ANALYSIS OF HUNGARIAN BIOFUEL SUPPLY CHAIN

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Abstract – Analysis of Hungarian biofuel supply chain
In the last century the increased energy demand of the world population is a huge amount and this trend is proceeding through the increased energy need of developing countries. The dramatically price growing of fossil fuels represents the fact that the traditional energy sources can't cover the energy supply of the whole world. Despite the repetitive conflict between food and fuel, use of agrofuels still topical question of nations.
The use of renewable energy sources is not only an obligation but also a source of opportunities. In spite of the fact that many nations implement them to the energy structure successfully and in a high measure, some countries couldn't use them in high quantity however its ecological manner would be optimal.
The subject of this paper is the biofuels which can (partly) substitute the fossil fuels in Hungary. During the last years, our country took some steps to stimulate the market of biofuels. This paper, using PEST analysis, focuses on the macro-economic conditions which can determine the success of biodiesel and try to connect with supply chain analysis. Using this two method it would be defined the source of risk which could affect the return of the invested capital to a biofuel unit.

Key words: bioethanol, biodiesel, PEST analysis, supply chain, source of risk

INTRODUCTION

By nowadays method and rate of application of renewable energy sources became a sphere of topics referring both to developed and developing countries. For the development countries they make possible the development of new industrial sector which can contribute to the growth of the gradually slackening GDP while developing countries can increase the rate of their self supply.
As the member of the EU, Hungary has to perform in the future with success in increasingly more fields, closely related to one another which may have fundamental effect on its competitiveness as compared to that of the nations to be found in the region.
Agricultural traditions, knowledge and experience which have accumulated during centuries may constitute an adequate starting basis for such fields as e.g. biomass utilisation, making possible the development of complex (small scale) energy systems. (Lakner et al., 2010)
In spite of the fact that numerous conditions (ecological potentialities, sources of support) are available for Hungary such changes which could significantly influence efficient and from economic point of view successful application of renewed energy sources are lacking till our days because of which fulfilment of the targets set as a member of EU because questionable. The system of market tools indispensable for the success could not only investments promote but also several advantages could be realized on makro economic and social level. (Popp, 2007; Laczkó, 2008)

MATERIAL AND METHOD

The main target of this paper to identify the source of risk through PEST analysis and to connect these factors with the elements of supply chain. Finally, it would be possible to prove them in the course of investment appraisal calculations.
Traditionally there are three current methods (PEST, five competitive force by Porter and SWOT analysis) to analyze the environment of an enterprise, to substantiate business strategy and to create the balance with external environment. A goal-oriented strategy is able to guarantee some competitive advantage in sector (Salamonné, 2000; Porter 2006; Kotler, 2002). In case of (agrarian) renewable energy sources, the role of PEST analysis rather to reduce the disadvantage in front of fossil fuels, to adopt to the traditional energy supply chain and to realize the expected positive effect, as reduction of greenhouse gases, additional revenues for farmers and other points (Popp, 2007).
General target of supply chain analysis is to identify the position of performers while the product gets to the consumer. Measuring the type and the intensity of relation between each performer, estimating the flow of information, it would be appointed the possible barriers of stock flow that could generate the rise of product, it is so called bullwhip effect. (Szegedi-Prezenszki, 2003)

RESULTS AND DISCUSSION

The PEST analysis was selected to search the four most important categories: **P**olitical, **E**conomical, **S**ocial and **T**echnical elements of macro-environment. During the definition of these factors, the target stills to emphasize the possible risk effects to an investment of biofuel plant.

Political environment

Under EU directives, the Governmental decision 2233/2004 (IX.22.) defined the target about the substitution of fossil fuels with biocomponent and its share must achieve the 0,4-0,6 percent – conversioned to energy equivalence - to 2005 and the 2 % to 2010. The Parliamentary decision 63/2005 (VI. 28.) modified the previous and it defined 2 % to 2007 and 4 % to 2010 regarding the same subject. The next Governmental decision 2058/2006 (III.27.) standed up for the whole original EU directive and made a new target: it must fulfil the common obligation without derogation. In the interest of the share of biodiesel achieves the 5,75 % in transport to 2010, it defined numerous arrangements for example:

- inspiration of biofuel through the taxation system,
- making of E85 fuel's national standard,
- starting on technological researches of agrofuels particularly supporting R&D(developing)&I(innovation) of the second generation technologies,
- extending the row material production and processing capacities for biodiesel.

