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QUALIFICATION BACHELOR PAPER

on the topic " PROBLEMS AND PROSPECTS OF BIOFUEL EXPORT TO THE WORLD MARKETS "

Specialty 6.030503 "International Economics"

Student ____*4*____ Course _____ _____
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Qualifying Bachelor's paper contains the results of own research. The use of the ideas, results and texts of other authors has a link to the corresponding source

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Sumy, 2019

ABSTRACT

on bachelor's degree qualification paper on the topic
«PROBLEMS AND PROSPECTS OF BIOFUEL EXPORT
TO THE WORLD MARKETS»

student _____*Stupina Liliia Eduardivna*_____
(full name)

The main content of the bachelor's degree qualification paper is presented on 38 pages, including references consisted of 40 used sources, which is placed on 4 pages. The paper contains 2 tables, 8 figures, as well as 3 apps that are presented on 16 pages.

Keywords: BIOFUEL, EXPORT OF BIOFUEL, EXPORT POTENTIAL, THE VALUE OF BIOFUEL, WORLD MARKET OF BIOFUEL, INTERNATIONAL TRADE.

The purpose of this work is to study the internal market of biofuels, identify problems and prospects for its export to the world markets, improving its production and rationalization.

The object of scientific research are the problems and prospects of developing the export potential of biofuels on the world markets.

The subject of the research is the biofuels market in Ukraine as a factor of energy independence and economic growth.

Research methods are: analysis, abstracting, system - oriented analysis and formalization. On the analysis base, the ways have been identified for improving the potential of biofuels and proposed new solutions to overcome the problems of its production and exports. Abstracting method allowed to plan the prospects for biofuel exports, as well as a system - oriented analysis was carried out, through which the actual problem was considered and studied. With help of the method of formalization was carried analysis of costs and determination of the rate of return on biofuel production.

The database of information of the bachelor's work served scientific articles and researches of domestic and international scientists, data of the State Statistics Committee of Ukraine, Global Bioenergy Statistics, Renewable Energy Directive, normative legal acts of Ukraine, data of the Ministry of Infrastructure of Ukraine and the Ministry of Energy, as well as UN legal acts.

The qualification bachelor's paper examined the problems and perspectives of biofuel exports to world markets, determined the indicators of the return on investment of biofuel production enterprises, and also offered the following ways of improving exports:

- subsidizing the bioenergy industry by the government;
- introduction of compulsory certification according to international norms;
- establishment of the road and transport infrastructure;
- introduction of a stock exchange for the bidding of biofuels;
- increase of the market by means of attraction of water transport;
- introduction of anticorruption reform to secure invested investments;
- training of specialists in modern biofuel production technologies and international knowledge exchange.

The results can be used to improve the production, promotion and export of biofuels to the world markets.

The year of qualifying paper fulfillment is 2019.
The year of paper defense is 2019.

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TASKS FOR BACHELOR'S DEGREE QUALIFICATION PAPER

(specialty 6.030503 " International Economics ")
student ___*4*___ course, group *ME-51an*
(course number) (group's code)
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1. The theme of the paper is *PROBLEMS AND PROSPECTS OF BIOFUEL EXPORT TO THE WORLD MARKETS*_____
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4. The object of the research are *the problems and prospects of developing the export potential of biofuels on the world markets.*
5. The subject of research is *the biofuels market in Ukraine as a factor of energy independence and economic growth.*
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7. Approximate qualifying bachelor's paper plan, terms for submitting chapters to the research advisor and the content of tasks for the accomplished purpose is as follows:

Chapter 1 *Biofuel as an energy carrier of the XXI century. Formation of the global biofuel market – 6.05.2019*
(title, the deadline for submission)

Chapter 1 deals with *describing biofuels as an alternative source of energy, its types, as well as the formation of a global market for biofuels; considered pricing for different types of biofuel in the world market.*

(the content of concrete tasks to the section to be performed by the student)

Chapter 2 *Problems and prospects of biofuel export to the world markets – 20.05.2019*
(title, the deadline for submission)

Chapter 2 deals with *identification and analysis of problems and prospects of the production and export of biofuels to the world markets; determined the indicators of the return on investment of biofuel production enterprises.*

(the content of concrete tasks to the chapter to be performed by the student)

Chapter 3 *Methods of solution the problems of biofuel exports in Ukraine – 27.05.19*
(title, the deadline for submission)

Chapter 3 deals with *analysis and proposal of ways to improve the problems of production and export of biofuels in Ukraine on a local and national scale.*

(the content of concrete tasks to the chapter to be performed by the student)

8. Supervision on work:

Chapter	Full name and position of the advisor	Date, signature	
		task issued by	task accepted by
1	Domashenko M. D., Candidate of Economics, Associate Professor		
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9. Date of issue of the task: « ___ » _____20 __.

Research Advisor: _____ _____
(signature) (full name)

The tasks has been received: _____ _____
(signature) (full name)

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INTRODUCTION

The current tendency of transition from traditional fuels to alternatives acquires considerable scale in the world. By providing itself with the new generation of energy, the country gains a great number of priorities, including independence from the traditional energy supplier countries, an increase in fuel prices, depending on the dollar exchange rate, etc. Biofuel as the energy carrier has an apparent number of benefits, including resource inexhaustibility, low cost and complete environmental friendliness. According to scientific reports, for the present Ukraine exports about 90% of biofuels to EU countries, mainly to Poland, Italy, Germany and the Czech Republic. The main problems of biofuel production in Ukraine are the illegality of deforestation, the indirect impact of land use changes, rising food prices, non-compliance with international standards, etc [1].

Biofuels market research has shown that biofuel exports have been increasing at a considerable pace in recent years, which, in exchange, led both to problems and prospects for the producer country as well as for the final buyer. The growth in demand for alternative fuels is a very topical issue withing the conditions of energy and economic dependence of countries. Such circumstances require a more detailed study and a research for ways to improve export policy in the world market, a new analytical review and the identification of the prospects for the development of alternative fuels. The relevance of the study of the manufacturing and distribution of biofuels is also underlined by the fact that it is one of the main ways of energy independence of the country and its prestige among other developed countries, which positively responds on the international political arena and the degree of cooperation and interaction with the leading countries of the world.

Problems and perspectives of biofuel production as an alternative source of energy are studied by researchers and scientists both domestic and foreign, among them: Masjuki Hj.Hassan, Md. AbulKalam, Kaletnik G.M., Sereda L.P., Gelotukha G.G., Demchak I.M.,

Dolinsky A.A., Kernasyuk Yu.V., Kobets M.I., Konenkhenko A.Ye., Kuznetsova AV, Lisnichy VM, Pooya Azadi, Robert Malina, Steven RH Barrett, Markus Kraft and others.

Despite a large number of scientific articles and materials, this scientific work is the only one that covers all the problems and prospects of biofuel exports to world markets; the issues covered in this scientific work have not been thoroughly considered beforetime and substantiated proposals for their solution.

The object of scientific research are the problems and prospects of developing the export potential of biofuels on the world markets. The subject of the research is the biofuels market in Ukraine as a factor of energy independence and economic growth.

The purpose of this work is to study the internal market of biofuels, identify problems and prospects for its export to the world markets, improving its production and rationalization.

The tasks of scientific work are: research of the biofuel market in Ukraine and globally, its production and domestic consumption; assessment of the export potential of biofuels in Ukraine and in the world, as well as its competitiveness; identification of advantages and disadvantages of biofuel production for the country; identification of problems and prospects of biofuel exports to the world markets; definition of the ways of adjusting the production, consumption and export of the biofuels.

Research methods: analysis, abstracting, system - oriented analysis and formalization. On the analysis base, the ways have been identified for improving the potential of biofuels and proposed new solutions to overcome the problems of its production and exports. Abstracting method allowed to plan the prospects for biofuel exports, as well as a system - oriented analysis was carried out, through which the actual problem was considered and studied. With help of the method of formalization was carried analysis of costs and determination of the rate of return on biofuel production.

