Small scale ethanol production-

Study on micro and macro economical efficiency

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Abstract

Exhaustion of the stocks of tradition energy bases, increasing demand on energy, enhancement of atmospheric concentration of greenhouse gas effect mean also hence toward global challenges where works directed to their solution can not come to a sudden stop in spite of the economic crisis.

The fictions price decrease and demand decrease originating from it which may to experienced on the mineral oil market as well as the restricted national system of tools for subsidization may throw back the earlier high-rate of growth.

The subject of the present study is meant by Hungarian application of bioethanol, which may be ranked amongst agro fuels of first generation. The production in small scale system is justified by the possibility of reaching the optimum of logistic costs of the basic material, end- and by-products. Further by the possibility of the development of regional – and through this, the national equilibrium of annual breeding crop production and food supply. As another advance, it may be mentioned that a low capacity plant (up to 10 t/year output) can more elastically adapt itself to macro-environmental changes and by means of supplementary technologies (biogas power plant) may be transformed into self-supplying unit from point of view of energetics. Taking for basis a system keeping in view complexity requirement features of return of investment. The fluctuation of demand associated with the change in price of mineral oil means the connecting link between the macro and micro economic sides: in the former case its effect on the return of investment utile in the later justification of implication and effects of tax proceeds on constituted the subject of the analysis.

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.

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.

The present work constitutes a part of such a decision preparing and subsidization system that may mean a point of support for development of bioenergy system sustainable from economic point of view. Subsequently to the quantification of external effects, however a model taking into account even ecological aspects can be developed.

International outlook

From the mid-90s developed countries could control over production of the agrarium by means of increasingly greater sources in order to reduce these accumulated stocks may initiate enhanced production of bioethanol and biodiesel.

Attacks, which can be experienced on our days can be traced back to the turning about of the ratio of offer to demand: energy industry responded to the possibility offered as the result of state (federal) supports set up a claim fast to goods on stock for nutritional purposes, subsequently seemingly to a past of areas maintained for the production of crops for nutritional purposes, while in case of countries the number of hungers and undernourished people increased. By means of this contradiction can the resistance be explained which makes responsible for the rate of food crisis to be experienced nowadays the spread of agrouels[1]

Of the two biofuels, getting to commercial turn over in our days, ethanol is the most severely criticized: it uses crops of such a high starch content which are rated as essential food for the most indigent social layers in many countries of the world (the most important crops are corn, sugar cane, cassava) thus partly more limited availability because of the decreasing stock partly increase on market prices may came significant problems. In the year of 2007 the United States (26.500 million liters), Brazil (19.000 million liters) and EU (2.253 million liters) were the three most important producers of the world while Brazil uses the greatest quantities (FAO, 2008). In spite of the fact that even the EU produced at significant rates in 2007 and enhancement of the production is taking part in the scenario of several European and international organizations (Figure 1.) of the biofuels because of the structure of fuel consumption the use of biodiesel was more expensive and it is to be expected that it will be so in the future too.

It can be seen that Germany and Spain in contradiction to the other countries indicated above, want to reduce both their production and consumption but at the same time in case of the former production is surpassed by consumption in the period under study. It is supposed that behind the changes may two causes be hidden.

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[1] According to the standing point of several experts among then also to that of the FAO, price decreasing role of bioethanol and biodiesel may be put approximately at 30 % in increasing food prices, while a greater difficultly punctualisable extent speculative capital movements may be beamed.

Once of them is that both countries intend to cover their future requirements from import of Brazilian and American ethanol which are significantly cheaper than the European biofuel: in Brazil the cost pro 1 liter of agrofuel amount to 8 us cent while in France to 25 (Berg – Licht, 2006).

