THE ENERGETIC WILLOW SOLUTION FOR AGRICULTURE, ENERGY AND ENVIRONMENT

SALCIA ENERGETICĂ - SOLUȚIE PENTRU AGRICULTURĂ, ENERGIE ŞI MEDIU

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Abstract: *The numerous benefits of the renewable energy enjoy of a wide recognition – these contribute to combating the climate change, represent a secure reserve of energy and serve for long term of economic interests. The producing sectors of high-tech devices could take advantage of the new economic opportunities, as it develops technologies without emissions of greenhouse effect gases (or with low emissions), meant to value renewable resources like wind power, solar energy, hydraulic energy or biomass.*
In order to accomplish the objective to reduce the gas emissions with greenhouse effect with 20%, the European leaders agreed to establish some national objectives, which are mandatory from legal point of view for each member state.

Key words: *energetic willow, variety, soil, briquetts, culture, energy*

INTRODUCTION

Energetic willow, throught it's different types according to local pedoclimatic conditions is the answer to getting in a short time to very good yields of timber per hectare. With a productivity that can reach 40 tons / ha timber after 2-3 years, the energetic willow can provide the raw material for various applications in order to obtain compacted wood products such as solid biofuel (pellets, briquettes) or of direct combustion to produce heat and / or electricity.

With a little pretentious technology, and great adaptability to all types of soil, energetic willow can become the basis of sustainable business in Romania. Is supported by EU funding programs, such investments can be quickly promoted and implemented by farmers, especially on land that can not provide good returns for traditional crops of grain.

MATERIALS AND METHODS

The authors of the research used the following methods: data identification and collection, data process and analysis, data observation and interpretation.

RESULTS AND DISCUSSIONS

Swedish willow is taking place among our crops of potatoes and beets. It's not edible, nor has any decorative purpose. But it's very good to put on the fire, say those who have already done the test. Salix viminalis comes from Sweden and loves cold areas with moist soil. Grow amazingly fast, 3 cm per day, without asking for special care. And from the wood it is obtained the desired biomass, a great future fuel.

Investment per hectare does not exceed 2,000 euros. Once planted, willow cuttings produce for all life. And in two years, growers can achieve a profit of 2,800 euros per hectare. Costs are low, less work and risk zero. The plant is resistant and does not give farmers emotions. Unfortunately the authorities do not encourage this culture through subsidies. Willow wood is chopped, and then turns to pellets, which are used for heating stoves.

Romania, along with all European Union countries, has pledged that by 2020 to use a rate of 20% renewable energy. Biomass, with wind, hydro and solar panels - can be a solution.

The costs of plantation establishment mentioned initially include all costs of initial land preparation by providing services, and are valid for land left fallow. For land that was previously worked, costs are up to 2000 euros.

Salix are renowned for their speed of growth and carbon assimilation, on condition that plenty of water. This is the reason it is so widespread in meadow of Danube, Delta, and the rivers. If productivity of Salix viminalis culture is indeed the one mentioned, that is 30-40 tons / hectare per year on average, is very profitable, even in small areas for consumption and energy independence. The problem foreseen will be the monopoly established by the owner of the culture and harvesting

technology, or processor of pellets. As usual, the grower will be given a small profit margin, cream being taken by the pre-mentioned, like in the best tradition of this type of business. However, demand will be increasing, given as conventional fuel prices climb, and as an alternative clean energy and economic efficiency, I think it has an interesting future.

Biological properties of energetic willow. It can be cultivated (even recommended) on the slopes, in addition to water, wetlands continuous or periodic. Has a capacity of evapotranspiration of 15-20 liters of water per day. This advantage gives the quality of plant that can be used thousands of hectares of land that is derelict.

In addition, energy willow has the ability to take annual 20-30 t / ha of sludge coming from wastewater. So waste water doesn't need to be treated biologically (expensive operation), willow will be cleaning it.

In Sweden, the use of energetic willow as an alternative energy source has a tradition of 30 years and there are over 50 000 hectares planted with this tree.

Benefits of using energetic willow.

- Willow can be grown (even recommended) on wetlands, flood plains. Having high capacity of evapotranspiration (ca. 15 to 20 l / m 2) is used successfully settling wastewater (around sewage treatment plants).
- Has a takeover of 20-30 t / ha annual capacity of sludge arising from wastewater treatment.
- By cultivating willow is obtained electricity and heat.
- Because it contains salicylic acid, willow chip storage does not require to be closed. Within months the water content of the chips decreases to 14 - 16%, which allows processing them without artificial drying.
- The spread of the culture of energetic willow guarantees safe and clean source of energy, at the same time protecting forests of continue deforestation.
- The life of a plantation is about. 25 to 30 years, which, starting from the second year, in addition to harvesting does not require any other substantial intervention.
- crop harvesting is done with conventional agriculture machines (combines, tractors, trailers) in winter (November to March, after leaf fall) thus ensuring a better exploitation of the stock of machinery and labor.

