

Arboreal Energy Plantations In Hungary

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Abstract: In Hungary more and more expert studies base the increase of the proportion of renewable energy sources on biomass utilization. The favourable local natural conditions provide opportunities for large-scale biomass production. The aims of growing arboreal energy plantations are the following: production of a greater amount of fuel having good combustion characteristics in a short period of time at low expense. The clarification of the concepts and ranges of duties with respect to these plantations are necessary for them to be spread and accepted among farmers, as well as for the strain of supports. The legal control of the deployment, maintenance and stopping of the plantations is also important.

Keywords: biomass, arboreal energy plantations, Hungarian regulation

Introduction

Biomass can play a pronounced role in increasing the proportion of renewable energy sources and therefore in maintainable power generation owing to multi-faceted opportunities of application, and its continuously reproducible character.

The role of renewable energy sources and biomass energy in the process of production will expand significantly in the future according to European Union's plans. EU keeps the tillage cultivation with an energetic aim and the deployment of energy plantations in mind as a possible breakout point of the agricultural policy and rural development (Ámon *et al.* 2006).

In Hungary more and more expert studies base the increase of the proportion of renewable energy sources on biomass utilization. The favourable natural conditions provide opportunities for large-scale biomass production.

The increase in agricultural biomass production plays a crucial role in increasing the proportion of renewable energy used in Hungary. The increase in

the proportion of bioenergy utilization has a considerable effect on national energy import reduction and it is, also, an environmental protection, agricultural facilitation and country improvement task (Bohoczky 2007).

Considerable changes have occurred in land use and cultivation in Hungary in the last 10-15 years. There is a growing proportion of areas being withdrawn from agricultural cultivation. The tillage areas being recorded as unsown waste area are considerable. These areas create an opportunity to engage in activities not being aimed at food production, in this manner.

Plants which can be used for power generation can be divided into two groups. The first group consists of currently grown plants which can be used for power generation after an utilization reversal (for example silo corn and rape). The plants that have not been found until now in the alley growing system belong to the other group, exploitable for energetic purposes (Tar *et al.* 2005). These arboreal energy plants belong to the latter group.

Materials and Methods

Experiments related to arboreal energy plantations were conducted intensively some years ago in Hungary. The first larger deployments have occurred in the past years. The general provisions of the decrees were defined on the most important concepts of arboreal energy plantations. Moreover, the permit process regarding the deployment of these plantations, their deployment and cultivation, their stopping and the prices of these procedures are regulated by proper elaboration. The aim of our examination is to present the features and types of Hungarian energy plantations and summarize the experiences. We would like to highlight the substantive elements of the decrees concerning the plantations and their assessment, and to present relative Hungarian regulations.

Results and discussion

Arboreal energy plantations

Arboreal energy plants (energetic tree plantations) are substances used for energy tree production. So the energy tree is a staple product. The aim of growing arboreal energy plantations is the production of maximum amount of fuel having good combustion characteristics in a short period of time at low expense.

A number of tree species are suitable for the establishment of energetic tree plantations. The most important expectations of them include the following:

- their juvenile increase must be intensive;
- good combustion characteristics, high calorific value;
- they must utilize the soil and the local climate well;
- their handling and maintenance costs must be low;
- resistible against diseases, pests (low protective expenses);
- drought and frost tolerant, healthy trees (Gergely 2005).

So the species which are quickly growing and which ensure many offspring may be considered from the energetic viewpoint. These include, for example, the acacia, the poplar and several types of willow in Hungary (Table 1).

Tab.1. Some features of acacia, poplar and willow

Acacia (<i>Robinia pseudoacacia</i>)	Naturalized tree species. Light and heat demanding, quickly growing, producing many offspring. Well spread in Hungary. Intensively growing already at a young age. Buds well from trunk and root.
Poplar (<i>Populus</i> sp.)	The improvement viewpoints with an energetic aim differ from the previous forestry viewpoints in that high volume yield and good formal characteristics (straight tree trunk, limited limb-growing) are the important ones. These are demanding characteristics, considering their growing place. A rich nutrient content, good water supply and thick soil surface can result in a high yield.
Willow (<i>Salix</i> sp.)	Wet pistil place is necessary. Regularly wet areas (floodplains, polder areas, flood and flood-endangered areas) are the most proper locations. They show a low tolerance of periods of permanently high temperature and dry air.

