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Consumers' Attitudes Related to Biofuel Use in Transportation

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ABSTRACT: This paper presents the results of a field survey to determine the attitudes of consumers (citizens) related to the use of biofuels in transport. Attitudes of citizens towards biotechnologies and renewable energy use to reduce pollutant effects on the environment are an important factor (and even decisive) in political decision-making necessary to develop new investments and the practical implementation of the proposed projects in the field of renewable sources. The aim of the study was to identify the attitudes of citizens (consumers) regarding follow specific issues: the identification of environmental attitudes and use of biofuels, exploring the connections between attitudes and actions declared effective environmentally taken and exploring attitudes towards authorities environmental policies. It was found that there is a favorable attitude for a massive use of biofuels in transport, even in the absence of relevant sources of information about the complexity of the effects of using biofuels in transport.

Keywords: consumer's attitude; survey; biofuels; transportation; environment.
JEL Classifications: C83; D12; L91; Q42

1. Introduction

The dynamic growth of human society in recent decades has led to the emergence of issues need to identify mineral resources, material and human resources required to achieve desired development goals. Human industrial activity has unfortunately not remained without consequences to the environment, health and social society, causing serious distortion (greenhouse effect, climate change and drastic short-term growth and globalization of epidemics, increase working staff mobility, cultural interference etc.) who extended immediate their effects on human society.

Awareness of the crisis in relations between humans and nature has been highlighted by the publication by R. Carson (2002) of the book "Silent Spring", which has led to increased attention and interest of policy makers, decision-makers and the general public to the environment problems. In concept the author, "the control of nature by man" expresses the essence of the human race arrogance. The author presents a range of results showing epidemiological and ecological effects of toxic chemicals and pollution emissions.

A number of international organizations and researchers have launched research projects to identify and understand the overall process of nature deterioration mechanisms. They have shown the correlation between economic growth and human populations and negative effects on environment (Ozturk and Acaravci, 2010).

EU makes continue efforts to reduce the effects of climate change and to establish a common sustainable energy policy. As part of this policy, each Member State must increase its production and use of renewable energy in electricity, heating and cooling and transport, to enable achievement of mandatory renewable energy quotas established (EC, 2010; EB, 2010). Transportation domain it is responsible for the emission of 23.1% CO2 in EU (OECD, 2010; Mariasiu, 2012), biofuels use for total or partial replacement of fossil fuels, is seen as a short-term solution to reduce the pollutant emissions negative influence on environment (EC, 2009).

Under the Directive 2009/28/EC on the promotion of the use of energy from renewable sources, this share rises to a minimum 10% in every Member State in 2020 (EC, 2009). Regarding the expand of biofuels use in the EU (from 5.75% share in 2010), the Directive aims to ensure the use of sustainable biofuels only, which generate a clear and net GHG saving without negative impact on

biodiversity and land use. Elaheh (2011) identified several factors influencing social acceptance of bioenergy in EU: lack of information; political uncertainties; sustainability of bioenergy; diversity in the supply chain and competition for new industries.

Each country should make implementation of European policies on the promotion of biofuels, by issuing specific laws in the field. However, besides the policy decision should be considered and social acceptance of new technologies by citizens (Krimsky, 1998; Oepen and Hamacher, 1999). Assefa and Frostell (2007) show that, ignoring citizens' belief can lead to delay implementation or development of community projects. Also, a positive social acceptance can lead to exceeding the quota imposed at EU level related to the percentage of use of biofuels in transport, with immediate and beneficial effects on the environment. In Romania, the study of social acceptance (consumer's attitudes) of the use of biofuels in transport is especially important, as Romania became a member of the EU only in 2007. Romania was obliged to harmonize domestic legislation with European legislation already passed. Regarding the issue of the use of biofuels in transport, EU directives have been transposed into practice without considering the citizens opinions. This paper presents the results of a market study relative to the consumer's attitude of biofuels use in public transport, based on methodology proposed and use by Raboca (2008). The study was conducted in northwestern part of Romania region (NUTS2 - RO11 code in EU nomenclature (Eurostat, 2007)), which consists of 6 counties, with an area of 34,159 km^2 and a total of 2,740,064 inhabitants (ADRNV, 2012). Further, investigation focused goals on three relatively distinct themes: the identification of environmental attitudes and use of biofuels, exploring the connections between attitudes and actions declared effective environmentally taken and exploring attitudes towards authorities environmental policies.

