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CHANCES AND CHALLENGES OF BIOFUEL PRODUCTION DEVELOPMENT IN UKRAINE IN THE CONTEXT OF AGRIINDUSTRIAL COMPLEX COMPETITIVENESS

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Summary. Chances and challenges of biofuel production development in Ukraine in the context of agriindustrial complex competitiveness. The results of investigation of ecological, social and economic aspects of alternative energy sources use problem resolving. The main attention is devoted to alternative energy sources produced in agriculture due to rapeseeds processing. Some chances and challenges of such way of problem resolving in Ukraine are shown.

Key words: power engineering, biofuel, biodiesel, ecology, agriculture.

INTRODUCTION

Situation as to energy carriers in Ukraine dictates necessity to review Ukrainian power engineering policy. Among the range of the relative directions to fulfill the required organizational and economic measures as to diversification energy resources the most important direction of this diversification is the development of alternative power engineering by means of getting biofuel from the raw material, that is produced directly in agriculture and may be efficiently used in the same branch. Nowadays, this way is considered to be one of the most effective and available to be fulfilled, because objectively Ukraine has favorable conditions for agricultural development. Introduction of the support policy of alternative power engineering development should not be left unconsidered, but grounded and scientifically proved as to concrete conditions, because rapid development of this direction of economy in the world is already one of the indicators of rapid price increase on food products resulting from competitive edge at areas available for growing farm crops for food and energy purposes.

MATERIALS AND METHODS OF RESEARCH

Data of statistic collections of works on agro industrial complex of Ukraine, some regions, materials of statistic reports of agricultural enterprises were used for this research. During this research set of methods was used and it allowed receiving results, sufficiently grounded. In particular, use of monographic method made it possible to get acquainted with this problem and ways to solve similar problems in other countries, to study works of national and foreign scientists, dedicated to the questions of rational use of energetic resources and alternative energy sources. Use of the

method of analysis of dynamic rows, comparison, statistic grouping and correlation made it possible to analyze the phenomenon under research in time and in various organizational farming forms, to find out main factors influencing the effectiveness of those processes.

THE RESULTS AND DISCUSSIONS

Analyzing possibilities of production of the energy carriers in agriculture, it is logically possible to come to the conclusion that basic factors that form the necessity of development of the alternative renewable power engineering for this sector are as follows: inevitability of the final exhausting of conventional energy sources and permanent growth of demand and prices on it; growth of environmental pollution as a result of the conventional energy sources usage; the necessity of diversification of agriculture functioning directions with the purpose of increasing of effective usage of agricultural product; and thus an increase of industry profit level and rural population employment.

It is worth mentioning that nowadays one can find publications dealing with the latest researches, according to which "imaginative advantages of biofuel are even more doubtful than it was considered before". [Rape biofuel..., 2007, p.37]. The rape and corn fuel can produce accordingly 70 and 50% more hothouse gases than mineral fuel. The disturbance is caused by level of nitrogen oxide emission that is, as hothouse gas, 296 times more harmful than carbon dioxide. Thus, biofuel can contribute to the global warming, due to N₂O, more than cooling due to a decrease of mineral fuels usage. The similar results of investigations are published on the pages of such magazines as "Chemistry World" and "Atmospheric Chemistry and Physics" [Rape biofuel..., 2007, p.37]. More frequently, Ukrainian press is discussing the fact that the usage of biofuel can bring more harm than benefit as in the process of burning of biodiesel, the nitrogen oxide emissions increase, hothouse effect from which is 100 times greater than the negative influence of carbon dioxide, and in the case of their combination with atmospheric moisture more aggressive acids are created, and the harm of these acids is 100 times greater than the harm from unstable carbonic acid. An additional problem is the necessity of the glycerin maintenance which is the by-product of biodiesel production and which can pollute the environment with poisonous methanol. The production of 1 liter of bioethanol can cause a pollution of 12 liter of clean water and emission of different dirt in the atmosphere has resulted in the coal usage for the production of steel that is used for making necessary equipment. [Mykhaylov Yu., 2007, p.12]. In addition it is possible to meet direct appeals to "stop a bioenergetic boom" because a frightful effect has happened. Biofuel demand has already caused a fast growth of prices on food. The deficiency of arable lands for people and machines is observed. [Kvitka H., 2007, p.8]. Analyzing similar ideas and statements we should remember that today the economy is developing under market conditions and oil-gas companies, as a fuel producers, will not give up their positions on the market "without fight", and scientific publications are also, as a means of their survival, on the market in competitive activity for the sales market. In any case, investigations of positive and negative aspects of biofuel usage in production must proceed and they do proceed. That is why we must be more careful, using statements, naming biofuel "biononsense" or "synonym of demagogy"; Ukrainian power strategy "simply nonsense" and factories producing bioethanol - as "wine distillery". [Mykhaylov Yu., 2007: Sin..., p.12; Mykhaylov Yu., 2007: Biofuel..., p.16,20].

