Step 2: Assess your risks. Understand how much you are willing to lose for the sake of high returns. High returns always come with high risks. If you are not ready to take risks, choose more stable assets;

Step 3: Diversify your assets. Spread your investments across different asset types. This helps reduce risks and increase the chances of stable income;

Step 4: Choose assets for investment. After assessing your goals and risks, select specific assets: stocks, bonds, real estate, cryptocurrencies, etc. Each asset has its own characteristics and risks;

Step 5: Rebalance your portfolio. Regularly review and adjust your portfolio to ensure it aligns with your strategy and goals. The market is constantly changing, so it is important to maintain the right asset allocation;

Step 6: Continuously monitor and adjust. The investment process does not stop. It is essential to track the market and adjust your portfolio based on changes in economic conditions and your personal circumstances.

Building and managing an investment portfolio is a key step in achieving financial goals. Important aspects include clearly defining your objectives, assessing risks, diversifying assets, and regularly adjusting the portfolio according to market changes. Properly applying these steps allows investors to reduce risks, maintain a stable income, and achieve desired results in a market economy.

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BIOENERGY IN UKRAINE (БІОЕНЕРГЕТИКА В УКРАЇНІ)

У статі подана інформація про біоенергетику в Україні як вона розвивалася. Чому саме вона може покращити життя наших фермерів і не тільки. Перспективи її розвитку на рівні інших альтернативних джерел енергії. А також сучасні проблеми та перспективи використання біоенергетики в Україні. І чому саме біоенергетика може покращити життя аграрно-промислового комплексу України.

The article presents information regarding the evolution of bioenergy in Ukraine. What enables you to enhance the lives of our farmers and beyond? Prospects for its advancement are comparable to other alternative energy sources. Current challenges and future potential for the advancement of bioenergy in Ukraine. And why Ukraine's industrial and agricultural complex may benefit from bioenergy itself.

Bioenergy is a branch of energy production based on the use of biofuels derived from biomass. Biomass refers to biologically renewable organic substances that undergo biological decomposition, including agricultural (crop and livestock) waste, forestry residues, and waste from industries technologically linked to forestry, as well as the organic fraction of industrial and municipal waste.

For Ukraine, bioenergy represents one of the strategic directions for the development of the renewable energy sector, given the country's high dependence on imported energy resources—primarily natural gas—and the significant potential of biomass available for energy production. Unfortunately, the development of bioenergy in Ukraine still lags significantly behind European standards. As of today, biomass accounts for 1.78% of the country's total final energy consumption. Annually, Ukraine utilizes approximately 2 million tons of coal equivalent of biomass of various types for energy production. Wood accounts for the highest percentage of economically viable biomass utilization—80%, whereas other biomass types (except sunflower husks) have significantly lower utilization rates. The energy potential of cereal straw and rapeseed straw is the least exploited, at approximately 1%.

Ukraine harvests over 50 million tons of cereal crops annually, generating large volumes of straw and plant residues as by-products of agricultural production. The annual technically accessible energy potential of solid biomass in Ukraine is equivalent to 18 million tons of oil equivalent, and its utilization could save approximately 22 billion cubic meters of natural gas annually.

Energy Crops

Certain types of trees and plants are cultivated specifically for solid biofuel production. These can be categorized into three main groups:

- Fast-growing trees;
- Perennial grasses (e.g., Miscanthus, switchgrass);
- Annual grasses (e.g., sorghum, triticale).

Additionally, energy crops include traditional agricultural crops grown for the production of biodiesel fuel (e.g., rapeseed, sunflower), bioethanol (e.g., corn, wheat), and biogas (e.g., corn). One application of biomass is its processing into liquid biofuels: biodiesel and bioethanol.

Biodiesel

Biodiesel consists of methyl and/or ethyl esters of higher organic acids derived from vegetable oils or animal fats, used as biofuel or a bio-component in fuel blends.

Bioethanol

Bioethanol is anhydrous ethyl alcohol produced from biomass or raw ethyl alcohol for use as biofuel. Ukraine possesses the necessary conditions for liquid biofuel production, including sufficient land resources, plant potential, and existing production facilities. The current biomass potential in Ukraine is sufficient for cost-effective liquid biofuel production (bioethanol and biodiesel), making this sector highly promising. The annual technically achievable energy potential of liquid biofuels in Ukraine is equivalent to 1 million tons of oil equivalent, and its utilization could save approximately 1.2 billion cubic meters of natural gas annually.

Economic analysis indicates a global trend of increasing energy prices. Consequently, expanding the cultivated areas for rapeseed and organizing biodiesel production using advanced global technologies and equipment are among the country's priority strategic objectives in the energy sector. Bioethanol production is mainly carried out at reconstructed distilleries. In recent years, fuel bioethanol production has been established at four distilleries, with plans to involve an additional eight facilities within the next three years. The use of liquid biofuels will help reduce greenhouse gas emissions and positively impact the reduction of petroleum imports.

Biogas

Biogas is a gas derived from biomass and used as fuel. Energy production from biogas is environmentally friendly, as it does not result in additional CO2 emissions and helps reduce organic waste volumes. Unlike wind and solar energy, biogas production is independent of climatic and weather conditions. Furthermore, unlike fossil energy sources, biogas in Ukraine has significant renewable potential. The annual theoretical potential of biogas in Ukraine is estimated at 3.2 billion cubic meters.

A highly effective method for supplementing and replacing traditional fuel and energy resources is the production and use of biogas, generated through the methane fermentation of livestock biomass. Biogas typically consists of 60-70% methane. Another biogas source is landfill waste at solid waste disposal sites.