2. Experimental Procedures

The sample used for survey was one of convenience, with 1036 valid questionnaires collected in 36 sampling points in each county's capital considered in survey. A number of 22 field interviewers conducted data collection at period of March 22 to April 11, 2012.

• Distribution by sex and age

Because of adopted methodology applied to the selections of subjects, questionnaires were applied in the majority of male subjects (60.2%), women represent only 39.8% of all respondents. Subjects were aged between 19 and 70 years, mean age being 37.3 years (23.1% aged 19-25 years, 31.2% aged 26-35 years, 20% aged 36-45 of years, 16.8% aged between 45-55 years, 8.9% aged over 55 years).

• Educational and occupational profile

Considering the school graduated, most respondents are high school graduates with baccalaureate (37.4%), 22.3% have completed college, 11% vocational or apprenticeship school, 17.4% post-college studies or foremen school. Less represented categories are "primary school or less" (2.7%) and "postgraduate studies" (9.2%). From total of subjects, 63% of respondents are employed, 8.4% are entrepreneurs, 12.2% are students or pupils, and 10.2% are retired. Differences up to 100% are unemployed people, people who work at home (household) or other reasons (6.2%).

• Respondents income

Is below 250 Euro to 26.3% of respondents, 39.4% have income between 250 and 500 Euro, 15.4% have incomes between 500 and 1000 Euro and 2.7% have incomes over 1000 Euro. 16.2% refused to report income (standard deviation of statistic results 2.8%).

• Ethnic composition

For the respondents included in this survey, 91.2% declared themselves ethnic Romanian, 7.3% Hungarian, 1.2% German and 0.3% Roma (Gypsies).

• Criteria for sampling

Were chosen two types of sampling points: 24 gas stations and 12 urban transports stations; selected in the counties capitals of northwestern region districts. A number of 35% questionnaires were applied in the daytime interval of 8-12 hours, the rest in the time interval of 12-20 hours slot. A set of questionnaires was applied to a sub-sample of 100 professional drivers (9.65%), to the aim being to identify the perception about modifications in vehicle performance using biodiesel fuel.

3. Results and Discussion

1). Attitude of consumers concerning the environment and biofuels use

The attitude of people interviewed in connection with environmental concerns and use of biofuels was supplemented by a set of items related to general satisfaction related to living conditions and concern for their health (Figure 1, Table 1). 53.3% of respondents are satisfied and very satisfied with current living conditions, but 30.4% are dissatisfied and 16.3% very dissatisfied). At the same time, a majority of 71% is dissatisfied regarding the environment quality in their city (Figure 2).

Figure 1. Attitudes related to living conditions

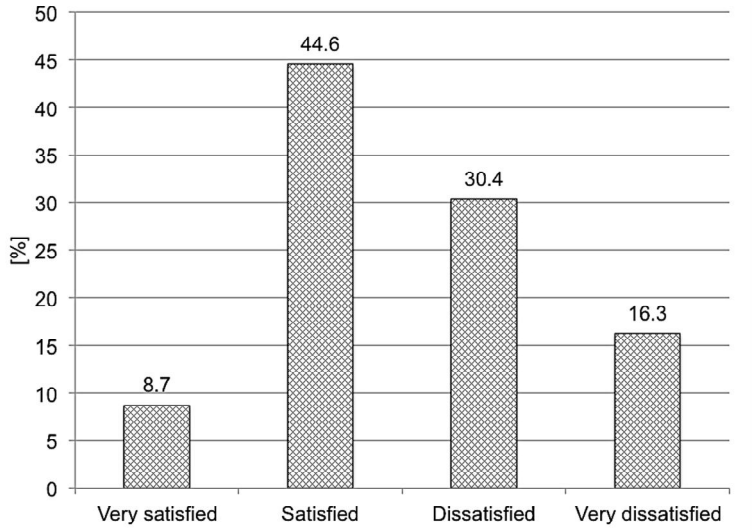


Table 1. The degree of satisfaction with actually living conditions

Are you satisfied with your current life?	Income category [Euro]					
	Below 250	250-500	500-1000	Over 1000	Don't know/NR	Total
Very satisfied	19.3	26.9	15.4	18.7	19.7	100
Satisfied	25	36	14.5	7.4	17.1	100
Dissatisfied	63	21.4	7.5	0	8.1	100
Very dissatisfied	63.4	22.8	4.9	0	8.9	100

