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**THE IMPORTANCE OF SUBSIDIES FOR THE PRODUCTION  
OF GRAIN LEGUMES FOR RECONSTRUCTION  
OF THE DOMESTIC MARKET OF PROTEIN RAW MATERIALS  
OF VEGETABLE ORIGIN IN POLAND\***

**Abstract**

*Total production of the native protein feed plant is 340 thousand tonnes. This represents a total of just 26% of the domestic demand. The resulting deficit of 960 thousand tonnes must be supplemented with imported soybean meal to be able to ensure feed security and safety for the population of pigs and poultry, whose Poland is Europe's largest exporter. In the event of such a significant dependence on imports of raw material an intervention was launched under subsidies are granted to cultivation of legumes. The aim of the research presented in this paper was to evaluate the effects of the EU subsidies for the production of legumes executed by 2015 on the development of the seed market and commodity production of these plants in Poland. The research found that subsidies for the production of legumes become an active segment of the market of production and sale of seed of these plants, it also contributed to the gradual increase in the sown area of these plants in Poland and simultaneously ensured financial benefits for seed companies. It was also found that in 2015, despite the positive formation of agricultural income derived from the production of native legumes, in practice it did not incline agricultural producers to greater interest in this crop as a commodity production. It was noted, however, that the this crop was widely used as*

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*a forecrop, improving soil structure and concentration. It was considered that this was caused by the lack of domestic market of seeds of native protein plants capable to meet the demand of the feed industry. This in turn caused lack of interest of the industry in the raw material and marginalization of domestic sources of vegetable feed protein on the market.*

**Keywords:** market of vegetable protein, legumes, production profitability, subsidies for production, seed, commodity production.

**JEL codes:** D2, Q1, Q13.

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## Introduction

Food security is one of the main aims of the economic policy of each country. The task is usually realised at three levels, particularly associated with distribution, availability and adequacy of food. It means that it is necessary to ensure provision of such volumes of food, healthy and free from substances that can endanger the lives of consumers, which is sufficient to satisfy the country's demand (Leśkiewicz, 2012). The adequate amount of plant proteins for feed purposes is one of the key factors determining food security. The present needs in this regard are met mainly by utilisation of protein raw materials based on soybean meal, especially of American origin. However, any crisis in that part of the world threatens to disrupt soybean meal supplies, which in consequence can lead to lack of the country's security as regards plant protein provisions.

In view of the above, the actions are undertaken to cause the recovery of the national market in protein plants and to that end, e.g. the Multiannual Programme was realised in 2011-2015, entitled "Improvement in domestic plant protein sources in terms of their production, trade and utilisation as feedstuffs", financed by the Ministry of Agriculture and Rural Development. The fifth Subject Area of the programme concerned the economic conditions of production development, market infrastructure, trade system as well as the profitability of usage of pulses for feed purposes. Within this part of research, the supply chain of pulses was analysed among others. The analysis included the following issues: the plant breeding and production of certified seed material conducted by seed companies, the marketable seed production conducted by seed growers and the feed sector as a buyer of seeds (Figure 1). The research results showed that the factors determining the development of the national market in pulses were observed both on the side of supply and on the side of demand of the particular links of the supply chain.

The domestic supply of pulses is generated by farms conducting their production and selling them on the market. According to the studies, the share of pulses in the total crop area in Poland in 2015 was 4.1%, whereas the share of cereals in the crop structure was 69.9%. Among pulses, the most important

were: lupines, fodder peas and field bean, which represented 42-79% in the crop structure of feed pulses. The cultivation area of pea increased from 14,287 hectares (ha) in 2011 to 37,983 ha in 2015. But the increase in the sown area did not translate into a rise in their share in the production or trade volumes. According to the data of the Central Statistical Office, in 2015 the market shares of production of pea and lupines in the total production obtained from the sown area were 1.8% and 3.6% respectively (Table 6). The research results of the Multiannual Programme showed that farmers cultivating domestic pulses, being aware of difficulties in selling seeds, often treat them as a forecrop. It is also justified by the fact that pulses improve the soil quality and their cultivation enables farmers to reduce application of mineral fertilisers for the next crop even by 20-25% (Prusiński, Kaszkowiak and Borowska, 2008).

