BEST
BioEthanol for Sustainable Transport

SUPPORTED BY THE EUROPEAN UNION

Report on survey of fleet operators' attitudes towards ethanol vehicles and fuel

March 2009, London, United Kingdom

BEST Deliverable No 9.25

Issued by: Imperial College London, Exhibition Road, London SW7 2AZ, www.ic.ac.uk;

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Language: English
Target groups: EU Commission

BEST
BioEthanol for Sustainable Transport

Project no: TREN/05/FP6EN/S07.53807/019854

Project acronym: BEST

Project title: BioEthanol for Sustainable Transport

Instrument: Integrated Project

Thematic Priority: 6.1 Alternative Motor Fuels: BioFuel Cities

Report title:

Report on survey of fleet operators' attitudes towards ethanol vehicles and fuel

Deliverable no: 9.25

Version: 1

Lead Participant for the deliverable:	Imperial College London
Date of delivering to EC, contractual:	April 2009 (M40)
Date of delivering to EC, actual:	March 2009 (M39)
Period covered:	M12-14 and M35-M36
Revision	
Approved by	[X] Site coordinator [X] Wp leader [X] Evaluation manager [X] Coordinator [ ] Steering Group [X] European Commission
Dissemination level:	[X] PU – Public [ ] PP – Restricted to other programme participants (including Commission Services) [ ] RE – Restricted to a group specified by the consortium (including Commission Services) [ ] CO – Confidential, only for members of the consortium (including Commission Services)
Start date of project:	01/01/2006
Duration:	48 months
Project coordinator name:	Gustaf Landahl
Project coordinator organisation name:	City of Stockholm, Environment and Health Administration

Table of Content

Summary

Government and corporate fleet demand is considered an important factor in the growth of markets for alternative-fuel vehicles (AVFs) and renewable fuels, as purchase decisions tend to be centralized and the few decision-makers can be efficiently targeted with information about alternative fuel technology The potential of vehicle fleets for adopting alternative-fuel technologies has been explored in a number of surveys that were administered to fleet operators of public (government) and private (company) fleets in the US as fleet managers tend to be involved in the management and purchase decisions of fleets, although they are not the sole decision-makers. This report presents the results of a survey that investigated European fleet operators' attitudes towards bio-ethanol fuel and bio-ethanol vehicles and their role in the market-breakthrough of bio-ethanol and ethanol vehicles (cars and buses) in Europe. The overall aim of the survey was to elicit information on fleet operators' perceptions of and attitudes towards bio-ethanol fuel and bio-ethanol vehicle technology and to offer an insight into the perceptions of European fleets that will enrich the perspectives offered by previous surveys of US fleets.

A questionnaire survey was administered to two hundred and seventy-four fleet operators at seven BEST sites that already had some ethanol flex-fuel vehicles (FFVs) and buses in their fleet. After one-reminder, fifty-eight completed questionnaires were returned resulting in a response rate of 21%. The results of the survey show that participating organizations were initially influenced by environmental considerations and issues like green image and social corporate responsibility when purchasing their first ethanol vehicles. Their overall experience with ethanol vehicles has been positive so far, with the vehicles being perceived as having good environmental performance and reliability and gaining the approval of drivers and mechanics as well. On the other hand, issues like fuel cost, refuelling infrastructure, range on full tank and capital/operating costs cause concern to fleet operators. Considerations about future ethanol prices and fuel availability significantly influenced future purchase decisions. Moreover, organizations that were satisfied with the current environmental performance of ethanol vehicles were more likely, as expected, to purchase more ethanol vehicles in the future. On the other hand, concerns or doubts about the safety of ethanol affected negatively future purchase decisions.

1. Introduction

The transportation sector is responsible for about one-quarter of global energy related greenhouse gas (GHG) emissions, with a share that is expected to continue rising. The European Union (EU) road transport sector accounts for more than 30% of the total energy consumption in the European Union [1], and it has been estimated that 90% of the increase of European Union's CO_2 emissions between 1990 and 2010 will be attributable to transport [1]. The European Union has set as one of its energy targets the increase of biofuels' share in the market to 5.75% by energy content by year 2010, while the Biofuels' Research Advisory Council has described a vision for 2030, where "...up to one quarter of the EU's transport fuel needs could be met by clean and CO_2-efficient biofuels..." [1].