Ecological and environmental advantages of alternative fuel is, of course, undoubtful and certified by the world practice. [Voloshko V., 2005, p.10]. In Germany, factories, producing biodiesel, work practically without waste and on the closed cycle of the water usage. [Chopenko V., 2007, p.83-86]. However, for today, the production of this energy is still expensive. At the same time, accessible foreign sources testify that the cost of biofuel must not exceed 90% of mineral fuel for the achievement of necessary level of the competitiveness on the market. The absence of methods of calculations in the monetary or physical items of direct benefits from an improvement of environmental state is the reason of price disparity.

Most oil in the world is made of soya (about 20 million tons), and palm (about 14 million tons). On the third place is the production of rape oil, which is the main sort of biofuel in the EU countries. 28 countries consider rape as the main oil crop. In Germany, near 2 million tons of rape biofuel is made in a year, and on the diesel fuel market its part makes 3% [Marchenko V., Sin'ko V., 2005, p.36]. In general, EU countries produce near 25% world volumes of rape, on the areas that exceed 3.5 million ha. The rape field occupies 24 million ha and the average productivity of rape makes 1.3 – 1.5t/ha [Marchenko V., Sin'ko V., 2005, p.37].

Expenses for ethanol production are on 65-70% set by the cost of raw materials and production range: when production is 3-3,5 thousand t per day, expenses are two times lower than when production is 1,5-2 thousand t [Roshkowski A., 2001, p.24]. In the structure of final price of rape biofuel nearly 60% is the cost of raw material. 3 t of rape seeds in total 750 US \$ and 110 liters of methanol are needed to produce 1 t of rape oil that gives us the price of 1 liter of biofuel in 1 US \$ [Chopenko V., 2007, p.86]. Such calculations are confirmed by practice: in Germany average price of biofuel is 700 euro/t [Ryzhov O., 2007, p.8].

Cost reduction for raw materials is possible but it often causes yield reduction of crops and worsening of raw materials quality. It is more prospective to use heterogeneous rape modifications, which are improved genetically, that allows getting yield by 10-20% higher than conventional one. Usage of genetically modified plants causes some mistrust in society but as for rape production for technical aims such measures are accessible and they are agreed upon certain statement of EU.

The necessity of a new approach to the solution of the problem, concerning the fuel and energy complex providing, by development of alternative power engineering can cause a revision of the traditionally provided structure of energy production, energy supply and energy usage in Ukraine. An achievement of a certain diversification level of power resources supply to the country (in the presence of more than 3 sources of supply with a level 25-30% of general volume) is one of the necessary requirements of Ukraine entry to EU) [Franchuk I., 2007, p.68]. Since Ukraine is an agrarian country, as it has an enormous potential for the development of agriculture, the development of this industry can play a deciding role not only in the increasing of the level of food safety of the country but also in the increasing of the level of its power safety and independence.

According to data of industrial news Agency, every year Ukraine uses nearly 200 mln. t fuel and it is the country of energy deficiency. It wipes out 53% of its own demands but importing 75% of bulk of natural gas and 85% of oil and oil products [Usenko L., 2007, p.7]. Ukrainian agriculture uses 2,5 mln. t of oil products every year [Mykhaylov Yu., 2007: Sin..., p. 12]. Fuel expenses per hectare is 120 l in Ukraine, it is too much [Mykhaylov Yu., 2007: Biofuel..., p.16]. In Ukraine possible bulk usage of renewable energy sources was foreseen at the level of 1-2% in 2005 and at the level of 4 -8% in 2010. But nowadays this value is not higher than 0,1% (mainly due to wind energy).