The choice of adequate tree species, the planning of the growing and harvest technology occur with respect to users' demands at the time of plantations. Some heating plants demand defined quantity and quality of stock during their operation.

In Hungary, similarly with other late socialist states, there were insecurities and inconsistencies in the terminology used for plantations and in their legal classification in the past, since this new growing technology represents a transition between silviculture and agricultural farming (hence the common use of the term agro-silviculture in some countries). An accurate legal definition of the concepts and the development of a system of standards in the said growing were missing until now (Bai 2002). Detailed regulations have come into existence at the time of deployment of arboreal energy plantations in the recent past in Hungary.

Current Hungarian regulation concerning arboreal energy plantations

Because of an increased demand for trees to be used for energetic purposes, a rapid spread of energetic tree plantations is expected in the immediate future not only in Hungary, but in other European countries as well.

In Hungary, national and EU supports provide considerable support in terms of necessary sources of production. The clarification of the concepts and ranges of duties concerning the plantations for the support and legal control of the deployment of the plantations, their maintenance and stopping is necessary.

The aim of deploying arboreal energy plantations is facilitated by the 71/2007 (IV. 14.) decree, as well as by the 45/2007 (VI. 11.) decree of the Ministry of Agriculture and Rural Development (FVM), which regulates the permission of the

deployment, cultivation and stopping of arboreal energy plantations and administration service fees of these procedures by proper elaboration.

The general provisions of the 71/2007 (IV. 14.) decree on arboreal energy plantations define the most important concepts.

According to this decree, an arboreal energy plantation is defined as follows: a vegetal culture for obtaining biological energy sources from the growing of plant species defined by a separate law, on an area exceeding 1500 m².

The decree distinguishes two types of woody stem energy plantations: the offspring one and the cylinder one (Table 2).

Tab. 2. Types of arboreal energy plantations in Hungary

<i>Types of arboreal energy plantations</i> (According to the 71/2007. IV. 14. decree)	
<i>Offspring</i>	<i>Cylindrical one (replanting)</i>
Plantation consisting of species defined in a suitable, separate law which are improved for the energy-aimed utilization and which can be grown by offspring technology, where the cut turning of a plantation (production frequency) cannot exceed five years.	All arboreal energy plantations, which are not offspring and the cut turning of the plantation (producing frequency) does not exceed fifteen years.

Source: Own table based on the 71/2007. IV. 14. decree

According to the decree, the deployment of arboreal energy plantations can be made only with a permit. The competent Agricultural Management Office (MGSZH) accomplishes the permission of the deployment. The plan of deployment, the definition of the applied species, the ancestry-document of the reproductive material and a short description of the used technology have to be attached to the licensing application.

The Agricultural Management Office decides on the deployment permission according to these documents. If it allows the deployment, the farmer must report on the completion of the deployment and the future stopping. The farmer has to keep a workbook. The workbook must include the following:

- the entries of the works done based on the deployment plan;
- the indication of the applied technology;
- the manner of timber harvesting;
- the manner of stopping.

At the time of plantation stopping, it is necessary to respect the soil preservation viewpoints and the spontaneity stretch of the deployed plant can be excluded. The soil has to be restored to its original condition (like it was before the plantation).

The proprietary, whose arboreal energy plantations were deployed before the decree came into effect, must apply for permission to the Agricultural Management Office for subsistence of their plantation.

According to the decree (45/2007. VI. 11. FVM, which defines the deployment, authorization, cultivation and liquidation of arboreal energy plantations), to deploy an arboreal energy plantation only licensed qualified reproductive material

can be used, such that has been manufactured by a producer of forestry reproductive materials according to the 110/2003. X. 21. FVM decree.

The following plants can be allowed as energy plantations in Hungary:

- if they are acknowledged by a European Union member state;
- if they are acknowledged under any non-European Union international contract;
- if they are included in the national reproductive material source catalogue;
- if they are entered in the Community Plant Variety Office register;
- if they are included in the listed basic species (Table 3) which were officially acknowledged in Hungary.