Government and corporate fleet demand is considered an important factor in the growth of markets for alternative-fuel vehicles (AVFs) and renewable fuels, as purchase decisions tend to be centralized and the few decision-makers can be efficiently targeted with information about alternative fuel technology [2]; [3]. The potential of vehicle fleets for adopting alternative-fuel technologies has been explored in a number of surveys that were administered to fleet operators of public (government) and private (company) fleets in the US. Previous empirical work, has investigated mainly fleet managers' perceptions of and attitudes towards alternative fuel vehicles [3], [4], [5],[6], as fleet managers tend to be involved in the management and purchase decisions of fleets, although they are not the sole decision-makers [2]. These surveys, where some of the surveyed fleet operators had AFVs in their fleet, while others did not, collected data on vehicle usage (e.g. mileage, maintenance etc.) and on attitudes and purchase intentions for alternative-fuel vehicles.

This report presents the results of a survey that investigated fleet operators' attitudes towards bio-ethanol fuel and bio-ethanol vehicles and their role in the market-breakthrough of bio-ethanol and ethanol vehicles (cars and buses) in Europe, using as a case study the EU project 'Bio-Ethanol for Sustainable Transport' (BEST). A questionnaire survey was administered to two hundred and seventy-four fleet operators at seven BEST sites that already had some ethanol flex-fuel vehicles (FFVs) and buses in their fleet. After one-reminder, fifty-eight completed questionnaires were returned resulting in a response rate of 21%. The survey aims to add to previous research on fleet demand for alternative-fuel vehicles by offering an insight into the perceptions of European fleets, which enriches the perspectives offered by previous surveys of US fleets.

2. Objectives of survey

The *overall aim* of the survey is to elicit information on fleet operators' perceptions of and attitudes towards bio-ethanol fuel and bio-ethanol vehicle technology and to offer an insight into the perceptions of European fleets that will enrich the perspectives offered by previous surveys of US fleets. Moreover, the survey explores in detail the factors affecting past and future purchase decisions, which provides an indication of what could determine the development of the European market for bio-ethanol and ethanol vehicles. Furthermore, as our sample consists of fleet operators that have differing levels of experience with ethanol vehicles (ranging from about four years to one year), we explore the effect of experience on the perceived performance of vehicles. Finally, we investigate in more detail the assumption that fleet managers are relatively more informed about alternative-fuel technologies, by looking at the effect of knowledge and information on perceived performance of the vehicles.

3. Survey implementation

A mail questionnaire survey was administered to two hundred and seventy-four fleet operators at seven BEST sites (Bio-fuel Region, Sweden; La Spezia, Italy; Madrid, Spain; Nanyang, China; Rotterdam, The Netherlands; Somerset, UK; Stockholm, Sweden) that already had some ethanol FFVs

and buses in their fleet, during December 2006-February 2007 and November-December 2008[1]. The fleet operators were identified and contacted through the BEST project, although the majority of them were not collaborating with the BEST project at the time of the survey. In order to facilitate the survey administration, volunteers from Imperial College translated the survey instrument into Swedish, Italian, Spanish and Chinese. After one-reminder, fifty-eight completed questionnaires were returned resulting in a response rate of 21%.

4. Survey structure

Following the review of relevant literature and a number of pilot interviews[2], conducted in order to (i) assess the relevance of questions to fleet operators and organizations and (ii) identify any problems with the survey instrument, the questionnaire survey included the sections below:

Table 1: Structure of fleet operators' survey

Section A	Questions on the organization's fleet
Section B	Use of alternative fuel vehicles and fuels in the fleet
	Use of bio-ethanol vehicles (FFVs) and fuel in the fleet
	Perceptions of FFVs performance and experience with FFVs
	Determinants of past purchase decisions
Section C	Determinants of future purchase decisions
Section D	Elicitation of fleet operators' knowledge of and information on biofuels and bio-ethanol
Section E	Fleet operators' socio-economic information

5. Descriptive statistics

5.1. Profile of fleets

Our sample consists of twenty-eight public/government fleets (48.3%) and thirty private/company fleets (51.7%). The majority of organizations (44.8%) have fleets with one to five vehicles in total, while there is also a significant number of organizations (13.7%) that have between one-hundred and three-hundred vehicles in their fleet. Details about the fleet size of organizations are presented in Table 2 below.

