained growth framed in these regulations. The implementation of clearly defined policies could be considered as one important factor for the development of this industry; therefore, the lack of these ones could become one of the main barriers to biofuels in any economy. Public perceptions and incentives to enter the market would become a barrier to this industry's boost in the situation where there is not sending right signals to the market. That is, in a situation where there are no public policies, especially blend goals; the public perception plays a key role in creating a potential demand for alternative fuels.

In Ecuador, the support for biofuels industry was incorporated into national policies through various executive decrees declaring as national interest the production, marketing and use of these alternative fuels as fuel components consumed in the country. Moreover, by executive decree, it was created the National Biofuels Board, which mission is to define policies and approving plans, programs and projects related to the production, handling, processing and marketing of biofuels. Other executive decrees were aimed at setting the price of ethanol. However, there has not set national goals for blending, so there is no obligation for consumption. The use of biofuels in Ecuador would then be determined by the social acceptance that this new fuel might have in the market.

In spite of these executive decrees and other government support, the industry has not shown a significant evolution. The country has an annual yield of 9000 liters of ethanol per hectare of sugar cane and a demand of 92,000 barrels of ethanol per year approximately in Guayaquil city. Similarly, it has the capacity to produce 136,000 liters daily of ethanol and it also has an estimated production of 50 million liters per year. Ecuadorian exports of ethanol have had an average growth rate of 12% annually from 2003 to 2009. In the last year, the export of this input registered $ 18 million, Colombia was the main destination.

The absence of a definition of public policy and an incentive scheme, as well as, lack of knowledge about the social acceptance have become the main barriers that have hindered the take-off of this industry in Ecuador.

The objective of this study is based on the assessment of public perception about biofuels and it identifies individuals' profiles (potential customers) according to their opinions, judgments, prior information on economic, social and environmental matters of production of these fuels. It has been shown that public support is important for the development of management strategies[1], thus, without a social license from the public, the development of biofuel industry would not be expected to be in large dimensions. This social license takes much more relevance when in the country there is no obligation nor in the blend of fuel, nor in consumption. The requirement of blend and consumption by governments has been fundamental for creating demand in those countries where biofuels industry has been consolidated. The analysis of the perceptions of individuals about biofuels and the resulting strategies for greater social support should be an integral part of any mechanism to introduce these fuels in the Ecuadorian market.

[1] See Biomass Energy and Biomass from Oregon´s Forest for further information.

This study is divided into three parts: the first part details the characterization of the sample and its indicators through descriptive statistics, the second part is about the data collection process and methodology used for sample analysis, the third part analyzes the perception of individuals through Correspondence Analysis method and finally, the last section shows the results and conclusions from the study.

2. Biofuels survey indicators in 2009

Biofuels are related to series of results such as: i) greenhouse gas effects reduction, ii) economy based on agriculture growth, iii) change in the energy matrix, iv) job creation and destruction, v) use of production factors such as water and land, vi) concerns about security and food sovereignty, and vii) other family concerns. Thus, the survey[2] was composed of questions that corresponded to each one of these results with 17 indicators in total. Data collected include the public perception variables based on opinions, judgments and prior information on biofuels. The questions were designed to collect information about:

1. Economic effects of their consumption: individuals' perception about the cost of biofuels and the economic effects both at home and in the country.
2. Environmental impacts: public perception about the environmental effects derived from production and consumption
3. Favorable factors (unfavorable) in the country: perceived obstacles and advantages of the production and consumption.
4. Knowledge about the existence and production of biofuels, and the negative effects derived from the consumption of fossil fuels.

Four out of 17 indicators were classified as questions about economic effects, 5 about environmental effects, 5 about favorable (unfavorable) factors, and the remaining questions were about biofuels knowledge, local production and damage generated by traditional fuels. These questions used a Likert scale from 1 (totally disagree) to 5 (totally agree). The economic impact questions were: (1) "A household that buy biofuels for their vehicle would save" (M=4.02, SD=.08); (2) "A household that buy biofuels would help to preserve family health" (M=4.02, SD=.08); (3) "Biofuel production should be in State