Figure 1. : Bioethanol production and consumption by the European Union, 2006-2010
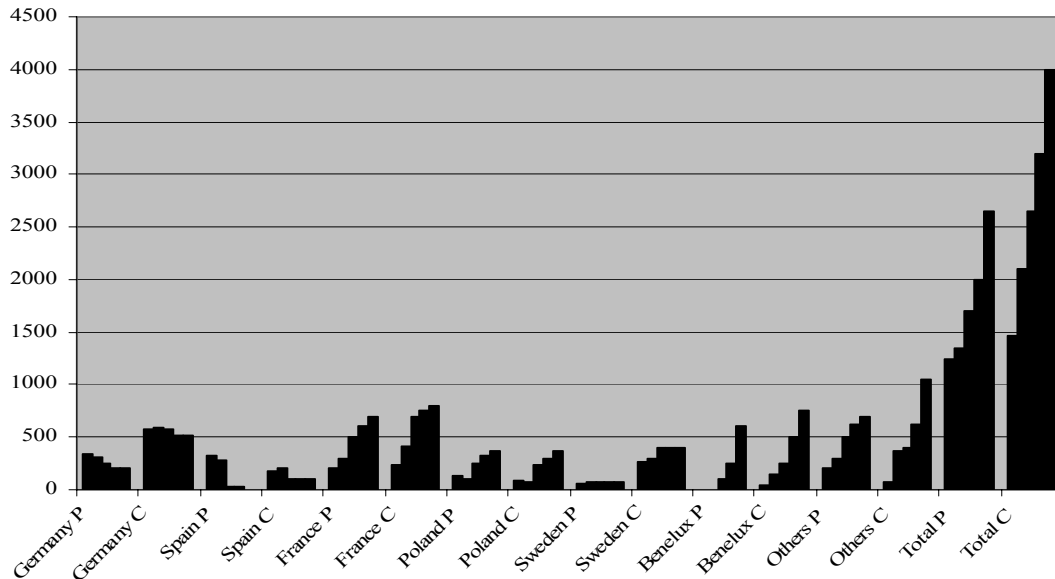
2006=revised, 2007-2008=estimated, 2009-2010=forecast; country P = production, country C = consumption.
Source: USDA, 2008

The other possible cause is the manufacturing of fuels of second generation of them BtL (Biomass to Liquid) may set to the foreground and production of biodiesel is possible.

Several misinterpretations originate from those badly communicated results which are directed toward estimations to determine a theoretical bioethanol (biofuel) poetical. In that case it all crops of the world suitable for ethanol production would be used for energetic purposes 57 % of the whole petrol use could be covered calculated in petrol equivalent (Rajagopal, 2007 in FAO 2008). It can be seen also from all these that whole substitution of fossil energy resources is impossible and above a certain rate it would be realizable at the price of great sacrifices only respectively. The problem is just ment by the determination of this rata. Several

plans, scenarios were complied till our days which are characteristically prepared a large scale for local decision makers national plans, guide members are often inconceivable.

Bioethanol in Hungary

In Hungary, following the II. World War 20 ethanol was intermingled under the name "Motalco", but later, because its role decreased form time to time, since petrol became cheap because of the historical background and relations.

Expectations on biofuels seeming sometimes to be exaggerated were caused by several events. Partly application of the proportion of intermingling obligatory in the EU but also the change in the structure of the agrarian sector may be more stressed.

The quota system referring to the production of field crops incidental to the Common Agricultural Policy of EU (CAP) structural transformation of supports change in operation of intervention as well as decreasing purchase prices on the average drew attention to non-food production and within this to biomass utilization. According to several decision makers and researchers, biofuels may contribute to a structural change which may improve income situation and life standard for a long term and by means of adequate planning of land use they may be share of the sustainable agrarium both from ecological and economic points of view.

Up to year 2004, two units produced ethanol: the necessary amount for the MOL Ltd. (single Hungarian intermingling company) was produced at Szabadegyháza by the Hungrana Starch and Isosugar Manufacturing and Trading Co. Ltd. just of all from corn while the Distillery Co. Ltd. of the town Győr produced ethanol by using sugar industrial by products (molasses).

In 2008, the position of supplier was acquired by the former manufacturer and it duplicated its production.

Upon the effect of powerful efforts of the Union plans of several processes came to light among them with the transformation of the sugar factory having been closed earlier following the privatisation. (Figure 2.)

In the course of planning for regions possess of breeding and ability making possible combined transport was significant capacities planned.

In spite of the fact, that public sources and relevant research results are available, up to the year 2008, with the exception of enlarging investments mention above realization did not occur. The reason for this is first of all immature market- and legislation environment, sales possibilities of internal markets are limited because of the out-of-date production technology the price of the goods may significantly surpass the price attainable in the neighbouring countries.