[1] Since the target group of the survey was fleet operators that had some experience with ethanol vehicles, fleet operators were sampled once they had ethanol vehicles in their fleet resulting in different sampling periods during the survey.
[2] Pilot interviews of fleet operators from Somerset County Council

Table 2: Fleet size

Number of vehicles	% of organizations
1 -5 vehicles	44.83%
6 – 20 vehicles	12.06%
21 – 40 vehicles	13.78%
41 – 100 vehicles	5.16%
101 – 300 vehicles	13.77%
301 – 1000 vehicles	5.16%
> 1000 vehicles	5.16%

Regarding the type of fleet vehicles, from Table 3 below we can see that there is some variety in the fleets, with almost all organizations having cars in their fleet, while approximately one-quarter of organizations have also vans and trucks in their fleet.

Table 3: Types of fleet vehicles

Type of fleet vehicles	% of organizations
Car	96.55%
Van	27.60%
Truck	24.14%
Bus	8.62%

Fleet vehicles are used for different purposes, with transportation of people (e.g. taxi companies) and use by employees being the most popular (65.5% and 43.1% respectively). In addition, approximately one-fifth of organizations use their fleet vehicles for products' pick up/delivery and other services (Table 4).

Table 4: Types of fleet vehicle usage

Type of fleet vehicle usage	% of organizations
Transportation of people	65.52%
Employee use	43.10%
Transportation of products	20.70%
Other services	17.24%

In terms of the presence of alternative-fuel vehicles (AFVs) in the fleets, 91.3% of fleets have at least one AFV in their fleet, with half (50.9%) of the organizations having only ethanol vehicles in their fleet, while the rest of organizations have a variety of AFVs in their fleets, apart from ethanol vehicles, with the most popular being vehicles running on biogas and hybrid-electric vehicles. One-fifth (22.65%) of the organizations has ethanol vehicles and one or two other types of alternative-fuel vehicles, while seven percent of organizations have five different types of AFVs, with one of them being flexi-fuel ethanol vehicles (Table 5). In addition, 87.93% of fleet operators had driven an AFV.

Table 5: Fleet AFV composition

Type of fleet vehicles	% of organizations
Only ethanol FFV	50.90%
Ethanol & 1 other type of AFV	15.10%
Ethanol & 2 other types of AFV	7.55%
Ethanol & 3 other types of AFV	18.90%
Ethanol & 4 other types of AFV	7.55%

Regarding the role of ethanol vehicles in the fleet, ethanol vehicles have replaced conventional vehicles in 79% of organizations and are mostly used for transporting people (72.9%) and by employees (39.5%) (Table 6).

Table 6: Types of ethanol vehicle usage

Type of ethanol vehicle usage	% of organizations
Transportation of people	72.92%
Employee use	39.58%
Transportation of products	10.42%
Other	12.50%

5.2. Profile of fleet operators

Table 7 displays detailed information about the professional characteristics of the sampled fleet operators.

Table 7: Summary statistics of fleet operators' socio-economic variables

Variable	% of fleet operators
Role of fleet operators	
Vehicle procurement	22.41%
Vehicle maintenance	22.41%
Vehicle maintenance & procurement	37.93%
Other	24.14%
Males	96.55%
Age	
< 25 years	0.00%
26 – 35 years	6.90%
36 – 45 years	31.03%
46 – 54 years	39.66%

> 55 years	22.41%
Years at job	
< 6 months	0.00%
6 months – 1 year	1.72%
1 – 3 years	17.24%
> 3 years	79.31%
Education	
Primary level	5.26%
Secondary level	35.09%
Undergraduate	35.09%
Postgraduate	24.56%

The overwhelming majority (96%) were male fleet operators and over 35 years old. Most were highly educated – over one-third (35%) had an undergraduate degree and almost one quarter (24.5%) had a postgraduate qualification. Almost eighty-percent of fleet operators have been more than three years at their current post, while their role in the organization varies, with 38% of them being responsible for both the procurement and operation of fleet vehicles and one-fifth (22.4%) of them being responsible for either only the procurement or operation and maintenance of fleet vehicles.