[2] This research used a database of 211 observations; we implemented a random sampling of individuals, car owners located in Guayaquil city. The implementation period of this survey was in December 2009 at ESPOL, specifically at the School of Business Administration (ESPAE), and the University of Guayaquil. In all cases, the questionnaire was self-administered and it took about 20 minutes to be completed by each person.

hands" (M=2.65, SD=.07). The environmental effects questions were: (1) "A person who buys biofuels contributes to reducing greenhouse gases" (M=4.21, SD=.08); (2) "Biofuel production would generate a productive use of arid or eroded lands" (M=3.78, SD=.08); (3) "The global food crisis is generated by the use of biofuels" (M=2.67, SD=.87); (4) "The use of biofuels could improve the quality of water consumed by households" (M=3.65, SD=.81); (5) "The use of biofuels could improve soil quality as a productive input" (M=3.73, SD=.09). The questions about the favorable (unfavorable) factors were: (1) "The use of biofuels would help reducing energy dependency" (M=4.25, SD=.08); (2) "The production and use of biofuels would increase rural labor demand" (M=3.78, SD=.07); (3) "Biofuel production would improve the use of disused lands" (M=3.79, SD=.75); (4) "A person who buys biofuels looks like a person concerned about the environment to the society" (M=3.99, SD=.79); (5) "The use of biofuels could improve the chances of nature conservation for future generations" (M=4.18, SD=.81). The questions about biofuels knowledge and local production were: (1) "Do you know about the existence of biofuels?" (M=.18, SD=.02; 0: Yes, 1: No); "Do you know about the production of biofuels in the country?" (M=.60, SD=.03; 0: Yes, 1: No); "Do you know the damages caused by fossil fuels?" (M=.26, SD=.03; 0: Yes, 1: No).

On the other hand, the survey also includes other measures: age (M=21.01, SD=.80), sex (53% women), education (M=2.94, SD=.05; 2: High school, 3: College y 4: Higher education), income (M=2.87, SD=.07; 0: less than 200, 1: between 201-600, 2: 601-1000, 3: more than 1000), main fuel used by respondents (M=1.4, SD=.05; 1: Super, 2: Extra, 3: Diesel). Moreover, questions about knowledge of biofuels, production in the country and damage generated by fossil fuels: "Do you know about the existence of biofuels?" (M=.18, SD=.026; 0: Yes, 1: No); "Do you know about the production and use of biofuels in the country?" (M=.601, SD=.33; 0: Yes, 1: No); "Do you know the damage generated by the production and use of fossil fuels?" (M=.265, SD=.03; 0: Yes, 1: No). Finally, the willingness to pay extra money for a gallon of biofuel (M=.77, SD=.05).

3. Methodology

The relation between the variables of individuals' perception was conducted from Correspondence Analysis. Correspondence analysis is an exploratory method to study associations between variables. The objective is to make the interpretation of data easier using a graph to represent the relation patterns between defined categories for the required variables to analyze. The categories are represented as vectors

that can be plotted as points in a dimensional space; the proximity (distance) relations between the plotted points reflect the dependency and similarity relations between them.

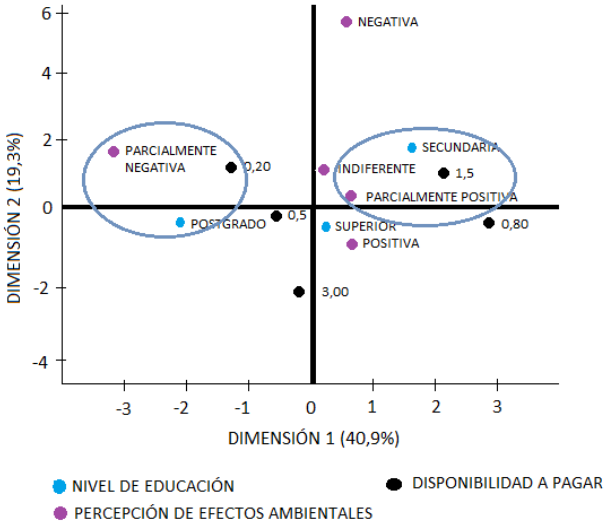
Graphic representations are derived from the contingency table analysis, where each variable is described with their respective categories. The associations of points plotted on the graph coincide with the categories that have the highest absolute and relative contribution in this matrix, i.e., the importance of each modality in the graph axis formation. This interpretation can be used to reveal the structure and association between the answer choices of the perceived economic and environmental impacts variables derived from the use of biofuels. The same analysis is used for those relating to socioeconomic aspects of individuals from the sample, so that you can define profiles of people surveyed.