The database of information of the bachelor's work served scientific articles and researches of domestic and international scientists, data of the State Statistics Committee of Ukraine, Global Bioenergy Statistics, Renewable Energy Directive, normative legal

acts of Ukraine, data of the Ministry of Infrastructure of Ukraine and the Ministry of Energy, as well as UN legal acts.

1 BIOFUEL AS AN ENERGY CARRIER OF THE XXI CENTURY. FORMATION OF THE GLOBAL BIOFUEL MARKET

1.1 Biofuels. Production and types of biofuels

In the 21st century, a feature of a strong economy of any state is enough self-sufficiency of its energy resources. Gas, oil or nuclear fuel have the single most important problem - their exhaustibility. Therefore in the stead of traditional energy carriers alternatives came: wood biomass, biodiesel, bioethanol, biogas, etc. According to International Energy Statistics, in 2016 South America became the leader in biofuel production, producing 51.7 MT (Metric tons, Metric tones), Central and North America placed behind it, producing 29.3 MT, Europe took the third stage with the quantity of 16.1 MT, while Asia and Oceania - 11.7 MT, Eurasia and Africa - were 711 and 591 MT respectively, on the fourth step [2].

With the use of working fuel, the main trend is to consider this material as a mean of replacing all human energy needs, ranging from home heating, and ending with fuel for the production of energy itself. The basic concept is that raw material is in used a person can only grow, and therefore, if it does not bear zero damage to the environment, it should be at least insignificant. The production of alternative energy sources can be established in any country and in any locality, since there are not only one type and one production method that allows each region to choose its own biofuel production version, referring to its own needs, benefits and opportunities.

At this point in time it is reasonable to switch to a more specific description of biofuels, its types and methods of production, description of the main advantages and disadvantages.

The power industries, which is based on the use of biofuels produced from biomass, is called bioenergy. In the narrowest sense, bioenergy is a synonym of biofuel, that is, fuel derived from biological sources. In the broad sense, this includes biomass, biological

material used as biofuels, as well as social, economic, scientific and technical areas related to the use of biological energy sources.

Biomass is a biological renewable material of organic origin, impacted by biodeterioration (agricultural waste), forestry and technologically related branches of the economy, as well as organic parts of industrial and domestic waste [3].

Presently biofuels actively explored by scientists around the world without leaving any progress on the ground. Until recent years famously bioethanol or biodiesel was replaced by biofuels produced from algae. All biofuels are divided into generations, the description and advantages of which are presented below:

1. The first generation or conventional fuel is the fuel from ordinary food crops grown on arable land. For the production of the first generation, cultivation of crops is characteristic only for the production of biofuels, and nothing else. Sugar, starch or vegetable oil obtained from cultures are converted into biodiesel or ethanol, using transesterification or yeast fermentation. The cultivation of such crops for the production of biomass has a major disadvantage: the land planted by these crops, overwhelmingly, lose its fertility, and therefore can't be suitable for growing food crops. In conditions of scarcity of goods and when demand prevails supply, the level of prices in the market increases, which, in turn, has a number of negative consequences.

2. Second generation biofuels are biofuels made from different types of biomass. As long as first-generation biofuels are produced from sugars and vegetable oils contained in arable crops, second-generation biofuels are produced from lignocellulose biomass or wood crops, agricultural waste or vegetable waste (from food crops that have already fulfilled their nutritional purpose). The raw material used to make biomass of the second generation also grows on arable land, but it is only a by-product of the use of food crops. It can also be grown on lands that are not entirely suitable for growing food crops or don't require watering or special mineral fertilizers at all. Types of raw materials required for biomass can include grass, yatropha, and other seedlings, vegetable waste, solid household waste, and the others. Second generation biofuels have both advantages

and disadvantages. The advantage is that the land for producing fuels shouldn't be obligatory cultivated. From the economic point of view, this is very advantageous, because the money don't spend for the cultivation of raw materials, and therefore, the production cost becomes low. The disadvantage is that, unlike conventional food crops, the process of fuel extraction can be quite difficult. For example, to convert lignocellulose biomass into liquid fuels suitable for transportation, a series of physical and chemical treatments may be required, which in turn increases the cost of the product [4].

3. Third generation biofuels are made exclusively from algae. Their main advantage over the previous two generations is that algae contain more than 50% of natural oil. Algae produce oil that easily refines into diesel or even some components of gasoline. Most importantly, such biomass is subject to genetic manipulation, from which it is possible to obtain a wide range of biofuels: from ethanol and butanol to gasoline and diesel directly. On average, algae can produce 1500 gallons of biofuels for 4.5 th. m^2. Scientists have noted that they can be grown directly near sources of carbon emissions (near power plants, industrial facilities, etc.), where they will be able to convert harmful emissions into fuel suitable for use. The disadvantages of algae are their need for large quantities of water, phosphorus and nitrogen. Such a large amount of fertilizers will lead to more emissions into the atmosphere of greenhouse gases, rather than using algae based fuel. It also means that the cost of such fuel is much higher than that of fuels made from other sources. It is also worth noting that fuels made from algae are less stable than other fuels.

This is due to the fact that the oil contained in algae is not sufficiently saturated. Unsaturated oils are more volatile and therefore more susceptible to degradation. This factor has a direct impact on the cost of such biofuels, indeed during the production a significant part of raw materials is lost [5].

4. In production systems of the fourth generation, biomass plants are considered as efficient carbon capture machines that remove CO_2 from the atmosphere and hold it in their branches, trunks and leaves. Thus, carbon-rich biomass is converted into fuel and

gases of the second generation. Such a biofuel production method is currently in the process of development and improvement, and therefore is still unknown for broad community [6].

1.2 Export potential of biofuels in the international markets

On the basis of the previously presented types of biomass, each country forms its demand and supply of certain energy resources. Referring to the latest research, renewable energy sources account approximately 14% of the total world primary energy supply. These data also take into account the energy generated by the energy of water, sun, wind, etc., but it is reasonable to assume that the percentage of biomass produced is predominant. Table 1.1 shows import and export data of different continents in 2014.

Table 1.1 - Imports and exports of biofuels in different continents of the world in 2014.

Continent	***Import, EJ***	***Export, EJ***
Africa	0.00	0.02
America	0.14	0.24
Asia	0.03	0.07
Europe	0.68	0.46
Oceania	0.00	0.00
EU - 28	0.67	0.42

Basing on geographic positions, each biofuel producer country is, in general, the leader of a particular type. Thus, according to Global Bioenergy Statistics 2018, continents - leaders in the production and supply of bioenergy are Europe, America and Asia [7].

In Figure 1.1, the main export flows of wood biofuel are clearly demonstrated, where the main consumer is the European Union.

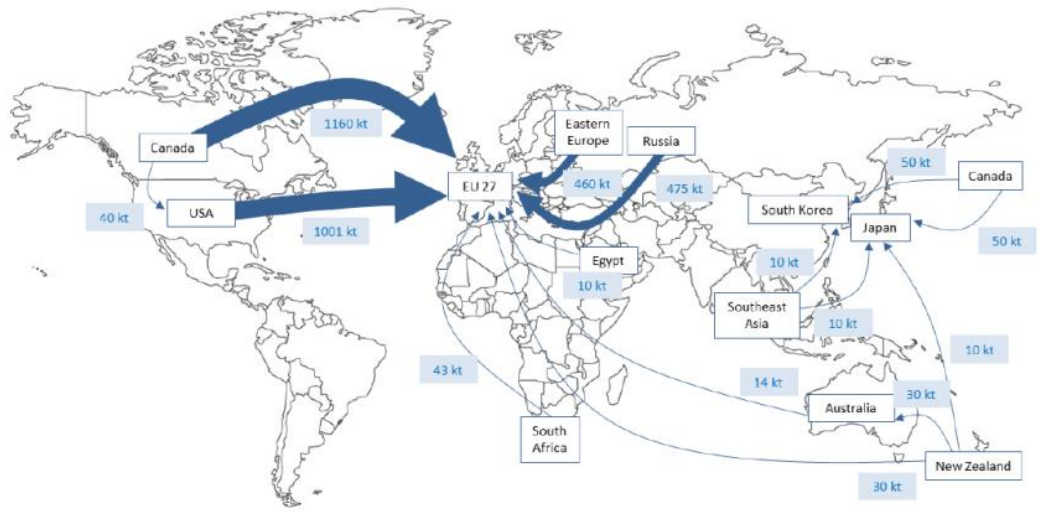

Figure 9: Global Wood pellet flows for 2011 in ktonnes (Pelkmans, et al. 2013)

Figure 1.1 - Export of wood biofuel in the world, 2011 [8].