5.3 Knowledge and information about bio-ethanol

One of the underlying reasons that is advanced for targeting primary fleets for the growth of alternative-fuel markets is the assumption that fleet managers are relatively more informed about new technologies, incentives and legislation, through a variety of channels [2]. In order to examine this assumption, we asked fleet operators a number of questions about their knowledge of and information about bio-ethanol. The results suggest that respondents perceive themselves to be relatively or very knowledgeable about bio-ethanol (on a 1-5 scale where 1 = very little knowledge and 5 = a lot of knowledge), with nearly half (48.28%) of them stating that they have quite a lot of knowledge or a lot of knowledge (rating of 4 or 5), 3.5% reporting no knowledge of biofuels and 48.2% reporting some knowledge (rating of 2 or 3 on the knowledge scale). Effort put into acquiring information about bio-ethanol was measured through the stated total time spent going through this information and through the personal search effort invested by fleet operators. Over one third (34.48%) of fleet operators stated that they had spent more than six hours in total going through information about bio-ethanol, while 31% of them had searched for this information themselves rather than having it provided in their working environment.

Fleet operators stated a variety of information sources on biofuels and these are presented in detail in Table 8 below. As we can see, newspapers (55.1%), national and other local authorities (55.5%), vehicle manufacturers (46.5%) and workshops (39.6%) were the most popular information sources. When asked about their main source of information on biofuels, fleet operators stated that newspapers (14.81%) were in most cases their main information source, followed by car manufacturers (9.26%), the internet (9.26%), and colleagues from within the organization (7.41%).

Table 8: Fleet operators' sources of information

Source	% of fleet operators
BEST material	17.24%
Newspaper	55.17%
TV	37.93%
Radio	10.34%
Internet	32.76%
.Miljobilar (applies only to Stockholm)	32.76%
Brochures	32.76%
Workshops	39.66%
Vehicle manufacturers	46.55%
Fleet managers from other organizations	15.52%
Colleagues	20.69%
BFR material (applies only to BioFuel Region)	6.90%
Friends/Family	6.90%
National, regional, local authorities	55.56%
Other sources	8.62%

The main topics this information related to were the environmental impacts of ethanol vehicles (55.1%), the use of bioethanol fuel in transport (44.8%) and the use of biofuels in general in transport, followed by information on the purchase price and technology of ethanol vehicles (32.7% and 31% respectively). Table 9 below presents in details the topics that fleet operators searched information on.

Table 9: Fleet operators' main topics of information

Source	% of fleet operators
Biofuels' production	27.59%
Biofuels' use in transport	36.21%
Bioethanol production	25.86%
Bioethanol use in transport	44.83%
Technology of ethanol vehicles	31.03%
Environmental impacts of ethanol vehicles	55.17%
Price of ethanol vehicles	32.76%
Other costs (than price) of ethanol vehicles	10.34%
Incentive programmes to promote ethanol vehicles	20.69%
Legislation about biofuels' in transport	15.52%
Legislation about ethanol vehicles	8.62%
Don't know/remember	13.79%

Finally, more than three fifths (66.07%) of fleet operators had been exposed to positive information about bio-ethanol and more than half (55.17%) perceived this information to be useful.

6. Survey results

6.1. Experience with and evaluation of ethanol vehicles and bioethanol fuel

As mentioned in Section 2, our sample consists of fleet operators that have differing levels of experience with ethanol vehicles and can be considered as having enough experience with ethanol vehicles as thirty-six percent of them stated having ethanol vehicles for at least three years and one-quarter of them having ethanol vehicles for over three years (Table 10). These differing levels of experience with ethanol vehicles will allow us to explore the effect of experience on the perceived performance of vehicles.

Table 10: Years of experience with ethanol vehicles

Overall Experience	% of fleet operators
1 year	1.79%
2 years	5.36%
2.5 years	19.64%
3 years	35.71%
3.5 years	10.71%
4 years	16.07%

Overall experience with the vehicles was evaluated on a five-point Likert scale with ‘very bad’ and ‘very good’ at the two extremes of the scale. Most were pleased with their experience (41.6% and 35.4% of fleet operators rated their overall experience with the vehicles as ‘good’ and ‘very good’ respectively), while less than a tenth (9.5%) evaluated the vehicles as ‘very bad’ or ‘bad’ (Table 11)

Table 11: Rating of overall experience with ethanol FFVs

Overall Experience	% of fleet operators
Very good	35.42%
Good	41.67%
Indifferent	12.50%
Bad	6.25%
Very bad	4.17%

Ethanol vehicles (cars and buses) were evaluated against a number of criteria on a five-point itemized rating scale, where 1 represents ‘very bad’ and 5 ‘very good’ evaluation (Table 12). These criteria included different aspects of interest relating to vehicle performance, such as environmental performance, cost, user’s perceptions and fuel use.