Tab.3. Basic species allowed in arboreal energy plantations

<i>Populus</i> sp.	<i>Populus alba</i>
	<i>Populus nigra</i>
	<i>Populus x canescens</i>
	<i>Populus tremula</i>
<i>Salix</i> sp.	<i>Salix alba</i>
	<i>Salix viminalis</i>
<i>Robinias</i> sp.	<i>Robinia pseudoacacia</i>
<i>Alnus</i> sp.	<i>Alnus glutinosa</i>
<i>Fraxinus</i> sp.	<i>Fraxinus excelsior</i>
	<i>Fraxinus angustifolia</i>
<i>Quercus</i> sp.	<i>Quercus rubra</i>
<i>Juglans</i> sp.	<i>Juglans nigra</i>
<i>Acer</i> sp.	<i>Acer platanoides</i>

Source: own table, based on the data of the
(45/2007. VI. 11. FVM) decree

Short rotation energy plantation can be established only from poplar, willow and acacia. The proprietor publishes the declaration for the ancestry of the used reproductive material for poplar and willow, and the Hungarian Forest Research Institute publishes it for acacia.

European regulations on arboreal energy plantations

Regulations on the cultivation of agricultural energy plants differ between European Union countries due to the lack of standard regulation. Since the cultivation technology for arboreal energy plantations represents a transition between forestry and agriculture; it is termed "agroforestry" in many European countries. This field is not governed only by the energy policy but is also related through the support system to the Common Agricultural Policy (CAP) of the European Union (Tar *et al.* 2005).

The regulation of the European Union aspired to allow using only permitted, qualified reproductive material at the deployment. There are integrator organizations and farmers co-operatives in almost all countries where this field has been important

for ages (Sweden, Germany, Italy and Denmark). The relative production is being implemented according to long-term plans and contracts in these countries.

The first experiments with short-rotation arboreal energy plantations began in Germany, in Westfalen (around Hann. Münden) in 1976. The government favoured the completion of an interdisciplinary research plan at the beginning of the 1980's. The plan included a study on fast-growing, short-rotation species. The topics of this study were the following: technology, mechanization, outputs and thrift. In 1995, Germany decided to maintain agricultural areas as agricultural areas if people used them to grow short rotation energy plantations. To deploy plantations larger than 50 ha a special permit is needed in the country. Local governments regulate the deployment of plantations of up to 50 ha. They also define tree species which are allowed to be used for deployment (Hofmann 2007).

The growing of arboreal energy plantations and the experiments with them in Sweden began in the 1970's and were implemented on a greater scale in the 1990's. As income from food-plant growing decreased at the time, the Swedish government started to support the deployment of willow plantations.

The Swedish National Energy Administration allocates large funds to studies in the field of energy plantations (for example: development of mechanization, capitalization of technology). The "Alliance of the Swedish Farmers Cooperative" does the administrative work of the production. The production and the distribution of reproductive materials, the monitoring and the assignment of the production fields and the deliverance of optimal production technology are managed by some companies only, like Agrobränsle AB (Kohlheb *et al.* 2004, Larsson 2004).

The features of arboreal energy plantations in Hungary

Individual arboreal energy plantations have already exceeded the frameworks of experimental plantations in Hungary. Greater-scale deployments have been implemented in the vicinity of Hungarian power stations, given the fact that some parts of big power stations have switched to burn firewood, which means serious demand on the firewood market. The first few hundred hectares of energy plantations approach the first harvest.

The summarized features of the Hungarian plantations are given below:

- Deployments include a great tree trunk number (8-15 thousand trunks/ha);
- Cutting at the age of 2-4 years, repeated 5-6 times. Restoration is performed by offspring, so the life expectancy of the plantations can be 10-24 years depending on the technology used;
- The main energy plant of the soil periodically covered by water is the willow. Areas having a dry, low organic matter content offer an opportunity to utilize acacia (besides a lower increase vigour). Suitable yield can be expected on thicker surface soil or on soils covered by water. Prior to deployment, it is necessary to make a selection of the area to be used and to implement preliminary soil surveys;
- The energy yield per hectare is around 120-260 GJ/ha/year depending on the production conditions and the species used (Ivelics 2008);
- In most cases, the trade, automatic deployment, and harvest of reproductive material are scheduled and conducted by integrator organizations.

Avoiding the unknown technology temporarily sets back the stretch of arboreal energy plants. Hungary does not have any tradition in deploying energy plants so there is ignorance in the market and in support opportunities. Energy plantations should be deployed by farmers who own large areas of land and want to supply power plants with fuel, or who have their own heating plants (for example: local governments, enterprises) or plan to construct them.

Conclusion

Arboreal energy plantations are used to grow energy trees. They are aimed at time- and cost-efficient and high-rate production of fuel having good combustion characteristics.