The excise tax law was changed also: if the biocomponent content of fuel blend is minimum 4,4 % per unit volume the measure of excise tax will be lower, otherwise super-tax have to be paid.

1. Petrol:
   - 103,5 HUF per litre if the biocomponent content is minimum 4,4 % per volume unit,
   - 111,8 HUF per litre if the biocomponent content is less than 4,4 % per volume unit.
2. Diesel oil:
   - 85 HUF per litre if the biocomponent content is minimum 4,4 % per volume unit (B5 fuel),
   - 88,9 per litre if the biocomponent content is less than 4,4 % per volume unit.

In Hungary for the current mixture obligatory (4,4 % per volume unit) 124.000 tons of biodiesel is needed and to achieve the indicative target of 2010 183.000 tons of biodiesel have to be added to fossil fuel. Because of the blending obligations did not change, presumably the need to biofuels will not increase significantly.

Economic environment

In our opinion the line between economical and technical conditions is very thin that is why we considered "economical" effect which represents the agrarian sector, and "technical" which influences the biodiesel production and use.
The Figure 1. shows the most important agrarian indicators from 2000 to 2006. It can be seen that the share of employments shows an increasing trend. The cause of this phenomenon is the significant change which has taken place in the last then years in this sector. The structure of food industry transformed and it was followed by the farmstructure: some farms became bigger and at the same time a shrinkage of arable areas could be seen.

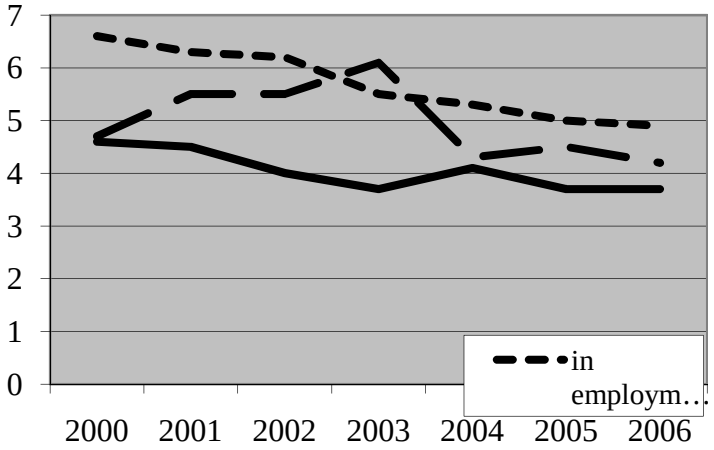

Figure 1: Agrarian numbers from 2000 to 2006
Source: Agrarian Statistic Book (2007)

The share of investments also shows a diminutions after an short growth which derives from supports of SAPARD programme. In way of biodiesel this is the most important category because it determines basically the technological and economical efficiency of production of biodiesel's raw materials and through it the price of biodiesel. The point of view of ecological effects the importance is obvious: the modern appliances permits the decreased use of the chemicals and pesticides and finally realize the sustainable land use.
The trend of GDP also increases but a very important connection should be noted: the agricultural production depends on the demand – in this context: on the demand of food industry – but if we account the outputs of related sectors the amount of GDP can be 12-13 percent. The main thing that the agriculture is the only which can fulfil positive foreign trade balance.

Social and cultural environment

The most important social problem which could affect indirectly and hard to the investment feasibility is the insufficient communication: the media report about some white lies or not enough professional news and people can't decide which the relevant information is. Often the negative behaviour to the biofuels stems from it.
According to survey of Domán et al (2010; *Table 1.*) the knowledge of biofuels became better from 2006 to 2009. An other important result of their research is the source of information: on the first rank is the television and the next is the internet.

Table 1. : Citizen's knowledge about biofuels in 2006 and 2009

		2006	2009
Elementary knowledge (relative prelevance, %)	Biodiesel	61,5	69,5
	Bioethanol	13,2	38,0
Elementary knowledge (percent of mention)	Biodiesel	36,8	35,6
	Bioethanol	5,1	15,5

Source: Own structure by Domán et al, 2010 p. 94-95.