4. Results

According to correspondence analysis conducted in this study, we found individuals' profiles according to the variables of knowledge of biofuels, environmental perception, willingness to pay (WTP) and level of education. Graph 1 represents the description of two potential consumers' profiles. On the one hand, Graph 1 (right side) represents one type of consumer that has higher WTP (between $ 0.9-1.5). These individuals have high school education and they have a positive environmental perception about the biofuels consumption. However, they say not to have information about the existence of this alternative fuel and its domestic production and they do not know the damage generated by conventional fuels, neither. On the other hand, we have represented individuals who have lower WTP (left side of graph).

Individuals who have lower WTP (between $ 0-20) are those who have a negative environmental perception level regarding to the use of biofuels and they also have the highest level of education. Furthermore, they mention having information from both the existence and the local production of this liquid fuel. This type of individual also mentioned to have information about the damage produced by the consumption of fossil fuels.

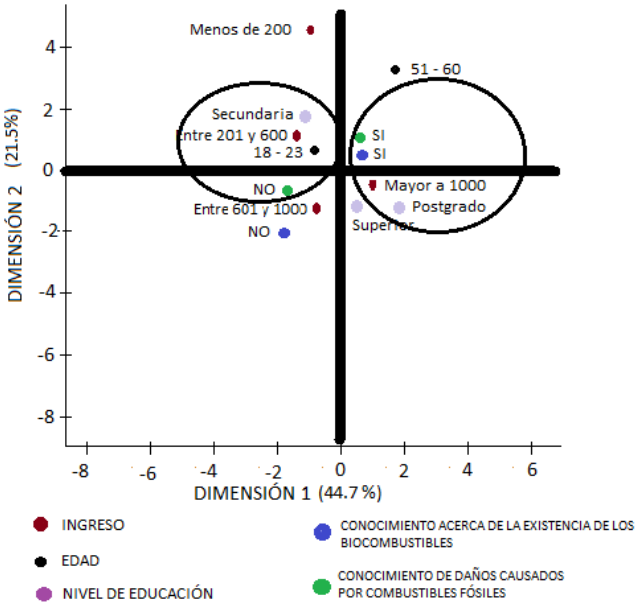
Graph 1: Correspondences WTP, Level of Education and Environmental Effects.



Elaboration: Authors.

Despite Graph 1 shows the results of the identification of the two profiles (based on environmental perception, WTP and level of education) directly, the methodology used could be understood step by step through the contingency tables reported in the appendixes. Table 2 in the appendixes shows the result of the selection of the first two dimensions with the highest contribution rate (60.2%), which will be used as axes to display obtained results mentioned above. Table 3 has information about the mass (specific weight category in terms of their marginal rate), coordinates and contribution. Table 3 shows the relation between the socioeconomic variables and knowledge variables, and this revealed that individuals who said they have information about existence of biofuels predominate in the sample and, finally, in Table 4 we constructed individuals' profiles. We identified two profiles: i) individuals (aged between 18-23) who do not have information about the existence and local production of biofuels, they do not have high school education and they have no knowledge about the damage produced by regular fuels ii) individuals (aged between 24-30) who have the highest level of education and they mention to have information about the existence of biofuels and their domestic production. Besides, they are aware of the damage generated by the consumption of fossil fuels. Finally, analyzing Tables 5 (which have information about the WTP) and 6 (identified profiles) they allow us to get the same profiles that are located in Graph 1.