- spread of energetic willow culture guarantees safe and clean energy source, but also protects forests also of continuous deforestation due to firewood cheap rush.

Energetic willow varieties marketed

Tora (EU 627). Tora is a Siberian willow species from crossing SW and Snake. Species have long branches and a trunk less to other species. The stem is dark brown and is glossy. Tora is often bent, inherited this feature from snake species. Bending may differ from year to year, depending on the weather and chemical treatment. Has a high production performance, which makes it a preferred species. Tora resists to pests and leaf rust. This species is not favored by wildlife, is avoided by rabbits and deer.

Tordis (EU 9288). Tordis comes from crossing species Tora and ULV. Develops exceptionally from the first year, (reaching heights over 4 m) in areas of southern Sweden and Poland. Also Tordis is leaf rust resistant species.

Sven (EU 11635). Sven comes from the crossing of Jorun and Bjorn. Sven has lanceolate leaves (face up), trunk straight with fewer branches, like the Tora. The species has a high production performance, as the Tora, resistant to leaf rust but pests prefers the shoots of this plant.

Inger (EU 11635). Inger comes from a cross between a Russian species (Novoszibirszk area) with Jorr species. Grows on dry soil better than other species. At harvest is drier than the Tora and increases due to higher number of secondary shoots. These secondary shoots are not very resistant and fall in the preparation of cuttings. Inger also resists to leaf rust and pests.

Jorr (EU 0626). Jorr is a Dutch species that resist leaf rust well. The species is characterized by rapid growth during planting. Plant with dark green stems and bushy is a "gray" but safe species. It is characterized by an average production and an average resistance to rust leaf. Jorr is used successfully in wastewater treatment, developing optimal in such environments.

Briquetting plant residues from agriculture. Have an agricultural farm or aqointances in agricultural association? Burn each year straw and other plant debris to clear land? Briqetting the waste and then sell briquettes obtained at a price of 250-450 lei / ton. You will be surprised to find that even make a better profit than selling main products (wheat, corn, soybean, rape)

- Briquetting plant residues from agriculture.
- Briquetting stalks of soy. beans
- Briquetting vine
- Briquetting rapeseed, mustard straw and corn stalks.
- Briquetting forest debris.

Briquetting is the mechanical or hydraulic compression of biomass for size reduction and achieving a compact product with a high calorific value. Briquettes forms differ from cylindrical to hexagonal and rectangular. From a ton of straw you get a ton of briquettes.

Calorific value of briquettes from plant waste is greater than the beech wood and make a saving of 60% compared to heating with gas and 40% compared to heating with wood. Costs of production of briquettes from straw or other plant debris is very low (up to 120 lei / t). Market is actually huge. Just think how many families use terracotta stoves or wood-fired plants. How many people would prefer to buy a ton briquettes ready for fire than 1.5 to 2 tons of wood you have to cut, break, etc. Export demand is also high.

ENERGETIC WILLOW (SALIX VIMINALIS "ENERGO"). With human concern for new and unconventional energy sources, research has been directed to various types of unconventional energy sources, to crops that can reproduce every year, and should represent an energy source as safe as possible.

Areas that have been tried and have achieved remarkable results are diverse, from solar, wind, heat pumps, and biomass. In agriculture, various plants have reached the list of those known as "Energo", such as rape, sugar cane, energy grass and different species as acacia, poplar and willow.

The most spectacular results were obtained in willow. If the remaining forest plants need 3-5 years before they can be harvested and used for energy purposes, willow can be harvested annually, with a timber volume of 40-60 t / ha of dry material.

Varieties grown for this purpose have main characteristics recorded as:

* an increase in very large-growing 3-3.5 cm / day
* are resistant to weather and various diseases
* have a high calorific value approx. 4900kcal/kg

BOTANICAL CHARACTERISTICS

Willows are dioecious woody dicotyledonous species with flowering before leafing, pollinating entoneofila. Of the 200 types (species) of willow, swedes selected and cultivated a variety that has a very large increase (3-3.5 cm / day) a high content of salicylic acid which gives them a number of properties very advantageous that - calorific value (higher than the beech or oak), weather resistance, resistance to degradation during storage in the form of chips (raw material for pelleting, briquetting).