In the category of very satisfied citizen with actually living conditions, 19.3% have incomes less than 250 Euro. The content citizens group is rather composed of persons with incomes up to 1000 Euro (42.3%), remaining category (over 1000 Euro) forming the difference up to 100%. The discontented are mainly those with incomes below 250 Euro. At least in declarative manure, environmental protection and quality is a concern for investigated citizens, the effects of pollution on the health problem being experienced by a large majority. On a scale in 10 steps, 87.6% are concerned and very concerned about environmental quality, at least in words (Figure 3).

A reverse correlation of environmental concerns with income level was identified; those with low incomes are less concerned about the effects of pollution on personal health (Pearson coefficient -0.189). Regarding awareness (information level), 70.3% believe they are less informed about the effects of using fossil fuels and renewable fuels (biodiesel) on the environment and 79% of respondents would like to know more about these effects (Figure 4). Of those who do not want to know more about environmental degradation and problems, most are those with low education or post-high school graduates. There are large differences among the interested parties according to the educational level graduated.

Figure 2. Attitudes related to environment conditions

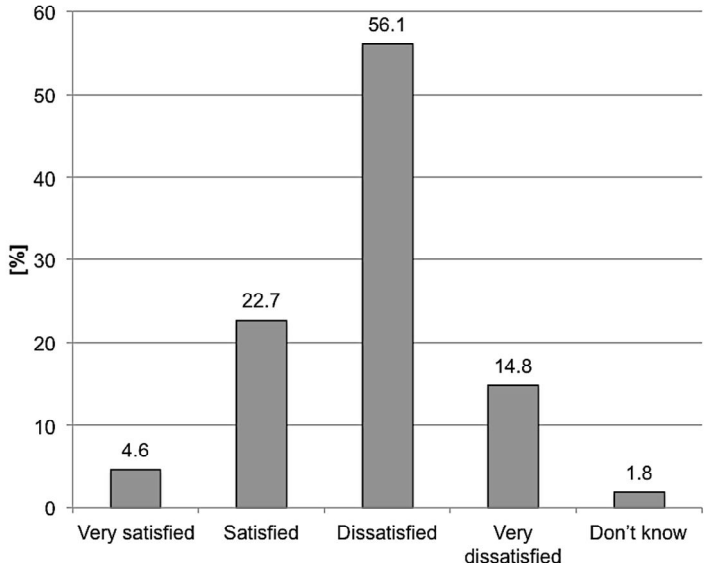


Figure 3. Attitudes related to environment quality

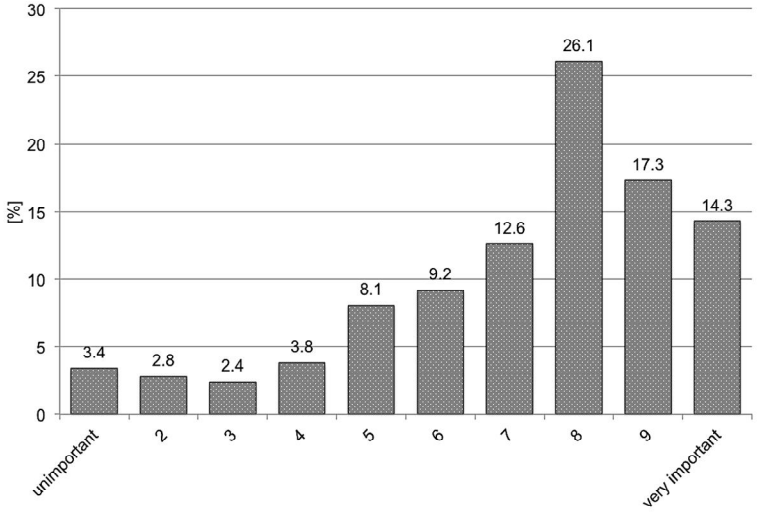
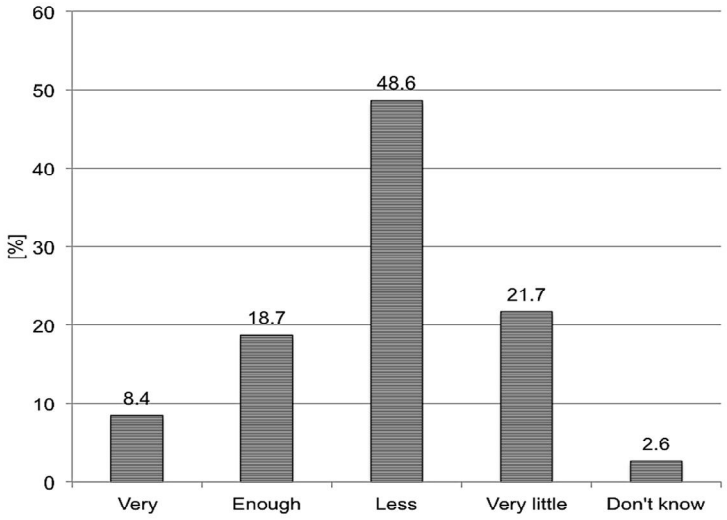


Figure 4. Awareness about fuels (fossil and renewable) use impact on environment



2). Attitudes related to biofuels

An 83% of respondents have heard about biofuels, 67% of from TV shows, 32% of the written press, and 28% via the Internet. Only 2.1% and 3.4% have heard about biofuels because of street advertisements or commercials. Alternative sources of information (10.2%) include school; work in a relevant field and private discussions with friends (or other persons). Attitudes towards biofuels are extremely favorable, 83.8% of those who have heard about biofuels are likely to use them and 92.1% would agree with their introduction in public transportation.

