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POLISH PROTEIN SECURITY AS PERCEIVED BY FEED MARKET PARTICIPANTS

Key words: food security, feed market, protein crops, soybean meal, feed mills, farms

ABSTRACT. This article aims to present the perception of protein safety by feed market participants in Poland and indicate the factors determining its development. In recent years, food security has become a subject of particular importance for European countries, including Poland. The growing number of the global population is causing an increase in the demand for animal protein, the production of which primarily requires a liquid supply of vegetable protein for feed production. In Poland, as in other EU countries, the demand for feed protein has, for many years, been much higher than the domestic production of protein feed raw materials. The COVID-19 pandemic has created many risks associated with maintaining the supply chain and clearly points to the need for greater self-sufficiency in feed protein. The research shows that a lack of vertical integration and agreement among players is one of the major problems in the functioning of the indigenous protein crop market. A solution could be to create an online platform that acts as a market maker.

INTRODUCTION

The growing number of the global population is causing an increase in the demand for animal protein, the production of which primarily requires a liquid supply of vegetable protein for feed production. According to the FAO (the Food and Agriculture Organization of the United Nations) [FAO 2009], the world's human population will grow from about seven and a half billion today to more than nine billion in 2050 and the increase in the food production of animal origin is estimated to be about 70% above the current state [Alexandratos, Burinsma 2012]. A greater number of people and a greater demand for food of animal origin translates into a greater demand for feed, which accounts for 50% to 70% of the cost of animal protein production [Flachowsky, Meyer 2015]. This is a consequence of the disproportionate conversion of vegetable to animal protein –

depending on the type of animal in question, as well as on rearing conditions. An animal's metabolism requires an average of 6 kg of vegetable protein to produce 1 kg of meat protein [De Boer, Aiking 2011]. The development of the vegetable protein feed market is mainly related to an increase in poultry production, as well as the progressive intensification processes of cattle production and pig rearing. The increasing productivity of animals has created a systematic increase in the demand for high-protein feed materials [Crépon et al. 2008, Dzwonkowski, Bodał 2014]. In the case of agricultural livestock production, feed is one of the most important inputs because it is consumed daily and, thus, must be delivered to the farm systematically throughout the year [Firlej 2008]. The availability of adequate amounts of vegetable protein for feed purposes is, therefore, one of the determinants of food security and ensuring it is the primary goal of every country's government [Jerzak et al. 2020, Buko et al. 2021].

In Poland, as in other EU countries, the demand for feed protein has been much higher for many years, compared to the domestic production of protein feed raw materials [Crépon et al. 2008, Magrini et al. 2016]. The EU market for native vegetable protein raw materials is small. More than 70% of the vegetable protein deficit is covered by imports of soybean meal and soybean seed, mainly from the US and South America. The European Union currently imports 26 million t of soybean meal and 15.9 million t of soybean seed annually [Nicolas 2014, Jerzak, Śmiglak-Krajewska 2020]. This heavy dependence of many countries in the Community on vegetable protein imports threatens their sovereignty in this regard. The COVID-19 pandemic has created many risks associated with maintaining the supply chain and clearly points to the need for greater self-sufficiency in feed protein. Some countries e.g., Finland, in the era of the pandemic, introduced an increased amount of faba bean seeds, even with reduced sowing value, to increase the production of protein feed in the country and, thus, reduce its dependence on the world market [Panasiewicz, Niewiadomska 2020].

Studies by Wojciech Świąćicki et al. [2007] and Piotr Dorszewski [2020] show that Poland required about 1 million tonnes of protein annually to balance its feed needs. This was met through the production of high-protein feed raw materials, which, in 2020, amounted to 2,378 thousand tonnes, of which faba bean seeds accounted for 462 thousand tonnes. This was supplemented by rapeseed meal (1,908 thousand tonnes, of which 700 thousand tonnes were exported) and fishmeal (8 thousand tonnes). This only covered 30% of the demand for high-protein feed components [IERiGŻ 2021]. The deficit of protein components, at a level of about 70%, was mainly supplemented with imported soybean meal, which is available almost exclusively in a genetically modified version. This raises consumer concerns [Milczarek, Osek 2019, Niwińska et al. 2020, Świąćkiewicz et al. 2018]. According to opinion polls, 56.8% of consumers prefer meat products produced on farms that produce without GM feed, while 65% do not believe that foods containing

