HIGH PROTEIN FEED MARKET: CURRENT TRENDS AND PROSPECTS FOR UKRAINE

Abstract. The research is devoted to the problem of formation of high-protein feeds market for farm animals in Ukraine in conditions of European integration processes. The problem of providing the population with high quality food is becoming more global, the demand for high protein food products of a good quality is growing as well as the need for protein-balanced feeds for livestock. The dynamics of high-protein feed production in Ukraine and EU countries has been studied. The tendencies of the high-protein feeds market formation in Ukraine are considered. By means of benchmarking, price trends in the protein feed market in the EU and Ukraine have been analyzed. Ukraine has favorable soil and climatic conditions for the production of quality, safe products as well as efficient logistic routes available. As a result of the study it was found that the key factor for Ukraine’s penetration into the EU feed market is the need for high-protein feeds. The directions of solving the problem of feed protein deficiency for the needs of animal husbandry are determined. Environmental problems regarding feed quality and safety in the context of Ukraine’s aspirations for European integration are substantiated. The legislative basis for ensuring the quality and safety of feed and feed resources is considered. As a result of SWOT-analysis of vegetable protein production in Ukraine, it was found that Ukraine has significant potential for the production of competitive feed protein that meets domestic needs, form high export potential and promote entry into European and Asian markets. It is emphasized that the process of Ukraine’s European integration requires constant marketing research of the sectoral situation changes with account of the specific features of domestic production of high-protein feeds, highlighting key factors of Ukraine’s presence and its potentialities in the EU agricultural market and outlining the prospects for its development. Increase in the performance of farm animals and margins of livestock production requires balanced diets and reduction of feed cost in the costs structure due to the use of high protein feeds. It is important for Ukraine to promote the development of the market for high-protein and bulk feeds on the industrial basis as well as the development of organic feed and livestock production. Development of the competitive feed market in Ukraine and solving of the environmental and social problems of intensive animal husbandry requires the improvement of legislation to meet the requirements of EU Directives on the production, processing and efficient use of feed resources.
**Keywords:** feed market, feed production, high-protein feed, protein balance, price, SWOT-analysis.

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**РИНОК ВИСОКОБІЛКОВИХ КОРМІВ:**

**СУЧАСНІ ТЕНДЕНЦІЇ РОЗВИТКУ І ПЕРСПЕКТИВИ ДЛЯ УКРАЇНИ**

Анотація. Дослідження присвячене проблемі формування ринку високобілкових кормів для сільськогосподарських тварин в Україні в умовах євроінтеграційних процесів. Проблема забезпечення населення високої якісною їжею стає все більш глобальною, зростає попит на харчові продукти з високим вмістом білка хорошої якості, а також потреба у збалансованих білках кормах для худоби. Досліджено динаміку виробництва високобілкових кормів в Україні та країнах ЄС. Розглянуто тенденції формування ринку високобілкових кормів в Україні. На основі бенчмаркінгу проаналізовано цінові тенденції на ринку білкових кормів в ЄС та Україні. Потенціал України — це сприятливі ґрунтово-кліматичні умови для виробництва якісної, безпечної продукції з наявністю ефективних логістичних шляхів сполучення. У результаті дослідження встановлено, що ключовими факторами присутності України на ринку кормів в ЄС є потреба у високобілкових кормах. Визначено напрями розв’язання проблеми дефіциту кормових білків для потреб тваринництва. У результаті SWOT-аналізу виробництва рослинних білків в Україні встановлено, що Україна має значний потенціал для виробництва конкурентоспроможного кормового білка для задоволення внутрішніх потреб, формування високого експортного потенціалу і виходу на європейський та азійський ринки. З’ясовано, що процес євроінтеграції в Україні вимагає проведення постійного маркетингового дослідження ситуаційних змін у секторальному аспекті з урахуванням особливостей вітчизняного виробництва високобілкових кормів, ви́ділення ключових факторів присутності і потенційних можливостей України на аграрному ринку ЄС та оцінення перспектив його розвитку. Збільшення продуктивності сільськогосподарських тварин і рентабельності виробництва продукції тваринництва вимагає збалансованого харчування і зменшення вартості кормів у структурі витрат завдяки використанню високобілкових кормів. Для України важливо сприяти розвиткові ринку високобілкових і сільських кормів на промисловій основі, а також розвиткові органічного виробництва кормів і тваринництва. Розвиток
Introduction. Modern feed production in Ukraine is characterized by the decrease in the area under forage crops, deterioration in feed quality, the decrease in production of high quality and safe feeds, and increase in the production cost. The fundamental basis for the development of sustainable animal husbandry is the supply of balanced feeding, high-quality livestock maintenance and a high level of breeding. Nowadays, feeds have become a commodity thus changing the approaches and priorities concerning the ways of developing the feed base, sources of feed supply, system of their production, preservation and their effective use for livestock and poultry feeding. In recent years, the safety and quality of feeds for livestock have become priority issues, and balanced feeding requires on-going monitoring of feed diets and conditions of livestock maintenance in accordance with EU Directives and international standards for the quality and safety of livestock products. Therefore, this research aims to evaluate the high protein feed market and to outline the prospects for its development in Ukraine.

