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RAPESEED GROWING FOR ENERGY PURPOSES IN UKRAINE

PRODUKCJA RZEPAKU NA CELE BIOENERGETYCZNE NA UKRAINIE

Key words: rapeseed, biodiesel, bioenergy, bioeconomy, efficiency, agricultural enterprises, processing

Słowa kluczowe: rzepak, biodiesel, bioenergetyka, biogospodarka, efektywność, przedsiębiorstwa rolnicze, przetwórstwo

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Abstract. The article presents the results of research of a solution to the problem of reducing energy dependency and replacing traditional sources of fuel production to agricultural ones. Nowadays it is very important not only for Ukraine but for most countries of the world. That is why the rapeseed as a row material for biodiesel fuel is a practical alternative being renewable and very productive. The analysis of the current situation of rapeseed growing, its processing and possible trends for the future industry are shown. Factors that can contribute to creating the conditions necessary to support these trends are grounded. Calculation results of rapeseed growing efficiency for bio-energy purposes in agricultural enterprises are displayed. It is proved that the rapeseed growing has the highest efficiency in the variant of its processing for biodiesel.

Introduction

Bio-economy in the agrarian sector, according to the definition proposed in the Communiqué of the European Commission “Innovation in the service of balanced development: bio-economy for Europe”, includes the production of renewable biological resources and their processing into such products as food, feed, organic products and bio-energy. Bio-economy encompasses many sectors of the economy, including agriculture, food industry and related sectors of forestry, chemical, biotechnological and energy industries [Chyłek 2012]. Efficient use of flora and fauna ecosystem resources with the support of biotechnology, genetics, chemistry, physics and economic science can provide positive results for the economy as well as consumers [Chyłek, Rzepecka 2011, p. 3]. China in general announced the agricultural biotechnology as a number one priority of national security. In the context of this perspective and based on the increasing restrictions of traditional sources of energy and particular increasing the relevance of the usage such renewable sources that can be grown in the agricultural sector, rapeseed growing is of great importance. Biodiesel made from rapeseed, compared with products of oil refining, gives lower emissions of harmful substances in the environment, although it is not entirely clean. Bio-fuels have to 8.10% less carbon monoxide, nearly 50% less soot and considerably less sulfur (0.005% vs. 0.2% conventional diesel) [Hanzhenko 2013, p. 40].

Ukraine has enough resources and favorable conditions for growing rapeseed for energy purposes. But now most of the products are exported as a raw material for biodiesel production and are not processed in the country. So the purpose of this paper is to present the main consequences of research in form of analysis of rapeseed cultivation dynamics, its usage, current state of the industry and possible ways of further development and recommendations for the creation of conditions for their implementation in Ukraine.

Material and methods

The study has been conducted based on statistical data and publications concerning the state and dynamics of rape growing individual regions of Ukraine. Studies of local and foreign scholars on specific aspects of the problem were reviewed and the results of their observations were analyzed. Scientific methods of research, method of analysis and synthesis, induction and deduction, monographic and graphics ones as well as economic and statistical methods were applied. Methods for expert assessments, system diagnostic, structural and logical analysis were applied to study the processes and phenomena influencing the efficiency of growing rapeseed for energy purposes. Researching the effectiveness of rapeseed growing for bio-energy targets, resulting the production of bio-fuels from rapeseed, the following methodological positions were used: objectively justified is to consider and explore the effectiveness of rapeseed growing for energy purposes, taking into account the efficiency of processing; determining the efficiency of rapeseed growing for energy needs it should be taken into consideration all the possible effects of this type of activity, including and those that may occur on the effective utilization of waste from biodiesel production; effectiveness of rapeseed growing should be considered in contexts both economic, environmental and social ones being effective for those who grow it, who convert it to bio-fuels (workers employed in these processes), for rural areas, where these processes occur and finally for the whole state.

In order to analyze the efficiency of rapeseed growing production according to EU standards a SGM (Standard Gross Margin) methodology and SO (Standard Output) methodology were used [EUROSTAT 2007, 2015]. The questionnaire survey was held in spring 2014 and covered 115 enterprises in Lviv region which were engaged in cultivation of rapeseed. According to the survey results five size groups were formed depending on the extent of cultivation (in hectares): 10-50, 51-100, 101-200, 201-300, 301-400, 401-500, over 500.