There are great possibilities for biofuel production in Ukraine. Power potential of biomass in the country is nearly 23 mln. t annually [Mykhaylov Yu., 2007: Biofuel..., p. 17]. We can produce 8 mln. t biofuel annually from maize only when gross yield is 12 mln. t. Sugar resources for fermentation can be crop residues and other materials with cellulose. But it is more profitable to get bioethanol from sugar contents crops processing them into ethanol (technical alcohol). Sugar beet is sugar contents crop in Ukraine. There are a lot of waste products of sugar industry due to lack of livestock farms in Ukraine.

Biofuel production in a form of bioethanol and biodiesel in Ukraine could largely substitute state subsidies and subventions to agricultural producers. Left over mass can largely contribute to animal breeding development because it is good forage that allows to have livestock farm nearby a processing plant.

Nowadays Ukrainian alcohol distillery can produce 7,5 mln. dhal bioethanol annually. Due to stable demand the production can be increased to 12 mln. dhal and, in perspective, to 35 mln. dhal annually. In parallels stable demand for molasses and grain is set up. Under condition that consumption bulk of biofuel is determined, 10000 labor places will be guaranteed to fuel producers in spirituous field. For this purpose it is not necessary to build new factories. It is necessary, hoever, to reequip those existing plants which do not operate at full capacity. To make production profitable the plants need to be supplied with raw materials for more than 60%. Now, on average, in Ukraine alcoholic distillery have been supplied only for 40%. In Ukraine only 28 alcoholic distillery, out of the total 79, work [Bioethanol..., 2007, p. 16].

Since 2003 the sowing areas under rape seeds in Ukraine have considerably increased, and producing output of oil seeds was doubled (from 158, 3 tys. t till 647,1 tys. t) [Lakemeyer E, 2007, p.31]. If to take into account that in Ukraine 75% of tillage is suitable for rape growing, which in our conditions is the best raw materials for production of biodiesel, it is possible to consider, that the country has powerful potential for decreasing of power dependence from oil magnates. Potential opportunities of Ukraine in rape growing approximately form 3 millions hectares at average productivity 30 c/ha.. Processing of only 75% of rape harvested from this area at productivity of 30 c/ha gives an opportunity to obtain 2, 7 mln t of biodiesel that is equivalent to 2, 3 mln t of traditional biodiesel for producing of which it would be necessary to process 7, 7 mln t of oil that is 3, 6 mln t more than the annual excavation of oil in Ukraine. Except that, at processing of all the rape it is possible to obtain 4, 8mln t of rape waste, which can satisfy all annual needs in feeds (6, 4 mln t). Current prices of rape waste export reach over 140 US \$ per ton that is practically at a level cost price of rape growing. Provided, that Ukraine gives 10% of tillage under the rape growing, which is technologically absolutely possible, and achieves the productivity of 25 c/h, which is also possible, we can annually produce over 8.5 mln t of rape. After processing of these raw materials it is possible to obtain 3 mln t of biodiesel that in 75% can satisfy the annual demand for fuel of agro industrial complex of Ukraine [Redzyuk A., Rubtsiv V.,. Hutarevych Yu,. 1999, p. 55].

According to different sources today the cost price of producing 1 liter of biodiesel in Ukraine reaches 2, 2 – 3.0 UAH. Its level depends on a number of factors: crop capacity, waste effectiveness use, value of chemical ingredients, and technological process quality of biodiesel obtaining [Maslo I., Vir'ovska M., Kalinchyk M., Vyshnivs'kyj P., 2004, p. 32-33; Semenov V., 2007, p.12]. Calculations show that the reason of rape seeds processing into biodiesel appears if seeds cost price is not higher than 700 UAH per ton that can be achieved at crop productivity not lower than 1,8-2,0 tons per hectare [Maslo I., Vir'ovska M., Kalinchyk M., Kalinchyk M., Vyshnivs'kyj P., 2004, p.32].

