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INFLATION AND PRODUCTION COSTS OF SELECTED AGRICULTURAL PRODUCTS IN POLAND IN 2022

The aim of the paper is to present measures taken in recent years by state public authorities that affect inflation in Poland. An assessment was made of the growth in prices for purchased agricultural inputs, which was correlated with cost structures, and on this basis an increase in the production costs of basic agricultural products in 2022 was estimated. This projected increase in production costs was then related to estimated income. This made it possible to determine their growth, which would allow the current level of agricultural income to be maintained. The government rescue measures triggered by COVID-19 had three main sources of funding: expenditure of the state budget and the budget of European funds - PLN 23.2 billion, COVID-19 Counteracting Fund - PLN 92.7 billion, and financial shields of the Polish Development Fund - PLN 63.5 billion,

While the government's intervention activities, under the conditions of the crisis, should be assessed positively, their methods of implementation should be assessed critically. Financial support under the shields was given to companies that showed a decline in turnover caused by the coronavirus pandemic. As a result, those companies that may have deliberately created the conditions to receive support were supported. In all analyzed types of agricultural crop production activities in 2022, there will be an increase in the cost of their production by about 50-60%. The exception will be the production of rye, where the cost increase will be even higher.

Keywords:. agricultural production, inflation, price, forecast
JEL codes: Q11, Q14

Introduction

The economic and productive effects of agricultural production depend on: the manager, weather phenomena, climate, soil quality, and market conditions. The latter are related to the prices producers receive for their products and the prices of purchased inputs (in other words, the so-called price scissors). The price scissors, on the other hand, are influenced by inflation, which manifests itself in price increases. The increase in prices of agricultural products and purchased means of agricultural production has the effect of disturbing the previously existing market equilibrium. However, this disruption of the previous market equilibrium may be caused by a decrease in supply with the same demand or a decrease in supply with an increase in demand. In the last three years (2020-2022) due to the crisis phenomena (COVID-19, war in Ukraine) there is a reduction in supply of

goods and services – which is a natural situation under crisis conditions – and an increase in demand caused by the intervention of state public authorities[1].

The aim of the paper is to present actions taken in recent years by state public authorities which have influenced inflation in Poland. Then, against this background, an assessment was made of an increase in prices for purchased means of agricultural production, which was confronted with a cost structure, and on this basis an increase in production costs of basic agricultural products in 2022 was estimated. In turn, the estimated increase in production costs of selected agricultural products was related to income, which made it possible to calculate their increase, which would make it possible to maintain the current level of income realized from these activities.

The study formulated the following research hypothesis:

If in 2022 the revenues from the production of winter wheat, rye, spring barley, sugar beets, winter rape, dairy cows, beef livestock and pork livestock are the same as in 2021, the increase in their production costs will result in a decrease in the income of agricultural producers. In the study, the literature on public finance, economic and agricultural literature, data of mass statistics and data of FADN farms conducting agricultural accounting for the European Union were used. To achieve the objectives and to verify the hypothesis the following methods were used: descriptive analysis, financial analysis, simulation and inference.

Actions of the state public finance authorities in the conditions of crisis

The coronavirus pandemic crisis necessitated additional, unplanned public spending. This was an objective circumstance and was the result of interventionist theory. Interventionist financial theory allows for the possibility of stabilizing the economy through increased public spending financed by public debt[2]. Increased public spending contributes to increased demand, which with reduced supply in a crisis leads to higher prices. The government bailout in 2020 triggered by COVID-19 had three main sources of financing[3]:

- expenditure of the state budget and the budget of European funds - PLN 23.2 billion,
- COVID-19 Counteracting Fund - 92.7 billion,
- financial shields of the Polish Development Fund - PLN 63.5 billion

The shields were financed with bonds issued by the Polish Development Fund. Out of the PLN 61 billion in aid for enterprises, micro-enterprises received PLN 29 billion, while small and medium-sized enterprises received PLN 42 billion[4]. According to Stanisław Owsiak, "at this stage it is difficult to explicitly assess the effects of the discussed programs. They were introduced in extremely difficult conditions, ... however, the rescue activities undertaken by the state were undoubtedly necessary"[5]. It seems that