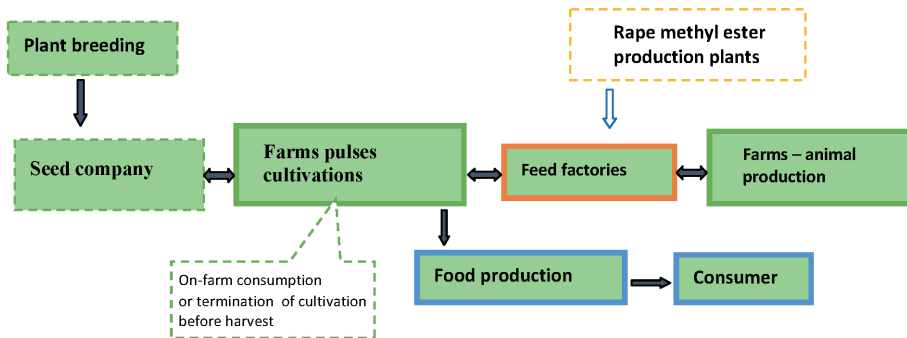


Fig. 1. The supply chain of domestic pulses in Poland.

Source: database of 5<sup>th</sup> Subject Area of the Multiannual Programme 2011-2015.

The demand for raw-materials originating from domestic pulses is generated above all by the feedstuffs factories. The increase in production of industrial fodder leads to the growing demand for protein-rich feed ingredients. The demand in Poland for feed proteins is estimated at approx. 1.3 million tonnes. The production of domestic pulses, dried pulp and rapeseed meal, representing the main source of feed proteins, amounts to approx. 340 thousand tonnes, which in total covers about 26% of the whole demand.

The deficit in the amount of 960 thousand tonnes needs to be compensated in other way so as to ensure the security of feed supplies for poultry, in case of which Poland is the largest exporter in Europe, as well as pigs. Thus the feed factories use imported soybean meal, made mainly in the USA, Argentina and Brazil. As a consequence, the demand for plant-based protein, necessary for feeding pigs and poultry, is covered in 74% by the imported soybean meal. The big influence on the situation has also the fact that the farmers are only capable of selling quite small batches at a time, which poses a risk for stability of feed production. Taking

advantage of soybean meal as a source of protein by feed factories is associated with its high quality and suitability for feed (Świątkiewicz, 2015).

The research results show that one of the main disadvantages of the domestic market in plant protein raw materials is the fragmentation of the area under protein plants cultivated for seeds (Jerzak (ed.), 2015). Also the market situation is determined by the unstable yields due to the big sensitivity of plants to changeable weather conditions, especially temperature and excessive precipitation. That is why Poland, as many other EU countries, is dependent on foreign protein sources, which may carry a risk associated with the lack of supply of feedstuffs for poultry and pigs in case of a downturn in the soybean meal market. Moreover, the growth in the world demand for this raw material leads to the increase in the cultivation area to the detriment of South American rainforests, being of great importance from the perspective of climate change.

As a consequence, the intervention action was launched in the country including the special payments to production of pulses. The analysis presented in this article aimed at the assessment of impact of the EU payments to pulses, paid out before 2015, on the profitability and development of both seed material market and marketable production of pulses in Poland. The analysis was conducted on the basis of results of the above-mentioned 5<sup>th</sup> Subject Area of the Multiannual Programme of the Ministry of Agriculture and Rural Development as well as the empirical material from the purposive sample of seed companies. Under the analysis, the profitability calculation was made for the market-oriented production of pulses on the example of pea and yellow lupine and considering the amounts of the financial support to pulses. The figures were then compared with respective ones for the production of wheat and rye.

When estimating the profitability of particular crops, the calculations of income from crop cultivation were used, in which the agricultural income was a difference between the gross margin without payments (the value of production less direct costs) and the indirect costs of the activity. Next, to the income from the activity, determined in this way, the payments to production were added. The measures of descriptive statistics were also used in the calculations.