Calculations of experts show that for today it is much better to export the rape than process it in oil or biodiesel. At present price correlation on energy carriers and biofuel raw material, the production of biofuel in Ukraine is not profitable. Just as the formation of biofuel internal market needs time and efforts (technology, equipment, elaboration of standards and so on) so the development of biofuel industry in Ukraine at the first stage is economically comfortable with calculation on export, particularly to EU, especially with consideration of possible channels of investment. As the results showed, the export of 1 ton rape is more profitable by 417, 87 UAH. than rape oil export or by 271,69 UAH. than rape biodiesel export. Thus, for the development of biodiesel industry the state should give not less than 350-400 UAH, in re-calculation to 1 ton of rape for producing of rape biodiesel [7, p. 12]. For today, a better strategy for Ukraine is export, which will give an opportunity to save the presence of Ukrainian production on international markets until price cor-

relation will not be changed [Lakemeyer E, 2007, p. 31]. However, the orientation of native agricultural production on the rape as the final production for longer period is dangerous, because of a possibility of transformation of Ukrainian agriculture into raw material appendix to the economy of the EU countries.

Available experience in Lviv region certifies that the opportunity of biodiesel production is over two times cheaper than traditional fuel. Nowadays, rape fields may satisfy 50% of the required fuel for agriculture. Calculations show that rape areas in Lviv region may be increased, without violating the food balance of the region, by 50000-60000 hectares.

In accordance with the Program development of biodiesel production, until 2010 Ukraine must produce and use above 520000 tons of biodiesel, for which it is necessary to provide total harvest of rape at the level of 1, 7-1, 8 mln t. Taking into account that average yield of rape seeds is 20 quintal per hectare, it is necessary to sow 0, 85-0, 9 ml hectares of soil that makes about 3% of total cultivated area of Ukraine. Replacement of a part of diesel fuel by rape- methyl ether (RME) gives an opportunity to provide agricultural engineering with binary fuel of rational contents: 30% of biofuel +70% of diesel fuel [Semenov V., 2007, p.12]. 1,7-1, 8 mln t solar fuel is required in a year for the needs of agrarian sector of Ukraine. To satisfy such need of biodiesel by average crop capacity of 10 c/ha it is necessary to sow almost 5,4 mln ha. It is also necessary to take into account the technological level of rape of fuel, at native – twice less . It is also necessary to take into account the experience of Poland and Slovak Republic which have developed the production of biodiesel "in small villages" by the equipment with capacity of 500 t fuel in a year, and now they try to sell it to Ukraine, since now, for example, in Poland biodiesel is produced in almost 40 plants with the capacity of 10000 tons.

Approximate volume of the Program from state budget financing is 69.7 mln. UAH and from commercial sources is over 8.8. bln. UAH [Plans..., 2007, p.3]. At such structure of distribution it is not a problem to foresee the share in the control of power engineering development in Ukraine. Coming from modern political situation in the country, there is not a reason to hope this Program will succeed, similarly to the Program "Ethanol". It was functioning during 2000-2005 but was not financed in a proper way and practically failed.

CONCLUSIONS

As now practically three-four countries possess 90% of total world oil and gas, they will accentuate regime and conditions of their sales and supply. Supplies of such raw materials will be enough for 30-40 years. Thus, the most acceptable alternative to traditional fuel is biofuel that can be produced by agriculture. In this sphere Ukraine has large prospects and potential. In many countries production of biofuel is stimulated by considerable subsidies, tax privileges and by regulating of biofuel obligatory consumption. At present, the main factors preventing the development of alternative renewable power carriers production are: active resistance of the oil and gas companies aiming most commonly at manufacturing traditional mineral fuels; insufficient technological development which does not allow yet to get cheap ecological fuel. Besides, in Ukraine we have at present general economic crisis, political and economic indetermination of the country development directions, absence of the complex state program of power engineering and economic development of alternative power engineering by means of biofuel production it is necessary to have a really balanced state program with proper financing and legal bases. In the situation of a maximum use of potential of biofuel production and non-regulated balance "export-import" for a long time Ukraine

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may be formed as raw material appendix to the developed countries. It threatens the reduction of non-effective domestic agricultural production and strengthens the Ukrainian food-staff market dependence on import. At present businessmen from abroad actively take interest in the scientific information gathered by our scholars as they can see serious opportunities for both making money and solving the problem of ecological safety of their countries. The common conditions of realization of Ukrainian alternative power engineering development directions described in this article are: domestic production development of technical equipment; creation of economic stimulative mechanism of the development of alternative power engineering in agriculture; development of real state program of alternative power engineering development.

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