or produced from GM crops are safe [Badora 2013]. Over the past 30 years, the country's protein deficit has worsened and soybean meal imports have increased. Between 1991 and 2020, its imports ranged from 0.4 million tonnes in 1993 to 2.7 million tonnes in 2020. Heavy reliance on soybean imports creates a danger in the event of unpredictable collapses in global agri-food trade, which could create a protein feed shortage.

It is, therefore, necessary to research and provide new sources of protein feeds, as genetically modified feeds may be banned in the near future. An interesting alternative to imported soybeans may be native bean crops, such as faba beans, lupins, peas and native soybeans, which are included in the group of crops with the agricultural name „legumes” and are rich in nutrients, especially protein [Jeroch et al. 2016, Niwińska et al. 2020]. Rapeseed pomace left over after pressing the oil is also a good source of protein. They contain a relatively high amount of sulfur amino acids, so they can be a good supplement to faba bean seeds [Hanczakowska, Świątkiewicz 2014]. Rapeseed meal and grain broths can come from increasing biofuel production [Rutkowski, Jankowski 2011]. On the other hand, to provide sufficiently large batches of seed for faba bean crops, the area under cultivation would have to be increased. According to animal nutritionists, replacing post-extraction soybean meal is not an easy but largely feasible and possible task. By applying existing knowledge about the nutritional value of native protein feeds and following the principles of their safe use, it is possible to eliminate soybean meal from the ration without significant losses regarding animal productivity [Grela, Czech 2019, Biesek et al. 2020, Grela 2020, Kuźniacka et al. 2020]. Poland has a real chance of becoming independent from imports of GMO soy products used in animal nutrition.

Self-sufficiency is a function of the protein crop supply and crude vegetable protein requirements. The supply side of the protein crop market is farms that produce and sell these crops. The demand side, reporting the demand for raw vegetable protein, is mainly represented by feed factories, whose activity is bilaterally related to the production sphere as, on the one hand, they buy the raw material necessary for production, coming from the plant production of farms (lupins, peas, etc.) and, on the other hand, these entities produce feed and concentrates for farms, which use them in animal production. Balanced protein production and consumption makes the industry less dependent on fluctuations in global production and feed protein prices [Peltonen-Sainio, Niemi 2012]. Therefore, the task of creating a market, which would allow, on the one hand, to provide fodder producers with an efficient supply of high-quality raw materials and, on the other hand, enable farms to secure the sale of produced products, is emerging [Jerzak et al. 2012]. Only joint action and the full integration of both demand- and supply-side actors will make it possible to organize an efficiently functioning market of domestic protein raw materials. The aim of this article is to present the perception of protein safety by feed market participants in Poland and indicate the factors determining its development.

RESEARCH MATERIAL AND METHODOLOGY

The primary material, allowing to achieve the set goal, was obtained on the basis of empirical studies covering selected farms and feed industry plants operating in Poland. The study was conducted in 2019. The selection of the sample was deliberate. Farms involved in legume production, which had in previous years declared that they received a special subsidy for legume cultivation, were selected for the study and agreed to take part in it. The basic criteria for the selection of feed plants were animal feed production as the main object of activity (group 10.9 of the Polish Classification of Activity) and the size of the entity, measured (according to CSO) by the number of employees. At that time, the survey covered 100 farms, 29% of which were small, up to 50 ha (the average farm size being 18 ha), 26% were between 50 to 100 ha (the average farm size being 83 ha), while large farms over 100 ha constituted 45% of the surveyed population (the average farm size being 1,212 ha), as well as 101 feed factories, 57% of which were small enterprises, employing up to 49 people, 21% were mixing plants, employing between 50 and 250 people, while large plants employing over 250 workers constituted 22%. The measuring method consisted of a direct interview, using a standardized questionnaire. Questions were constructed using the Lickert and rank scales. The collected data were analyzed in detail and then described using descriptive statistical methods.