Figure 2. : Planned capacities in Hungary, 2006
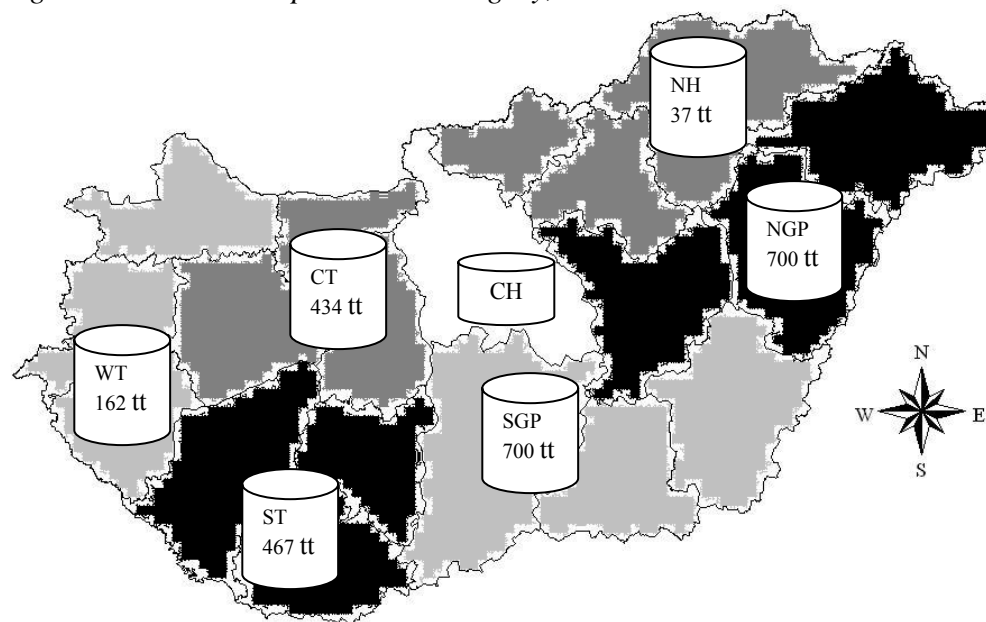
WT=Western Transdanubia; Southern Transdanubia; CT= Central Transdanubia, CH=Central Hungary; SGP= Southern Great Plain,NH=Northern Hungary, NGP= Northern Great Plain
Source: Own construction by Hingyi et al., 2006

Also farmers are irresolute thus the selection of the corn variety is unspecific often grain for human consumption is processed. With regard to the fact that the proportion of immingling meeting public prescription amounts to 5,75 % and the quantity necessary for this (taking for basis expectable fuel consumption) may mean a need of 144 thousand tons, plan calculated with significant expert as it will be shown by the examination it be presented below by means of processing corn produced under circumstances of the presented agricultural structure Hungarian

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ethanol can be made competitive at the price of great sacrifices only if at all. In this study our aim was to examine that under conditions of the present system tools which are the economic indices characteristic of the investment of a bio ethanol plant further effect of the regulation of the presently valid revenue-based tax on macro level was examined.

Material and methodology

In the study a cash-flow calculation applying the calculation mode of net present value served for basis for a model making possible micro economic examination. By the aid of this also basic and sensitivity examination were made. A case of dynamical calculation indices exclusively only cash-flow was taken into account while cash-flow calculation provided the opportunity to examine also the effect of rendered credits and amortisation. In the course of sensitivity examination of the changes in receipts in specially justified focus of the derived demand feature.

In composition of the cost however consideration of the raw material price is justified by the increase which task place in 2008 and by the effect of average yield and yield quantities fluctuating because of extreme weather conditions on the market price. It is a further argument supporting the importance that as EU member Hungary can not expect authorization of the production of genetically modified crops first of all resistant to climatic changes. It may be evaluated as an additional problem is this field that contractual cultivation of specific varieties for nutritional purpose gets to industrial utilisation.

It is one of the most important arguments supporting technological changes that according to the present trend of the changes in the animal breeding sector utilizing by products (DDGS) will not be demand on the whole resulting quantity and the cost of energy avoided by means of energy recycling may expectably more important than the income attainable by sales as animal feed.

In the course of the examination valid legal regulation was taken into account including accounting laws, determining the settlement of amortisation and revenue basis tax too.

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According to our opinion in case of the results not demonstration of exact numerical data rather presentation of the effect of changes in several factors in of essential importance.

Results

Firstly it had to define the optimal energy input combination which could prove the viability of combined technology. Analysing the energy flow during the production it can be counted the energy source contents which can assure the minimum total energy cost.

After the simulation the Table 1. shows the result. In the first way - to produce the potential income - the total energy need was satisfied from electric current and the whole production could be saled.

Table 1.: Input and output of energy demand

	Electric current					Use pellet and biogas electricity		
	Output	Income		Input	Cost	Input	Cost*	Income**
Bioethanol	10.000 t	88%	Steam	27.689 t	83%	3542 t	15%	100%
			Electricity	0,7 MJ	4%	0,7 MJ	100%	17%
Pellet	8.450 t	8%	Electricity	2,7 MJ	13%	2,7 MJ	100%	26%
Bg-Electric energy	4,6 MJ	4%						
Bg-Thermic energy	not for sale							
		100%			100%		29%	93%

*Source: Own calculation, 2009 (*Compared to electric current, **Compared to potential income)*

The second way was: the total pellet production can be used for ethanol steam and electricity need and for pellet production too. In this variation 2 % pellet can be sold of 8.450 tons but the realized income would be lower than in the next case.

