



## Possibilities of evaluation of energy plant sector in agriculture

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### SUMMARY

The importance of energy plant sector – being one of the agricultural sectors – shows a growing tendency in the developed world, at the same time considerable competition exists on the energy market among the different energy sources and basic materials. The competition between the two major groups, the fossil energy sources and the renewable energy sources is present in all the energetic sectors, and the competition is also considerable among the energy sources used for similar energetic purposes. According to the directive of the European Council, Hungary is supposed to reach a 13% share of renewable energy sources by 2020 in the final energy use. The new National Action Program sets the target value of 107 PJ/year concerning the gross utilisation of renewables by 2020.

Agricultural conditions are favourable for energy farming in Hungary, along with its positive effects. Due to its complex and widespread relations, the present situation and future development of energy farming have a considerable effect on the other sectors of the national economy. The macro-economic evaluations of energy farming may highlight those factors that – either in negative or in positive direction – influence the present state of the sector and support the elaboration of the sector strategy.

**Keywords:** renewable energy, energy plant sector, competitiveness.

### INTRODUCTION

The share of renewable energy sources shows an increasing tendency in the world, and energy farming can play an increasingly important role also in the future of the Hungarian agricultural sector. It is indicated both in the mid- and long-term expectations of the European Union concerning the use of renewables and in the Hungarian commitments to increase the share of renewables in energy use.

The increase of share of renewables is both an international and national priority. Besides, energy import dependency could be decreased, and – not at last – the safety of supply could

be increased. All these factors underline that renewable energy sources are emphasized in the energetic development plans from the beginning of the new millennium; among the renewables the utilisation and the analysis of characteristics of biomass play an important role.

## MATERIAL AND METHODS

Several sources have been included and different viewpoints have been mapped for collecting and evaluating data concerning the research topic. During the research macro-economic evaluation methods have been used to support the elaboration of the strategy for the energy farming sector.

In the first phase of analysis different macro-economic factors – such as political and economic situation, social, technological, environmental and legal background – have been mapped with PESTEL analysis. In order to define further possibilities and limiting factors, the evaluation of the sector and the already established or potential competition factors have been revealed. Finally, the method of SWOT analysis has been applied to collect and structure the collected data and findings, to support the evaluation of the present state and future position of the investigated sector.

## RESULTS AND CONCLUSIONS

### *Analysis of the environment*

One possible method for the evaluation of the environment in a wider sense (macro-environment) is the PESTEL analysis. The method refers to the investigation of the significant macro-environmental factors (Political, Economic, Social/Socio-cultural, Technological, Environmental, Legal) and explores the present state and future development possibilities of the energy farming sector (*Bartek-Lesi et al. 2007*). Macro-environment provides a frame that cannot be influenced, what the investigated sector needs to adapt to.

The effect of **policy** on the energy farming sector can primarily be perceived through international and national strategies that aim to improve renewable energy sources.

In 2008 the European Council defined the following objectives: to decrease the emission of greenhouse gas effects by 20%, energy consumption should be decreased by 20% by 2020 compared to the prognosis, the share of renewable energy sources in the total energy consumption of the EU should be increased to 20%, gasoline and diesel use in the traffic should include at least 10% biofuel use (in energy value). According to the directive Hungary is supposed to reach a 13% share of renewable energy sources in final consumption by 2020. The new National Action Plan defines a target value of 107 PJ/year of gross renewable energy use by 2020 (*MET 2008, MND 2010*).

From the **economic** factors the current changes in agriculture and energetic considerably influence the situation of energy farming. Energy prices increased significantly in Hungary in the past years, at the same time energy consumption is continuously above 1100 PJ and this value is not expected to decrease in the near future. Almost 70% of energy use in Hungary originates from import; this value well indicates the dependency from the service providers. Development possibilities unambiguously refer to the increase of renewable energy sources; therefore the increasing tendency of biomass-based energy production is a favourable process (between 1997–2008 from 408 toe /tonnes of oil equivalent/ up to 1520 toe).

While the share of agriculture from the GDP reached 6.8% in 1995, by 2008 this rate fell back to 3.7%. Deepening the problem, the proportion of the main sectors in agriculture changed unfavourably: the total gross output reached 1621 million HUF in 2009, of which plant production reached 54%, the share of animal and animal products was 37%, and 9% came out from agricultural services and secondary activities (*HCSO 2010 a,b*).

The main objective is to increase the income-generating ability and competitiveness in agriculture, the production of energy plants can considerably support this objective.