### **The EU payments to production of pulses**

The EU payments to pulses, such as the single area payments (SAP), the special payments to production of pulses and the payments to seed material, play a significant role in generating income from agricultural production (Zawadzka, Strzelecka and Szafraniec-Siluta, 2013). Therefore, they may act as a stimulus to the increase in cultivation area of pulses in the country. The amounts of payments to pulses, paid out in 2011-2015, are presented in Table 1. Their analysis reveals that farmers obtained the greatest financial support in 2013, in the total amount of PLN 1849.10 per 1 ha of cultivation.

Table 1

*The payments to pulses in 2011-2015*

| Specification                         | Year   |        |        |        |       |
|---------------------------------------|--------|--------|--------|--------|-------|
|                                       | 2011   | 2012   | 2013   | 2014   | 2015  |
| Single area payment                   | 710.6  | 732.1  | 830.3  | 910.9  | 453.7 |
| Supplementary payment                 | 274.2  | 211.8  | 139.4  | -      | -     |
| Special payment to the area of pulses | 219.5  | 672.6  | 719.4  | 566.4  | 415.2 |
| Payment to seed material              | 160.0  | 160.0  | 160.0  | 160.0  | 130.0 |
| Total                                 | 1364.3 | 1776.4 | 1849.1 | 1637.2 | 998.9 |

Source: Agency for Restructuring and Modernization of Agriculture, data for 2011-2015.

As a result of the financial support paid out to the farmers who had taken a decision to cultivate domestic pulses, the growth of the cultivated area of this crop was over two-fold in the last 5 years (Table 4). The growth in the area of the crop is accompanied by the reductions in the amounts of funds allocated from the national budget for the support of the pulses' producers and since 2014 – by the decrease in special payments to the area of cultivated pulses (Table 1). The payment amounted to PLN 566.4 in 2014 and PLN 415.20 in 2015. There was also the reduction in the payment to seed material – from PLN 160 in 2011-2014 to PLN 130 in the last of the analysed years. The decrease in funds that support farmers financially and encourage them to commence this type of production, may retard the growth of the cultivation area in the following years. These payments cover as much as 60% of costs incurred by farmers on cultivation of pulses. Therefore, they form a considerable part of agricultural income. The intervention policy implemented by the government in this regard, although designed for farmers, has also to some degree its impact on the economic results of other entities at the particular links of the pulses' supply chain.

### **Impact of payments to pulses on the economic results of the domestic production of seeds**

The seed companies providing seeds for the market are not directly supported from the national budget or the EU funds. They function in the conditions of the market economy, according to which the law of supply and demand plays a decisive role in the profitability of any activity. However, the introduction of intervention instruments in 2009 to the market-oriented production of pulses exerted also an influence on the economic results of seed companies indirectly. The policy of payments to pulses resulted in the increase of demand for their seeds (Table 2).

Table 2

*The amounts (tonnes) of the seed material sold for sowing of the selected species of pulses in the marketing years, in total*

| Specification          | 2009   | 2010   | 2011   | 2012   | 2013   | 2014     | 2015     | Change<br>2009-2015<br>(%) |
|------------------------|--------|--------|--------|--------|--------|----------|----------|----------------------------|
| 1 Field bean           | 206.3  | 329.1  | 371.9  | 470.7  | 647.0  | 1112.5   | 2367.2   | 1147.5                     |
| 2 Pea                  | 1861.6 | 2236.4 | 2042.3 | 2488.0 | 2613.7 | 3233.9   | 5499.1   | 295.4                      |
| 3 White lupine         | 21.1   | 24.9   | 24.2   | 8.1    | 52.7   | 37.4     | 22.2     | 105.2                      |
| 4 Narrow-leaved lupine | 1623.9 | 2542.0 | 2688.2 | 2660.0 | 2821.1 | 4164.6   | 7206.1   | 433.7                      |
| 5 Yellow lupine        | 860.1  | 1615.3 | 1005.9 | 913.0  | 1254.0 | 1663.9   | 2025.6   | 235.5                      |
| Total                  | 4573.0 | 6747.7 | 5132.5 | 6539.8 | 7388.5 | 10 212.3 | 17 120.2 | 374.4                      |

Source: own calculations on the basis of data concerning the selected seed companies.