Graph 2: Knowledge of Biofuels, Fossil Fuels Damage, Socio-economic variables Correspondence



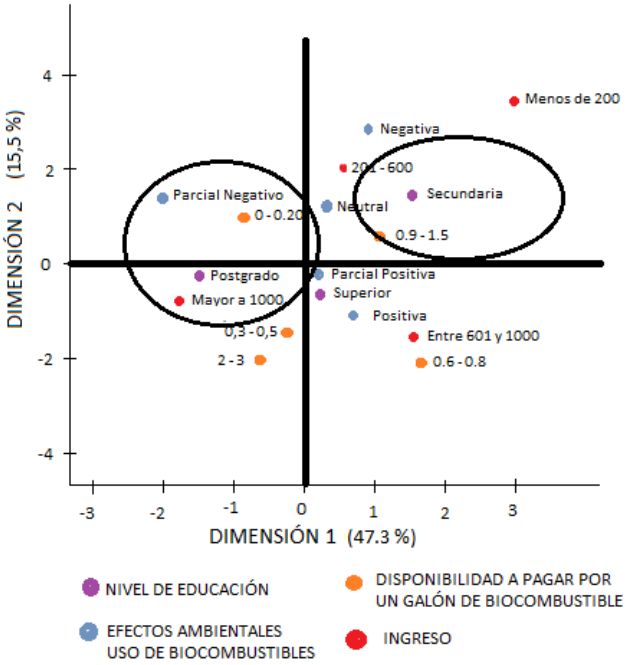
Elaboration: Authors.

This analysis can be extended to include other variables that allow us to continue identifying profiles of individuals. For example, Graph 2 shows the relation between knowledge variables about the existence of biofuels and their production in the country with the socioeconomic variables of education, age and income (this variable was not included previously). The results of this chart are also available in Tables 7 and 8. Graph 2 shows two consumers' profile: i) individuals (aged between 18-23) who do not have information about the existence and the local production of biofuels, they have high school education and they have no knowledge of the damages produced by regular fuels. These individuals have an income between $ 201-600, and ii) individuals (aged between 24-30) who have the highest level of education and they say to have information about the existence and domestic production of biofuels. Moreover, they are aware of the damage generated by the consumption of fossil fuels and they are in the highest income range of the sample (more than USD $ 1.000).

As we have seen the results in Graphs 1 and 2, it is clear to identify two potential biofuels consumers' profiles in Guayaquil city. Individuals who do not have information about the existence, or the local production of ethanol, and they are also not aware of the damage that traditional fuels on the market could cause, correspond to the first profile. These individuals (aged between 18-23) have the highest level of High School education, and an income between $201-600. On the other hand, we have the group of individuals who have high educational level, knowledge of the existence and production of alternative

fuel and they also say to know the damage caused by regular fuels. This group of people aged between 24-30, earns more than USD $ 1000 and they have a negative perception of the environmental impacts caused by the consumption of biofuels.

Graph 3: WTP, Income, Education Level and Environmental Effects Correspondence.



Elaboration: Authors.

Graph 3 allows us to extend the features of the two consumer profiles identified above, in order to reincorporate the WTP and income variable. Thus, we conclude consistently that the first profile has higher WTP (between $ .9-1.5), while the second profile has lower WTP (between $ 0-2). However, environmental perception variable is no longer significant for the second profile. For details see Tables 9 and 10 in the appendixes.

Finally, it is important to note that the survey has a section focused on analyzing the design of public policies that would improve the social acceptance to promote the development of biofuels industry in Ecuador. This study evaluated the effects of policies in preferences of individuals in 4 attributes: i) employment in rural areas, ii) greenhouse gases emissions (GHGs), iii) prices of biofuels, and iv) institutions. The policy which had the highest acceptance by respondents was the one[3] that promotes job creation, reduces GHG levels, it is indifferent respect to the biofuels efficiency and prices (variations) of

[3] See Table 11 in appendixes for further explanation.

this new product on the market gasoline. This result is consistent with data in Table 12 that shows the preferences of individuals toward the attributes that could be used for the design of public policies. 43.35% individuals in this sample think that job creation is the most important attribute, followed by the reduction of GHG (35.96%) and, moreover, efficiency and price changes are considered as unimportant attributes for these new liquid fuels; if the responsible institution for the promotion and development of this industry is public or private (or mixed) it was considered the least important attribute for 65.84% respondents.

5. Conclusions

The best technology is not successful unless people use it. Thus, the future of biofuels depends not only on the development of effective and efficient technologies but also social, economic and political context where individuals choose to consume or avoid these new fuel sources. In a social psychological level, individual behaviors are often guided by other people attitudes toward the object and by the rules set by others in the social environment. Therefore, the analysis of the adoption of new technologies requires understanding how public attitudes form or modify, and the implications of these changes in social norms[4]. Moreover, management strategies will be much more socially acceptable if the public's views and perceptions are known in advance and they are incorporated into the proposal development.

