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MAZUR, V. A., candidate of Agricultural Sciences, Associate Professor

TSYTSYURA J. G., candidate of Agricultural Sciences, Associate Professor

Vinnitsa National Agrarian University

e-mail:oleg.kotov.80 @ list.ru

PROSPECTS OF HIGH-ENERGY CROPS AND BIOENERGY POTENTIAL ASSESSMENT VINNYTSYA REGION

The complex estimation of biopower potential of Vinnitsa region from position of resources' potential of biomass for the production of alternative fuel types and other side from production of high-energy cultures volumes was conducted. The conclusions in relation to the role of region in the structure of alternative energy production and energy consumption are reflected.

***Key words:** biopropellant, biogas, bioethanol, energycontaining cultures, biomass, productivity, energy consumption.*

Introduction. After researches of G. M. Kaletnika Ukraine is included in ten of most potential producers of bioenergy in the world. Development of production of biopropellant will become one of priorities of Ukrainian power sooner or later, as it a question is related not only to power safety of country but also with development of contiguous sectors of economy - agriculture and engineer. At the same time Ukraine behaves to the energyscarce countries. The requirement of home market in oil products is estimated at the level of 5,5 million tons petrol and 6,5 million tons of diesel fuel. The provision of Ukraine owns power mediums do not exceed 40 percents [2].

Today mastering of alternative refurbishable energy sources looks especially actual. The most perspective unconventional energy source are vegetable and animal fats that can be used for the production of biological fuel [3, 6].

In the conditions of present time development agrarian to the sector of economy impossible without the stable providing of agricultural production a fuel.

For implementation of complex of agricultural works it is annually necessary over 1,9 million and 620 thousand ton petrol of diesel fuel [4, 5].

The permanent increase of cost of fuel and oil materials negatively influences on the state of providing by them agricultural commodity producers, and in course of time can result in substantial reduction of production of agricultural goods in Ukraine or to their rising in price [2, 3, 7].

Thus, one of ways of improvement of the state of providing of agricultural producers' fuel and energy resources there is development of biological types of fuel, namely - diesel biopropellant due to growing of high-energy cultures.

The aim of this article is an estimation of biopower potential of Vinnytsya region after volumes growing of agricultural cultures, raw material of that is potentially possible for the production of different types of biopropellant.

The materials and methods of research. For writing of the article used the results and statistical accounting of the Vinnytsya regional management of agroindustrial development of regional state administration and position of complex Program of development of agriculture of the Vinnytsya region in 2006 – 2012 years and on a period to 2015year [1].

The results of research. In comparing to other countries of the world, Ukraine owns considerable potential for the production of biodiesel fuel for the enough low level of productive charges on unit of products, which is predetermined by the presence of favourable natural and climatic terms, corresponding source of raw materials and in relation to cheap labour force (table. 1).

Certainly, that biopower potential of areas of Ukraine is different. He is folded optimal in those regions where positive combination of natural and anthropogenic factors. The Vinnytsya region in this plan is the special (table 2). Technically accessible power potential of this region after the side products of agriculture from data of Ministry of agrarian politics makes 0,67 million tons of conditional fuel (c.f.). On this index our area occupies the 6th place among all areas of Ukraine. After power potential of arboreal biomass (60 thousand tons of c.f.) – on the 10th place, after potential of power cultures (550 thousand tons of c.f.) – on the 9th place, after

power potential from wastes of stock-raising (161,4 thousand tons of c.f.) on the 1th place, after power potential to the biodiesel from oilseed rape (44,7 thousand tons of c.f.) on the 2th place, after power potential of bioethanol 146,7 thousand tons of c.f. - on the 5th place. On the perspective indexes of regional development of bioenergetics the Vinnytsya area is included in the first five of areas of Ukraine [2].

Table 1

Comparison of biodiesel capacity of some countries (data [3])

Country	Potential biodiesel production, million liters	Productive charges USD. USA/liter	Total revenue from exports, million. USA	Number of jobs created, pieces
Australia	887,6	0,62	233,8	1030
Argentina	6169,6	0,62	1633,0	7157
Belarus	15,5	0,63	3,9	18
Belgium	1008,3	0,71	175,6	1170
Brazil	5153,4	0,60	1432	5978
Great Britain	454,5	0,74	64,6	527
India	1,8	0,62	0,45	2
Italy	194,4	0,65	45,0	226
Kazakhstan	10,4	0,77	1,1	12
Canada	2185	0,70	394,7	2535
China	77,0	0,75	9,9	89
Latvia	0,20	0,44	0,1	0
Lithuania	53,7	0,84	2,3	62
Malaysia	14509,0	0,53	5065,6	16830
Germany	1652,4	0,70	292,7	1917
New Zealand	135,1	0,47	55,3	157
Paraguay	538,5	0,60	153,4	625
Peru	1,0	0,78	0,11	1
Russia	127,2	0,69	23,9	148
USA	6568,2	0,66	1450,0	7619
Thailand	343,0	0,56	110,5	398
Ukraine	1073,4	0,69	200,5	1248
France	1,6	0,70	290,1	1853

Irrefutable is circumstance that efficiency of production of biopropellant will be most effective in regions where ground-climatic terms, source of raw materials, present complex of production capacities, combine effectively, an investment climate and presence of the developed scientific and production infrastructure are certain. In this aspect the Vinnitsa region is a powerful industrial and agrarian area innovative activity of that is effective after a number of directions.