The results show that ethanol vehicles were perceived by fleet operators to have an overall good performance, in terms of vehicle behaviour, silence while in operation and ease of start and environmental impacts. Moreover, drivers' and mechanic's perceptions were also positive when comparing ethanol to conventional vehicles. At the same time ethanol vehicles were rated lower compared to conventional vehicles in terms of their capital and operating cost, service intervals, refueling and fuel range, while fuel cost was given the worst rating compared to conventional vehicles.

Table 12: Rating of ethanol vehicles on 1-5 scale (1=very bad; 5=very good)

Criteria	Median	Mean
Environ. performance	4	4.27
Performance (acceleration)	4	4.00
Drivers' perceptions	4	3.93
Silence/Noise in operation	4	3.93
Mechanics' perceptions	4	3.81
Ease of start	4	3.44
Capital cost	3	3.31
Service intervals	3	3.13
Refueling infrastructure	3	3.02
Operating cost	3	3.00
Range on full tank	3	2.76
Fuel cost	2	2.26

When asked about the three most important and least important criteria when evaluating ethanol vehicles to conventional vehicles, fleet operators stated that vehicle performance, mechanics' perceptions and silence/noise while in operation had the most influence on their evaluation. Interestingly, fuel cost, operating cost and refueling infrastructure were viewed as the least important evaluation criteria. This result suggest that fleet operators are more interested in the performance and reliability of the vehicles and trust the mechanics without considering much the involved cost aspects of the vehicles, but at the same time might be an indication of a 'pro-environmental' behaviour and 'early adopters' attitude towards new technologies.

Table 13: Rating of evaluation criteria

Most important criteria	Least important criteria
Performance	Fuel cost
Mechanics' perceptions	Operating cost
Silence/Noise in operation	Refueling infrastructure

In order to elicit information on fleet operators' perceptions of bioethanol fuel, they were asked to state their level of agreement and disagreement with a number of statements regarding bioethanol's properties. Table 14 below presents in details the results of fleet operators' perceptions. Overall, fleet operators are aware of bioethanol's environmental attributes, production process, engine and start

properties, while at the same time they seem unsure about its safety aspects, such as being more/less explosive and poisonous than gasoline and diesel.

Table 14: Fleet operators' perceptions of bioethanol's properties

How far do you agree/disagree?	***Strongly disagree***	***Disagree***	***Unsure***	***Agree***	***Strongly agree***
Bio-ethanol burns cleaner than gasoline	0.00%	1.75%	10.53%	15.79%	**71.93%**
Bio-ethanol does not contribute to the emissions of greenhouse gases	15.52%	12.07%	8.62%	31.03%	**32.76%**
Bio-ethanol can be produced from starch, sugarcane and a variety of feedstock	0.00%	3.45%	5.17%	15.52%	**75.86%**
Bio-ethanol can harm the environment if it leaks out	24.14%	22.41%	**25.86%**	18.97%	8.62%
Bio-ethanol is less poisonous than gasoline and diesel	5.26%	7.02%	8.77%	35.09%	**43.86%**
Bio-ethanol is as explosive as gasoline	14.04%	10.53%	**31.58%**	15.79%	28.07%
Bio-ethanol can improve the energy effectiveness of the engine	10.34%	15.52%	24.14%	18.97%	**31.03%**
Bio-ethanol has the same start properties in both cold and warm climates	**50.00%**	20.69%	17.24%	3.45%	8.62%

6.2. Motivations behind past and future decisions

A number of considerations were rated by fleet operators in terms of their influence on their organization's decision to purchase ethanol vehicles (cars and buses). Table 15 displays these considerations and the respective median and mean values. *Past decisions* were influenced by a number of diverse considerations, with environmental motivations being the most influential, followed by organization's green image, social corporate responsibility and future availability of ethanol. The least influential considerations, as rated by fleet operators, were the existence of a second hand market for ethanol vehicles, future EU legislation and financial incentives. The rating of these considerations suggests that initial purchase decisions are mostly influenced by environmental considerations rather than 'practical' considerations (such legislation and finance issues), perhaps due to the limited effect of the latter during the period the purchase decisions were made.