Biogas, which is mainly produced in Europe, namely in Germany (the largest biogas producer in the world), is actually consumed by Europe. Biodiesel is widely used and exported to North and South America, Europe, Australia, some countries of Asia and Africa (Figure 1.2).

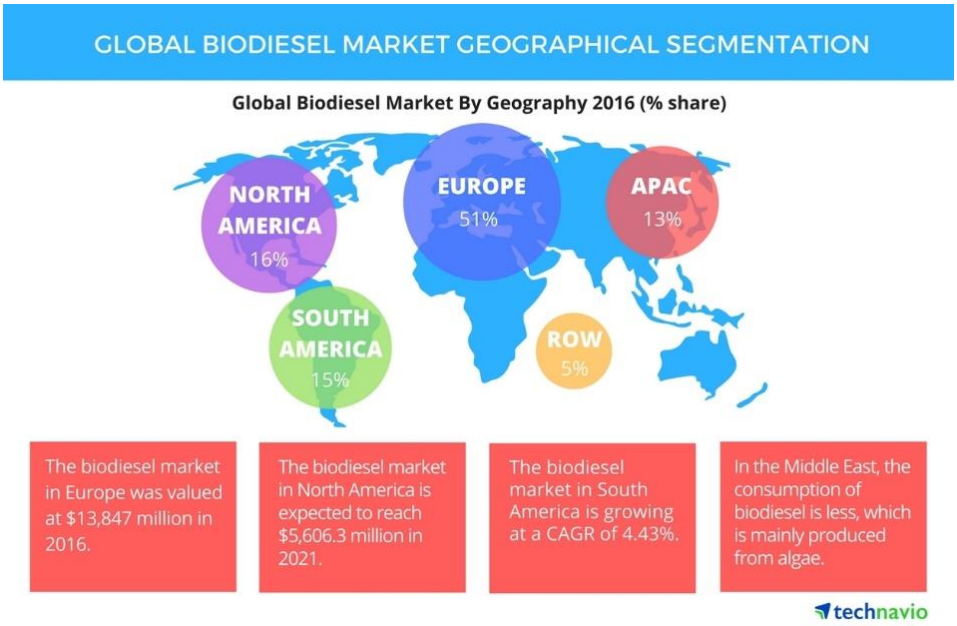

Figure 1.2 - Segmentation of the global biodiesel market

1.3 Financial and economic indicators of biofuel production. Pricing of biofuels

The costs of biomass supply for biofuel production depend mainly on region-specific conditions such as the biomass potential associated with the overall area of the region, infrastructure from the point of view of the transport network and its use, and the availability of multi-modal factories that have access to roads, railways, ports, etc. Since there is no established market for most of the major agricultural waste, there is no reliable data on the cost of developing biofuels. Pricing of raw materials for biofuels varies considerably only depending on the country where it is produced - in developed or in developing countries.

As general, biomass supply costs increase with increasing production capacity and increasing demand for the product. This is due to increased distances in traffic and often more complex logistics (processing and storage requirements). In the production of biofuels from residual materials of primary production it is necessary to have a specially adapted transport for the transportation of such raw materials, which undoubtedly is more expensive and will have an influence on the price. Since the moisture content of biomass

also affects the costs associated with the provision, naturally dried biomass in the air can significantly reduce transport costs, depending on the concept of supply.

For favorable plant sites, biomass supplies account for about 10-25% of the total biomass cost (including production and supply costs), but under adverse conditions, the cost of supply can be more than 65%, thus increasing production costs. The general infrastructure conditions, namely logistics, are quite good in developed and in urban regions of individual transition countries, and also to some extent in developing countries, which are important for regional and international trade flows. However, the quality of infrastructure and road maintenance in suburban areas in developing countries are often unsatisfactory, which has a direct impact on the growth of domestic biomass and biofuel supply prices.

Taking abovementioned into account, it is difficult to estimate the total costs of biomass supply for countries with economies in transition and developing countries. Among the factors that influence costs, it is also important to note: the quality of land preparation and tillage, alternative costs, production efficiency, costs of provision (for example, depending on the structure of land ownership), etc. In order to successfully produce and develop a biofuel market, a large-scale implementation of the concept of sustainable biomass supply, which is governed by the state policy, is required.

Concerning production costs, they show significant differences, depending on the complexity of production plants and the efficiency of conversion of biomass. For example, in the production of biodiesel, the largest factor of cost is capital expenditure, which accounts for about 50% of total costs. The cost of raw materials is about 35-40%, from 1% to 10% consist of energy costs, maintenance, operation, etc. According to the International Energy Agency study, which was conducted in many countries, upon condition of lower raw material prices and some alternative costs, the cost of biodiesel can range from $ 50 to $ 80 in gasoline equivalent at a gasoline price of about $ 60 per barrel [9].

The financial and economic indicators that make up the final price of biofuels are an important stage in production. The main components of the financial and economic analysis are presented below.

Calculation of capital expenditures:

- the cost of all equipment;
- cost of design, construction and other adjustment works;
- level of automation and quality of equipment and components, etc.

Calculation of operating costs:

- permanent administrative and variable production costs for energy resources;
- maintenance and repair of equipment;
- wages and social payments;
- depreciation charges, etc.

Additional costs for the operation of solid fuel boilers are also included.

Calculation of net savings: financial and economic analysis of biofuel production has certain features compared with other industries. In particular, the main source of return on invested assets is the cost savings achieved through the use of cheaper sources of energy and reducing energy intensity of production.

Determination of the main macroeconomic indicators:

- the level of interest rates on loans;
- the refinancing rate of the national financial regulator;
- discounting rate;
- definition of sources and conditions of financing of the enterprise [10].

Under condition of favorable location, the profitability of production can reach 200% or more. The cost value of solid biofuels is rather small, which allows you to set your own competitive price in the market. Cost and profitability analysis is presented in the second section of the scientific effort.

2 PROBLEMS AND PROSPECTS OF BIOFUEL EXPORT TO THE WORLD MARKETS

Ukraine has a very strong potential in the production and distribution of bioenergy, due to its favorable geographical location, the availability of sufficient resources and free soil. At the moment, the Polissya and some areas of Western Ukraine are considered as the most suitable areas for the development of biofuels production in Ukraine, but it is produced in about 20 regions. The biofuel market is bad adaptable to statistical analysis, as there are many small producers in it. Places for production in general are formed depending on the availability of the raw material base. Basically it is rape, corn, sunflower and industrial wood residue. In general, biofuels from wood raw materials occupy the first place in the production and sales abroad [11].

Based on the statistics of the State Statistics Service of Ukraine, the volume of exports in the last 4 years has increased significantly and continues to grow. The figure below shows the volume of exports in recent years in millions of US dollars.