Research results

Over the past 30 years the world production of rapeseed increased more than in five times and reached 6 million tons. Among the 25 oil crops, the leadership is for soybean oil – 28.4%, in the second place is palm oil – 25.4% and in the third place – rapeseed oil 6.8%. Nowadays rapeseed is grown more than in 30 countries. This is one of the most common crops in the world occupying 30 million hectares (10.5% of the area major oilseeds) [Babiy 2015, p. 34] (Fig. 1).

The results of calculations presented in figure 1 show that the overall dynamics of acreage of this crop, yield and total yield for the 2005/2006-2014/2015 marketing years in the world is positive, though in some years there is a decrease in the values of these characteristics, overproduction associated with certain products of cultivation and the corresponding failure of the market to absorb these periods. The main reason for the intensive production rapeseed growth and its processing

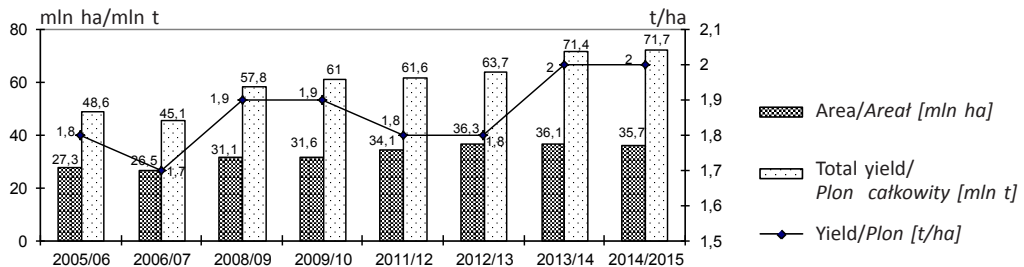


Figure 1. Dynamics of world production of rapeseed

Rysunek 1. Dynamika światowej produkcji rzepaku

Source: own study based on USDA data [Maslak 2016, p. 5]

Źródło: opracowanie własne na podstawie danych USDA [Maslak 2016, p. 5]

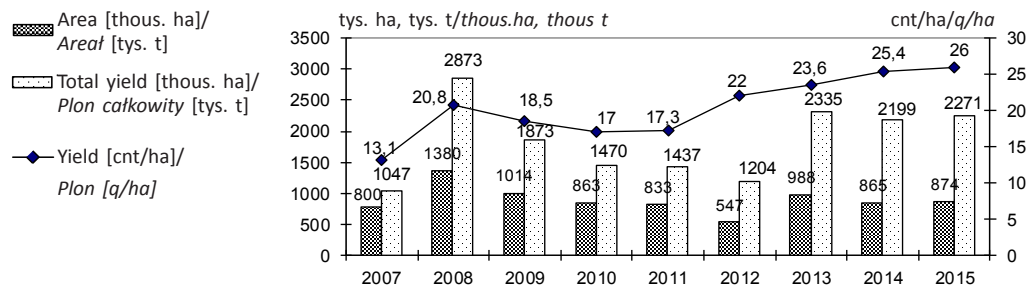


Figure 2. Dynamics in rapeseed production in Ukraine in terms of its factors

Rysunek 2. Dynamika produkcji rzepaku na Ukrainie

Source: own study based on USDA data [Maslak 2016, p. 5]

Źródło: opracowanie własne na podstawie danych USDA [Maslak 2016, p. 5]

is that the resulting oil raw material is mainly used for the production of biodiesel. And although Ukraine currently has no major facilities for the processing of biodiesel, but the state has all the chances to have grown in farm canola plants are not exported abroad and used for processing into biodiesel in their growing regions, which are far more profitable [Stepovanyj 2013, p. 3].

Beginning with the 2010-2011 marketing year, the world production of rapeseed constantly exceed the 60 million t [Maslak 2015, p. 11]. The largest producers of rapeseed are countries of European Union. In 2014/2015 marketing year the EU produced 24.3 million tons of rapeseeds – third of world production. The big producers were also Canada with volume at 15.6 million tons, China (14.6 million tons) and India (7.1 million tons), which are also the largest consumers of seeds [Maslak 2015, p. 11]. In Germany, for instance, the power of rapeseed biodiesel increased from 533 thous. t in 2001 to 923 thous. t in 2003 and to more than 1.2 mln t in 2012, due to the great demand for biodiesel [Babiş 2015, p. 35].