Additional source material constituting the basis for the study were statistical yearbooks of CSO and reports of the Institute of Agricultural and Food Economics. The study also refers to the results of research carried out under the Ministry of Agriculture and Rural Development's multi-year program for 2016-2020, entitled „Increasing the use of domestic feed protein for the production of high-quality livestock products under sustainable conditions”.

STUDY RESULTS

In a survey conducted among feed market participants, livestock feed producers and protein crop producers were asked whether, in their opinion, Poland is safe in terms of vegetable protein supply. The responses show that more than 46% of participating feed manufacturers are not worried about the country's protein security, 22% have no opinion, while 32% express such concern, including almost 12% who strongly emphasize that Poland may face a shortage of high-protein raw materials for the production of feed for livestock (poultry and swine). Respondents also suggested that such a situation is possible if unpredictable events occur in the global market. Half of participating protein crop producers are concerned about the country's protein security (52% of indications), 14% have no opinion, 30% of respondents believe that Poland is rather safe and is not threatened by a lack of protein animal feed and, consequently, by a lack of food for the population.

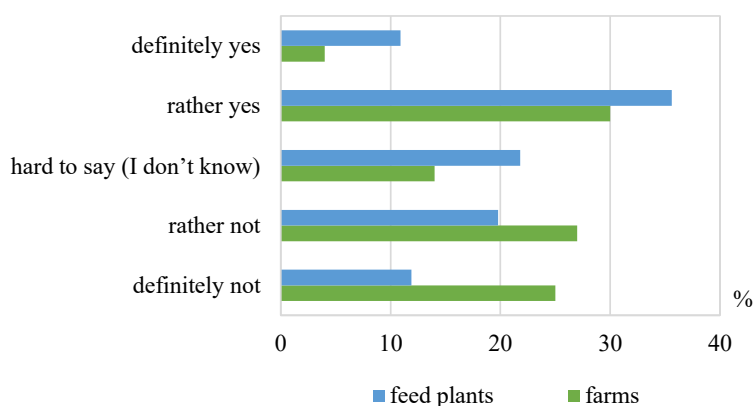


Figure 1. The perception of Poland's protein security by protein raw material producers and feed manufacturers

Source: own study based on surveys

Only 4% of protein raw material producers surveyed are of the opinion that, despite the large share of imported soya in the feed balance, Poland has protein security (Figure 1).

On the other hand, when asked how to ensure the country's protein security, both groups agree and believe that Poland is not able to ensure its protein security purely on the basis of domestic raw materials (73% of indications in the group of agricultural producers and 83% of indications in the group of feed producers). According to respondents, the best way to counteract the problem would be a mixed system based on both indigenous protein feedstock (i.e., rapeseed meal, seeds of broad bean legumes – peas, lupins and beans) and on imported genetically modified soybean meal (Figure 2).

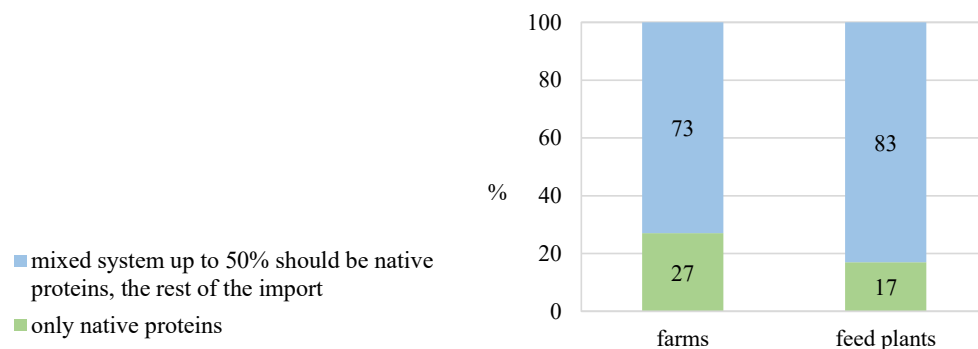


Figure 2. The structure of responses regarding ensuring the country's protein security in the opinion of protein raw material producers and feed manufacturers