One of such important strategic directions there is alternative bioenergetics, as modern changes in the power vector of the state provide for and production of alternative types of fuel, creation of reliable and effective plant-breeding base of energycapacious cultures, development of projects from bringing in of investments in an agroindustrial complex for development of potential objects from the production of biopropellant, biogas, input of the system of alternative energy consumption. All of it in eventual case will provide forming of effective infrastructure of agrarian market, development of rural territories, increase of efficiency of nature protection.

Table 2

Technically feasible energy potential of Vinnitsa region, thousand tons of conditional fuel (c.f.) (data for 01.01.2013)

Number of order	Energy potential	Ukraine in general million tons of c.f.	Vinnitsa region, million tons of c.f.	Rated among the regions of Ukraine
1	At the adverse agricultural products	13,03	0,69	6
2	The woody biomass	1,75	0,06	9
3	The potential of energy crops	13,24	0,58	8
4	The animal waste	2,81	0,17	1
5	Biodiesel from rapeseed	0,56	0,047	2
6	Bioethanol	2,57	0,16	5

Thus, the Vinnytsya area that answers all higher indicated to the factors is an extraordinarily attractive region in the plan of development of alternative bioenergetics both in the plan of research-and-developments and in the plan of

adjusting of effective industrial production of alternative types of fuel. Traditionally in Ukraine so as well as in the Vinnytsya region for the production of biological types of fuel use oilseed rape, corn, sugar beet.

On sowing area of these cultures in the structure of total sowing area is consists from 4 to 9 percents. The grain corn this index on the average for period 2011 – 2013 years presents about 18 percents (tabl. 3).

Moreover, the data presented in the tables indicate that Vinnitsa region has far better balanced system structure of sowing areas for the production of alternative fuels. Highly energy crops in the crop field area ranged from 3 to 18 % of the high content of legumes such as soybean components – 8.1%. These cultures have different energy efficiency (Table 4).

Table 3

Structure acreage Vinnitsa region (average 2011 – 2013 years)

Crops	Sowing area, thousand ha	% in the structure of total cultivated area
Winter cereals, whole	411,8	25,5
Spring cereals and legumes	469,5	29,1
Of these maize	296,5	18,4
Technical cultures – all	289,5	17,9
of which: sugar beet	76,5	4,7
sunflower	152,8	9,5
spring and winter oilseed rape	75,9	4,7
soybean	130,8	8,1
Total cultivated area	1614,2	100,0

Thus, the highest energy efficiency among the crops grown in the Ukraine and are presented in, is corn. However, in a growing deficit in soil organic waste in agricultural production in our country used as a raw material for fuel wasted because corn stalks, soybean straw is better to leave the field. Equally important crops in terms of biomass are sugar beets. Technology of its cultivation, transportation and storage of evidence-based, but the production of ethanol from domestically produced sugar in Ukraine is economically inefficient. According to specialists of the Institute

for Economic Research and Policy Consulting, manufacture of ethanol (from corn and sugar beet) and biogas (from corn) in Ukraine are characterized by high production costs and are not competitive compared to other countries (particularly from Brazil and the United States) that due to the presence of the last natural, technological and scale advantages. Since the current level of agricultural raw material prices is quite expensive, it is impractical to spend it on the production of biofuels that are not competitive with mineral fuel and other feedstocks.

Table 4

Energy performance of a number of agricultural cultures

Indicator	Rape (biodiesel)	Sugar beet(ethanol)	Corn (bioethanol)	Corn (biogas)
The fuel equivalent	0,91	0,65	0,65	1,40
The heat emission, MJ/l	33,10	21,2	21,2	50,0
The biomass, ton/ha	3,0	35,0	4,10	45,0
The biofuels, l/ton of biomass	401,5	65,1	240,4	79 kg/ton
The biofuels l/ha	1204,4	2280,2	985,7	3555 kg/ton
The fuel equivalent per 1 ha	1096,0	1482,1	640,7	4977
Gross output fuel GJ/ha	39,9	48,3	20,9	178

In recent years Ukraine has considerable attention to rape as a raw material for biodiesel containing 38 to 50% vegetable oil. Thus, for the period 2004 – 2013 years sowing area under rapeseed in Ukraine increased from 110 to 1030 ha, (grew in 9,4 times) (in Vinnitsa region from 8,7 thousand hectares to 103 thousand hectares, and the prospect of up to 160 thousand hectares (grew in 15,3 times). Calculations of experts and expertise developed countries (Austria, Germany, USA, France, Czech Republic) confirmed that the production of biodiesel from rapeseed is the most effective options for agricultural producers of energy resources [5, 7].