The next set of questions aimed at identifying possible positive and negative effects related to the usage of biofuels, both for city environment and also for citizens. Questions were intentionally formulated in open-response format, to capture the complexity and the degree of knowledge of responses. Positive effects were identified in terms of: "less polluted environment" and variations of this response as "cleaner air", "protecting the ozone layer" or "less emissions ";" lower cost"; better health; protecting agriculture; personal satisfaction and psychological comfort.

The negative effects identified in the area of concern were mainly to: higher costs of use, the altering the vehicle engine functionality / efficiency and accessibility to cheap biofuels. Instead, over 70% see no negative effects related to the use of biofuels (more pollutant emissions).

3). Availability to use biofuel in higher volumetric percentage in blends with fossil fuels

The set of questions aimed at professional drivers, was created to obtain information on the proportion of biofuel-fossil fuel blends used, changes observed at engine equipments at first use, and generally problems observed due to the use of biofuels. From the interviewed professional drivers, 86.4% used 5% biodiesel blend mixed with diesel fuel (even that at the gas stations all diesel fuels have already 5.75% biodiesel in composition!), while only 14.6% have used biodiesel in higher proportion (>30%). 63% use biofuel blends but they did not know how to specify the proportions used. Among the changes regarding the engine equipments, 11.2% have replaced the fuel filter in a shorter interval that using diesel fuel, 8.8% supplementary clean the fuelling system or adjusted the injection pressure. Regarding problems, only 7.4% of the professional drivers pointing them, mention the higher consumption and lower engine performance and efficiency.

4). Attitudes related to pollution taxation policies

A particularly sensitive item for Romanians environmental attitude is the introduction of supplementary taxes for polluting vehicles (Table 2). Among the subjects included in the survey, those who approve these measures regardless of cost are the older people (over 55 years) and younger (up to 25 years inclusive). People who would approve such measures provided (but the costs not to affect directly) are the age group of 26-35 years, while subjects in the 46-55 years group would not agree to such a measure.