The calculation results, presented in figure 2, indicate, that the configuration of the curve dynamics of production of rapeseed in Ukraine almost follows this dynamic in the world, due to the significant dependence of the rapeseed industry in Ukraine on fluctuations in the world market. Most exports from Ukraine go to Europe and, in recent years – to Asia. In 2014 there was an increase in harvest but the 2013 the total production of seeds decreased by 5%. In 2015 an increase in production in all respects can be seen as well.

Ukrainian rapeseed exports for 2014/2015 season reached 1.96 million tons, which is 11% less than it was exported in the previous season, but 55% higher than during 2012/2013 marketing year. EU initiatives that increase biodiesel production formed a huge additional demand for rapeseed oil. And this is one of the main factors for the rapeseed production growth in the neighboring countries, particularly in Ukraine [Shuvar 2015, p. 54].

Natural and climatic conditions in the most regions of Ukraine are favorable for rapeseed growing, so rapeseed is an economically attractive crop for Ukraine. When growing winter rapeseed the overall economic costs of 1 ha according to calculations carried out amount to 14.7 thous. UAH. For 35 kg/ha cost of 1 ton of product 4.2 thous. UAH. The profit from 1 ha will be almost 6.3 thous. UAH, which will ensure profitability at 43%. This level allows to return costs and additionally get 0.43 UAH per 1 UAH invested in production [Maślak 2016, p. 5]. Rapeseed positively affects also the ecological status of environment – 1 ha of crops allocates nearly 10.6 million liters of oxygen. It is in the second place after sugar beet that allocates more than 15 million liters of oxygen [Shuvar 2015, p. 54].

In Ukraine the production of winter rapeseed is very favorable. Its share in 2014 was 96%. [Maślak 2016, p. 4]. Yields of winter rapeseed was 25.7 c/ha, while the spring rapeseed was at 18 c/ha. The biggest producers of winter rapeseed are Odessa (250 thous. t), Vinnytsia (233 thous. t), Khmelnytsky (205 thous. t). The biggest producers of spring rapeseed are Sumy (92.6 thous. t), Kiev (47.7 thous. t) and Ivano-Frankivsk (46.4 thous. t). The main rapeseed production is con-

centrated in agricultural enterprises – almost 98% of the crop [Mašlak 2015, p. 10]. Ukraine consumes 6.5 million tons of diesel fuel. To replace the 10% of which by bio-fuels we need to produce about 650 thous. t of biodiesel. This is equivalent to processing approximately 2 million tons of rapeseed. Potentially Ukraine can achieve 7.5 million tons of rapeseed (for the crop area of 3 million hectares and yield of 2.5 t/ha). This is of great interest to the industry in the EU, which marked shortage of raw materials for the production bio-fuel. Therefore, these countries are interested only in rapeseed import. On the other hand; some foreign investors have expressed interest in biodiesel production in Ukraine, followed by its exports to the EU, which could stimulate the development of business in Ukraine. Today in Ukraine there are over 40 small enterprises for the production of biodiesel, which produce bio-fuels for their own use [Hanzhenko 2013 p.43]. Major companies – processors of rapeseed in Ukraine are following: “V-oil” (38.81%), “Grado-lia” (21.22%), “Vidrogenia” (15.35%), “Agroteknika” (14.29%), “Oliar” (6.61%), “Nidzenskii” (3.20%) [Hoshovska 2014, p. 8]

Currently, the volume of domestic rapeseed processing in Ukraine is relatively small. However, they increased substantially in recent years – from 25 thous. t in 2011/2012 marketing year to 245 thous. t in 2014/2015, in the current marketing year (2015/2016) is expected to increase to 342 thous. t. In 2015 Ukraine produced 148 thous. t of rapeseed oil to 96.7 thous. t in 2014 [Olijnyk 2016, p. 13]. Growing export supplies up to 150 thous. t in the 2015/2016 marketing year (+31% to 2014/2015) and meal – 190 thous. t in the 2015/2016 marketing year (+22% to 2014/2015).

The main buyer of Ukrainian products is EU. In 2015/2016 marketing year, they bought 80% of the total exports of rapeseed (against 66% in 2014/2015 marketing year), rapeseed oil – 60%. China also shows high interest to Ukrainian rapeseed oil – 22-24% in the last two seasons [Burka 2016, p. 8]. However recently the leader of purchases has become Pakistan, which has gained over 422 thous. t of culture, and in 2016 it was still in third position in the ranking of importers – about 13%) [Kupchenko 2015, p. 18]. Another prospective importer may be India, which has acquired 15% of exported oil from Ukraine this season.