SELECTED SPECIES BIOLOGY

The most important characteristic which has gained ground in its cultivation in recent years (Sweden over 50,000 ha, 2,000 ha Hungary, Poland, etc..) Is rapidly growing both in length and in volume stems, but this advantage we may include a number of other advantages, so that in the last 3-4 years and came to the attention of the EU, where it was decided to be subsidized to energy plant.

These most important advantages are:

It can be cultivated (even recommended) on the permanent or periodic swampy land. Has an evapotranspiration capacity of 15-20 liters of water / day. This advantage gives it an undisputed place as the plants used to make thousands of hectares of land are derelict. This was noticed by countries like Sweden - already eight years where willow is grown on the surface energy of over 50,000 ha, found a very economic use of land unusable by now, but on the other hand to grow unconventional energy source, a very profitable economic one.

Has an annual capacity of takeover of 20-30 t / ha of sludge coming from wastewater. This property, besides the advantage that in an area where plantation can be flooded with sludge from purification plants, grow faster, has the great advantage that should not be treated biological waste water (expensive operation) and on the other hand water results the treatment plants - very clean river reach, avoiding pollution and also additional costs due to penalty payments for poor quality of water poured out.

Willow cultivation creates new jobs for unskilled people. Harvesting is done during the break crop after leaf fall (serve as fertilizer) so in the months from November to March, a period when agricultural machinery is not used for anything else.

Can be a safe alternative energy source (heating) for localities, being used as biomass (chips), briquettes or pellets. There are pelleting equipment

units - briquetting of different capacity to transform the willow chips in briquettes or pellets, and these products are used for heating functionality (at least the schools, dispensaries, kindergartens, etc..) in commons.

CLIMATIC – EDAPHIC CONDITIONS.

Salix viminalis Energo willow - is highly resistant to different weather conditions. First in Europe had spread in Sweden and Baltic countries, in the climatic conditions of the region. In the last three years has been cultivated in growing areas (thousand hectares) in Poland, Hungary, Slovenia, in different climatic conditions than the first.

The results after three years of experience of Hungary shows that willow performed very well on sandy soil and the heat much higher, resulting in a higher yield by 45% (cca.60t/ha in Hungary to 40-45 t / ha in Sweden).

The above led to the conclusion that in Romania there are all favorable conditions for its cultivation (in river beds, unused flood plains). Edaphic conditions are ensured by optimal groundwater supply, of abundant precipitation on the alluvial soils of pH 5.5 to 6.5, but withstand also on sterile of 3.5-10, 0 but with lower biomass production

POSSIBILITIES OF USE.

In principle, this species has been experienced to serve as an energy source in a different form of fuel (chips - for power plants, briquettes, pellets). High calorific value (4.900kcal/ha) makes it comparable to other fuel sources as natural gas, coal, oil.

The willow cultivation on large areas (1000-1500 ha / area) is justified the development of investments like pellet plants that provide energy source for cities, both in area and central heating in houses.

By a simple calculation - assuming that in Romania would make plantations on 20,000 ha (in Sweden are over 50,000 ha, Hungary - energy transmitted to the EU program for 2007-2013, provides energy willow plantations extending to 36,000 ha) would get a quantity of 1,000,000 tons biomass, which would make 1,000,000 tons pellets which means about heat source of 4,900,000 Gcal energy - produced on cultivated areas now - and this source is repeated annually.

Thermal energy which can be obtained from this source, providing heat to 145000 conventional apartments annually.

By extending energetic willow plantations, besides being a source of renewable energy puts into use unused land, avoid (or diminishes) deforestation generated by the growing need for cheap fuel.

In addition to use for energy, energetic willow is used successfully in the following areas:

* As a source of cellulose
* When setting the steep slopes and landslide prevention
* The manufacture of aspirin (in Germany)

If plantation expansion may turn to mechanization, both planting and harvesting them.

There are a range of special equipment in the Nordic countries, but can be successfully adapted existing agricultural equipments.

WITCH ARE THE PROBLEMS IN THE WAY OF EXPANDING THESE PLANTATIONS?

* Lack of information about the existence and benefits of these varieties
* lack of regulations in the delivery of plantations, on:

1. clarification of where is included - agricultural plant or wood (forest) species
2. whose regulations are subject to the agricultural or forest plant?
3. determine how grant
4. setting grant conditions
5. coverage of national programs in the cultivation, processing biomass

More detailed:

1. Energy willow is a living plant with existence from spring - autumn, so in one agricultural year.

The plantation is done by planting cuttings, made in nurseries accredited in compliance with all regulations relating to registered varieties. Is possible that the sampling was done in two in two years, but experience of the advanced in this area indicates that the most advantageous is the annual harvest (November - February / March, depending on area).