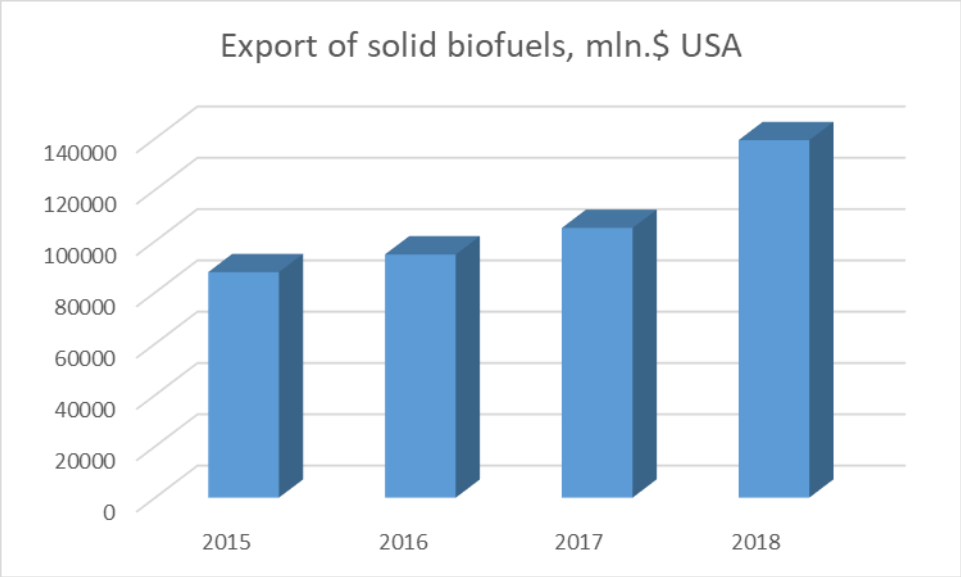

Figure 2.1 - Exports of biofuels, mln. USA

Europe is the largest consumer of wood biofuels (Fig 2.2). This is due to geographical proximity, which is attractive in terms of logistics, as well as the active demand for biofuels by EU countries.

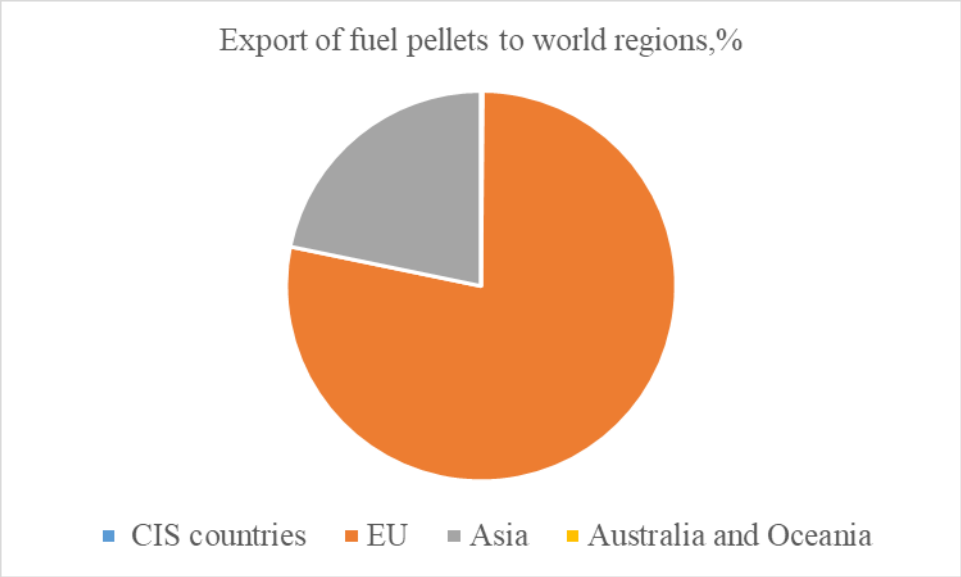

Figure 2.2 - Export of biofuel pellets by regions of the world

The export potential of biofuel pellets depends to some extent on price values. Features of the pricing on the export market of fuel pellets from biomass is formed under the influence of a variety of factors, including: prices for traditional energy sources; state energy policy; state environmental policy (including aimed at reducing greenhouse gas emissions); climate change and weather conditions; type of pellets; basic delivery terms according to Incoterms (Ukrainian fuel pellet manufacturers more often use EXW, FCA, DAP, DDU); logistics solutions (packing, packaging quality, transportation costs, availability / absence of transport and warehouse infrastructure); marketing strategy of the enterprise; length and width of distribution channels.

The cost of exporting Ukrainian biofuel pellets to different regions of the world has significant differences. This mainly depends on the mandatory characteristics of the

biofuels that the importer requires, as well as the cost of delivery. The average cost of exporting pellets to world markets is shown in Figure 2.3

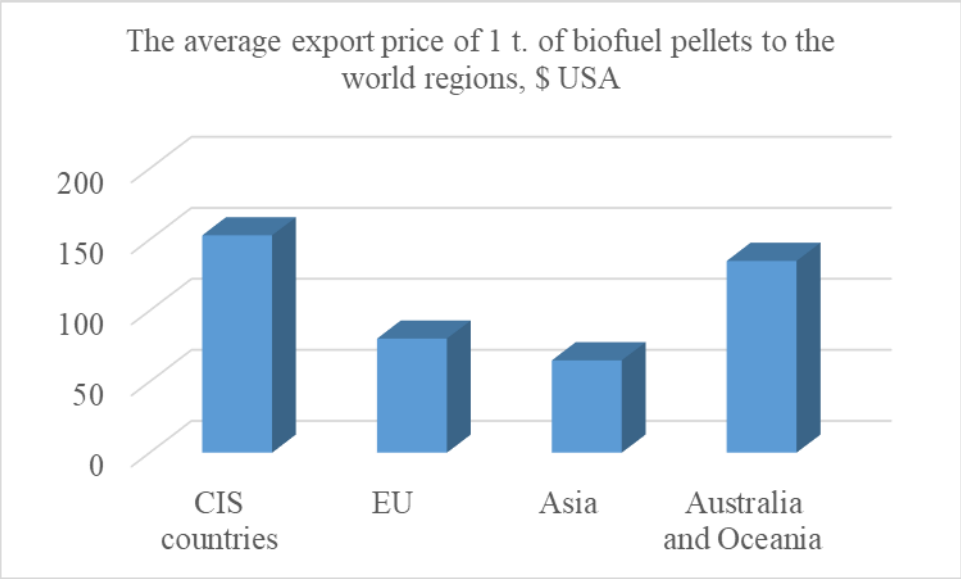

Figure 2.3 - Average cost of export of 1 ton of wood pellets in different regions of the world

Analysis of exports structure of biofuel pellets by Ukrainian producers makes it possible to conclude that the market potential is rather high and continues to grow at this period.

The main consumer dwell the European countries, in the second place is Asia, followed by the CIS countries and others.

The lion's share of biofuel exports takes sunflower oil for biofuel production with a profit of 37104771.5 $ USA per year, placed behind it rapeseed oil with 110719.4 $ USA and soybean oil - 139469.4 $ USA [12].

The main consumers of almost all types of biofuel raw materials, or directly biofuels remain Europe and Asia. This is explained by the course of sustainable development of the countries in the field of energy and ecology, economy's strength of the country and the policy of the state.

Nowadays, biofuel trade is very actual around the world. Ukraine has a great potential in its production and sales both in the domestic market and abroad. As noted above, the flagship part in the production and export of biofuels remains solid wood biofuels, which carries both the prospects for the development of the country's economy and many problems that require timely response. Therefore, it would be advisable to consider the problems and prospects of biofuel export to world markets, especially to European countries, using the example of pellets and briquettes [13].

2.1 Problems of biofuel exports by the example of wood solid biofuels

Certification is one of the most important questions of export sale of biofuels. Currently, the EU market has a complete certification system EN plus (formerly DIN plus).

EN plus - A1, EN plus - A2, EN - B standards are three degree of quality of wood pellets that are based on the European standard specifications EN 14961-2.

The certification system is carried out in four directions:

- requirements for production and quality of wood pellets;
- product requirements (EN 14961-2);
- marking requirements, logistics and intermediate storage requirements;
- delivery requirements to the end users (buyers).

The sale of the pellets at a high price is possible only with strict control over the quality of production, which certifies the EN plus certificate given to the company. The issue of certification of production lies only on the manufacturer. Most wood pellet producers do not certify their products and work with traders, because they can’t find a buyer to sell their uncertified products without referring on the help of intermediaries. This leads to an additional overpayment for mediation, as well as price volatility, which depends not only on market conditions, but also on the terms of the traders for the purchase.

As at 2018, there were 523 productions in Ukraine, the number of which grew significantly compared to 2017 - 395 production facilities. Based on the data of the official site of the independent international organization of certification EN plus, Ukraine has only one registered wood pellet producer with the presence of such an international certificate [14].