Table 15: Rating of considerations influencing past ethanol vehicle purchase decisions on 1-5 scale (1=not important; 5=very important)

Considerations	**Median**	**Mean**
Environ. Motivations	5	4.33
Green image	4.5	4.18
Social corporate responsibility	4	4.02
Future availability of ethanol	4	3.79
Internal targets of organization	3.5	3.47
Future oil prices	3.5	3.31
Financial incentives	3	3.16

EU legislation	3	2.89
Second-hand market	3	2.66

Regarding *future purchases* of ethanol vehicles, fleet operators were asked whether their organization was considering the option of replacing a large number of their fleet vehicles with ethanol vehicles in the future. Almost one third (29.31%) replied 'yes' and one quarter (24.14%) replied 'perhaps', while a quarter (24.14%) stated that their organization was not considering this option. Of those that answered 'yes' or 'perhaps' to the above question, thirty-four percent estimated that it will take two to four years for this replacement to take place, while twenty-seven percent stated that it will take one to two years. Our sample results thus suggest that many organizations that are already using AFVs and in particular ethanol vehicles, do have a positive attitude towards bio-ethanol and are willing to invest more in ethanol vehicles and in a short period of time (Table 16).

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Table 16: Future replacement of conventional cars with ethanol FFVs

Time period	% of organizations
Less than 1 year	8.51%
1 – 2 years	27.66%
2 – 4 years	34.04%
5 – 7 years	2.13%
More than 7 years	0.00%

Fleet operators were also asked to rate three broad categories of factors, named 'environmental', 'financial' and 'regulatory', in terms of their influence on future purchase decisions. The results are displayed in Table 17 below and indicate that all factors were seen as equally important, with financial factors being slightly more important than the other two factors:

Table 17: Rating of considerations influencing future ethanol vehicle purchase decisions on 1-3 scale (1=not important; 3=very important)

Considerations	Median	Average
Financial factors	2	2.08
Environmental factors	2	2.06
Regulatory factors	2	1.72

In an effort to clarify further the determinants of future purchase decisions, fleet operators were asked to rate a variety of considerations in terms of their possible influence on their organization's decision to purchase ethanol vehicles in the future. Table 18 displays these considerations and the respective median and mean values. In this case and contrary to the factors that influenced past decisions (Table 15), we can see that legislation and cost-related considerations are the most influential. Legislation on air pollution, air quality and alternative-fuel vehicles is expected to have the most influence, followed by a number of cost-related considerations, such as lower fuel tax, subsidy on purchase price, tolls, exemption and free parking. In addition, in a separate question, fleet operators rated very highly the role of national, regional and local authorities in the promotion of ethanol vehicles and bioethanol fuel.

Table 18: Rating of considerations influencing future ethanol vehicle purchase decisions on 1-5 scale (1=not important; 5=very important)

Considerations	Median	Mean
Environmental legislation on air pollution and air quality	4	3.88
Simplified legislation/regulations on "clean" vehicles and fuels	4	3.88
Lower ethanol fuel tax	3	3.88
Dissemination of technical and environmental information on ethanol cars and fuel by regional and local authorities	3	3.55
Subsidy on car/bus purchase price	3	3.55
Cooperation with regional and local authorities for the promotion of ethanol cars and bioethanol	3	3.44
Exemption from paying tolls	3	2.88
Free parking for ethanol cars	3	2.66

6.3 Logistic regression

Two logistic regression models were estimated in order to try to explore the factors:

- that influenced the overall evaluation of ethanol vehicles, as stated by the fleet operators **(MODEL 1 – Table 19)**
- that are likely to influence future replacement decisions of conventional fleet vehicles with ethanol vehicles **(MODEL 2 – Table 20)**

Model 1 presents the factors that influenced the overall evaluation of ethanol vehicles, as these were rated by fleet operators. Overall, the explanatory power of the regression was high for a small-scale study, with a Pseudo R^2 of 64%. The results of the logistic regression (Table 19) confirm our expectations that length of experience with the vehicles (months or years) influences significantly and positively the overall evaluation of the vehicles. Moreover, the environmental performance (emissions) and the starting properties of the vehicles also have a significant effect, where better environmental performance and easier vehicle start increase the overall evaluation. Furthermore, the type of service the vehicles provide also has a significant effect and in particular, vehicles that are used by employees for their transportation individuals are evaluated higher. The type of information (positive or negative) the fleet operators were exposed to also affects significantly their evaluation, with more positive information resulting in higher evaluation. Finally, fleet operators' level of education is also an important factor with higher educated fleet operators evaluating higher the overall performance of ethanol vehicles. The latter results could have implications for the market-breakthrough of bio-ethanol, as the type of information that will be available on bio-ethanol, together with fleet operators' ability to process this information, will potentially affect the perceptions of decision-makers within organizations about the fuel and its possibility as an alternative fuel for transportation.