Rapeseed growing is beneficial both to produce and recycle. Since rapeseed oil – products with added value, has become much more profitable because producers get more oil. In Rotterdam market this oil costs 754.55 dollars per ton, but in Ukraine it is \$750, futures delivery (Euronext) – 748,2 \$ per ton. Ukrainian rapeseed oil – almost completely export-oriented commodity prices are influenced by external market. Therefore, their level in Ukraine and Europe is almost equal [Olijnyk 2015, p. 13]. Although at present the proportion of rapeseed, processed for oil in Ukraine is so relatively insignificant that there is reason to believe that the Ukrainian rapeseed is almost entirely exported as raw material [Kupchenko 2016, p. 4].

There is a hypothesis that the first generation bio-components only fundamentally contribute to the realization of the concept of sustainable development, but in practice is largely contrary to its postulates [Borychowski 2014, p. 126]. Despite this, growing rapeseed for energy needs in the world has become quite widespread. It is so wide that in Europe there is a problem of public opposition to this direction of energy development on the basis unresolved problem of providing the population with food produced from raw materials of the same as bio-fuels. Obviously, the solution to this problem should be sought on the verge of “golden mean”. It needs food by growing food grade canola accordingly due to technical seed varieties of this crop. Currently, Europe is largely ready to solve this problem by purchasing rapeseed in Ukraine.

The results of calculations of efficiency of cultivation of rapeseed for bio-energy purposes in the agricultural enterprises of Ukraine indicates the presence of obvious economic benefits of alternative processing of rapeseed biodiesel to implementation of rapeseed in unprocessed form on the domestic market. For processing into oil – the implementation of rapeseed biodiesel in most cases is higher than a rapeseed growing, even if the implementation of its export at price of this product for export mainly is the highest of all options.

Conclusions

Aggravation of the energy crisis in the world objectively necessitates finding alternative ways to traditional solutions, one of which is the use of biomass. In Ukraine it can be effectively realized through the cultivation of rapeseed and processing it into bio-fuel. In Ukraine rapeseed growing has almost export orientated character – the vast majority of all harvested rapeseed (90-96%) is exported for sale abroad, resulting from the absence in the country the processing base, economic system and agricultural enterprises to the process of rapeseed in the country and then use it. Since production of rapeseed in Ukraine has export orientation, production of rapeseed in Ukraine and the prices are almost proportional to the fluctuations in the world market: The higher world production and stocks rapeseed leads to lower prices in Ukraine, and vice versa, in the lean season – prices grow as the global market demand for these products. The results indicate the presence of certain benefits of alternative processing of rapeseed biodiesel to options in implementation of rapeseed in unprocessed form on the domestic market, export for processing into oil – the implementation of rapeseed biodiesel in most cases, the overall profitability of cultivation is higher than just rapeseed growing, even if the implementation of its export at price of this product for export mainly is the highest of all options. For effective implementation of the existing potential in Ukraine for the development of alternative energy by biodiesel requires national program with appropriate financial and legal support. By maximizing the opportunities for bio-fuels and unregulated balance “export-import” in the long term Ukraine may become as a kind of raw material appendage to the developed countries, threatening the relative reduction of inefficient domestic agricultural production and food market increased dependence on imports. The important economic levers motivate domestic producers to expand production of bio-fuels are the following: improvement of taxes, direct state subsidies, export restrictions by quoting its scope and levying export duties, establishing mandatory standards for the use of bio-fuels. Up today it will be economically reasonable for Ukraine to build relatively small processing plants and create favorable conditions for the development of such activities (preferential duties for imported equipment, production and economic incentives to use biodiesel). This will ensure to use significantly cheaper domestic production.

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Streszczenie

Przedstawiono różne warianty rozwiązywania problemu zmniejszenia zależności energetycznej Ukrainy od zewnętrznych źródeł i zastępowania tradycyjnych źródeł produkcji paliwa surowcami pochodzenia rolniczego. Analizowano obecną sytuację w produkcji rzepaku i jego przetwarzaniu na Ukrainie oraz wskazano tendencje i perspektywy rozwoju tej branży. Wskazano czynniki, które mogą sprzyjać stworzeniu warunków potrzebnych dla realizacji tych celów. Przedstawiono także efektywność produkcji rzepaku na cele bioenergetyczne w rolniczych przedsiębiorstwach. Stwierdzono, że najwyższą efektywność uzyskuje się przetwarzając nasion rzepaku na biodiesel.

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