Concerning **social and cultural** relations of the investigated sector it is very unfavourable in Hungary that environment-conscious way of thinking and living is still not popular or widely considered, mainly due to financial reasons. Consumer practices and habits concerning energy supply depend on the established and operating systems, and the influence of "demand on possibilities" is very limited!

Production **technology** and the technical conditions are mainly available; the available agricultural and forestry machinery base can be used for energy farming purposes. The technical background for the use of energy originating from renewable is also available; moreover, the existing capacities are not totally utilised. As the result of current developments heating units designed for small-scale or family use can be purchased; the efficiency of such heating equipments can reach 90%, but the switch to such technology is very expensive.

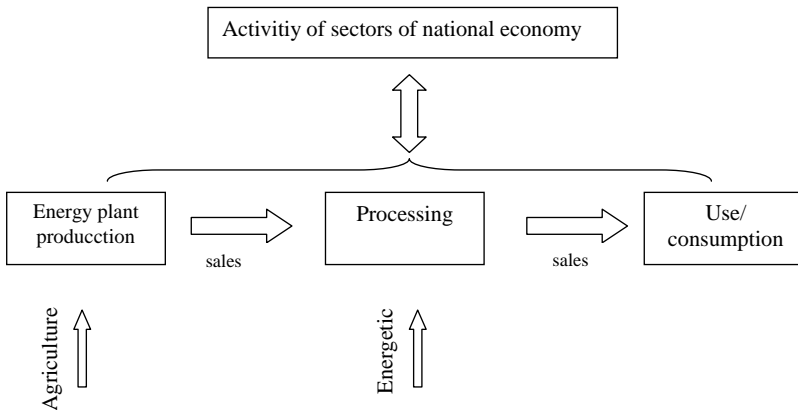
The importance of energy plants from **environmental protection** aspects can be primarily described by the rate of decrease of emission of dangerous materials originating from the use of fossil energy sources, whereas the decrease is the resulting from the use of renewables. It should be mentioned that some energy plants also have excellent organic melioration characteristics.

Investigating **legal** aspects it should be emphasised that the explanation of green energy, biomass should be accurately defined when we talk about renewable energy sources. At the moment the inaccurate definition or approach gives floor to processors to free explanations. As a consequence the increasing share of fire wood in heat energy production puts considerable pressure on silviculture.

### **Sector analysis**

The analysis of different sectors of the national economy highlights certain connecting points of energy farming. Energy gained can be used by almost every sector of the national economy, on the other side these sectors can be connected to the production process in several ways. Just to mention some connecting points: machinery and other equipments

used in the production and processing process, education that provides skilled labour, advisors working in the extension service, or for example banking services that are crucial in business financing, or the shipping industry at sales activities (*Figure 1.*).



*Figure 1.* Connection points of energy plants and the uniform sector classification system of economic activities (*Source:* Edited by the authors)

Energy plants are in direct contact with two major national strategic sectors, namely agriculture and energy industry.

The favourable agricultural conditions in Hungary evidently facilitate plant production for energetic purposes, improving profitability, employment in rural areas, and the utilisation of less favoured areas. Besides the positive factors the main conflict of interest between food production and land use for non-food purposes should also be mentioned, this conflict of interest affects producers and national strategy decision-makers as well. It seems indispensable that the balance should be found.

The outstanding development fields in energetic include renewable energy sources, and biomass is one among them. Production potentials – that are not utilised at the moment – should be used primarily for heat energy, in secondary form for "green power". The increase of share of renewables is both an international and national priority, besides environmental aspects, energy import dependency could be decreased, and the safety of supply could be increased.

### ***Competition situations, advantages, strategies***

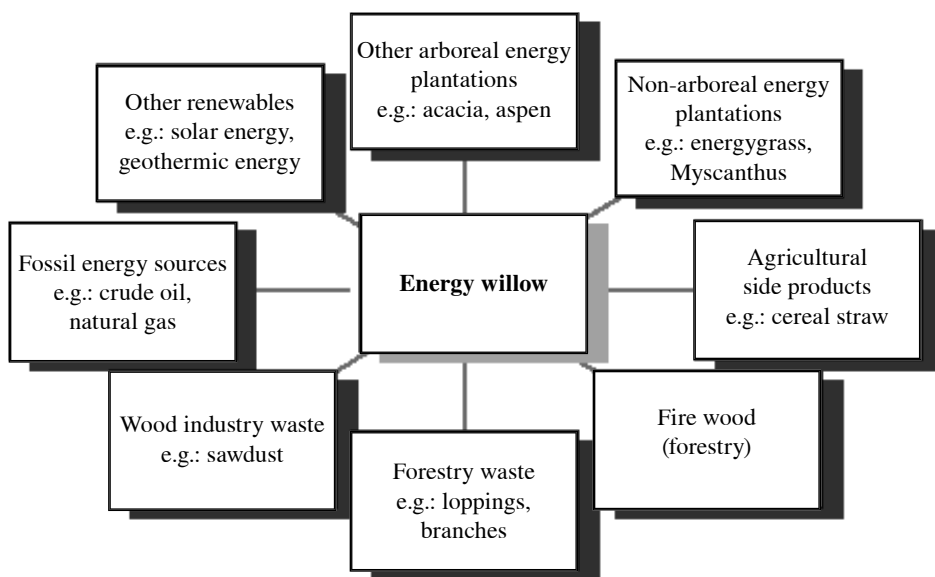
Competition in agriculture is present between the main sectors, within the main sectors and also among products.