Considering what we explained above and adding the fact that the Ecuadorian government has not imposed a mandate for consumption or blending of biofuels in the gasoline market, this study gains fundamental importance to find the social acceptance that the introduction of this new product could have on the market and to take advantage of consumer profiles in order to implement policies, programs or projects, successfully. It will be important to develop national policies on biofuels considering key factors such as:

- The consumers of biofuels' WTP decreases as a function of education. That is, as the individual has a higher level of education, it also increases his negative perception of environmental impacts (potential conflict with the food industry) that biofuels could have and therefore, that decreases his willingness to pay for this new fuel. It is worth noting that these same individuals with the least WTP are those at the highest level of income.

[4] See Wegener and Kelly for details.

- However, these individuals are in favor of biofuels' public policies that contribute job creation and ensure effective GHG reduction.

- According to this sample, the results suggest a review of incentives for the consumption of this new product. On average, respondents would be willing to pay additional 77 cents per gallon of fuel. This could have policy and incentive mechanisms implications for introduction of a friendly environment fuel, and consequently it produces a moderate tax impact.

The results of this study could be helpful for future lines of research which detail the factors that influence in favor or against the use of biofuels carrying out econometric modeling.

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7. Appendixes

TABLE 15: Regulations and Incentives in the Biofuels Industry

Regulations in the United States

Type of incentives	Description
Tariffs	Ad valorem on imports 2.5% and 1.9% for undenatured and denatured ethyl alcohol respectively. Ad valorem on imports of biodiesel 1.9%. Specific tariff for ethyl alcohol imports of 0.54 U.S. $ / gallon. The beneficiary countries of the Initiative for the Caribbean Basin (CBERA) are exempt, as long as, 50% out of the raw material has local origin and the amount of tax-free ethanol does not exceed 7% of U.S. demand, those were the restrictions.
Purchases by mandate	The EPACT (Energy Policy Act) 2005 imposes the purchase of biofuel mandate; this order called Renewable Fuel Standard (RFS) requires a minimum consumption per year, set at four billion gallons of renewable fuels by 2006 and an increase of 7.5 billion by 2012.
Tax credits	Through the AJ-CACT (Creation American Jobs Act) 2004, the VEETC provides tax credit for biodiesel, this provision allows tax credit for 1US $ / gallon of biodiesel produced from virgin oils or animal fats and 0, 50 U.S. $ / gallon of recycled oils and fats.

[5] Table 1 has been reproduced from the document: Dominguez J. Espinel and R. (2009). "Feasibility Analysis for the Introduction of Biodiesel in Ecuador." Revista Mexicana de Agronegocios, XIII Year, Volume 25.

Regulations in the United States (Continuation)

Type of incentives	Description
Subsidies to production factors	It allows accelerated depreciation of capital; this benefit allows corporations to receive larger deductions in early years of investment. In the EPACT05, section 741, it is financed the conversion of school buses so they can use E85 and biodiesel. Some states exempt purchases of equipment used for the production of biofuels.
Subsidies to agricultural products	Many of them are used as inputs in the production of biodiesel.
Consumption	EPACT05 provision allows fuel stations to get tax credit that covers 30% of the eligible cost of those depreciable property, excluding land, up to $ 30 000 for the installation of tanks and equipment. EPACT92 determined that government fleets have to acquire adaptable vehicles to the use of alternative fuels.
Environmental subsidy	The Agency for the Environmental Pollution Control imposed that sulfur levels in diesel should be reduced from 500 ppm to 15 ppm in 2006.

Regulations in Europe

Type of incentives	Description
Consumption	In 2003 the target for biofuels consumption in the transportation sector was set at 5.75% by 2010.
Production factors	The European Commission has established policies to expand the production of inputs, originally planned by the CAP in 2003, to allow the inclusion of eight new members that were not benefiting from these incentives before. This will allow to increase the maximum area that would benefit from this aid from 1.5 to 2 million hectares.
	The European Commission has made changes to the Directive for the Fuels Quality, which specifies that diesel must have ultra-low sulfur content with a maximum of 10 ppm at the beginning of 2009.
Commerce	Imports of biodiesel are subject to ad valorem rate of 6.5\%.