These types of plantations were not used in alley growing until now in Hungary. Legal control is necessary for them to be spread and accepted among farmers. There were many insecurities in the past in this area. However, decrees on deployment, cultivation and liquidation of arboreal energy plantations appeared in 2007. Stopping the insecurities of the support system is expected to result in the rapid spread of these plantations in the immediate future.

Agrarian and forestry employment, transport, trade and industrial processing, which are related with the utilization of renewable energy sources, can create new workplaces in an area, and accordingly, contribute to the extension of rural income opportunities and help increase the maintenance power of the rural population.

On a large scale, modern technologies and reproductive materials can be already used in the cost-effective production of wood chips at current prices. This new purpose of land use in agriculture may be a solution to sales problems for the current overproduction in the future, and it may contribute to reasonable utilization of the soil and the production of marketable goods.

It is necessary to strive for minimum environmental pollution and avoid damaging nature during the process of deployment, maintenance, output processing and utilization of short-rotation arboreal energy plantations. It is necessary to minimize the emission of greenhouse gases and other harmful pollutants in the course of production, transport and utilization.

The requirement to deploy arboreal energy plants is an extensive regulation, which is nevertheless not too bureaucratic. Knowledge of the regulation system of different countries would be necessary to conduct further research in this field by recognizing and adopting some of the foreign instruments that can facilitate the domestic system.

References

- Ámon A., Kardos P., Kazai Zs., Perger A., Tóth N. (2006): Magyarországi fenntartható energiastratégia. *Tanulmány*, Energia Klub, 26. p.
 Bohoczky F. (2007): Az agrárium helye az energiafejlesztésben. *Agrárium*. 17 (10) szám. 24. p.
 Bai A. (szerk) (2002): *A biomassza felhasználása*. Szaktudás Kiadó Ház, Budapest.

- Gergely S. (2005): *Energiaerdők*. Magyar Gazda Európában, Raab Kiadó, Budapest.
- Hofmann, M. (2007): Energieholzproduktion in der Landwirtschaft. Hrsg. Fachagentur Nachwachsende Rohstoffe e.V. (FNR), Gülzow, 7-11.
- Ivelics R. (2008): Energetikai faültetvények telepítésének és betakarításának gépesítése. Konferencia anyag, *Energiaültetvények telepítése és hasznosítása*, 2008.04.04., Pusztamagyaród.
- Kohlheb N., Laki G., Podmaniczky L., Skutai J., Szakál F. (2004): Javaslat a megújuló energiaforrások gyorsabb mértékű elterjedését lehetővé tevő támogatási rendszer kidolgozására a mezőgazdaságban (közgazdasági, szervezési, szervezeti és jogi feltételrendszer), Gödöllő, KAC K-36-02-00114H, 7-9.
- Larsson, S. (2004): *Full scale implementation of short rotation willow coppice, SCR, in Sweden*. Agrobränsle AB.
- Tar F., Kárpáti Z., Marticsék J. (2005): *Megújuló energiaforrások termelésének és felhasználásának lehetőségei a mezőgazdaságban*. FVM, .
- 71/2007. (IV. 14.) FVM decree on arboreal energy plantations in Hungary.
- 45/2007. (VI. 11.) FVM decree, which regulates the permission for the deployment of arboreal energy plantations, i.e. their deployment, cultivation and stopping and the administration service fees of these procedures by proper elaboration in Hungary.

PLANTAŽE DRVEĆA ZA PROIZVODNJU ENERGIJE U MADJARSKOJ

- originalni naučni rad -

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Rezime

Sve veći broj stručnih istraživanja u Madjarskoj bavi se pitanjem povećanja udela obnovljivih izvora energije na osnovu iskorišćenja biomase. Povoljni prirodni uslovi u zemlji omogućuju proizvodnju biomase velikih razmera. Cilj osnivanja plantaža drveća za proizvodnju energije („energetskih plantaža”) jeste ekonomična proizvodnja veće količine goriva dobrih osobina sagorevanja u kratkom vremenskom periodu. Neophodno je u potpunosti razjasniti pojmove i obaveze vezane za pomenute plantaže da bi se one proširile na što veća područja i bile prihvaćene od strane poljoprivrednih proizvođača, kao i da bi se dobila podrška za njihovo osnivanje. Od značaja je i obezbeđivanje pravne kontrole rasporedjivanja, osnivanja, održavanja i zaustavljanje eksploatacije ovih plantaža.