Because of this (annual collection) were cases in which plants classified as agricultural, with modest subsidies and annual similar to agricultural output. In recent years at EU level it was decided that power plants be separately funded, and was left to individual countries to decide individually how to categorize.

2. In all countries where energetic willow plantations have a significant scale - were classified as "special" wood species, putting forestry regulations as plantation, but special for its harvesting (harvesting does not require approval).

3. The way of grant was originally set at 200 EUR / ha - (in Sweden and Hungary) in each year after harvest.

A plantation has a life of 25-30 years, the production in the first year of life is insignificant, approx. 10t/ha (in this period grow roots) and in subsequent years the annual production is 40-45 t / ha (as Swedish records and 50-60 t / ha in Hungary). This crop provides a considerable income to farmers (cca.1.400 EUR / ha) without annual subsidy, but so far has been slow crop development due to significant costs of plantation (about 2000Eur/ha).

In 2006 - most countries have moved to subsidizing 50% plantation costs, giving up the annual subsidy. Following this measure, in Hungary in autumn 2006 - requests for cuttings and registration of lands for plantation increased by 50% and in Sweden is considered the most viable solution for the realization of the EU, each member state to cover 12% of unconventional sources of energy consumption.

4. Grant conditions are clearly outlined in EU countries, and apply a standard method.

* Producers need to show ownership of agricultural land or a long term lease

* Producers must also demonstrate that they have used cuttings of registered varieties and licensed nurseries.

* Producersers need to show a contract with a user - directly from biomass energy production, or produces products that serve this purpose (briquettes, pellets)

* Contractor (purchaser) must also demonstrate that it has ways that transform biomass into energy (area boiler, power plant) or products that serve this purpose (briquetting lines, or lines of pellet)

* The purchaser pays a bond for each hectare of plantation in the contract (amount differs between countries, the values between 15-40 Euro / ha) bond that can recover when he takes the contracted crop.

With these five steps is ensured that the applicant (producer) has the land for seeking a grant, that the cuttings used variety is secured, that the producer is selling for energy production purposes, and the latter guarantees

that the purchaser has the technical capability to transform in a biomass energy source, but that one takes the contracted quantities (for bail release)

5. Currently, Romania has bought both companies licensed in Sweden and in Hungary, there are steps to authorize the nursery, but without some national programs to compete to expand their plantations throughout the country and no national programs to boost the development of regional investment of biomass from plantations (briquetting plant, pelletising) can not extend this idea so much supported in Sweden, Denmark, Hungary, Baltic States and Slovenia.

Renewable energy means, usually, new forms of power generation from other sources such as wind (wind energy), solar radiation (photovoltaic), geothermal energy, tidal energy or produced by burning biomass.

Renewable energy as a primary source of energy, is part for a long time of the property of energy industry, primarily through hydroelectric plants.

Regarding other sources, some have been used previously to generate energy, without being converted into electrical energy - mills driven by wind or heating on geothermal heat trapped underground.

Near the time of depletion of energy from fossil sources (oil, coal, gas), or environmental considerations related to safety and energy independence have made over the last 40 years of renewable energy sources are increasingly considered as alternatives taken into account to ensure supply.

Renewable energy sources do not meet all requirements to be considered the best sources of energy. There are still many inconveniences in the way of making them favorites of energy consumers. Of these there are: low efficiency equipment that captures or transforms natural energy (wind, solar, geothermal) and the existence of fluctuations in power generation due to large changes in small intervals of time the "raw material" used.

In these conditions, renewable energy investments were struck by the reluctance of investors, financiers and consumers who preferred to think many times before daring to engage in the construction of such sources.

This was the moment when the states have decided to intervene, based on environmental considerations and the energy independence. It wasn’t the first time the states intervened and showed the direction in the

energy sector, an essential resource for any modern society. Large hydropower works, building nuclear power plants and electricity transmission networks were made by direct involvement or only at the urging and with the support of the states.

After all, if of public money is done stadiums, why would not achieve energy and infrastructure projects?

This is the context and atmosphere that dominates in business, political and Romanian media in recent years - since the European Union decided that renewables represent 20% of energy by 2020, while reducing consumption energy by 20% - the famous strategy "20-20-20".