[1] St. Owsiak, *Finanse Publiczne. Współczesne ujęcie*, PWN, Warszawa, 2017, s. 76, 77
[2] St. Owsiak, *Ibidem*, p. 87-94
[3] M. Zioło (red.), *Finanse publiczne*, CIMPO, Warszawa, 2021, [w:] B. Guziewska, *Wybrane problemy strukturalne i instytucjonalne finansów publicznych w warunkach kryzysu wywołanego COVID-19: refleksje nad ewolucją paradygmatu*, p. 46
[4] M. Zioło (red.), *Finanse publiczne*, [w:] St. Owsiak, *Oracjonalne wykorzystanie finansów publicznych w warunkach kryzysu*, p. 28
[5] *Ibidem*, p. 28

the actions of the state can be assessed as necessary, although the manner of their implementation should be subject to a critical evaluation. It is worth recalling that financial support under the shields was given to companies that showed a decline in turnover caused by the COVID-19 pandemic. In effect, support was given to those companies that may have deliberately created conditions for receiving support by taking advantage of an actual or hypothetical decline in turnover.

It is arguable that a better solution would have been support based on lowering the tax burden for companies. Then, all companies would benefit from this financial support, including those that did well during the crisis. In this situation, companies that prospered in crisis conditions, which required a lot of effort from them, were ignored by the state aid. Hence, the conclusion is that it is not worth striving for revenue optimization. It is more profitable to show weakness – whether for objective or subjective reasons – and receive support.

Returning to the proposal of lowering taxes for companies in the crisis, it is possible guess why it was not used. Tax relief for companies would have resulted in increased shortages in the state budget, and this would not have been in line with the strategy pursued by those in power. The current strategy of public finance management is based on the debudgetization of public finances, which is based on the growth of extra-budgetary economy units. According to Stanislaw Owsiak, from 2010 to 2020 there has been an alarming increase in the number of agencies and state legal entities and funds from 24 to 40[6] . Additionally, as a result of the social policy pursued by the government, there has been an increase in the money supply from PLN 1.553 billion in 2019 to PLN 1.866 billion in mid-2021[7] . While in 2019 the benefits to individuals, across the public finance sector, amounted to PLN 399.6 billion, in 2020 they increased to PLN 461.1 billion[8] .

It is worth referring to the Family 500+ program. This was a planned tool to stimulate population growth, but also contributed to the redistribution of national income. The basic goal of the aforementioned program, based on the potential increase in family fertility, was not achieved. Social transfers, on the other hand, brought positive changes in the sphere of income inequality. In 2011, the Gini coefficient was 31.1%, while in 2019 its value was equal to 28.5%, which is a favorable result compared to other European Union countries, as the average value of this indicator in the period 2011-2019 was 30.5%[9] . The Family 500+ program, in addition to its positive effects, has a serious drawback, which is the lack of application of income criterion. The assumption was made that every child – regardless of family wealth – should receive support from the government. This does not seem to have any economic justification.

At the end of these considerations, it is worth pointing out the size of property expenditures implemented from public finances. In 2019, these expenditures amounted to PLN 28.5 billion, of which the government subsector spent PLN 27 billion[10]. These measures in the structure of all expenditures of the entire public finance sector accounted for slightly more than 3%. In 2020, property expenditures totaled PLN 113.9 billion, which accounted for more than 10% in the structure of expenditures of the entire public finance

[6] *Ibidem*, p. 25
[7] *Ibidem*, p. 28
[8] *Ibidem*, p. 45
[9] *Ibidem,* p. 24
[10] *Sprawozdania z wykonania budżetu za 2019 rok*, Rada Ministrów, Warszawa, 2020, p. 333

sector[11], which should be evaluated positively if among them there were no expenditures for the purchase of bonds. The analysis of recent years allows us to observe a small share of property expenditures in the structure of public finances, which translates into a lack of sustainable basis for economic growth in the future.