The less favorable to the introduction of biofuels in urban transport are the age group of 46-55 years, who either did not agree or would agree to the conditions under which it would not affect financial while among those the group of over 55 years of age has the largest share of the measures agreement regardless of cost.

When asked about the willingness to pay more for biofuels use (Table 2) to ensure a less polluting transport and a cleaner environment, 55.5 % of study respondents said that they agree. Of these, nearly 30% would be willing to pay up to 2% more, 38.4% with 5 percent more, 19.2% up to 10 percent, and 12% to over 10 percent more (Table 3).

Was not observing a correlation between willingness to pay more for the price of biofuels and the "educational level" variable. However, university graduates best represent the undecided category.

Women category are in greater willingness to pay more for biofuels and thus to ensure a less polluting transport (Table 4). However, considering the volume of the women sub-sample category in the total respondents, the information should be treated with the necessary reserves. This availability decreases according to age; older people are less willing to pay for biofuels.

Among occupational categories, the most willing to pay extra for the introduction of biofuels are the employees, entrepreneurs and retirees (pensioners) (Figure 5).

Table 2. Attitudes related to pollution taxation policies (age category)

Are you agreeing to higher taxation of polluting vehicles?			Agree, no matter what the cost is	Agree even if they would pay more	Agree but no with personally supplementary costs	I'm not agree	Don't know/No response (NR)	Total
Age category [years]	19-25	% From age category	37.3	18.1	16.9	26.5	1.2	100
		% Total	11	5.3	4.9	7.8	0.4	29.4
	26-35	% From age category	33.8	20.6	25	20.6	0	100
		% Total	8.1	4.9	6	4.9	0	23.9
	36-45	% From age category	21.7	34.8	17.4	26.1	0	100
		% Total	3.5	5.7	2.8	4.2	0	16.2
	46-55	% From age category	34.2	13.2	15.8	28.9	7.9	100
		% Total	4.6	1.8	2.1	3.9	1.1	13.5
	Over 55	% From age category	39.6	23.1	12.5	22.7	2.1	100
		% Total	6.7	3.9	2.1	3.7	0.6	17
	Total	% From age category	33.9	21.6	18	24.7	1.8	100
		% Total	33.9	21.6	18	24.7	1.8	100

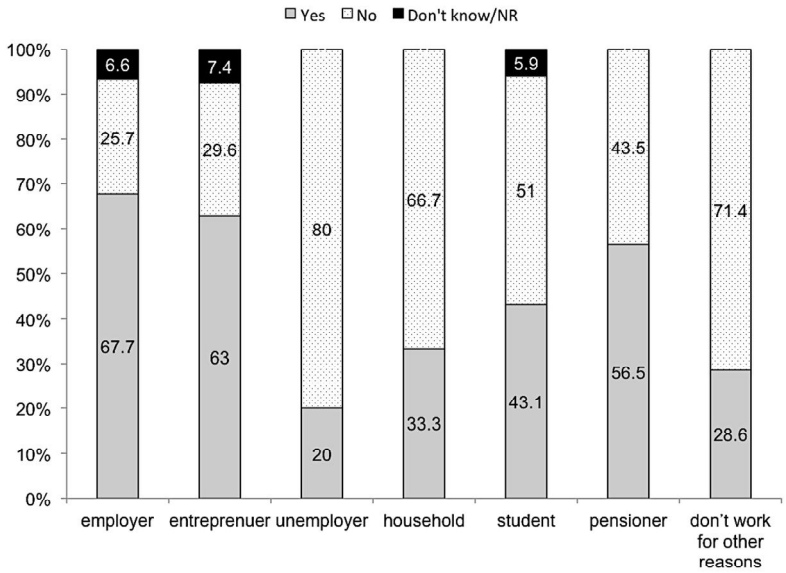
Table 3. Acceptance of additional charge for use of biofuels (education level)