Thus, for the formation of a favorable price, one of the most important factors is independent certification, but taking into account its cost and the conformity of production with European standards, only a small share of production can afford such a document. On the average, the cost of certification run up to 40000-60000 EUR, additional fee is paid for using the EN plus logo - 15 euro cents per ton of such biofuels (Table 2.1).

Table 2.1 - Solid biofuel certification

Type of the Certification	***Oriented Price, EUR***
Manufacturing and procedures for quality and control assurance	10000-15000
Product requirements	10-15 EUR/t
Chain of supply (raw materials, place of origin, logistics, storage, marking, transport)	5000-10000
Delivery requirements to the end buyers	5000
In general, for solid biofuel certification	40000-60000
Added value of the certified solid biofuels	100-125 EUR/t

Such a certificate must be obtained every 3 years, besides the company is subject to constant unexpected inspections, and in case of unsatisfactory state of a certain process of production, the certificate may be called away. Paying attention to the impressive value of certification, not every company can afford it, thus affecting the cost price of such biofuels. It is worth pointing out that despite the high price, the presence of certification significantly increases the confidence of buyers and the establishment of the whole

process of production and sale; the supply of goods is possible at a higher, transparent price. If the product is delivered to the EU market, the volatility of the price will be lower, since it is regulated directly by the market, other factors, such as additional profit of traders, are not affected by it. Certified product is also awarded an individual identification number, according to which the end user can track the way passed by the product.

The product code consisting of these numbers will be placed on the consignment note or directly on the commodity package. Thus, in the event of a product quality mismatch, the consumer will be able to quickly identify the source of the problem throughout the product chain and forward the reclamation directly to the responsible chain [15].

If the demand for liquid biofuels, such as biodiesel or bioethanol, is not influenced by climate factors, then solid biofuels directly depend on the seasonality of the consumer country. Only wood biofuel of EN – B class, or so – called industrial biofuel, does not depend on climate. As you can see in the chart below, the total value of exported pellets in January-February of 2015-2018 years is quite large, which suggests that the European countries have reduced the demand for pellets due to the warm winter in 2017 and the increase in demand in 2018.

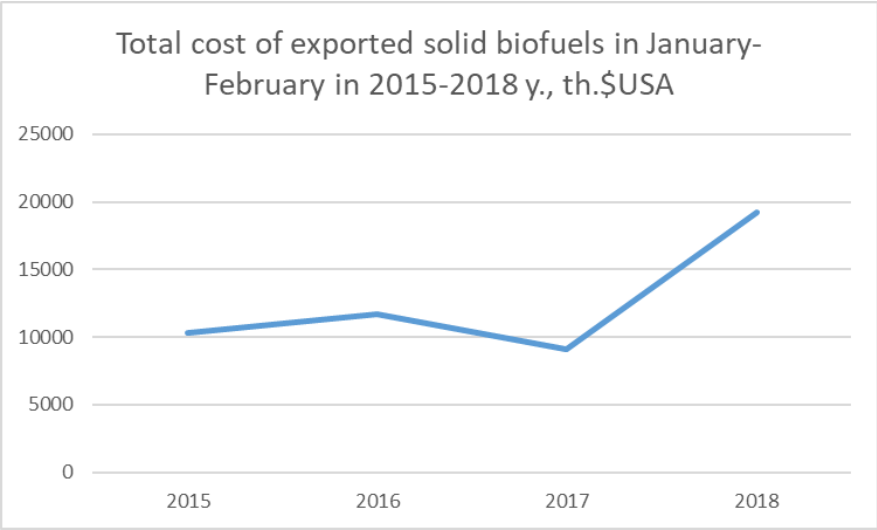

Figure 2.4 - Quantitative value of exported solid biofuels by months

Such seasonal restraints have a fairly powerful effect on the export price, since in this case the consumer may ask low prices due to low demand. The falling profit of an enterprise can lead to irreversible changes in the activities of the enterprise, up to its bankruptcy.

The logistics system of foreign economic activity also plays an important role in the success of business development and the cost of services provided. Based on experts estimates, the cost of logistics services can reach up to 40-60% of the total price of the final product. Qualified logistics management is a guarantee of unrestricted trading activity of the enterprise. Taking into account the fact that the transporting of solid biofuels, namely wood biofuels, is carried out by means of road transport, it is appropriate to consider the problems of logistics on the example of freight transport [16].

Among the problems of logistics in Ukraine, which resist the successful export potential, it is reasonable to highlight the following aspects:

- non-conformity of freight transport with the requirements of the General Assembly of the United Nations;
- undeveloped transport infrastructure, old - fashioned technologies;
- non - use of "Just in time" concept in many industries;
- incomplete interpretation of Incoterms.

Transportation of goods abroad, namely to Europe, requires compliance with the conditions of international freight traffic. The driver of such a vehicle is required to have a special license for the permission of international freight traffic, and the vehicle must meet the requirements specified by the General Assembly of the United Nations. The license costs an average of 200 $ USA and requires periodic renewal, which in turn raises the cost of logistics services [17].

According to the Global Competitiveness Index 2017-2018 [18], Ukraine ranks 130th place out of 137 of road-quality roads. 90% of roads have not been repaired for the last 30 years. The unsatisfactory state of road infrastructure increases the losses of transport companies and reduces the attractiveness of Ukraine as a transit route, which

could lead to an additional inflow of currency. Construction of roads and international routes will allow to increase cargo and passenger traffic through Ukraine, which will increase the country's GDP by 3-4%; participation in international infrastructure projects provides attraction of investments into the country; construction and proper road maintenance has a multiplier effect on other sectors of the economy - cement, metal, machinery and related services. According to researcher Mark Zandy, the multiplier effect of every dollar spent on infrastructure projects is 1.59 $ USA; improving the transport infrastructure contributes to reducing the delivery time of goods [19].

Regarding the concept "Just in time", it assumes that all materials, components and raw materials needed for production are delivered in the required quantity, in the right place and up to the appointed time for the production, assembling or distribution of finished products. This concept allows you to eliminate the cost of storage, reduce the level of material inventories in the production process, freeing from the need for large production areas, etc [20].

The terms Incoterms are the basic terms of delivery in accordance with foreign economic contracts of enterprises in different countries. They determine the terms of supply and receipt of the goods, facilitate the formulation of the final purchase and sale agreement, and therefore have a direct impact on the price of the goods.

The incomplete interpretation of these rules is that they do not identify many important aspects that the parties usually do not take into account. For example, Incoterms does not consider the issue of the consequences of breakdown of obligations under the contract, the quantity and quality of goods, the forms and methods of settlement between the parties, the grounds for the release of parties from liabilities, increases in costs after the conclusion of the contract, etc. Such and other aspects should be taken into account by the contracting parties and resolved directly by joint agreements [21].

Supply of biofuel pellets from Ukraine in 2018 amounted to about 90% of the total production. As mentioned below, the main exports destination remains Europe. Despite the enormous volumes of production, Ukraine is far from being the leader in the share of

world exports of wood pellets. As shown in the figure below, the world leader in the production and sale of wood biofuels according to Statista in 2017 is the USA, in the second place is Canada, and Latvia is closing three of the world's leaders. In this case, the main importer of the United States is the United Kingdom with an average cost per ton of 140 $ USA. Canada's priority destination for exports is also the United Kingdom, partly the United States and the western part of Europe. In general, coastal western countries import solid biofuels from the United States and Canada, because they are shipped by the ocean, and therefore the cost is lower than that delivered by vehicles from the eastern regions.

Currently, Latvia, Russia and Estonia have the largest competition for Ukrainian biofuel exports, as the export policy of these countries is directed towards Europe (Figure 2.5). An interesting fact is that these countries most often purchase biofuels from Ukraine, re-package pellets in their own branded packages of the company and sell them to EU markets at an overcharge price. The most important factor is that such biofuels are bought at a low price, because it is without an EN plus certificate and resell it based on the fact that European consumers trust the internal supplier more than Ukrainian. These and related export issues are described in the points above.