In terms of high culture in other regions of Ukraine the Vinnitsa region included in the top ten. The results of this ranking are presented in Table 5.

A positive factor is the tendency to increase yields and acreage main energy crops in the area. These dynamic changes in the performance of energy-intensive crops will enable Vinnichchine in the future to produce 500 thousand tons of rapeseed, 7,5 million tons of sugar beets, soybeans 400 thousand tons , 300 thousand tons of sunflower seed that brings Vinnytsia region into one of the leaders in terms of production among regions Ukraine.

Table 5

Rated performance of major products in Vinnitsa region, 2000 - 2012 years

Crops	Figures	
	Rank in Ukraine's regions	
	In 2012 year	Average for the period 2000-2012 years
Cereals and legumes - total:	4	5
including corn	3	4
Technical - all		
spring and winter oilseed rape	1-2	3-4
sunflower	8	9
soybean	7	9
sugar beet	3	2

Conclusions. Thus, the higher brought arguments over and facts, give an opportunity to assert that Vinnitsa region is a powerful industrial and agrarian area innovative activity of that is effective after a number of directions to us. One of such important strategic directions there is alternative bioenergetics, *поскі́льки* modern changes in the power vector of the state provide for and production of alternative types of fuel, creation of reliable and effective plant-breeding base of energycapacious cultures, development of projects from bringing in of investments in an agroindustrial complex for development of potential objects from the production of biopropellant, biogas, input of the system alternative energy.

In this plan the Vinnytsya region can become a research center in relation to development of the regional and national program of production, consumption of alternative types of energy, having necessary exceptional natural and climatic and research resources for this purpose.

Bibliography

1. Агропромисловий комплекс Вінницької області // Зведений довідково-статистичний збірник. – Вінниця, 2009. – 128 с.
2. Калетнік Г. М. Розвиток ринку біопалив в Україні: Монографія. – К.: Аграрна наука, 2008. – 464 с.
3. Колодько Т. Г. Потенціал виробництва біопалива в Україні // Колодько Т.Г., Губено В.І. - [Електронний ресурс]. Точка доступу: http://www.btsau.kiev.ua/files/list/edition/ed_fkbijdakvh.pdf
4. Назаренко А. В. Біопаливний потенціал України на світовому ринку сільськогосподарської продукції / А.В. Назаренко // Економіка АПК. – 2010. – № 1. – С. 72 – 77.
5. Калетнік Г. М., Пришляк В. М. Біопалива: ефективність їх виробництва та споживання в АПК України. Навч. посібник. – К: Аграрна наука, 2010. – 327 с.
6. Лежнева Л. И. Потенціал розвитку нетрадиційних джерел енергії в Україні як фактор забезпечення енергетичної безпеки / Л.И. Лежнева // Культура народів причерномор'я – 2010. – №3. – С. 52 – 54.
7. Енергетична стратегія України на період до 2030 року. Схвалена розпорядженням Кабінету Міністрів України від 15 березня 2006 р. № 145-р. [Електронний ресурс]: Точка доступу: <http://zakon.rada.gov.ua/signal/kr06145a.doc>.

Анотація

Мазур В. А., Цицюра Я. Г.

Перспективи виробництва високоенергетичних культур і оцінка біоенергетичного потенціалу Вінниччини.

Проведена комплексна оцінка біоенергетичного потенціалу Вінниччини як з позиції потенціалу ресурсів біомаси для виробництва альтернативних видів палива, так і з позиції об'ємів виробництва високоенергетичних культур. Зроблено висновки щодо ролі регіону в структурі альтернативного енерговиробництва та енергоспоживання

Ключові слова: біопаливо, біогаз, біоетанол, енерговмісні культури, біомаса, продуктивність, енергоспоживання

Аннотация

Мазур В. А., Цицюра Я. Г.

Перспективы производства высокоэнергетических культур и оценка биоэнергетического потенциала Винниччины

Проведена комплексная оценка биоэнергетического потенциала Винниччины как с позиции потенциала ресурсов биомассы для производства альтернативных видов топлива, так и с позиции объемов производства высокоэнергетических культур. Сделаны выводы относительно роли региона в структуре альтернативного производства и потребления энергии.

Ключевые слова: биотопливо, биогаз, биоэтанол, энергосодержащие культуры, биомасса, производительность, энергопотребление.