Analysis of research. The main factors and consequences of globalization of the world agricultural production are the constant objects of research. Export capabilities of Ukrainian agricultural enterprises in international markets have attracted the attention of many researchers from various countries of the world: Ukraine (Kvasha, Kashuba, Kirilov), USA (Deininger), Montenegro (Tangermann, Cramon,) and others. In the papers of S. Chadd, R. Davis and D. Koivisto (Great Britain), Julia Jouan, Aude Ridier, Matthieu Carof, Naylor et al (France). Scientific investigations of the authorities of domestic agricultural science P. T. Sabluk and of other scholars from the «Institute of Agrarian Economics» [1] and experts of the Institute of Feed Research and Agriculture of Podillya of NAAS of Ukraine [2—4] are devoted to the search for economic and organizational-technological reserves to increase the efficiency of production and use of feed.

Unsolved aspect of the problem. Given the dynamic character of the market environment and importance of the feed industry, there is an urgent need to further develop and substantiate strategic alternatives for the formation of the high-protein feed market. Trade integration of production and processing of high-protein crops of Ukraine in the world opens new opportunities for the development of the national agricultural sector which will help to increase the competitiveness of protein feeds in the market, in particular in Europe and Asia.

The purpose of the article. The purpose of this study is to assess the potential of Ukraine in the market of high-protein feeds and to outline the prospects for its development in the context of global economic integration processes.

Research results. Feed production is one of the most resource-intensive industries in the agricultural sector of Ukraine. It includes field and pasture farming, industrial production of feeds and protein-and-vitamin additives, waste from the flour-milling, grain production, sugar, alcohol, and oil industries.

In 2018, the share of forage crops in the EU-28 was 6.3% of the total cropping area, and it was 4.4% in 2010 [5]. While the EU countries experienced a sustainable increase in areas under forage crops, in Ukraine, on the contrary, there was a tendency towards the decrease (Fig. 1).
Currently, forage crops in Ukraine account for 1.7 million hectares against 12 million hectares in 1990. The main forage crops are annual and perennial grasses, corn grown for silage and grain-forage crops (barley, corn, soybean, and pea). The analysis shows that during the period of 2010—2019, production of corn grown for grain increased significantly, almost twice, in Ukraine (Table 1).

### Table 1: Dynamics of forage crop production in Ukraine, thousand tons

| Crops                        | 2010  | 2015  | 2016  | 2017  | 2018  | 2019  | Change, % |
|------------------------------|-------|-------|-------|-------|-------|-------|-----------|
| Cereal and leguminous crops  |       |       |       |       |       |       |           |
| wheat                        | 39,271| 60,126| 65,952| 61,283| 69,800| 75,078| 91.2      |
| maize for grain              | 11,953| 23,328| 27,963| 24,108| 35,569| 35,848| 199.9     |
| barley                       | 8,485 | 8,288 | 9,429 | 8,279 | 7,346 | 8,908 | 5.0       |
| oat                          | 459   | 489   | 499   | 471   | 418   | 422   | -8.1      |
| millet                       | 117   | 213   | 190   | 85    | 80    | 170   | 45.3      |
| leguminous crops             | 592   | 502   | 876   | 1,237 | 954   | 711   | 20.1      |
| including pea               | 452   | 378   | 746   | 1,096 | 775   | 573   | 26.8      |
| faba bean                    | 6.8   | 6.5   | 3.2   | 7.4   | 8.3   | 3.9   | -42.6     |
| vetch                        | 33.1  | 24.9  | 23.8  | 11    | 7.4   | 6.1   | -81.6     |
| sweet lupine                 | 60.4  | 30.8  | 30.4  | 18    | 14.6  | 10.4  | -82.8     |
| Soybean                      | 1,680 | 3931  | 4279  | 3,890 | 4,461 | 3,699 | 120.2     |
| Winter rapeseed and colza    | 1,470 | 1,738 | 1,152 | 2,195 | 2,747 | 3,274 | 122.7     |
| Sunflower seed               | 6,771 | 11,181| 13,604| 12,171| 14,162| 15,268| 125.5     |
| Fodder corn                  | 7,511 | 6,843 | 6,958 | 6,546 | 6,923 | 6,351 | -15.4     |