As a consequence, the increase in the sale of seed material was observed in the period under analysis. In 2009 its volume was 4573.0 tonnes, whereas in 2015 it increased to 17,120.2 tonnes, which is 374.7%. In the analyzed period, the highest growth concerned the sale of seed material of field bean – by 1145%, and narrow-leaved lupine – by 433.7%. The volume of the sold seed material of yellow lupine rose in the same period by 235.5%. The higher demand for seeds of domestic pulses directly translated into economic results of the seed companies which produced the sowable material of pulses. In the case of the sale of yellow lupine’s seeds, the profit of the analysed seed company, obtained in 2009-2016, increased from PLN 20 per 1 dt to PLN 37 per 1 dt, whereas for fodder pea the profit was PLN 33.7 per 1 dt in 2009, and in 2015 it rose to PLN 42.5 per 1 dt (Table 3).

The comparison of the figures in Table 3 with the economic results of the sale of winter wheat, which generated profit of PLN 15.4 per 1 dt in 2015, leads to the conclusion that the profits from the seed production of yellow lupine were higher by 218%, and in the case of the production of fodder pea – by 275% than the profits generated from the production of seed material of winter wheat.

Table 3

*Economic advantages of a seed company from seed production of pulses' varieties purchased from a Polish breeder*

| Specification                    | Yellow lupine                          |  | Fodder pea                             |  | Winter wheat                           |
|----------------------------------|--|--|--|--|--|
|                                  | Purchase 2009<br>Sale 2010<br>(PLN/dt) | Purchase 2015<br>Sale 2016<br>(PLN/dt) | Purchase 2009<br>Sale 2016<br>(PLN/dt) | Purchase 2015<br>Sale 2016<br>(PLN/dt) | Purchase 2015<br>Sale 2016<br>(PLN/dt) |
| Production cost<br>"C"           | 270                                    | 195.0                                  | 145.0                                  | 140.0                                  | 120.0                                  |
| Licence                          | 20                                     | 20.0                                   | 25.0                                   | 15.0                                   | 20.0                                   |
| Purchase of seeds<br>"B"/1dt "C" | 10                                     | 18.0                                   | 6.3                                    | 9.5                                    | 4.6                                    |
| Total costs                      | 300.0                                  | 233.0                                  | 176.3                                  | 164.5                                  | 144.6                                  |
| Sale price of 1dt                | 320.0                                  | 270.0                                  | 210.0                                  | 207.0                                  | 160.0                                  |
| Profit PLN/dt                    | 20.0                                   | 37.0                                   | 33.7                                   | 42.5                                   | 15.4                                   |

Source: own calculations based on data from the seed companies.

### **Impact of the payments on the economic results of market-oriented production of domestic pulses**

The market-oriented cultivation of pulses on domestic farms has the long-standing tradition since the crop has been always important in the crop rotation and as the plant protein source. The highest volume of pulses has been produced in the country in 1988 thus far, when pulses represented one of the main sources of plant-based feed protein for pig and poultry production. In that year above 450 thousand hectares of arable land were under pulses. But the introduction of soybean meal to the Polish feed market in the 1990s resulted in the marginalisation of the domestic sources of plant protein for many years. In 2011, the total area under pulses accounted for only 156,818 ha. In the next years, the area edged up and in 2015 its increase was above 2-fold, to the level of 403,913 ha (Table 4).

The same situation was observed as to the volumes of domestic pulses' harvests. Between 2011 and 2015 the harvest, calculated as a product of the average yield and the total area under pulses, increased from 335.1 to 714.8 thousand tonnes.

In the case of edible pulses, the harvest grew over 2-fold in the analysed period, amounting to 83.8 thousand tonnes in 2011 and 171.6 thousand tonnes in 2015. The similar situation was in the case of the total harvest of fodder pulses, which volumes oscillated between 251.3 thousand tonnes in 2011 and 543.2 thousand tonnes in 2015.

Also, the growth in the sown area indicated the profitability of this production type.