In summary, since the second quarter of 2020, so since the start of the coronavirus pandemic, changes in the area of public finance include:

- an amendment to the Law on Public Finance, which resulted in the suspension of the provisions on the expenditure rule and changed the public debt limits,
- amending the 2022 budget to increase spending and the budget deficit,
- the creation of new special purpose funds from 29 to 37 and thus an increase in the scope of extra-budgetary economy. In 2020, the costs of the funds amounted to 377.6 billion zlotys and the state budget expenditures amounted to 504.8 billion zlotys, which accounted for about 75% of budget expenditures[12],
- no significant impact on the state budget as a result of COVID-19, as a result of the debudgetization of public finances,
- increased public spending and increased public debt that are beyond parliamentary and public control,
- an increase in inflation, which has its source not only abroad, but also in Poland.

Forecasted increase in production costs of selected agricultural products and forecasted income situation of Polish agricultural producers in 2022

Using data from FADN farms, the cost structure was assessed for basic agricultural, plant and animal products such as:

- winter wheat,
- rye,
- sugar beets,
- spring barley,
- winter rapeseed,
- dairy cows,
- beef livestock,
- pork livestock.

Then, on the basis of observations and statistical analyses of CSO No. 12 of 2021, the price level of basic agricultural inputs in 2022 was estimated. On the basis of this information, the development of production costs (their increase) in 2022 relative to 2021 was calculated. The so-called integrated index of forecasted costs (ZWPK for short) was calculated. Then different situations were assumed concerning the development of revenues from the analyzed activities in 2022. On the basis of these simulations, a forecast assessment of the economic situation of agricultural producers in 2022 was made.

[11] *Ibidem*, p. 333
[12] M. Zioło (red.), *Finanse publiczne*, [w:] St. Owsiak, *Oracjonalne wykorzystanie finansów publicznych w warunkach kryzysu*, p. 25

The data presented in Table 1 show that direct costs (i.e. those which can be precisely assigned to a given activity) constitute about 40% of total costs. Their share is slightly higher in the production of sugar beets and winter rape.

Table 1. Crop production cost structure in 2021 per ha

Specification	On average, farms growing:				
	winter wheat	rye	spring barley	sugar beets	winter rape
Total costs [%]	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**
total direct costs:	**40,5**	**39,9**	**39,3**	**44,8**	**45,0**
seed	6,6	6,2	9,2	11,5	6,0
total mineral fertilizers	21,9	26,6	23,6	18,6	24,4
foreign organic fertilizers	0,0	0,2	0,0	0,0	0,6
crop protection products	10,4	6,5	6,6	14,6	12,5
growth regulators	1,0	0,4	0,4	0,0	0,7
other	0,0	0,0	0,0	0,1	0,8
total indirect costs	**59,5**	**60,1**	**60,7**	**55,2**	**55,0**
electricity	1,8	3,2	2,6	1,5	2,0
coal	1,0	0,0	1,0	0,6	1,0
propellant fuels	26,8	28,9	25,4	21,0	24,6
repairs, maintenance and inspections	12,1	12,5	11,9	9,5	10,9
services	12,2	9,0	13,9	17,2	10,8
insurances	2,9	3,1	2,9	2,3	2,6
other	3,3	3,5	3,7	3,1	3,1

Source: M. Podstawka (red.), Ocena sytuacji ekonomiczno-produkcyjnej rolnictwa i gospodarki żywnościowej w latach 2015-2020, IERIGŻ, Warszawa, 2021.