*Source: calculated by the authors [7; 8].*
A growing demand for high quality protein resources is one of the long-term global trends. The population of the Earth as well as the living standards is increasing. This results in higher demand for meat, milk, eggs, fish and other products, which are the sources of food protein. The main source of feed protein is legume crops (mainly soybean). Global soybean production was 358 million tons in the 2018/2019 MY. About 82% of the world’s crop production was shared by three countries, namely, the United States (34%), Brazil (33%) and Argentina (15%). In 2018, 4.5 million tons of grain of protein crops were produced in EU countries and 5.4 million tons were produced in Ukraine indicating its high raw material potential [1; 9; 10] (Fig. 2).

![Fig. 2. Dry pulses and protein crops for grain production, million tons](source)

Source: calculated by the authors [1; 9; 10].

Soybean occupies an important position in the feed balance of Ukraine, and its cropping area has grown 8 times in the past 15 years. In 2019, the area under soybean occupied about 1.6 million hectares. Ukraine’s soybean production ranks 1st among EU countries and 8th in the world. It has been found out that soybean seed yield has almost doubled in 9 years, while in the EU it remains stable and amounts to 2.8—2.9 t/ha (Fig. 3).

![Fig. 3. Dynamics of soybean yields in Ukraine and EU countries, t/ha](source)

Source: calculated by the authors [3] and https://ukrstat.gov.ua.

The main source of feed protein in animal husbandry is the products of oilseed processing. Unlike cereals, these crops are used mainly for forage purposes. Due to its biological value, soybean protein is used more efficiently than other plant proteins when feeding livestock. Moreover, roughages are generally suitable only as the feed for ruminants.

Over the last few years, the oil market has been experiencing high development rates due to the changes in the market. In 2019, the world oil market has been shaken by natural and climatic conditions. Delayed planting in the US, droughts in Argentina and Europe resulted in the decrease in rapeseed and soybean yields. The trade war between the US and China led to a collapse in prices. A comparative analysis of soybean production and structure of use shows that its production and processing have increased in the world over the last three years, but exports have decreased. At the same time, there can be observed an increase in processing in the world by 2.6%, in EU countries by 16.8% [7] and in Ukraine by 68% (Table 2).
Table 2

| Indicators | Region, country | 2017 | 2018 | 2019 | Change, % |
|------------|----------------|------|------|------|-----------|
| Production | World          | 341.9| 358.3| 337.7| -1.2      |
|            | EU-28          | 2.67 | 2.83 | 2.87 | 7.5       |
|            | Ukraine        | 3.9  | 4.5  | 3.7  | -5.1      |
| Export     | World          | 153.1| 149.2| 149.2| -2.5      |
|            | EU-28          | 0.293| 0.158| 0.167| -43.0     |
|            | Ukraine        | 2.8  | 2.5  | 2.2  | -21.4     |
| % to production | 71.8 | 55.6| 59.5| -12.3 |
| Imports    | World          | 153.27| 145.95| 147.97| -3.5     |
|            | EU-28          | 14.1 | 15.1 | 14.8 | 4.8      |
|            | Ukraine, thousand tons | 9.8 | 5.3 | 3.2 | -67.3 |
| % to production | 71.8 | 55.6| 59.5| -12.3 |
| Processing | World          | 295.2| 299.8| 302.83| 2.6      |
| % to production | 86.3 | 83.7| 89.7| 3.3     |
|            | EU-28          | 13.96| 15.8 | 16.3 | 16.8     |
| % to production | 522.8 | 558.3| 567.9| 45.1 |
|            | Ukraine        | 0.878| 0.987| 1.475| 68.0     |
| % to production | 22.5 | 21.9| 39.9| 17.4     |

Source: calculated by the authors [7] and https://ukrstat.gov.ua.