Competition between the main sectors primarily is resulted from the use of resources. Plant production produces feed for animal keeping; therefore animal husbandry can affect the structure of plant production, the use of product considerably. Let's think about maize that can be used for energetic, industrial purposes and for feeding animals or straw that is a basic material for both animal keeping and heat production.

Within plant production – as one of the major sectors in agriculture – fierce competition exists for the use of land as a primer resource, but also for the use of further resources (e.g. labour, tools and equipments). On one hand the so-called traditional food and feed producing plant production sectors compete with energy plant production, on the other hand even within the energy farming sector the different plants, species compete. The level and strength of competition within energy farming is primarily defined by the direction of use, purpose of consumption. The competition is less important between oilseed rape produced for biodiesel and energy grass produced for heat energy, than between for example two arboreal energy plantations.

Concerning energy industry the competition is strong for the different energy sources. The two main groups, fossils and renewables compete in every energy sector. The example of electricity could be mentioned, where besides wind energy and connected heat energy, biomass also appeared.

The competition among energy sources used for similar purposes can be significant, as illustrated on *Figure 2*.



*Figure 2.* Substitutes to heat energy originating from energy willow  
(Source: Edited by the authors)

In the drafted competition situation, from energetic aspect the production cost of certain energy unit is the most important factor; production cost is affected by the procurement price of the energy source, further costs of processing, energetic parameters etc. At the moment production cost is an advantage for fossil energy sources, mainly due to the high investment costs of renewables. On the other hand if one considers the limited stocks and the low level of energy-sources in Hungary, another approach comes to focus.

The most important advantage that comes from differentiation is defined by the government strategy. Even if nowadays the processing of renewable energy sources is more expensive than of fossil energy sources, the government ensures the use of renewables with direct and indirect incentive tools in order to reach the long-term objectives. Such tools are for example the obligatory procurement balance circle and development supports; concerning developments in the main thermal power stations the effects of these factors can already be observed.

The problem is that this tempo is slower in the production of the basic material. The strategy exists and defines biomass as the main development field (having the highest potential in this renewable source), and according to statistical data biomass use increases year by year, but the questions is: from what basic material source? Considering the current situation of energy farming fire wood can be a basic raw material, but in this case the sustainability of sylviculture is endangered! Government regulation is needed to avoid similar anomalies in the production of renewables, and to provide advantage for the real "green" energy sources in the competition to encourage the spread in a wider scale. This way the reputation of energy plant production could be improve within the agricultural sector.

### ***SWOT analysis***

The method originates from business life and it is mainly used for strategy-making purposes; it is a tool used for the analysis of an organisation with open evaluation of the situation. The method can also be applied for the evaluation of an organisational unit, person, region, sector, project etc. with the main objective to prevail the current state of the subject of investigation, to define strengths or missing or underdeveloped phenomena. Besides, the analysis focuses on the affecting positive and negative external conditions and tendencies – threats and possibilities. Its function is to connect the evaluation of the situation with the definition of objectives and priorities by summarizing the situation in a well-structured form and by helping to select or structure the certain statements.

	<b>Positive factors</b>	<b>Negative factors</b>
<b>Internal factors</b>	<b>S</b> (Strengths)	<b>W</b> (Weaknesses)
<b>External factors</b>	<b>O</b> (Opportunities)	<b>T</b> (Threats)

### ***Strengths***

#### *Resources*

- The primer resource of production – land – is available.
- Technological and technical conditions are adequate. The available agricultural and sylviculture machinery base could also be used in plantations; furthermore, machine utilisation efficiency can be increased in case machines are used in dull seasons.

#### *Profitability*

- Supports: even 40–60% of planting costs of arboreal or non-arboreal plantations for energetic reasons (MRD 2007). Besides, producers are eligible for direct payments, or can apply for LFA support (Lukács Gergely 2009).