Insufficient governmental communication and consequently insufficient social supporting. The typical example is the use of E5 (the fuel contains 5% bioethanol): people who have suitable car, sometimes don't choose this type of fuels because they don't have enough information about its effect for their car.

Technical and technological environment

On the one hand the technological conditions means the mount of usable raw materials and one other hand the implacable technologies.
In Hungary the (technology of) production of raw materials for the biodiesel production is eligible but the fluctuation is significant both of rapeseed and corn.
Behind these trends two traps for the biodiesel production can be found. Firstly, the unbalanced raw material production jeopardizes the return of investment capitals through the unstable biodiesel production and indirectly it is impinging to the food security and prices trough the animal husbandry. Secondly on the other view of the same problem: the significant fluctuation denotes the absence of an established (central) plan and these circumstances can't be a stabile found for biodiesel production.
The technological point in Hungary: the first generation technology is available but according the Hungarian Scientifical, Technological and Innovational Strategy (from 2007 to 2013) the research of second generation technologies is one of the national priorities. But in our opinion the firs element of technological success is the reliable material production.

Supply chain of agrofuels

The result of supply chain analysis and PEST analysis is designed by Figure 1. and it is contents also the derived risk that can influence to the return of invested capital in biofuel plant.
During the analysis of biofuel's supply chain it has to concentrate two main topic. Firstly the type of the market – which can be push or pull – defined the rhythm of producing based on the relevance and "quantity" of information.

In face of McComic-Kaberger (2007) and Rentizelas et al. (2009) the Hungarian supply chain is more simply as in developed countries. The production and logistics of feedstock are totally independent from the production of biofuels except contractual rapeseed or corn production. Basically and despite the increase of role of biofuels, the purpose of grain production is feeding for self-sufficient or export. This mentality reflects in the process of biofuel production: in one hand the vegetable oil industry produce refined raw material to biodiesel units to esterase it and in other hand the biofuel is produced in one step. In case of bioethanol, the alcohol industry is the producer.
The next performer of supply chain is the blender, who passes the biofuel to consumer through own infrastructure.
In Hungary the renewable fuel market not typical push market because the main stimulus to the production the governmental/political environment and partly the need of blender. To cover and to perform the commitment, the MOL Ltd. , as the only Hungarian blender, found its own biodiesel unit and that is why the statement above applies only to the independent producers.