Source: own study based on surveys

For the mixed system to work and, thus, for Poland's protein security to be partially assured, feed producers should use native protein crops. To the question addressed to producers of feed for farm animals: what is the share of native raw materials among the components used for production, as many as 64% of respondents responded that they do not use the seeds of native legumes. The remaining 36% of respondents use this raw material, but their share is small – 3% of respondents reported using native faba bean plants making up to 10% of the total raw material, while 33% even more than 10%. CSO data show that the main high-protein components are oilseed meal, mainly soybean [IERiGŻ-PIB 2021, CSO 2021]. These data are also confirmed by questionnaire surveys, which show that feed producers mainly use imported soybean meal (89%) and domestic rapeseed meal (86%) in the production of mixtures for livestock. Only single producers declared that they used seeds of native bean plants in production, i.e., faba beans, peas and lupins.

The possibility of using different raw materials for production can only be ensured by a well-functioning raw materials' market that meets the expectations of all participants. Currently, this market in Poland is not developed enough to meet the demand of the feed industry, as indicated by the responses of both farmers and feed manufacturers surveyed (Figure 3).

Comments were made specifically about the seed supply of native protein crops. This was the opinion of 73% of feed manufacturers participating in the survey, 10% had no opinion and 17% felt that the market was well prepared and could meet the demands. Among protein crop producers, 75% of respondents expressed their concerns about the level of market development.

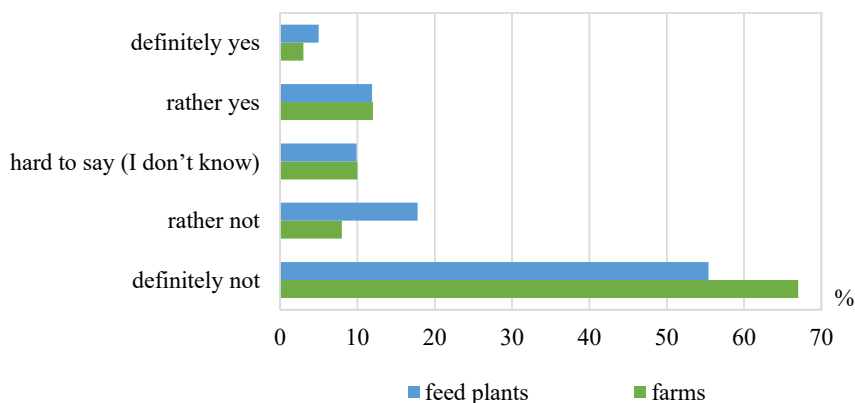


Figure 3. The structure of responses on whether the market of native protein crops is developed enough to meet the needs of the feed industry