*Risk-decreasing factors*

- Demand for biomass increases continuously, purchase (procurement) needs are ensured on the long-term. The obligatory procurement of the secondary product (green current) increases sales safety.
- Appearance of integration systems.

*Utilisation*

- Production for own needs is encouraged by incentives to use renewables from agricultural sources, to decrease fossil dependency. Furthermore, thanks to technological developments, it is not only the power plants that have suitable equipments for effective use of biomass.
- Certain plantations (energy willow) offer solution to the environment friendly use of liquid manure from animal keeping, or wastewater from industrial or communal sources.

**Weaknesses***Factors that detain entrepreneurial activity*

- Low level of spread of use, few positive examples.
- Lack of information on producer level.
- Lack of advisory network.
- Transport costs are very high, energy density is low; therefore the distance of location of energetic use is a determining factor.

*Risk-increasing factors*

- The most important blocking factor of planting is the high investment cost.
- Own share of investments can be reduced with support applications, but only afterwards – such support projects require pre-financing from the investor.
- Concerning land-use aspects it should be noted that energetic plantations "occupy" the land for 15–20 years.

*Agro-technical requirements*

- The special production needs of certain plants concerning the production site (e.g. willow needs much water) or other agro-technical needs should be considered.

**Possibilities***Agriculture*

- Favourable climatic conditions, considerable un-used biomass potential.
- The traditional structure of agriculture widens, competitiveness improves.
- Employment in agriculture increases, in harmony with the rural development strategy.
- Significant sources from EU funds are available for production, processing, use and developments.

*Energy policy*

- The production of renewables contributes to the decrease of import; therefore the serious energy dependency can be improved.

- Facilitates decentralised energy supply.
- The limits of fossils can be increasingly observed in increasing prices, ensuring more favourable competition positions to the production and use of renewables.
- Highly developed technologies are available, further R&D sources are expected.

#### *Environmental protection*

- Undertakings to international and EU regulations should be fulfilled.
- The emission of dangerous agents decreases, in harmony with climate-political ambitions.

### **Threats**

#### *Conflict of interest*

- Concerning land use in agriculture for food or non-food purposes might result a conflict of interest. It is hard to define the balance and support level to ensure that energy farming only takes place in fields recommended for this purpose and not for food-production purposes.
- The opposition of salesmen of fossil energy sources is very strong.

#### *Finding the balance*

- Lack of balance between production and processing. Energy demand and processing capacities are considerably higher than the available volume; this difference seems to enlarge.
- Dependency on support system. The spread and development of the sector highly depends on financial supports.

#### *Regulations (supports)*

- Strict regulations and suitable supports are needed to ensure that biomass reaches processors (agricultural and silviculture side products, waste from wood industry, energy plants), meeting the defined objectives. (At present the majority of biomass refers to the traditional fire wood, endangering the sustainability of silviculture.)
- The transformation of the available technology, or new investments are extremely expensive, financing from own sources can be problematic. (For example to change from gas heating with existing gas network to biomass heating.)



## Az energianövény-ágazat elemzésének lehetőségei az agráriumban

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### ÖSSZEFOGLALÁS

Az energianövény-szektornak, mint mezőgazdasági ágazatnak a jelentősége a fejlett világban növekvő tendenciát mutat, ugyanakkor az energiaiparon belül jelentős verseny zajlik a különböző alapanyagot biztosító energiahordozók között. Két fő csoport, a fosszilis energiahordozók és a megújuló energiaforrások versenye minden energetikai ágazatnál jelen van, valamint jelentős versenyhelyzet alakulhat ki az azonos felhasználási irányú energiahordozók körében is. Az Európai Tanács irányelve alapján Magyarország felé 2020-ra 13%-os megújuló energiahordozó részarány-elvárást fogalmaztak meg a végfelhasználásban. Az új Nemzeti Cselekvési Tervben foglaltak szerint 2020-ra a bruttó megújuló energiahordozó-felhasználás célértéke 107 PJ/év lesz.

Magyarország kedvező mezőgazdasági adottságai kiváló lehetőséget kínálnak az energetikai növénytermesztésre, annak számos pozitív hatásával együtt. Szerteágazó kapcsolatrendszere révén az energianövény-ágazat helyzete és fejlődése komoly hatást gyakorol a nemzetgazdaság más részeire is. Az energianövény-ágazat makrogazdasági elemzései feltárhatják azokat a tényezőket, amelyek – pozitív, vagy negatív irányban – befolyásolják a szektor helyzetének alakulását és segíthetik az ágazat stratégiájának kidolgozását.

**Kulcsszavak:** megújuló energia, energianövény-ágazat, versenyképesség.

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