In Romania, tensions caused by new sources of power generation exploded since in 2008 when following a parliamentary initiative was adopted Law 220/2008 on the production of energy from renewable sources.

Although Law 220/2008 was a law adopted by the Romanian Parliament, promulgated by the President and published in the Official Gazette, it was not until recently applied for reasons considering its contents and its external environment.

Thus, application of Law 220/2008 was conditional, from the start by implementing of secondary rules, in the responsibility of the Ministry of Economy and ANRE and adapt some of the secondary regulations regarding the functioning of energy markets.

Subsequently, these requirements were added to solve the problems posed by lack of continuity of generation in some sources - wind, photovoltaic – caused by fluctuation and unpredictability of natural factors used as a source of generation and amounts of energy on acquisitions within the national power. Solving these technical issues was and is linked to the revival of major hydro projects - eg Tarnita - Lăpusesti - or the creation of energy storage capacity in wind power or solar products to ensure continuity in unfavorable periods (no wind etc.).

In the end, but eventually, the European Commission consulted on the subject, was of the opinion that should be drawn and subject to his approval a State aid scheme for green certificates provided by Law 220/2008.

The existence of the above problems were quickly identified after the entry into force of Law 220/2008 and was, in fact, predictable. Harder to understand was, at first glance, the attitude began to manifest in the energy sector, an attitude with dramatic accents, like the famous "salt block".

Stimulating production of renewable energy started with enthusiasm soon became bogged down in bureaucratic labyrinth, marked by many expressions of "what", "to analyze", "See ya" and orher alike. Investors have shown interest upon renewable energy projects had to add quickly to investment package patience, perseverance and understanding of the Romanian bureaucratic mechanisms.

The new baby of the family appeared in Romanian energy industry, from the beginning, that is unwanted by family members, especially from the perspective of those involved in energy production in large hydroplants. For the latter, and not only the new child is also an "extra mouth", that funding for the energy sector now appears that will be shared with new renewable energy sources. We are still in financial crisis and Romania's country risk is high.

To technical and administrative difficulties of implementing it was added the accusation that renewable energy projects would be oversized to a new type of current consumption in Romania. It is possible, but let's not forget that Romania could export more energy than it currently does, the European Union countries and other countries in the region. Then, the idea of oversizing is released without taking into account the forecast of the next 20-30 years and need replacement generating capacity of hydro and thermal sources reached the end of their normal operation. Or, is the principle that energy projects should be designed in the long run, given the high costs of building them.

If we agree with the argument of oversize should apply to any projects that add additional capacity to the current installed capacity, which includes new facilities that will use natural gas - Brazi (Petrom), Braila and Galati.

In fact, even if it was an excess of generating capacity, it would have at least the advantage of increasing domestic competition and create export opportunities. In fact, if we speak so much of energy transport in solar-based North Africa or Northern Europe, the poor regions of Europe, could not be achieved such a flow and building the capacity of the Romanian energy ?

As long as private energy projects are financed by investors and banks who take the necessary risks, the above objections are worthless.

It is true that if new forms of energy generation from renewable sources by Law 220/2008 has been established a support mechanism that

was characterized by the European Commission as a form of state aid. In this context, it is necessary that support is proportional to the difference in economic efficiency of new energy capacities, there is as emphasized the European Commission, an over compensation of the investors.

The best way to avoid such consequences is the support mechanism to be limited in duration to the period required for supplementary investments amortization and for new energy sources become viable by themselves. Any extension of forms of aid would amount to failure to generate new forms of renewable energy and encourage speculative investors at the expense of serious investors who want to become a credible alternative energy market. It should be noted that renewable energy can be generated in units of small capacity - micro-hydroplants, small wind turbine parks or small solar parks - which facilitates access to such projects of small investors who usually are not specialized in this field and who have the goal to resell eventually to companies of this profile.

A too large proportion of the number of speculative investors increases the risk of creating a "bubble" that could break if investors fail to find buyers amid the crisis and the uncertainties of the internal environment.

CONCLUSIONS

The solution to the troubles that we have mentioned and finding solutions for the "unwanted child“ holds in great measure also of state energy policies and future plans he has to propose and implement.

Development of generation of renewable energy holds to the private market but depends also on state energy policies, since energy is an essential input for any segment of social life and econcomic field, and problems of this field have direct and important effects from the economical growth to national safety.

In this case it takes more determination, clarity and useful ideas for the development of energy generation will no longer be based on contradictions and conflicts, but the coordination to ensure that Romania will have to any point in time, right mix of energy at competitive prices.

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