Regulations in Central America

Country	Policies
Costa Rica	In April 2005, the Costa Rican government approved the 15.853 Record, a law promoting biofuels that supports research, development, generation and use of biofuels and derivative petrochemicals products.

Guatemala	In 1985 Guatemala, through Decree 17/85 began to promote the use of renewable fuels, especially ethanol, this allowed a mixture up to 25%. In 2003 Guatemalan government passed the Law of Incentives for the Development of Renewable Energy Projects, which provides tax, economic and administrative incentives to such projects.
El Salvador	El Salvador has proposed a law which establishes that from September all gasoline distributed in the country must have ethanol as an oxygenate agent. The minimum mix is in the range between 8 to 10 percent of ethanol. Those entities committed to the production of ethanol will benefit from duty-free imports of machinery and other inputs for ethanol production for two years, during this time they will enjoy tax exemptions on the sale of ethanol.

Regulations in South America

Country	Policies
Argentina	The Biofuels Act known as Senator Falco Law (SFL) was approved in May 2006; this law provides a combination of tax incentives and mixtures quotas to promote the industry. The SFL not only lays down tax cuts for producers of ethanol and biodiesel, but also it exempts taxes as: i) VAT on capital goods and infrastructure projects, ii) income taxes on goods related to production, iii) water infrastructure tax, iv) general taxes on fuels. The SFL has scheduled a required level of 5% blend of biodiesel and ethanol by 2010.

Colombia	In 2001 Law 693 laid down on the one hand, reductions in emissions of hydrocarbons and carbon monoxides, and on the other hand it promoted agro-industrial development. In 2002 Law 788 strengthened Law 693 by introducing tax breaks for ethanol, such as exemption from VAT. Law 939, whereby Colombian government created tax breaks and incentives for production and marketing of biodiesel. A resolution made by the Ministry of Energy and Mines extended the incentives for mixtures of 5% biodiesel - B5 petrodiesel.
Brazil	In the seventies the Brazilian government created the National Alcohol Program, Pro Alcool. In 2003, the introduction of flexible fuel vehicles associated with low tax rates, achieved the goal of increasing the demand for ethanol. Currently, there has established mixtures by mandate which vary between 20 and 25% ethanol and a target of 3% for biodiesel in 2008. Government joined efforts of the programs called National Biodiesel Production and Use Plan to set quota targets, such as the established 5% mix for the biodiesel by the year 2013. Other objectives include: i) diversification in the use of oils for biodiesel production, ii) production of biodiesel using ethanol as a catalyst in the transesterification process, iii) to discover uses for those biodiesel co products such as glycerine.

TABLE 2: MATRIX L RESULTS

Dimension	Inertia	Percentage	Cumulative Percentage
Dimension 1	0.01600	46,12	46,12
Dimension 2	0.00782	22,56	68,68
Dimension 3	0.00116	3,36	72,04
Dimension 4	6,35e-08	0,00	72,04
Total	0.03470	100.00	

Source and elaboration: Authors.

TABLE 3: Correspondence, Knowledge and Socioeconomic Variables.

			Dimension 1		**Dimension 2**	
		Mass	**Coord.**	**Contr.**	**Coord.**	**Contr.**
Do you know about the existence of biofuels?	YES	0,165	0,459	0,035	0,4	0,026
	NO	0,035	-2,163	0,164	-1,883	0,124
Do you know about the production of biofuels?	YES	0,079	1,067	0,09	1,168	0,108
	NO	0,121	-0,696	0,059	-0,763	0,07
Do you know about the damage caused by the use of fossil fuels?	YES	0,146	0,682	0,068	0,179	0,005
	NO	0,054	-1,843	0,183	-0,484	0,013
Level of education	High School	0,052	-1,393	0,101	1,989	0,206
	College	0,107	0,034	0	-0,592	0,038
	Higher education	0,041	1,679	0,116	-0,978	0,039
Age	18-23	0,118	-0,739	0,064	1,057	0,132
	24-30	0,07	0,904	0,057	-1,758	0,216
	41-50	0,008	1,192	0,011	-1,122	0,01
	51-60	0,004	3,607	0,052	1,813	0,013

Source and elaboration: Authors.