Table 2. Cost structure of livestock production in 2021

Specification	On average in farms		
	keeping dairy cows (per cow)	producing beef livestock (per 100 kg of gross livestock)	producing pork livestock (per 100 kg of gross livestock)
Total costs [%]	**100,0**	**100,0**	**100,0**
total direct costs	**50,1**	**61,3**	**80,8**
herd exchange	7,5	44,6	50,0
feed from outside the farm	23,5	5,7	18,3
own fodder	9,2	8,0	11,1
non-commodity own feedingstuffs	3,8	2,0	0,0
other	6,0	1,1	1,1
total indirect costs	**49,9**	**38,7**	**19,2**
electricity	3,5	2,1	1,8
coal	0,1	0,1	0,0
propellant fuels	16,4	14,3	6,5
repairs, maintenance and inspections	13,8	8,2	4,8
services	10,5	8,9	4,1
insurances	1,7	1,9	1,0
other	4,0	3,1	1,3

Source: M. Podstawka (red.), Ocena sytuacji ekonomiczno-produkcyjnej rolnictwa i gospodarki żywnościowej w latach 2015-2020, IERIGŻ, Warszawa, 2021

The respective shares of these costs in the generation of these costs amounted to 44.8% and 45% in 2021.On the other hand, indirect costs (i.e. those that cannot be attributed to an activity) amounted to about 60% of total costs. A slightly smaller share of these costs occurs in the production of sugar beets and winter rape. Their share in 2021 was 55.2% and 55%, respectively.

Table 2 shows the total cost structure of selected agricultural animal products. These costs are shown per cow, 100 kg of beef livestock and 100 kg of pork livestock. From the data in Table 2, it can be seen that in the case of keeping one cow on a FADN farm, the share of direct costs and indirect costs in the total cost structure is 50% each. In hog livestock production, the share of direct costs is much higher and was more than 80% in 2021. Indirect costs in this production accounted for about 20%. In the case of production of 100 kg of beef livestock, direct costs in 2021 in FADN farms were more than 61%, while indirect costs in this production were about 39%. According to the methodological assumptions indicated earlier, the price indices of agricultural inputs in 2010, 2020, 2021 and their forecast for 2022 are presented in Table 3.

Table 3: Price indices for agricultural inputs

Specification	Previous year = 100			
	2010	**2020**	**2021**	**2022***
Seed	102,9	102,5	106,2	118,7
Mineral fertilizers	89,4	97,5	171,0	290,4
Plant protection products	100,8	102,0	104,9	137,5
Fodders	100,4	101,4	116,5	141,0
Agricultural machinery and tools	101,4	103,8	113,2	120,0
Fuels	108,8	93,5	128,3	143,4
Lubricants, electricity	108,8	93,5	128,3	143,4
Machine operation of agricultural production	103,5	103,8	113,2	126,6
Veterinary services	101,7	103,1	104,8	126,6

* - forecast

Source: Statistical analysis of GUS (the Central Statistical Office) 12/2021

The data of Table 3 indicate a significant increase in the price of agricultural inputs in 2022. This is the result of economic, social and fiscal policies of the government and the international situation related to COVID-19 and the war in Ukraine. The prices of mineral fertilizers, energy, feed and plant protection products will increase to the greatest extent in 2022. The collected data in Tables 1, 2 and 3 allowed to estimate the increase in production costs of selected inputs of selected agricultural, plant and animal products.

For 1ha of winter wheat, production costs in 2022 will increase by 57.5% compared to 2021, as the following calculation shows:

- ZWPK = 1,19 x 0,07 + 2,9 x 0,22 + 1,38 x 0,1 + 1,43 x 0,02 + 1,43 x 0,27 + 1,26 x 0,24
- ZWPK = 0,083 + 0,638 + 0,138 + 0,028 + 0,386 + 0,302
- ZWPK = 1,575

For 1 ha of rye, production costs in 202 will be 105% higher than in 2021, as determined below:

- ZWPK = 1,19 x 0,06 + 2,9 x 0,27 + 1,38 x 0,06 + 1,43 x 0,03 + 1,43 x 0,29 + 1,26 x 0,22
- ZWPK = 0,071 + 0,783 + 0,083 + 0,429 + 0,415 + 0,277
- ZWPK = 2,058

The production cost of 1ha of spring barley in 2022 will increase by 55.4% compared to its production cost in 2012, as shown in the calculations below:

- ZWPK = 1,19 x 0,09 + 2,9 x 0,24 + 1,38 x 0,07 + 1,43 x 0,02 + 1,43 x 0,21 + 1,26 x 0,26
- ZWPK = 0,107 + 0,696 + 0,096 + 0,028 + 0,3 + 0,327
- ZWPK = 1,554

For the production of 1ha of sugar beets, their acquisition cost in 2022 will increase by 51.5% in relation to the production cost in 2021. This is the result of the calculation below:

- ZWPK = 1,19 x 0,11 + 2,9 x 0,18 + 1,38 x 0,15 + 1,43 x 0,02 + 1,43 x 0,21 + 1,26 x 0,26
- ZWPK = 0,131 + 0,522 + 0,207 + 0,28 + 0,3 + 0,327
- ZWPK = 1,515

As for the increase in the cost of production of 1ha of winter rapeseed, the cost of its production in 2022 will increase by 61% compared to the previous year, which is the result of the following calculation:

- ZWPK = 1,19 x 0,06 + 2,9 x 0,24 + 1,38 x 0,13 + 1,43 x 0,02 + 1,43 x 0,25 + 1,26 x 0,22
- ZWPK = 0,071 + 0,696 + 0,179 + 0,029 + 0,358 + 0,277
- ZWPK = 1,608

The cost of keeping one dairy cow in 2022 will be 23% more than the 2021 cost. This is shown in the calculation below:

- ZWPK = 1,20 x 0,08 + 1,41 x 0,24 + 1,43 x 0,04 + 1,43 x 0,17 + 1,26 x 0,14 + 1,26 x 0,11 + 1,41 x 0,13
- ZWPK = 0,096 + 0,338 + 0,057 + 0,243 + 0,176 + 0,139 + 0,183
- ZWPK = 1,232

In terms of the cost of producing 100 kg of beef livestock, there will be a 20% increase in 2022 over its 2021 cost. This is evident from the calculation below:

- ZWPK = 1,20 x 0,45 + 1,41 x 0,14 + 1,43 x 0,02 + 1,43 x 0,14 + 1,29 x 0,19
- ZWPK = 0,54 + 0,197 + 0,029 + 0,2 + 0,239
- ZWPK = 1,205

The cost of producing 100 kg of pork livestock will increase by 37% compared to the cost of obtaining it in 2021 as a result of this calculation:

- ZWPK = 1,2 x 0,5 + 1,41 x 0,2 + 1,43 x 0,02 + 1,43 x 0,06 + 1,26 x 0,09
- ZWPK = 0,6 + 0,282 + 0,289 + 0,086 + 0,113
- ZWPK = 1,370

The presented simulations show that definitely worse production cost conditions will exist in 2022 for plant products, especially for rye, which is produced on poor quality arable land and requires a large amount of mineral fertilizer, the prices of which increased the most in 2022. A relatively smaller increase in production costs is predicted in 2022 for animal products.

In this part of the paper, the research hypothesis was verified. It was confirmed on the basis of simulation and inference. The FADN farm accounting results show that in crop production, production costs account for about 65 % of the operating income[13] . In view of this, a projected increase of about 50% in the cost of production of primary crop products in 2022 will, assuming that their revenue is the same as in 2021, result in a drastic reduction in income, as shown below:

- P – K = D
- 100 – 65 = 35 in 2021
- 100 – 98 = 2 in 2022

Where:

- P – Revenue,
- K – Costs,
- D – Income,

It should be assumed that, under crisis conditions, revenue from agricultural activity will also increase in 2022. Another simulation shows by how much the revenue from crop production should increase in 2022 in order to maintain the revenue level of 2021 with a 50% increase in costs.

- P – K = D
- 100 – 65 = 35 in 2021
- 133 – 98 = 35 in 2022

Thus, crop production revenues in 2022 should increase by 33% to maintain 2021 revenue levels. In the case of livestock production, costs versus revenues vary. The simulation will be done only for pork livestock production. Based on FADN farms, costs relative to income were about 70%[14] , and will be 37% higher in 2022. Thus, to maintain the 2021 income level from this production, income should increase by 26% according to this simulation.