Educational level			School graduated	Vocational or apprenticeship school	High school graduates with baccalaureate	Post-college studies or foremen school	Bachelor	Master and PhD studies	Total
You agree to pay more for biofuels to ensure a less polluting transport (for a cleaner environment)?	Yes	%	2.9	14.7	31.8	12.9	30.6	7.1	100
		% From Total	1.8	8.8	18.9	7.7	18.2	4.2	59.6
	No	%	4.1	10.2	41.8	10.2	27.6	6.1	100
		% From Total	1.4	3.5	14.4	3.5	9.5	2.1	34.4
	Don't know/NR	%	5.9	11.8	23.5	5.9	35.3	17.6	100
		% From Total	4	7	1.4	0.4	2.1	1.1	16
	Total	%	3.5	13	34.7	11.6	29.8	7.4	100

Table 4. Acceptance of additional charge for use of biofuels

You agree to pay more for biofuels to ensure a less polluting transport (for a cleaner environment)?			Yes	No	Don't know/NR	Total
Gender	Male	%	57.5	35.8	6.7	100
		% From Total	28.3	25.4	6.5	60.2
	Female	%	71.1	26.7	2.2	100
		% From Total	32.7	5.6	1.5	39.8
	Total	%	63.2	31.6	5.2	100
		% From Total	63.2	31.6	5.2	100

Figure 5. Acceptance of additional charge for use of biofuels (occupation)



5). Environmental policy and biofuels

Regarding the legislation on the environment and EU policies regarding the use of biofuels, 62.9% say they have no information but would like to know, 44.2% said they had little information (only 9.2% know a lot and pretty much) (Table 5). The general attitude is positive instead of environmental protection measures taken by the EU, 76% saying that environmental policies are needed to find new solutions (comparative to the 72% level at EU countries and 68% level for Romania. Correlated, 63% believe that the Romanian government should take necessary measures (according with the European Union legislation), while 23.6% believe that the Romanian government itself should take the decisions.

Surprisingly, the university graduates (32.2%) are among those who believe that EU environment policies are obstacles to economic development, while the category of those who believe these policies needed to find alternative solutions is best represented by high school graduates (31.6%). The explanation lies in the introduction of "age" variable, the youngest are more favorable and support the environmental policies promoted by the European Union (Table 5).

From point of view of occupational categories, most favorable categories to EU environmental policies are pensioners and entrepreneurs. Men consider these policies necessaries in greater manure than women.

Table 5. Opinions on EU environmental policies

The EU environment policies are ...		Educational level						
		School graduated	Vocational or apprenticeship school	High school graduates with baccalaureate	Post-college studies or foremen school	Bachelor	Master and PhD studies	Total
Obstacles for future development	%	4.1	13.1	26.7	23.9	32.2	0	100
	% From Total	0.4	0.7	1.8	1.2	1.9	0	6
Necessary to finding of new solutions	%	3.2	12.1	31.6	11.3	27.6	14.2	100
	% From Total	2.5	11	26.5	8.1	26.1	6.7	80.9
Don't know/NR	%	5.4	10.8	51.4	18.9	8.1	5.4	100
	% From Total	0.7	1.4	6.7	2.5	1.1	0.7	13.1
Total	%	3.2	12.7	32.3	15	28.2	8.6	100
	% From Total	3.2	12.7	32.3	15	28.2	8.6	100

3. Conclusions

This paper presents the results of a field survey conducted in the northwest region of Romania, having as theme identifying consumer attitudes towards the use of biofuels in transport.

The major conclusions that can be issued from the analysis of the field survey are as follows:

- Consumer attitudes towards widespread use of biofuels in transport to reduce pollution and protect the environment are a positive one.
- Consumer awareness related to biofuels remains low one; the main source of information is the mass media. It is necessary for academic environment to become a key information factor, to convey relevant information to the public about existing opportunities and threats through massive use of biofuels. Government and local authorities should undertake regular information and promotion actions related to the use of biofuels in transportation domain, to facilitate massive use of this type of renewable fuel by widespread consumer acceptance.
- It is found that with increasing education level of the respondents, the negative perception on the use of biofuels in transport increases. This is due to the additional knowledge that this group has: knowledge about the potential negative effects of lands use for industrial crops, the problem of "food vs. fuel" and increased NOx emissions (compared to fossil fuels).

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