TABLE 4: Individuals' Profiles (Knowledge and Socioeconomic Variables).

	PROFILE 1			PROFILE 2		
	Answer	**Coord.**	**Contr.**	**Answer**	**Coord.**	**Contr.**
Do you know about the existence of biofuels?	NO	-2,163	0,164	YES	0,459	0,035
Do you know about the production of biofuels?	NO	-0,696	0,059	YES	1,067	0,09
Do you know about the damage caused by the use of fossil fuels?	NO	-1,843	0,183	YES	0,682	0,068
Level of education	High School	-1,393	0,101	Higher education	1,679	0,116
Age	18-23	-0,739	0,064	24-30	0,904	0,057

Source and elaboration: Authors.

TABLE 5: Correspondences Perception, Level of Education and WTP.

			Dimension 1		Dimension 2	
		Mass	**Coord.**	**Contr.**	**Coord.**	**Contr.**
Level of education	High School	0,085	0,915	0,071	1,509	0,193
	College	0,182	0,126	0,003	-0,591	0,064
	Higher education	0,066	-1,514	0,152	-0,3	0,006
Willingness to pay extra for a gallon of biofuel	0-0,20	0,083	-1,462	0,177	0,715	0,042
	0,30-0,50	0,106	-0,345	0,013	-0,175	0,003
	0,60-0,80	0,028	1,924	0,104	-0,51	0,007
	0,90-1,5	0,08	1,385	0,153	0,637	0,032
	2,0-3,0	0,036	-0,183	0,001	-2,111	0,163
Perception of the environmental impacts caused by the use of biofuels	Negative	0,013	0,491	0,003	4,928	0,322
	Partly Negative	0,035	-2,86	0,285	0,829	0,024
	Indifferent	0,032	0,03	0	0,62	0,012
	Partly Positive	0,158	0,262	0,011	-0,008	0
	Positive	0,096	0,528	0,027	-1,171	0,132

Source and elaboration: Authors.

TABLE 6: Individuals' Profiles (Perception, Level of Education and WTP).

	PROFILE 1			PROFILE 2		
	Answer	**Coord.**	**Contr.**	**Answer**	**Coord.**	**Contr.**
Level of education	Higher education	-1,514	0,152	High school	0,915	0,071
Willingness to pay	0-0,20	-1,462	0,177	0,9-1,5	1,385	0,153
Environmental perception of use of biofuels	Partly negative	-2,86	0,285	Positive	0,528	0,027

Source and elaboration: Authors.

TABLE 7: Correspondences Income, Knowledge and Socioeconomic Variables.

			DIMENSION 1		DIMENSION 2	
VARIABLE	**ANSWER**	**MASS**	**COORD.**	**CONTR.**	**COORD**	**CONTR.**
Do you know about the existence of biofuels?	YES	0,165	0,402	0,022	0,436	0,026
	NO	0,035	-1,915	0,106	-2,078	0,125
Do you know about the production of biofuels?	YES	0,078	0,527	0,018	1,345	0,118
	NO	0,122	-3,41	0,012	-0,87	0,077
¿ Do you know about the damage caused by the use of fossil fuels?	YES	0,147	0,614	0,046	0,363	0,016
	NO	0,053	-1,657	0,124	-0,98	0,043
Level of education	High school	0,05	-1,581	0,104	1,796	0,134
	College	0,108	0,074	0	-0,543	0,026
	Higher education	0,042	1,895	0,125	-0,574	0,011
Age	18-23	0,099	-0,749	0,055	0,891	0,078
	24-30	0,058	0,942	0,051	-1,518	0,133
	41-50	0,007	1,775	0,021	-1,193	0,01
	51-60	0,003	2,163	0,016	2,355	0,019
Income level	Less than 200	0,007	-1,285	0,008	2,537	0,064
	Between 201 and 600	0,026	-1,766	0,069	1,436	0,046
	Between 601 and 1000	0,06	-1,03	0,055	-0,664	0,023
	More than 1000	0,107	1,131	0,122	-0,175	0,003

Source and elaboration: Authors.

TABLE 8: Individuals' Profiles (Income, Knowledge and Socioeconomic Variables).