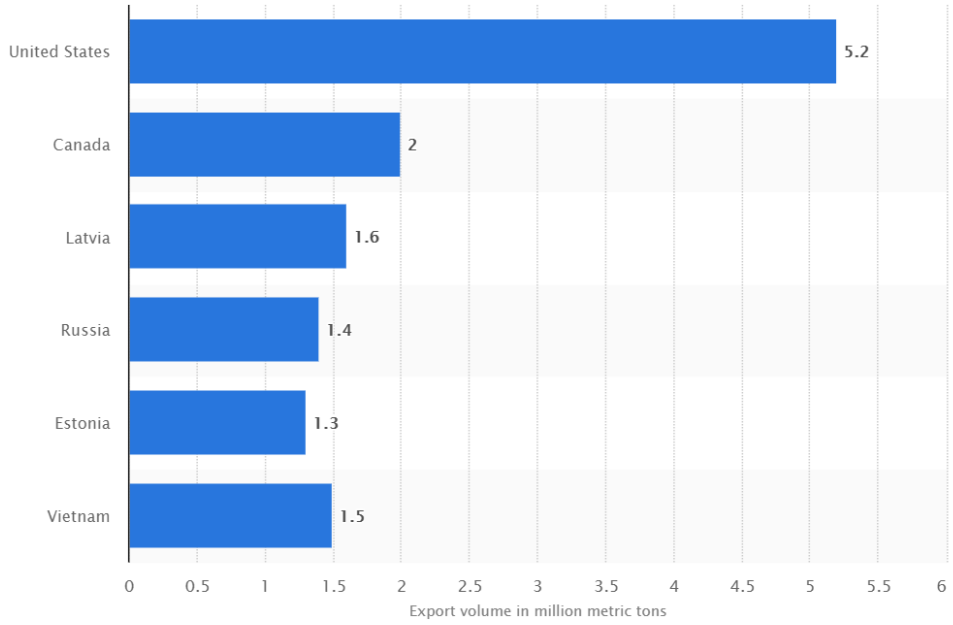

Figure 2.5 - Export volume of wood pellets globally in 2017, by major country (in million metric tons) [22].

Along with this there is also one more significant problem - the export of raw materials, but not finished products. When exporting raw materials, for example, sawdust, there is no need to certify the product and spend on its further processing as an independent biofuel, but it can be limited to only a laboratory analysis of a batch of raw materials, which costs an average of 100 $ USA and do not recycle it. As long as there is such a problem, the country can become a raw - material appendage of developed countries, as well as an industrial site, without providing itself with independence in matters of environmental and profitable production [23].

In summary, on the basis of the foregoing, Ukraine has a rather small number of uncertain problems, but at the same time, very important ones that have a significant resistance to successful exports. All of them directly affect the price and competitive potential of Ukraine as a producer of biofuel materials. These problems require an immediate solution, because that depends on the country's success in international trade, not only on the biofuel market, but also on the other markets.

2.2 Prospects of the production and export of solid biofuels

Along with the export problems, there are a number of perspectives that greatly increase the interest in such industry productive industry. The following offers the prospects of exporting biofuels to the world markets.

Despite the fact that in general production and trade are the subjects of a taxation, the production and export of biofuels are not the subjects of taxation, thus increasing the quality of production conditions. The overall driving force behind biofuels production is threats related to energy security, economic downturn and climate change. If you take into account liquid biofuels, such as bioethanol or biodiesel, for example, then it is an alternative to traditional fuels such as oil, diesel, and another. In the long run, the stable

demand for biofuels not only from different modes of transport but also from economic units can drastically change the current situation in the global energy market [24].

According to Bloomberg New Energy Finance, investments in green energy increased significantly between 2005 and 2018 (Fig. 2.6). In 2018, investments amounted to 332.1 billion $ USA, which is by about 8.2% less than in 2017, but still staying stable.

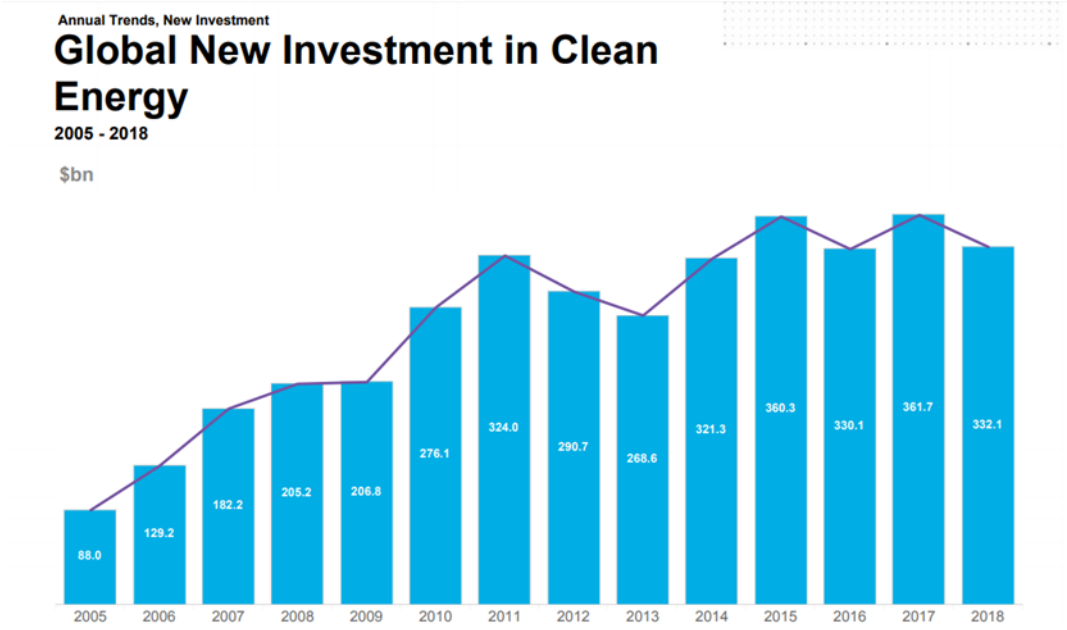

Figure 2.6 - Global Investments in Alternative Energy in 2015-2018 [25].

These trends are explained by the fact that countries such as China, the United States or European countries are active in investing in the sustainable development of bioenergy and green energy as a whole. Currently, PKN ORLEN, a Polish company that specializes on the extraction, processing and distribution of oil and gas, is a well-known investor in biofuels in Ukraine. Also, the American corporation Universal Business Ventures was planning to start construction of a complex in Volyn of the production of automotive and aviation biofuels from agricultural raw materials, as well as the creation of a complex for the processing of solid household wastes and other complex and hazardous waste [26].

Some entrepreneurs are engaged themselves in the search for investors, demonstrating the indicators of return on investment. Shown below the calculations of costs and profitability of production on the example of LLC "Lisotehnolog Ukrainy", which directs its products for export to the European countries. The enterprise specializes in the production of solid biofuels.

The calculation is based on the production line of biofuel pellets with productivity of 2 t / h.

Monthly production is 1320 tons.

The value of pellets – 3200,00 UAH / ton.

1. Calculation of Gross Monthly Profit:

$$I = Q_{h/d} \times Q_{d/m} \times P_{t/h} \times V_t \qquad 2.1$$

$$22 \times 30 \times 2 \times 3200 = 4224000{,}00\ UAH$$

where $Q_{h/d}$ – quantity of working hours per day;

$Q_{d/m}$ – quantity of working days per month;

$P_{t/h}$ - productivity of tones per hour;

V_t – the value of 1 ton of finished product.

The calculation is based on the 22 hours of the production work, because 2 hours a day takes maintenance of basic equipment and personnel shift.

Monthly Operating Expenditures:

2. Expenditures of raw materials procurement:

$$C_r = Q_{h/d} \times Q_{d/m} \times P_{t/h} \times V_t \qquad 2.2$$

$$22 \times 30 \times 2 \times 400 = 528000{,}00\ UAH$$

where $Q_{h/d}$ – quantity of working hours per day;

$Q_{d/m}$ – quantity of working days per month;

$P_{t/h}$ - productivity of tones per hour;

V_t – the value of 1 ton of raw materials.