If the energy need could be guaranteed from own pellet and biogas electricity, the measure of the sacrificed income would be only 7 % but the costs would be 29 % compared both to the original version. This result could mean 180 million income sacrifices to 530 million cost reduction. In Hungary the consumption price is going to increase year by year but the commercial price was fixed in the law system and that is why this proportion will be more advantageous. Finally the 60 % income of potential pellet income can be achieved.

In the continuation of analysis we used the last combination.

With all three technologies, the project during the investment efficiency calculation did not show positive net present value in the time period (15 years) and the IRR and the DRR indicators were also unfavourable.

The first sensitivity work did not present important and special effects of raw material and income and it did not explicate the bad results.

There was an indirect component which modified in huge measure the numbers: it was the parity of Hungarian forint and the Euro. In the last year (2008) and the beginning of 2009, the relation of this two devise was very changeable and instable. In the base calculation it was used 240 EUR/HUF parity but when it was changed to 290 EUR/HUF the net present value become positive in the sixth year and the DRR indicator became to 1,61. In our opinion this condition is not sustainable in long term and when the rate of exchange is going to relatively stabile the 250 EUR/HUF parity can be real. When we connected the raw material price too, the result was interesting: the last parity combining with 10 % corn price decreasing which is an average market price (in 2008 the corn's price was more higher than anytime in the last ten years), the investment returned in the same time (seventh year) but the measure was minimal lower.

The subject of the macro economic method was the analysis about the potential tax advantages from use of ethanol as petrol addition. To 2010 in Hungary the 5,75 % share biofuel component in transport fuels has to be reached and for the successful achievement the rule would be modified: 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.

- 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.

This regulatory system is based on the feed in tariff system, but the process of procurement is founded on the method of tender.

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The financial advantage of feeder depends on the price of bioethanol and, because of its demand is derivative, the price of petrol is the key factor on the calculation (Table 2.).

It can be seen that the annual law does not support the higher measure blending of bioethanol and the company which has to blend the agrofuels is not enough motivated to do it. In the work it was presented than in some situation paying the extra tax is more economic than using biofuels and this is going to have a negative effect on the market and through it on the investment efficiency.

If the sold amount of ethanol decreases 10 % the time of return would be around 18 years and the unit would need a short time period credit to finance a part of operative costs.

Table 2.: Tax advantages from ethanol blending in Hungary

Price of petrol €/t	4,4 % blended ethanol		5,75 % blended ethanol	
	Tax advantage (€/t) (Bioethanol 1000 €/t)	Tax advantage (€/t) (Bioethanol 900 €/t)	Taxadvantage (€/t) (Bioethanol 1000 €/t)	Taxadvantage (€/t) (Bioethanol 900 €/t)
90	1,99	6,39	-10,30	-4,55
85	1,77	6,17	-10,59	-4,84
80	1,55	5,95	-10,87	-5,12
75	1,33	5,73	-11,16	-5,41
70	1,11	5,51	-11,45	…
65	0,89	5,29	…	…
60	0,67	5,07	…	…
55	0,45	4,85	…	…
50	0,23	4,63	…	…

Source: Own calculation, 2009

A huge problem is too that the export price is going to be higher with the transport cost, the timely stocking cost and the negative external effects are going to be realized during the transportation. These processes may neutralize the potential positive effects which originate of use of biofuels.

Conclusions

1. In these days in Hungary the price of bioethanol neither follows nor depends on the price of crude oil and that is why biofuels cannot compete

with traditional energy sources without governmental support (as it is in many EU's member state). Potential implement is e.g. modification and moderation of taxes for flexifules and of prices of cars which use it.

2. In spite of the potential brazil ethanol export, Hungary has to aspire to the development of (partly) internal supply while taking its direct and indirect effects for food industry and animal husbandry into consideration.

3. For undisturbed and equalized production it is indispensable to inform farmers about their possible role in the new agricultural structure, especially by developing agriconsulting system and with this process avoiding the conflict between the energy industry and the agriculture, rural areas and cities and other typical relations. The communication with farmers will help to make a new and special energetical crop structure and through it, the feedstock price will be stabilized and the risk of investment capital's return will be moderated.

4. To stabilize the market positions and roles, and the macro economic components as the EUR/HUF parity (or to take in the euro) are essential to attain the financial opportunities.

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PAPER:

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