Source: own study based on surveys

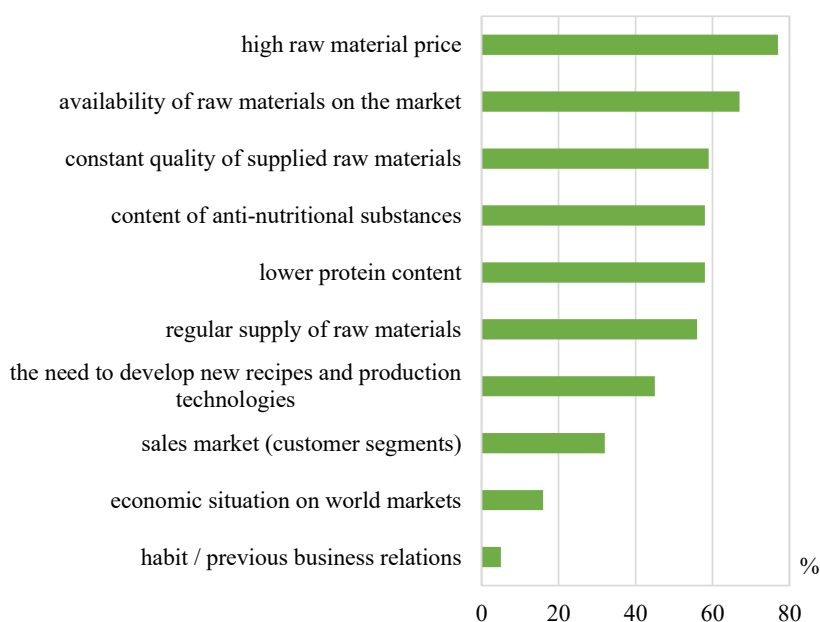


Figure 4. The determinants of the use of native faba bean plants for protein feed production
Source: own study based on surveys

Failure to align the market with the needs of its participants can have many causes (Figure 4). According to feed manufacturers, the main factors limiting implementation – the expansion of feed production with the use of domestic protein raw materials are: the high price of domestic raw material (77% of respondents indicated this feature), the availability of raw material on the market (67%) and the constant quality of delivered supplies (59%). Without ensuring an adequate availability of raw material, consistent quality and a regularity of supply, any plans to increase the use of native faba bean crops in the feed market are unrealistic. Companies are not willing to take the risk and give up proven soybeans that are available in any quantity if, in return, they will not have any guarantee or confidence in the supply of an alternative component. Apart from the lower quality of protein being off-putting, compared to imported soybean meal, feed manufacturers mainly pointed to economic issues of using faba bean plants in compound feeds. They believe that the cost of a blend based on native protein is significantly higher than feed prepared using imported soybean meal. It is influenced, among other things, by technological problems, causing an increase in the cost of preparing mixtures with the use of faba bean plants, which was estimated by the interviewed feed producers to be at a level of over 30%.

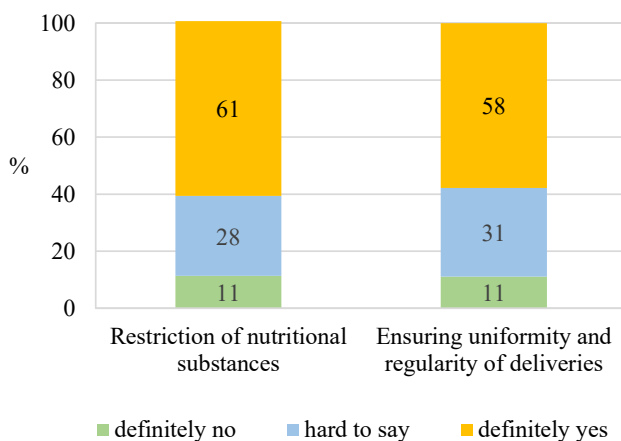


Figure 5. The possibility of using native legumes for the production of fodder

Source: own study based on surveys

Other possible determinants that should be eliminated include a lower protein content (58% of indications) and an antinutritional sub-nutrient content (58% of indications). According to respondents, protein content is one of the important factors worth considering when selecting feed materials. From the perspective of rational animal nutrition and, thus, the quality of the produced feed, it is also important to reduce antinutritional substances in the protein of native legumes.

As can be seen from the data presented in Figure 5, when these substances are reduced, 61% of the producers surveyed say they are willing to start or even increase their use in livestock feed production. On the other hand, in a situation of improved availability of raw material and regularity of supplies, 58% of surveyed producers declared they would start or even increase the use of faba bean seeds for feed production. Only 11% of livestock feed manufacturers participating in the study were unwilling to forgo the use of proven and available soybean meal, which they considered the best ingredient for the products they produced.

It is worth noting that about 30% of respondents, at the time of the survey, did not have a developed opinion on increasing the use of native faba bean crops. This may imply that this is a group of so-called observers, who follow the changes taking place in the market and if there is improved availability of domestic raw material, a guarantee of constant quality and regularity of supplies as well as an appropriate price that ensures profitability of production, will readily replace the currently used soybean meal with an alternative raw material from domestic leguminous plants. This view is supported by respondent statements about the possibility of replacing soybean meal with other native protein ingredients (Figure 6).