3. Energy costs:

- the time of the chip flaker is taken 10 hours a day, because during this time the daily reserve of raw materials will be prepared for the production;

- to reduce the energy costs, a three-zone numerator will be used.

$$C_e = Q_{h/d} \times Q_{d/m} \times P \times V_e \qquad 2.3$$

$22 \times 30 \times 112 \times 0{,}13 = 9609{,}6\ UAH$

where $Q_{h/d}$ – quantity of working hours per day;

$Q_{d/m}$ – quantity of working days per month;

P - installed capacity of the equipment;

V_e - the average cost of 1 kW of electricity.

4. Transportation costs:

Expenses on delivery of raw materials to the investigated enterprise are absent, because the production of pellets is secondary production. The average cost of shipping raw materials in the average production per month is about 25000,00 UAH.

5. Labor costs:

$$C_s = Q_l \times S \qquad 2.4$$

$52 \times 8713 = 453076{,}00\ UAH$

where Q_l – the number of employees;

S - an average salary.

6. Depreciated costs:

The depreciation period of the equipment takes 3 years.

The total investment in the project is 1200000,00 UAH.

Amount of monthly depreciation is 25000,00 UAH.

7. Operating expenditures:

The planned monthly amount of operating expenditures is about 1200,00 UAH.

8. Packaging of finished products:

The cost of packaging products is about 198.00 UAH / t. The total cost of packaging for finished products is UAH 261360.00 UAH

9. Space rental:

The enterprise has its own placement, therefore, there are no rental costs.

Total direct monthly expenses make up UAH 1278245.6.

Proceeding from the above calculations, the cost per ton of finished goods will be 968.3 UAH.

10. Monthly profit without taxes and VAT will be:

$$Profit_m = I_m - C_m \qquad 2.5$$

$$4224000 - 1278245{,}6 = 2945754{,}4\ UAH$$

where I_m – monthly profit;

C_m – monthly expenditure.

The payback time is 4.8 years

11. The profitability of production of fuel pellets amount:

$$Net\ profit = (I_m - C_m) \div C_m \times 100\% \qquad 2.6$$

$$(4224000 - 1278245{,}6) \div 1278245{,}6 \times 100\% = 230\%$$

where I_m – monthly profit;

C_m – monthly expenditure.

Following on from the results obtained, we can conclude that such production is quite cost-effective for attracting investment. In summary, the main prospect of biofuel development is attracting investments, because it contributes to increasing the competitive status and the possibility of increasing exports.

The next prospect is a continuous increase in exports of all types of biofuels in conjunction with the EU renewable energy directive. According to it, the percentage of energy produced from biofuels should reach 20% by 2020 and 32% by 2030, while 10% of the total transport should also use fuels produced from alternative sources.

An increase in demand generates a broad supply from Ukraine, which also leads to the growth of related branches and industries, as well as the need for labor force generating additional workplaces [27].

Government support and allowances also play a significant role in the prospects of the development and export of biofuels. According to the administrative regulation of the Tax Code of Ukraine, the import of machinery, equipment and equipment that is used for the reconstruction of old and construction of new biofuel production enterprises, as well as for the manufacture and reconstruction of technical and transport vehicles for the purpose of using biofuels, is exempt from the taxes. The Customs Code also specifies the customs privileges for enterprises operating in the field of the use of renewable energy sources and alternative fuels, namely: exemption from customs duties when importing into the customs territory of Ukraine or the export of technical and transport vehicles and agricultural machinery beyond its borders, working on the use of biofuels [28].

The profit from the sale of biofuels is also exempted from taxation [29].

In addition to economic prospects, environmental considerations must be taken into account. By burning solid biofuels and coal, harmful emissions to the atmosphere are reduced, which is approximately 8 100 000 t / year [30].

Within this research and analysis of the biofuels market in Ukraine and in the world as a whole, it can be affirmed that such a branch of production and business is quite profitable and perspective. In order to liberate the country from the energy dependence

and improve the environment, alternative fuels are the best possible tools. Nevertheless, its production and sales, and especially exports, also have a multiplier effect for the country's economy. Benefits of biofuels are relatively cheap raw materials, as well as benefits provided to its manufacturer that allow unrestricted development in this field. As for disadvantages, the main drawback is the lack of certification due to its high cost, the need to attract traders to export to international markets, underdeveloped logistics infrastructure and considerable competition from the other countries - the flagships of biofuel production [31].

Considering this, there is a need to formulate a plan of action to stimulate the production and export processes, based on the above problems. Under the conditions of state and foreign support, the green fuel industry has the opportunity to move up quickly, catching up with the leading countries of production for the several years.

It is also worth noting that there is a positive effect for the producer country itself, because an increase in biofuel production is an incentive for its use within the country, which is a direct way for energy independence.

This issue is very relevant for the country, taking into account the price of fuel from the other supplier countries. This strategic goal is to address security issues, investment opportunities and the introduction of new technologies [32].

3 METHODS OF SOLUTION THE PROBLEMS OF BIOFUEL EXPORTS IN UKRAINE

The study of problem issues and the prospects of biofuel exports showed up the need to introduce new methods and approaches for the development of the biofuels sector, as well as its related industries. Taking into account the fact that the biofuel industry can revitalize the agrarian economy, promote the development of logistics infrastructure and other industries, remains the need to find ways to promote its expansion and popularization both in the domestic and foreign markets.

The main support of any branch of the country's economy is to involve its public policy processes. At the moment, privileges have already been set for alternative fuel producers, but they do not regulate many important issues, including the provision of free access to heat networks for private producers, the average weighted tariff for alternative biofuels users, and so on.

Proposed actions of the state for solving issues of production and export of biofuels:

- to develop mechanisms for stimulating the replacement of tridional alternative fuels;
- introduce a program of partial reimbursement of credits for biofuel producers;
- simplify land allocation procedures for the construction of biofuel production facilities;
- to exempt from payment of taxes on exports and imported equipment;
- bring under the international norms a legal framework for attracting foreign investments.

The last point is very important due to the fact that the great number of foreign partners has a distrust about the Ukrainian enterprises due to a number of problematic issues: corruption, imperfection of the legislative framework, lack of experienced specialists in project management, imperfect methodological provision of investment

projects, etc. This issue requires a very important study and response, since foreign investment is a good tool for the rapid development of business and the release of its products to world markets [33].

The next proposed step to improve the domestic conditions of the production and export of biofuels is the introduction of mandatory certification of biofuels in accordance with the needs of the international market. Now the process of certification of production is a very serious issue for producers, because the main consumer - the countries of the European Union, are obliged to have a certificate for the purchase of biofuels.

The implemention of European standards for biofuels provides a number of benefits:

- untrammeled product promotion in the markets of the EU and the world;
- increase in the distribution price for products (15-20%);
- no need to attract traders to export biofuels;
- competitive advantages;
- introduction of quality management systems, production process organizations and other enterprises at enterprises [34].

Despite the fact that Ukraine has a favorable geographic location, the country's road and transport infrastructure remains in critical condition. This problem is acutely worth on the agenda, because the roads in Ukraine are limited to import and export commodities, as well as transit traffic. As previously stated, Ukraine ranks 130th out of 137 in terms of road quality according to the Global Competitiveness Index. Improvement of the high-quality and operational level of the network of highways will contribute to the development of production and trade sectors, as well as the volume of transit traffic, which will positively affect the economy of the separate regions and Ukraine as a whole. Proceeding from the above, in order to address the insecurity and poor quality of road transport infrastructure, there is a need for a number of reforms, in particular:

- ensuring sufficient permanent financing of the road sector;

- ensuring the quality of road works through independent control and quality assurance;
- creation of a competitive road market (liquidation of the monopoly of Ukravtodor);
- protection of roads from early failure with the help of systems of dimensional and weight control;
- ensuring openness and transparency of data on the funds used and the work performed by the public.

Among the road transport infrastructure, it is also necessary to mention the reform of the licensing system and the conformity of transport to international standards:

- to introduce European rules in the field of cargo transportation;
- to introduce systems for assessing the conformity of vehicles and their parts in accordance with the Geneva Agreement of 1958 and the EU legal acts;
- introduction of European rules of work of economic agent market participants etc [35].