	PROFILE 1			PROFILE 2		
	Answer	**Coord.**	**Contr.**	**Answer**	**Coord.**	**Contr.**
Do you know about the existence of biofuels?	NO	-1,915	0,106	YES	0,402	0,022
Do you know about the production of biofuels?	NO	-3,41	0,012	YES	0,078	0,527
¿ Do you know about the damage caused by the use of fossil fuels?	NO	-1,657	0,124	YES	0,147	0,614
Level of education	High school	-1,581	0,104	Higher education	1,895	0,125
Age	18-23	-0,749	0,055	24-30	0,942	0,051
Income	Between 200 and 600	-1,766	0,069	More than 1000	1,131	0,122

Source and elaboration: Authors.

TABLE 9: Correspondence, Environmental Perception, Knowledge, Socioeconomic Variables and Income.

			DIMENSION 1		DIMENSION 2	
VARIABLE	**CATEGORY**	**MASS**	**COORD.**	**CONTR.**	**COORD**	**CONTR.**
Level of education	High School	0,062	1,535	0,147	1,255	0,098
	College	0,136	-0,075	0,001	-0,555	0,042
	Higher education	0,051	-1,679	0,144	-0,052	0
Willingness to pay for a gallon of biofuel	0-0,2	0,063	-1,083	0,073	1,293	0,105
	0,3-0,5	0,082	-0,269	0,006	-0,502	0,021
	0,6-0,8	0,022	1,787	0,069	-2,211	0,106
	0,9-1,5	0,056	1,144	0,073	0,819	0,038
	2,0-3,0	0,028	-0,474	0,006	-1,351	0,051
Environmental perception of the use of biofuels	Negative	0,01	1,05	0,011	2,442	0,061
	Partly Negative	0,026	-2,16	0,119	1,558	0,062
	Indifferent	0,024	0,468	0,005	1,245	0,038
	Partly Positive	0,117	0,106	0,001	-0,091	0,001
	Positive	0,073	0,283	0,006	-1,158	0,097
Income level	Less than 200	0,009	2,464	0,054	3,082	0,085
	Between 201 and 600	0,033	0,172	0,001	2,047	0,139
	Between 601 and 1000	0,075	1,403	0,148	-0,792	0,047
	More than 1000	0,133	-1,005	0,134	-0,27	0,01

Source and elaboration: Authors.

TABLE 10: Individuals' Profile (Environmental Perception, Knowledge, Socioeconomic Variables and Income).

	PROFILE 1			PROFILE 2		
	Answer	**Coord.**	**Contr.**	**Answer**	**Coord.**	**Contr.**
Level of education	Higher education	-1,679	0,144	High school	1,535	0,147
Willingness to pay	0-0,20	-1,083	0,073	0,9-1,5	1,144	0,073
Environmental perception of the use of biofuels	Partly Negative	-2,16	0,119			
Income	More than 1000	-1,005	0,134	Between 601 and 1000	1,403	0,148

Source and elaboration: Authors.

TABLE 11: POLICIES CHOICE

Option 1	Policy A	66,83%
	Policy B	24,39%
	None	8,78%
Option 2	Policy A	55,28%
	Policy B	29,15%
	None	15,58%
Option 3	Policy A	39,90%
	Policy B	36,87%
	None	23,23%
Option 4	Policy A	15,15%
	Policy B	71%
	None	13%
Option 5	Policy A	58,46%
	Policy B	31,79%
	None	9,74%
Option 6	Policy A	46%
	Policy B	42%
	None	11%

Option 7	Policy A	23,32%
	Policy B	50,26%
	None	26,42%

Source and elaboration: Authors.

TABLE 12: ATTRIBUTES FOR THE POLICY CHOICE

Significance level	Employment	Greenhouse gas emissions	Efficiency	Price changes	Institutions
Very important	43,35%	35,96%	6,40%	8,37%	6,44%
Important	22,17%	27,09%	24,14%	20,69%	5,94%
Indifferent	13,79%	17,73%	27,59%	30,05%	10,89%
Not much important	13,79%	13,30%	30,54%	31,03%	10,89%
Nothing Important	6,90%	5,91%	11,33%	9,85%	65,84%

Source and elaboration: Authors.