Table 4

The cultivation area of pulses in 2011-2015

| Specification | Years     |         |         |         |         |
|---------------|-----------|---------|---------|---------|---------|
|               | 2011      | 2012    | 2013    | 2014    | 2015    |
|               | Area (ha) |         |         |         |         |
| Pulses, total | 156 818   | 205 115 | 170 575 | 205 318 | 403 913 |
| Edible pulses | 37 431    | 34 517  | 39 274  | 53 194  | 91 032  |
| Fodder pulses | 119 387   | 170 598 | 131 012 | 152 124 | 312 880 |
|               | Share (%) |         |         |         |         |
| Edible pulses | 24        | 17      | 23      | 26      | 23      |
| Fodder pulses | 76        | 83      | 77      | 74      | 77      |

Source: own calculations based on the data provided by the Central Statistical Office and the database of the 5<sup>th</sup> Subject Area of the Multiannual Programme.

The cost-effective analysis was performed for the production of pea and yellow lupine, on the basis of data for 2015 (Table 5). The analysis proved that the agricultural income from pea production without payments had its positive value, i.e. PLN 233.84 per 1 ha, only beginning with the level of yield of 30 dt per hectare. Taking into account the payments due to the producers, the agricultural income accounted for PLN 1697.28 per 1 ha, assuming the same level of yields. As to yellow lupine, the farmers would record losses of PLN 271.74 per 1 ha when the yields were at the level of 23 dt per 1 ha. But when the payments were added to the calculation, the agricultural income would account for PLN 1201.70 per 1 ha.

In comparison to the economic results of the winter wheat production without payments, the above-mentioned result is very good, because the agricultural income from the production of winter wheat, taking into account the yield of 60 dt per 1 ha and after adding the payments due to its producers, amounted to PLN 1056.48 per 1 ha in 2015. Despite the favourable level of agricultural income from the pea production, compared with the winter wheat, and the analogous figure for yellow lupine compared with rye, in practice it does not arouse more interest of agricultural producers in market-oriented production of pulses. The fact is confirmed by the small share of domestic pulses cultivated for fodder in the market turnover. In 2015 the procurement of pulses included only 1.8% of potential production of pea, 3.6% – yellow lupine, and 4.3% – field bean (Table 6).



Table 5

*Production profitability of winter wheat and pea at different levels of yields in 2015*

| Specification                     | Yield dt/ha | Value of production (PLN/ha) | Total costs (PLN/ha) | Agricultural income less payments (PLN/ha) | Payments (PLN/ha) | Agricultural income (PLN/ha) |
|-----------------------------------|-------------|------------------------------|----------------------|--|-------------------|------------------------------|
| Fodder pea<br>(PLN 103 per dt)    | 20          | 2060                         | 2866.16              | -816.16                                    | 1473.44           | 667.28                       |
|                                   | 30          | 3090                         | 2866.16              | 233.84                                     | 1473.44           | 1697.28                      |
|                                   | 40          | 4120                         | 2866.16              | 1253.84                                    | 1473.44           | 2727.28                      |
| Winter wheat<br>(PLN 69 per dt)   | 40          | 2760                         | 3667.22              | -907.22                                    | 583.7             | -323.52                      |
|                                   | 50          | 3450                         | 3667.22              | -217.22                                    | 583.7             | 366.48                       |
|                                   | 60          | 4140                         | 3667.22              | 472.78                                     | 583.70            | 1056.48                      |
| Yellow lupine<br>(PLN 100 per dt) | 13          | 1300                         | 2571.74              | -1271.74                                   | 1473.44           | 201.70                       |
|                                   | 16          | 1600                         | 2571.74              | -971.74                                    | 1473.44           | 501.70                       |
|                                   | 23          | 2300                         | 2571.74              | -271.74                                    | 1473.44           | 1201.70                      |
| Rye<br>(PLN 49 per dt)            | 40          | 1960                         | 3427.32              | -1467.32                                   | 583.70            | -883.62                      |
|                                   | 50          | 2450                         | 3427.32              | -977.32                                    | 583.70            | -393.62                      |
|                                   | 70          | 3430                         | 3427.32              | 2.68                                       | 583.70            | 586.38                       |

Source: Multiannual Programme database, averaged data according to the Agricultural Advisory Centre.