Conclusions

1. The COVID-19 crisis necessitated additional, previously unplanned public spending.
2. The government bailout in Poland had three main sources of funding:
    a. state budget - PLN 22.3 billion,
    b. COVID-19 Counteracting Fund - PLN 92.7 billion,
    c. financial shields of the Polish Development Fund - PLN 63.5 billion,

[13] Table compilation IERIGŻ-PIB ZFZR 2022.04.24
[14] *Ibid*

3. Financial support was given to companies that showed a decrease in turnover, which should be evaluated critically. It would be more rational to support companies with tax relief. Then, those companies which did well during the crisis would also benefit from this aid.
4. Increased public spending due to the coronavirus pandemic and the government's social policies, combined with a reduced supply of goods and services, contributed to price increases (inflation).
5. In all analyzed types of crop production in 2022 the cost of their production will increase by about 50-60%, except for rye production where the cost increase will be even higher. It will amount to 105% compared to the previous year.
6. Regarding the analyzed livestock production, the increase in production costs ranges from 20.5% for beef livestock to 30.7% for pork livestock. Keeping one cow in 2022 will combine with an increase of 23%.
7. Assuming that revenues in 2022 will be the same as in 2021, the increase in production costs will reduce the income of agricultural producers. This will particularly affect crop-only farmers.
8. When we assume that on average in crop production, costs to income are about 65%, then to maintain the current level of income from this production, with an increase in costs of about 50/60%, income should increase by about 33%. This will probably be impossible.
9. There will likely be a reduction in revenue due to a greater decline in crop yields than an increase in crop prices, creating a dramatic situation in terms of income levels for agricultural producers in 2022.
10. In the case of hog livestock production, to maintain the current 2021 revenue levels with a 37% increase in production costs in 2022, revenues should increase by 26%.

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Inflacja a koszty produkcji wybranych produktów rolniczych w 2022 roku

Streszczeie

Celem opracowania było przedstawienie działań podejmowanych, w ostatnich latach, przez państwowe władze publiczne wpływających na inflację w Polsce. Na tym tle dokonano oceny wzrostu cen na rolnicze kupowane środki produkcji, które skorelowano ze strukturą kosztów i na tej podstawie oszacowany został wzrost kosztów produkcji podstawowych produktów rolniczych w 2022 roku. Następnie ten prognozowany wzrost kosztów produkcji odniesiono do szacowanych

przychodów. Pozwoliło to ustalić ich wzrost, który umożliwiałby utrzymanie dotychczasowego poziomu dochodów rolniczych. Działania ratunkowe rządu wywołane przez COVID-19 miały trzy główne źródła finansowania:

- wydatki budżetu państwa i budżetu środków europejskich – 23,2 mld zł,
- Fundusz Przeciwdziałania COVID-19 – 92,7 mld zł,
- tarcze finansowe Polskiego Funduszu Rozwoju – 63,5 mld zł,

O ile działania interwencyjne rządu, w warunkach kryzysu, należy ocenić pozytywnie, to ich sposoby realizacji krytycznie. Wsparcie finansowe w ramach tarcz otrzymały firmy, które wykazywały spadek obrotów spowodowany pandemią koronawirusa. W efekcie wspierano te firmy, które być może celowo tworzyły warunki do otrzymania wsparcia. Firmy dobrze prosperujące w warunkach COVID-19 takiego wsparcia były natomiast pozbawione.

We wszystkich analizowanych rodzajach działalności produkcji rolniczej roślinnej w 2022 roku nastąpi wzrost kosztów ich wytwarzania o około 50-60% Wyjątkiem będzie produkcja żyta, gdzie wzrost kosztów będzie jeszcze wyższy.

Słowa kluczowe:. produkcja rolna, inflacja, cena, prognoza
Kody JEL: Q11, Q14

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