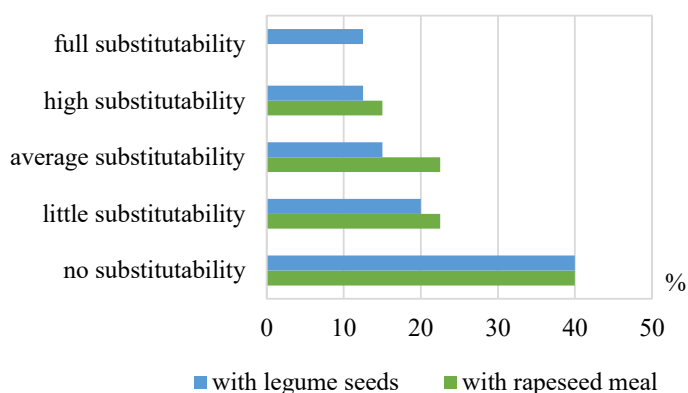


Figure 6. Substitutability of soybean meal with native protein crops in the opinion of feed manufacturers

Source: own study based on surveys

The survey showed that 60% of respondents anticipated the possibility of substituting soybean meal with faba bean or rapeseed meal, of which 25% highly rated the possibility of substitution. A fairly high percentage (40%) of respondents declared a lack of substitutability between domestic protein feed ingredients and soybean meal. This may have been due to insufficient knowledge of the properties of native protein crops as potential feedstock.

Agricultural producers, on the other hand, declare that they will be interested in growing protein bean crops provided there is a demand for seeds and the possibility of similar economic effects compared to other species that are easier to grow. According to the conducted research [Florek, Czerwińska-Kayzer 2018], more than 60% of respondents declared the possibility of increasing the production of faba bean plants in their own farms up to 40%. In contrast, 17% of respondents would have sown a 40% larger area with native faba bean plants. Only 21% of respondents said they would not increase the share of native faba bean crops in the sowing structure, despite comparable profitability of the crop to rye and wheat. Respondents cited too low profitability (26% of respondents indicated this characteristic) and yield instability (15%) as factors that currently limit their cultivation. Similar conclusions are drawn from the study of Mahmood Faisal and team [2018], in which French producers would be keen to increase the area under faba bean crops, but this would require a much higher level of subsidies than current crop subsidies in the EU. In addition, farmers indicated that yields of coarse legumes are highly variable due to crop physiology and technical difficulties e.g., at harvesting, as confirmed in their study [Książak et al. 2000, Flores et al. 2012, Bojarszczuk, Podleśny 2016]. The farmers surveyed were also asked to identify the most important factors that

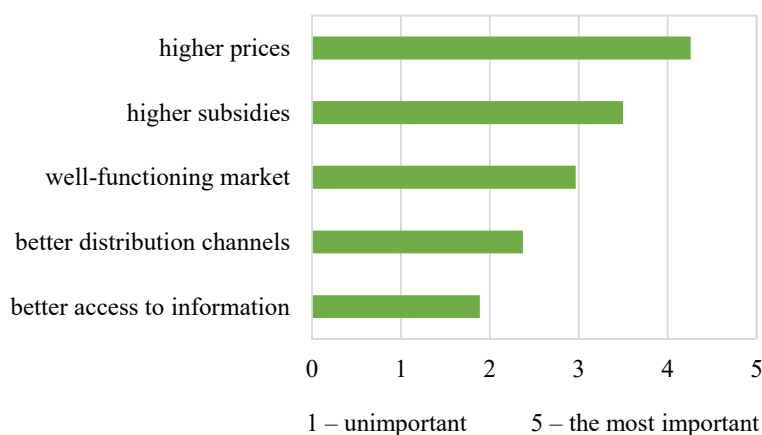


Figure 7. Factors for increasing the production and sales of faba bean crops

Source: own study based on survey

could influence them to increase their production and sales of faba bean crops. Producers most often indicated an increase in purchase prices and support in the form of subsidies, i.e., factors directly translating into production profitability. Fundamental to building the legume segment of the feed market is the issue of profitability. An agricultural producer will be interested in growing faba bean crops provided there is a demand for the seed and potential for similar economic returns compared to other species that are easier to grow. Until now, legume farming has been perceived as unprofitable or useless on the farm. According to the conducted studies, however, the cultivation of coarse bean plants is becoming economically justified [Faligowska et al. 2016, Florek, Czerwińska-Kayzer 2019]. The argument for the economic support of protein crops and, thus, increasing their cultivation, may be environmental sustainability. Indeed, faba bean plants are among plants with a high nitrogen fixation efficiency and ability to improve soil structure and enrich soil fertility [Wang et al. 2012].