Table 6

*Harvests and procurement of pea, lupine and field bean in 2011-2015*

| Year | Pea harvest (dt) | Pea procurement (dt) | Pea procurement (%) | Yellow lupine harvest (dt) | Yellow lupine procurement (dt) | Yellow lupine procurement (%) | Field bean harvest (dt) | Field bean procurement (dt) | Field bean procurement (%) |
|------|------------------|----------------------|---------------------|----------------------------|--------------------------------|-------------------------------|-------------------------|-----------------------------|----------------------------|
| 2011 | 368 927          | 17 000               | 4.6                 | 785 615                    | 38 000                         | 4.8                           | 178 582                 | 6 000                       | 3.3                        |
| 2012 | 449 778          | 10 000               | 2.2                 | 777 992                    | 46 000                         | 5.9                           | 248 533                 | 2 000                       | 0.8                        |
| 2013 | 332 317          | 2 000                | 0.6                 | 1 020 443                  | 48 000                         | 4.7                           | 176 077                 | 7 000                       | 3.9                        |
| 2014 | 444 206          | 2 000                | 0.4                 | 1 398 016                  | 93 000                         | 6.6                           | 309 285                 | 16 000                      | 5.1                        |
| 2015 | 912 543          | 17 000               | 1.8                 | 2 911 818                  | 106 000                        | 3.6                           | 777 457                 | 34 000                      | 4.3                        |

Source: CSO database for 2011-2015.

Pulses are often used as the forecrop, which improves the soil quality and structure. The study showed that the reason for such a situation was the lack of efficient market in their seeds in the country. As a result, the feed industry has no interest in domestic pulses' raw materials.

### **Conclusions**

1. The payments to pulses stimulated the part of the market dealing with their production and sale of their seed material, which translated into the profits of the seed companies.
2. The marginalization of the market in protein raw materials based on the domestic pulses leads to the situation that the payments paid out to farmers at present do not encourage them to conduct the market-oriented production of pulses for fodder, but the cultivated pulses are used either as the forecrop for next crops or a relatively cheap fertiliser only.

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## ZNACZENIE DOPŁAT DO PRODUKCJI ROŚLIN STRĄCZKOWYCH W ODBUDOWIE RYNKU RODZIMYCH SUROWCÓW BIAŁKOWYCH POCHODZENIA ROŚLINNEGO W POLSCE

### Abstrakt

*Całkowita produkcja rodzimego paszowego białka roślinnego wynosi 340 tys. ton. Stanowi to łącznie zaledwie 26% krajowego zapotrzebowania. Powstały deficyt wynoszący 960 tys. ton musi być uzupełniony importowaną śrutą sojową, aby możliwe było zapewnienie bezpieczeństwa paszowego dla pogłowa trzody chlewnej oraz drobiu, którego Polska jest największym w Europie eksporterem. W sytuacji tak znacznego uzależnienia od importu tego surowca uruchomiono działania interwencyjne, w ramach których uprawiający rośliny strączkowe mogą liczyć na dotowanie tej produkcji. Celem badań zaprezentowanych w niniejszym artykule była ocena wpływu dopłat UE do produkcji roślin strączkowych realizowanych do 2015 r. na rozwój rynku materiału siewnego oraz produkcji towarowej tych roślin w kraju. W wyniku badań stwierdzono, że dopłaty do produkcji roślin strączkowych uaktywniły segment rynku produkcji i sprzedaży materiału siewnego tych roślin. Przyczyniło się to do stopniowego zwiększania powierzchni zasiewów tych roślin w kraju, a jednocześnie zapewniło korzyści finansowe dla przedsiębiorstw nasiennych. Stwierdzono też, że w 2015 r. pomimo korzystnie kształtującego się dochodu rolniczego uzyskiwanego z produkcji rodzimych roślin strączkowych, to jednak w praktyce nie skłoniło to producentów rolnych do większego zainteresowania się tą uprawą jako produkcją towarową. Zauważono natomiast powszechne wykorzystywanie tego typu upraw jako przedplonu poprawiającego strukturę gleby i jej zasobność w azot. Za przyczynę takiej sytuacji uznano brak w kraju rynku nasion rodzimych roślin białkowych zdolnego zaspokoić wymagania popytowe przemysłu paszowego. Stąd też wynika brak zainteresowania tym surowcem ze strony przemysłu i marginalizację rodzimych źródeł paszowego białka roślinnego na rynku.*

**Słowa kluczowe:** rynek białka roślinnego, rośliny strączkowe, opłacalność produkcji, dopłaty do produkcji, materiał siewny, produkcja towarowa.

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