In view of quantity of necessary reforms, one can make a clear conclusion: the adequacy of development of Ukraine's road and transport infrastructure is in a very critical condition and requires an immediate response from the government. Solving these problems will greatly simplify the international flow of goods, and, consequently, increase the economic income of the state and other communal and private enterprises.

One of the options for solving transport issues is the involvement of other modes of transport, such as water. This will solve the issue of the expansion of markets, as Ukraine has access to the sea, which will allow the export of biofuels to countries neighboring the sea.

It is also necessary to consider the need for the introduction of a unified biofuel stock exchange for the introduction and development of biofuel mass. The Biofuels Exchange will allow the sale and purchase of biofuels (liquid, solid and gassy) both at the state level and internationally. Its main characteristics should be:

- compliance of all types of biofuels with the international quality standard;
- operation of the stock exchange through branches in the cities of Ukraine (such as the Chamber of Commerce and Industry);
- transparent participation in the stock exchange for all entrepreneurs, including foreign ones;
- the stock exchange is regulated in accordance with international requirements.

An additional way to increase the export of solid biofuels may be the abolishment of the moratorium on timber exports, in which case the volumes may increase to a considerable dimensions, but this option is very dangerous for the environment. The development of bioenergy should be considered not only from the side of economic profitability, but also the environmental situation, which is envisaged by the conditions of sustainable development of alternative energy.

It is worth mentioning out that such a problem as corruption also has a powerful impact not only on the development of biofuel production and exports, but also on all economic sectors in general. According to the international organization Transparency International, in 2018, Ukraine ranked 120th among 180 countries in the Corruption Perceptions Index. Most foreign investors are worried about investing in Ukrainian companies because of numerous corruption cases, and therefore drastic remedies to combat corruption should be introduced at the state level, as well as to improve anti-corruption reform and to create an anti - corruption court in accordance with international law standards and norms [36].

An important factor in the country's bioenergy development is cooperation with other countries and international partners in this field. Training of young specialists on the latest technologies of fuel production will stimulate its development and distribution, and the exchange of experience with foreign partners will increase the number of foreign investments.

In summary, analyzed all the problems of biofuel exports to world markets, the final ways of development of export potential are:

- the creation of a permanent state support to biofuel producers through the introduction of additional privileges and necessary legislation;
- replacement of traditional types of fuel with biofuels;
- introduction of mandatory certification of biofuels in accordance with the international standards;
- to reform the management and country's road and transport infrastructure;
- reforming the licensing system and transport compliance with international standards;
- increase of the biofuel sales market by means of attracting water transport;
- introduction of a biofuel stock exchange for transparent bidding on biofuels both on the domestic and foreign markets;
- improvement of anti-corruption reform to ensure the security of investments for foreign legal entities;
- specialists training in modern biofuel production technologies and international exchange of knowledge [37].

Thuswise, the development of biofuels within the country is mainly influenced by the support of the state and the promotion of privileges, while from the outside, the main stimulating factor is the influx of foreign investment. Under the conditions of proper stimulation and support of production, the volumes of biofuel exports will increase significantly, which in turn will lead to the economic growth of the enterprise and the state as a whole. The above proposed ways to improve production and exports can significantly increase industrial and economic turnover [38].

CONCLUSION

Modern trends in the consumption of traditional fuels have a considerable number of disadvantages, including not only economic impact on certain states, but also the international political situation. For replacement of traditional fuel, a rather powerful alternative - biofuels has already emerged, which already allows country to gain energy and political independence and contribute to the domestic economic development of countries [39].

Biofuel is the modern ecological energy carrier, which is made entirely of organic products, their by-products or residual materials of their production. Production facilities for biofuel production can be installed in any area and in any quantity. The latest technology now allows you to have mobile lines for the production of certain types of biofuels, and even those that can be installed in the household. The cost of such an alternative fuel is quite small, which makes it accessible in every corner of the world.

The flagship biofuels producers are stay Europe, America and Asia. Depending on the capabilities and needs, each country is a leader in the production of certain types of biofuels. America, for example, is the largest producer of biodiesel, while solid biofuel production is concentrated in Europe [40].

Ukraine has a very powerful potential in the production of all types of biofuels, but the first step now is the production of wood biofuels, take cure from the availability of resources and the high demand from neighboring countries. Poland is currently the main consumer of Ukrainian solid biofuels, importing about 40 % of biofuel production, Italy is the second largest in terms of exports (14 %), while the Czech Republic is third in terms of volume with quantity of 11 %. Other perspective markets include Germany, Sweden, the United Kingdom and the Benelux countries. Thus, the field of bioenergy in the country should remain one of the leading sectors of state support, in recognition of its economic potential.

In this work was conducted a detailed study about biofuel production in the world and directly in Ukraine, were identified a number of problems and perspectives for biofuel exports abroad, as well as ways to improve the work of the biofuel industry and its trade. The study revealed the following problems:

- lack of certification;
- seasonality of demand for solid biofuels;
- high competition;
- undeveloped logistics;
- corruption;
- mass exportation of raw materials, not finished goods.

Without limiting the foregoing problems, there is also a large number of perspectives that drive the development of biofuels in Ukraine and its popularization as a factor of energy independence. Among the prospects are the following points:

- attraction of foreign investments;
- state support;
- provision of privileges for biofuel production;
- ecological non - redundancy.

On the assumption of the existing problems, the following solutions were proposed:

- the creation of a permanent state support for biofuel producers through the introduction of additional privileges and necessary legislation;
- replacement of traditional types of fuel with biofuels;
- introduction of mandatory certification of biofuels in accordance with the international standards;
- reforming the management and country's road and transport infrastructure;
- reforming the licensing system and transport compliance to international standards;
- increase of the biofuel sales market by means of attracting water transport;

- introduction of a biofuel stock exchange for transparent bidding of biofuels both on the domestic and foreign markets;
- improvement of anti-corruption reform to ensure the security of investments for foreign legal entities;
- specialists training in modern biofuel production technologies and international exchange of knowledge.

Thus, following on from the results of the study, it can be affirmed that the biofuels industry is very perspective for Ukraine. Despite a number of problematic issues, biofuels in Ukraine continue to increase production volumes and export volumes abroad. The proposed paths of development can make a number of changes that will allow this industry to reach the international level and successfully compete with the leading countries, providing its own energy, economic and political independence.

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APPENDICES

APPENDICE A

Summary

Stupina L. E. Problems and prospects of biofuel export to the world markets. - Bachelor's qualification paper. Sumy State University, Sumy, 2019.

The final paper is devoted to studying the problems and prospects of biofuel export to world markets. Calculated profitability of enterprise investments. The main problems of biofuel production and export in Ukraine are determined, as well as the ways of their solution are proposed. The prospects of export are analyzed and additional ways of its stimulation are offered.

Keywords: biofuel, export of biofuel, export potential, the value of biofuel, world market of biofuel, international trade.

Анотація

Ступіна Л. Е. Проблеми та перспективи експорту біопалива на світові ринки. – Кваліфікаційна бакалаврська робота. Сумський державний університет, Суми, 2019.

Кваліфікаційна бакалаврська робота присвячена дослідженню проблем та перспектив експорту біопалива на світові ринки. Проведений розрахунок рентабельності інвестицій підприємства. Визначені основні проблеми виготовлення та експорту біопалива в Україні, а також запропоновані шляхи до їх вирішення. Проаналізовані перспективи експорту та запропоновані додаткові шляхи його стимулювання.

Ключові слова: біопаливо, експорт біопалива, експортний потенціал, вартість біопалива, світовий ринок біопалива, міжнародна торгівля.

APPENDICE B

Table B. 1 – Expenditures of LLC «Lisotehnolog Ukrainy»

Indicator	Current month, UAH	Per 1 ton, UAH
Purchase of raw materials	528000,00	400,00
Energy costs	9609,6	7,28
Transportation expenses	0,00	0,00
Labor costs	453076,00	343,2
Depreciation costs	25000,00	18,9
Operating costs	1200,00	0,9
Final product packaging	261360,00	198,00
Rental costs	0,00	0,00
Total	1278245,00	968,3