Additionally, biogas can be sourced from wastewater. The treatment of municipal and industrial wastewater sludge addresses critical environmental, energy, and social challenges, particularly in metropolitan areas. Municipal and industrial wastewater sludge contains substantial amounts of organic matter.

Biogas derived from anaerobic biomass fermentation can substitute the following fuel types:

- Natural gas and liquefied gases used for industrial and domestic energy needs;
- Gasoline, diesel fuel, and kerosene in internal combustion engines.

The use of biogas enables the production of both thermal and electrical energy, which is particularly attractive for agricultural enterprises.

Moreover, landfills and solid waste disposal sites significantly impact the environment. The closure of landfills and the establishment of modern waste collection and utilization systems are essential measures for environmental sustainability.

The construction of biogas collection and utilization systems at municipal solid waste landfills has become a standard practice in developed countries around the world. In particular, in the United States, over 150 large landfills are used to generate thermal and electrical energy for industrial and residential purposes. The number of biogas plants in the country amounts to about 244 units, producing 4.3 billion cubic meters per year. In Germany, there are approximately 4,000 biogas plants (half of the global total). Each year, 280 plants generate biogas amounting to 3.7 million tons. According to expert forecasts, by 2020, Germany will have 20,000 biogas plants in operation.

Bioenergy Potential in Ukraine

According to the Bioenergy Association of Ukraine, as of 2018, the potential energy from biomass in the country amounts to 23 million tons of conventional fuel. The main components of this potential are by-products of crop production (a total of 10 million tons of tce, or 44% of the total biomass potential) and energy crops (a total of 7.5 million tons of tce, or 32% of the total potential). By-products of crop production include straw from cereals and rapeseed, stalks of corn, sunflower, etc. Energy crops include willow, poplar, and miscanthus for solid biofuels, and corn for biogas. The biomass available in Ukraine is sufficient to replace all imports of gas, coal, and gasoline (as of 2018). According to the Energy Balance of Ukraine, the share of biofuels in the total supply of primary energy (TSPU) in 2018 amounted to 3.2 million tons of conventional fuel , which constitutes 3.4% of the TSPU.

Current Issues and Prospects for the Use of Bioenergy in Ukraine

Bioenergy in Ukraine is one of the important sectors of the energy industry, which has significant potential due to the vast volumes of agricultural and forestry waste, as well as favorable natural conditions for biogas and biofuel production.

Current Issues in Bioenergy in Ukraine

- Low Infrastructure Development

One of the main challenges is the insufficient development of infrastructure for the production and use of bioenergy resources. Most bioenergy stations in Ukraine are small or medium-sized enterprises, which prevents the efficient utilization of biomass potential. Ukraine lacks a unified biomass collection and processing system, which significantly hinders the development of this sector.

- Low Level of Investment

Bioenergy requires large financial investments; however, the level of investment in this sector in Ukraine is currently insufficient. Insufficient state funding and investor mistrust towards infrastructure projects amid economic instability and war significantly limit the opportunities for bioenergy development. To attract investment, favorable conditions for business need to be created, including tax incentives and other stimuli.

- Legislative Inadequacy

The legislative framework regulating the development of bioenergy in Ukraine remains incomplete. Existing regulatory acts often do not meet the current needs of the sector and fail to promote its development. In particular, the presence of numerous bureaucratic barriers and the instability of the legal environment for investors create additional challenges for the development of bioenergy projects.

- High Technological Costs

The development of bioenergy technologies requires significant expenditures on research, implementation, and modernization of production facilities. Ukrainian enterprises often face the problem of high costs for purchasing modern equipment, which limits their ability to effectively use available biomass and achieve high efficiency levels.

- Untapped Waste

Ukraine has enormous potential for the production of bioenergy resources; however, a significant portion of agricultural and forestry waste remains unused or is simply destroyed. The lack of efficient collection, processing, and transportation schemes for biomass leads to large potential losses and negative environmental impacts.

- Prospects for Bioenergy Development in Ukraine. Reducing Dependence on Imported Energy Sources. Bioenergy can significantly reduce Ukraine's dependence on imported energy sources such as natural gas and oil. Thanks to abundant natural resources, the bioenergy sector is capable of replacing part of the imported energy, which will enhance the country's energy security and reduce vulnerability to fluctuations in global energy markets.
- Improving Environmental Situation

The use of biomass and biofuels for energy production contributes to reducing greenhouse gas emissions, which is an important step in the fight against climate change. Bioenergy helps mitigate the negative environmental impact, as CO2 emissions from biomass combustion are almost entirely offset by the photosynthesis process of the plants from which this biomass is derived.

- Creation of New Jobs

The development of the bioenergy sector contributes to the creation of new jobs in agriculture, forestry, and processing industries. Ukrainian farmers can gain additional income from biomass production and processing, which also helps develop rural areas and reduce unemployment in rural regions.

- Utilization of Agricultural Waste

Ukraine has immense potential for utilizing agricultural waste for biofuel production. The high levels of agricultural crop production, such as wheat, corn, and sunflower, allow for a significant increase in the biomass that can be processed into biofuels or biogas. Additionally, the processing of agricultural waste helps reduce environmental pollution.

- Support for International Initiatives

Ukraine has the opportunity to take advantage of international support for bioenergy development. The European Union actively supports renewable energy programs, and Ukraine, as a candidate for EU membership, can benefit from funding and technological assistance in this area.

- Technological Innovations

The development of new technologies for the production of bioenergy resources, such as biogas and biodiesel, opens up new possibilities for increasing biomass utilization efficiency. The implementation of modern technologies, such as anaerobic digestion and gasification, will significantly enhance energy efficiency and reduce production costs for biofuels.

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