In order to increase farmer interest in the production of faba bean seeds and, thus, their supply in the feed market, measures are needed to make them easily marketable. Creating an appropriate market structure for the marketing and use of protein crop seeds would greatly facilitate disposal and create opportunities for collaboration with feed mills. It is this factor that the study found to be the most important factor considered in crop production decisions, in addition to financial benefits (Figure 7).

Agricultural producers, often aware of the great difficulty in selling the seeds of broad bean plants, sowed them, treating the crop as a forecrop for other crops and, consequently,

ploughing the plantation before harvesting. Current financial support from the state, which encourages the production of large-seeded bean plants, only serves to stabilize producer income without translating into commodity seeds.

A lack of vertical integration or agreement among players is one of the major problems in the functioning of the native protein crop market. A solution could be to create an online platform that acts as a market maker. In this way, it would be possible to reduce territorial dispersion, small scale production, the quality heterogeneity of the raw material, the impossibility of supplying it regularly in a specified quantity to feed mills and facilitate producer disposal of the produced seed.

SUMMARY

The production and utilization of domestic fodder protein in Poland are insufficient, which, in a situation of growing demand, results in growing imports, especially of genetically modified soybean meal. This is quite a dangerous phenomenon, especially in the face of the Covid-19 pandemic.

It is possible to regain a significant share in the domestic market of feed components for native protein crops by offering a native vegetable protein product competitive in terms of quality and price.

In current agrotechnical and market conditions in Poland, the security of the country in terms of supply of vegetable protein can only be ensured by the development of the mass production of indigenous legumes and the active animation of marketing raw material. Rebuilding the domestic protein crop market, if possible, would also require greater commitment from feed mills, industry associations and government agencies. The solution could be to create an online platform that acts as a market maker. The existing barrier resulting from competition from imported soybean meal, as well as a lack of developed market logistics for native protein crops and their promotion, make this production, with the exception of rapeseed meal, unable to overcome its market marginalization independently.

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BEZPIECZEŃSTWO BIAŁKOWE POLSKI W OPINII UCZESTNIKÓW RYNKU PASZ

Słowa kluczowe: bezpieczeństwo żywnościowe, rynek pasz, rośliny białkowe, śruta sojowa, wytwórnie pasz, gospodarstwa rolne

ABSTAKT

Celem artykułu jest przedstawienie postrzegania bezpieczeństwa białkowego przez uczestników rynku paszowego w Polsce oraz wskazanie czynników determinujących jego rozwój. W ostatnich latach bezpieczeństwo żywnościowe stało się tematem o szczególnym znaczeniu dla krajów europejskich, w tym Polski. Coraz większa liczba ludności na świecie powoduje wzrost zapotrzebowania na białko zwierzęce, którego produkcja wymaga przede wszystkim zapewnienia płynnych dostaw białka roślinnego do produkcji pasz. W Polsce, podobnie jak i w innych krajach UE, popyt na białko paszowe od wielu lat jest znacznie większy niż rodzima produkcja surowców pasz białkowych. Doświadczenia pandemii COVID-19 spowodowały wiele zagrożeń związanych z utrzymaniem łańcucha dostaw i wyraźnie wskazują na potrzebę większej samowystarczalności w zakresie białka paszowego. Z przeprowadzonych badań wynika, że brak integracji pionowej i porozumienia między podmiotami to jedno z głównych problemów funkcjonowania rynku rodzimych roślin białkowych. Rozwiązaniem problemu może być stworzenie platformy internetowej pełniącej funkcję animatora rynku.

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