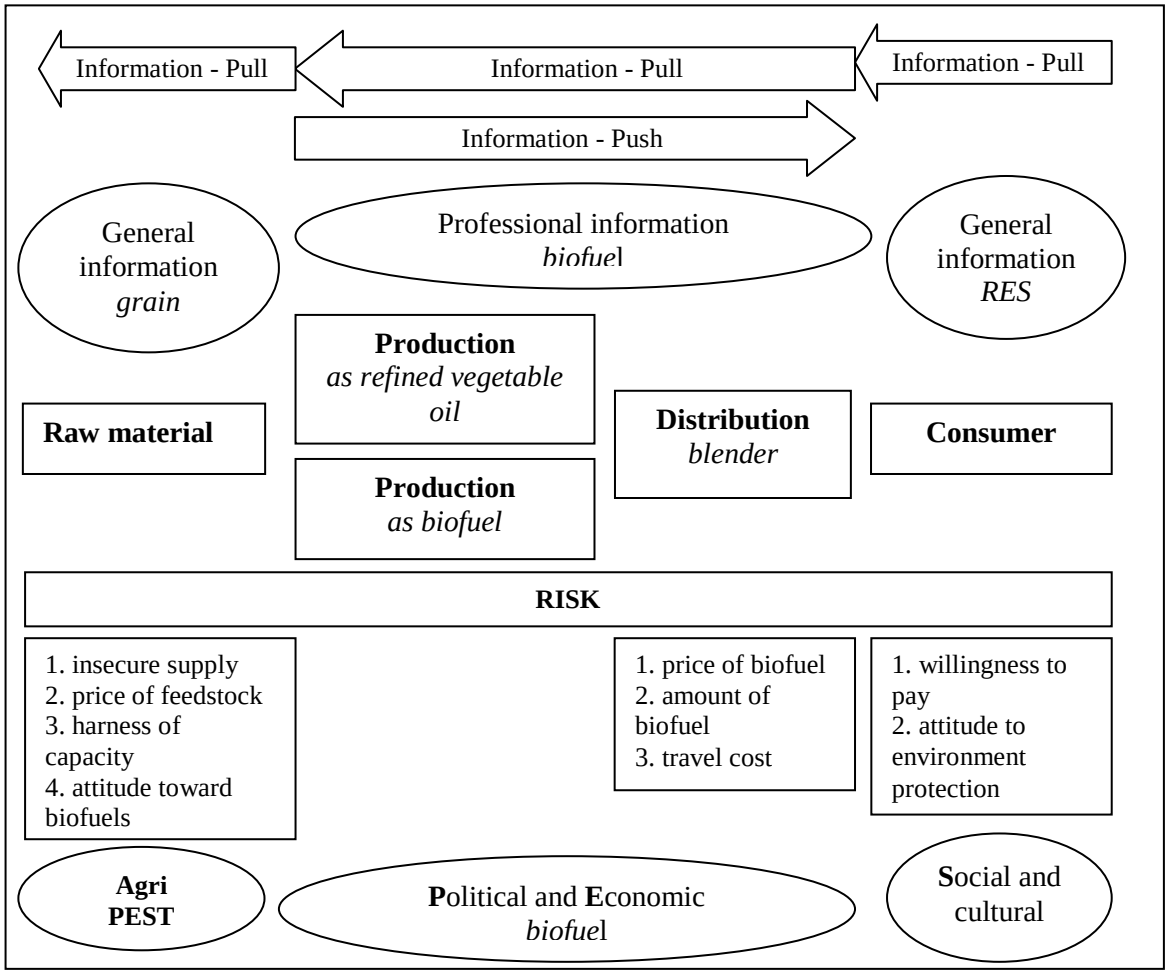

Figure 1. : The relation of supply chain, information flow and PEST analysis
Source: Own structured by Szegedi-Prezenszki, p. 358

To define the type of market, there is indispensable to analyse the flow of information. In case of push market the way of relevance could be persistent between producer and

contributor but it is hardly limited for consumer who see often only the change of price but according previous result of a survey they do not know the real contain ordinary fuels. An other main problem is the source of information of farmers who can base their decisions preferably on agrarian market not on energy market.
Elemental condition of evaluation of pull market structure is the consumer's strong attitude toward environmental protection, willingness to pay, well knowledgeable and risk-seeking attitude because use of renewable energy sources can ensure independence from supplier (electricity or gas) but it does not able to ensure the same security of supply.
On the one hand the blender has no information about consumers attitudes towards biofuels because the data about consumption does not reflect the potential purpose to get higher biodiesel or bioethanol content. On the other hand there is contrary interest: at the consumer the lower fuel price increases the willingness to pay for green fuels but at the blender higher fuel price induce additionally need for the biocomponent because (assuming average grain produce) it would be more economical than high fossil fuel content.
Absence of long term contraction induces that the stock accumulates at the biofuel producer not at the owner of infrastructure. An other occasion of atypical bullwhip effect is the change of legal/political environment which allows choosing about the share of blended biocomponent or the blender has to pay penalty.

CONCLUSION

1. In Hungary the food and fuel problem is not topical because of tradition of farmers and food industry. The main problem in view of a biofuel refiner is the harnessing of capacity that is made from the insecurity of raw material supply.
2. The type of information is not fit to the role of each chain's participants and that is why they can't optimize own decision in consideration of indirect effects: the share of blended biocomponent and the amount of biofuel producing is obligatory by the EU.
3. There need sufficient governmental communication which present the national target for every participant of supply chain and what do a part in success of sector. Finally through these complex programs could decrease the informational disharmony and evaluate a hard social supporting which could mean growing demand.
4. These phenomenon can be considered during investment appraisal studies of biofuel production plant as qualitative risk factors, and there can be precisely represented effect that were denoted by only hypothetical percents in sensitivity analysis.
5. The only numerical referred and usable factor is the excise tax and the conformation of the price of crude oil. The producer or the investor can prognosticate the prospective demand (if it independent of blender) using these two economic component of blender's decision and finally the bullwhip effect generate lesser stock aggregation and the risk from produce could be minimize.

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