Thus, Ukraine has got the potential to increase protein production, primarily due to intensification of the production of high protein crops. EU countries are crucially dependent on soybean and soybean meal imports. In 2020, EU countries imported 14.8 million tons of soybeans and produced only 2.9 million tons, which met 14.5% of their needs (Table 3).

Table 3

| EU-28 Feed Protein Balance 2020, thousand tons |
|-----------------------------------------------|
| Rapeseed | Soybean | Sunflower | Total |
|---------|---------|-----------|-------|
| Oilseed |         |           |       |
| Beginning stocks | 1,520 | 2,140 | 891 | 1,520 |
| Usable production | 16,716 | 2,874 | 10,077 | 16716 |
| Area (thousand ha) | 5,570 | 984 | 4,319 | 5,570 |
| Yield (tons/ha) | 3.0 | 2.9 | 2.3 | 3.0 |
| Imports (from the third countries) | 6,000 | 14,800 | 600 | 6,000 |
| Total supply | 24,236 | 19,814 | 11,568 | 24,236 |
| Domestic use | 23,136 | 18,546 | 10,240 | 23,136 |
| Exports (to the third countries) | 22,297 | 16,279 | 9,143 | 22,297 |
| Total use | 100 | 167 | 503 | 100 |
| Self-sufficiency rate, % | 69.0 | 167 | 503 | 69.0 |

| Oilseed Meal |         |           |       |
|---------------|---------|-----------|-------|
| Beginning stocks | 50 | 343 | 100 | 493 |
| Usable production | 12,709 | 12,860 | 5,029 | 30,598 |
| Imports (from third countries) | 350 | 19,000 | 3,500 | 22,850 |
| Total supply | 13,109 | 32,203 | 8,629 | 53,941 |
| Domestic use | 12,659 | 31,548 | 8,230 | 52,438 |
| Exports (to third countries) | 400 | 314 | 298 | 1,013 |
| Total use | 13,059 | 31,863 | 8,529 | 53,451 |
| Ending stocks | 50 | 343 | 100 | 493 |
| Self-sufficiency rate, % | 69.0 | 39.9 | 58.3 | 56.7 |

Source: EU oilseeds balance sheet (2015-16 to 2019-20 overview). URL: https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/markets/overviews/balance-sheets-sector/oilseeds-and-protein-crops.

The analysis shows that EU countries process 5.6 times more soybean than they produce, while Ukraine processes only about 40% of domestic soybean.

Today, Ukraine is considered to be Europe’s feedstock for soybean production, although in recent years there has been observed a tendency towards the increase in its processing and use for the development of intensive industries. According to the estimates conducted by the scientists from
the Institute of Feed Research and Agriculture of the Podillia of NAAS, Ukraine loses about $ 77 per ton of soybean, or about $ 172 million, provided that there are all the necessary conditions for processing on a mutually beneficial basis for all participants of the agricultural market in Europe [11; 12]. The balance of protein crop use by EU countries in 2020 identifies the trends mentioned above [7].

Assessment of the rate of self-sufficiency with protein resources shows that in 2019 the EU met its needs for rapeseed meal by 100%, soybean meal by 41.5%, and sunflower meal by 61.3%. At the same time, the needs for oilseeds were also partially met, i.e. rapeseed by 69%, soybean by 14.5%, sunflower by 87.1%. At the same time, price trends in the world oil market were stable, although Ukraine had the lowest price (Fig. 4).

Fig. 4. Soybean and sunflower seed prices, $/t
Source: calculated by the authors [5] and (European Commission (EC). Eurostat Data. Database. URL: https://ec.europa.eu/eurostat/data/database; European Commission (EC). Trade Helpdesk. URL: https://trade.ec.europa.eu/tradehelp/statistic).