Table 19: Overall vehicle evaluation - Logistic regression

MODEL 1		
Variable	**Coefficient**	**(s.e.)**
Constant	-35.021	(16.73)
Vehicles' use by employees	6.862**	(3.91)
Length of experience with vehicles	0.435**	(0.22)
Type of information	5.417**	(2.71)
Environ. performance	2.821*	(1.58)
Ease of start	1.825**	(0.92)
Education	-2.842**	(1.41)
Pseudo-R^2	0.64	
Prob>chi2	0	
Sample size	N=46	
LRchi2(6)	32.41	

** Significant at 5% level; * Significant at 10% level

Model 2 presents the factors that are likely to influence future replacement decisions of conventional fleet vehicles with ethanol vehicles. Overall, the explanatory power of the regression was again high for a small-scale study, with a Pseudo R^2 of 54%. The results of the logistic regression (Table 20) show that considerations about future ethanol prices and fuel availability significantly influence future purchase decisions. In particular organizations that view future ethanol prices as one of the most important decision factors are less likely to replace more of their conventional fleet vehicles with ethanol vehicles, while organizations that are more interested in fuel availability in the future are more likely to purchase more ethanol vehicles in the future, perhaps due to their expectations of improved ethanol refueling infrastructure. Moreover, organizations that are satisfied with the current environmental performance of ethanol vehicles and have strong beliefs about the environmental advantages of ethanol over petrol are more likely, as expected, to purchase more ethanol vehicles in the future. On the other hand, concerns or doubts about the safety of ethanol (Level of agreement with the statement 'Bio-ethanol is as explosive as gasoline') affect negatively future purchase decisions. Again, the starting properties of ethanol vehicles play a significant role with improved starting properties influencing positively any further purchase decisions. Finally, fleet operators/organizations that are particularly interested in current and future clean fuel legislation are more likely to replace more of their conventional vehicles with ethanol vehicles.

Table 20: Future replacement with ethanol vehicles - Logistic regression

MODEL 2		
Variable	**Coefficient**	**(s.e.)**
Constant	-15.591***	(5.39)
Future ethanol prices	-0.866**	(0.42)
Future refueling availability	1.565**	(0.61)
Vehicle environmental performance	1.230**	(0.50)

Env. Advantage of ethanol over petrol	2.395**	(0.97)
Safety of ethanol	-1.204**	(0.55)
Fuel legislation	3.600*	(1.98)
Ease of start	1.932*	(1.08)
Pseudo-R^2	0.54	
Prob>chi2	0	
Sample size	N=48	
LRchi2(6)	35.4	

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

7. Conclusion

The results of the survey show that participating organizations were initially influenced by environmental considerations and issues like green image and social corporate responsibility when purchasing their first ethanol vehicles. Their overall experience with ethanol vehicles has been positive so far, with the vehicles being perceived as having good environmental performance and reliability and gaining the approval of drivers and mechanics as well. On the other hand, issues like fuel cost, refuelling infrastructure, range on full tank and capital/operating costs cause concern to fleet operators. Our results suggest that vehicle emissions' performance and reliability, the type of services the vehicles provide and the length of experience with the vehicles influences fleet operators' perceptions of ethanol vehicles, together with type of information (positive or negative) the fleet operators were exposed to. Fleet operators in our sample were mostly highly-educated and seemed to be relatively knowledgeable and informed about bio-ethanol, with a significant proportion of them having invested substantial effort to search for and investigate information about bio-ethanol. The significant effect of information and knowledge on perceptions underlines the potential of information provision and its implications for the market-breakthrough of bio-ethanol, as the type of information that will be available on bio-ethanol, will potentially affect the perceptions of decision-makers within organizations about the fuel and its possibility as an alternative fuel for transportation.

Considerations about future ethanol prices and fuel availability significantly influenced future purchase decisions. In particular organizations that were concerned with future ethanol prices were less likely to replace more of their conventional fleet vehicles with ethanol vehicles, while organizations that were more interested in fuel availability in the future were more likely to purchase more ethanol vehicles in the future, perhaps due to their expectations of improved ethanol refueling infrastructure. Moreover, organizations that were satisfied with the current environmental performance of ethanol vehicles were more likely, as expected, to purchase more ethanol vehicles in the future. On the other hand, concerns or doubts about the safety of ethanol affected negatively future purchase decisions.

8. References

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