Processing plants are the key players in the Ukrainian oil market. In 2019, processing plants of Ukraine produced about 1.2 million tons of soybean meal, including 66.7% that were exported (Fig. 5).

Fig. 5. Production and export of protein meal in Ukraine, thousand tons
Source: calculated by the authors (https://ukrstat.gov.ua).

We have noted that price trends of the market were declining for all oilseeds in 2019. Thus, the price for soybean decreased by 22%, sunflower seed by 11.6%, while it was somewhat less for
Rapeseed, in particular, 4.6%. The price factor may play a negative role in the next marketing year, which will lead to a decrease in oilseed production. Over the past 5 years, prices for soybean meal on the European market have declined. In 2018, EU-28 countries imported soybean meal from the US at a price of 354 €/t, Brazil — 346 €/t, Argentina — 341 €/t and Ukraine — 331 €/t [13—16] (Fig. 6).

![Fig. 6. Price trends for soybean meal imports by EU countries, €/t](https://example.com/price_trends.png)

It should be noted that the fall in prices was influenced by several factors, including the world market conditions associated with the harvest forecast at the level that would not be lower than in 2018. The optimal way out for the agricultural sector of Ukraine’s economy is to increase the volumes of oilseed processing. Ukrainian agribusiness can reduce economic losses caused by adverse market conditions, primarily due to intensification of oilseed production, which will reduce the cost of production and compete more effectively not at the price of sales, but at costs. The real export potential of increasing foreign currency earnings can be fulfilled due to reorientation of the oil industry from using raw materials to using products having different degrees of processing and added value.

Nowadays, the development of oil industry in Ukraine is characterized by certain instability of production during some years (rapeseed, soybean), insufficient application of mineral fertilizers, depletion of soils and gradual decrease in their fertility [16—19]. It becomes obvious that these problems can be solved through the introduction of modern intensive and innovative technologies using high-quality seeds, science-based crop rotations, fertilizers, plant protection agents, etc.

SWOT-analysis of plant protein production in Ukraine shows that Ukraine has a significant potential to produce competitive feed protein to meet domestic needs, generate high export potential, and enter the European and Asian markets (Table 4).

| SWOT-analysis of plant protein production in Ukraine |
|-----------------------------------------------|
| **Strengths**                                      | **Weaknesses**                                      |
| Favorable natural and climatic conditions for the cultivation of protein crops | Lack of competitiveness without direct price support through related payments |
| Contribution to reducing protein deficiency in the EU (strategic aspect) | The need for the most efficient allocation of land resources |
| Positive environmental effect (N-fixing crops) | Reduction of the area under forage crops |
| Real demand in the market niche of meal (soybean, rapeseed) | Expanding of the area under market-determined crops |
| Lack of GMO cultivars in Ukrainian soybean breeding | **Opportunities**                                  |
| **Combining high quality protein sources with the physiological needs of animals to ensure their high performance** | Degradation of land resources as a result of anthropogenic factors |
| Development of feed production and animal husbandry | Competition with foreign companies as for varietal seed production |
| Formation of the feed market | Market dependence on the import |

*Source: author’s development.*
Feeds hold a leading position in the system of factors affecting the competitiveness of livestock production. Adequate livestock feeding balanced by all macro- and micro-elements ensures high productivity and quality of products, contributes to reduced feed consumption per unit of production and reduces the cost of daily diets. It is estimated that protein deficiency increases the cost of 1 kg of milk at least by 10—12% [4].

**Conclusion and recommendation.** The world market for high protein feeds is characterized by the steady development trends. The problem of providing the population with high quality food is becoming more global, the demand for high protein food products of a good quality is growing as well as the need for protein-balanced feeds for livestock.

A modern feed market is characterized by reorientation of production of high-protein crops to solving problems of food and feed protein and a stable tendency towards the development of agricultural technologies, production and processing.

Increase in the performance of farm animals and margins of livestock production requires balanced diets and reduction of feed cost in the costs structure due to the use of high protein feeds. It is important for Ukraine to promote the development of the market for high-protein and bulk feeds on the industrial basis as well as the development of organic feed and livestock production.

Development of the competitive feed market in Ukraine and solving of the environmental and social problems of intensive animal husbandry requires the improvement of legislation to meet the requirements of EU Directives on the production, processing and efficient use of feed resources.
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