

## ANALYSIS OF THE PROFITABILITY OF GROWING HERBS AND THE MOST COMMONLY CULTIVATED AGRICULTURAL CROP SPECIES

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### ABSTRACT

**Background.** The aim of this study was to determine the profitability index of herbs (evening primrose, glandular plantain, black caraway, garden dill) and to compare it with the index of dominant species in the cropping system in Poland.

**Material and methods.** Economic analyzes were carried out based on accounting books made available by the owners of two farms located in the Koronowo Gmina (community) of the Kuyavian-Pomeranian Voivodeship and on data provided by the Kuyavian-Pomeranian Agricultural Advisory Centre. The calculations concern the years 2017–2019 and took into account production value, the amount of gross margin, net agricultural income and profitability index.

**Results.** The calculations carried out confirmed the hypothesis that in most cases growing herbs in the field is more profitable than it is for other plant species. The analysis showed that glandular plantain and garden dill had the highest profitability indices. Herbs from which lower financial results were obtained still enabled an income similar to that from sugar beet, pea or winter oilseed rape. The most profitable among the other species was table potato. A farmer's decision regarding the choice of plants for cultivation on a farm should depend on the possibility of selling the produced raw materials on local markets and on their base of machinery and equipment. The study has shown that growing plants from groups that occupy the largest acreage in the cropping structure is characterized by the need to incur very high overheads.

**Conclusion.** Some selected herbs are characterized by a large profitability index that is even several times higher when compared to commonly cultivated agricultural crop species. While other analyzed herb species allow for an income that is at a similar level compared to crops that occupy the largest acreage in Poland. The selection of herbs for cultivation is an economic opportunity, especially for farms with a small area. Their cultivation enables larger agricultural incomes due to their relatively low overhead costs compared to other species. Herb cultivation, however, is a very specific branch of agriculture that requires more human labour.

**Key words:** cropping structure, gross margin, herb cultivation, net agricultural income, profitability index

### INTRODUCTION

In recent years an increase in interest in the cultivation of herbs has been observed, especially due to the ease of their cultivation and high yield (Dristika *et al.*, 2019), while their use in medicinal and

flavouring of food, beverages and pharmaceuticals, as well as their use as ingredients for perfumes and cosmetics continues to grow (Peter, 2006).

Growing herbal plants is an alternative for small Polish farms. The annual harvest of raw material is up to 13 thousand tons, and the demand for it is

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constantly growing. Herb cultivation is characterized by greater stability and certainty of sale, which is a result of the commonly used contractual agreements with local buyers (Hołubowicz-Kliza, 2012). The results of an economic analysis regarding the cultivation of herbs in various technology variants show that their profitability is often greater than that of cereals and certain legume species (Zająkała and Wielewska, 2018). They found that net agricultural income from a two-year common caraway cultivation under pure sowing and under coordinated sowing with other plants in 2017 turned out to be higher than for the previously mentioned cereals and legumes.

The Polish crop structure in 2018 was dominated by cereals, which accounted for 72.1% of the total area sown. Wheat and triticale occupied the largest acreage. The next largest group of plants, cultivated on an area of 1,145 thousand ha, were industrial crops, mainly oilseed rape and sugar beet. Of the remaining total area sown 9.4% was covered by fodder plants, 2.7% was used for potato cultivation, while 2.5% was taken by grain legumes. The remaining 2.8% (i.e. approx. 303 thousand ha) in the cropping structure was used for other plant species. These include outdoor vegetables, outdoor strawberries, seed plantations, ornamental plants and open field flowers, crops under shelter, and herbs (GUS, 2019). Agricultural market fluctuations forces Polish farmers to look for new, profitable sources of income. Herb cultivation is a chance for them. In 2001 the average area of a herb farm was 1.88 hectares, while after a decade it had only increased by less than 0.20 hectares. The total area of herb sowing has decreased – to 14.5 thousand ha. Herb farms are clustered mainly in the areas of Mazovia, Lublin region, Greater Poland, Kuyavia and Pomerania (Olewnicki *et al.*, 2015). Despite this, raw material production still remains at a high level. Many farms undertake the cultivation of herbs and choose for cultivation, among others, evening primrose (*Oenothera biennis*), glandular plantain (*Plantago psyllium*), black caraway (*Nigella sativa*) and garden dill (*Anethum graveolens*). Herb plants have always been present in human life. The role of raw materials produced in controlled plantations is increasing and is driving out from the market wild herbs harvested by hand. The raw materials produced

by herb farmers are used to produce medicines, cosmetics and spices. Consumers are increasingly consciously choosing herbs as a healthier alternative to synthetic ingredients and food additives (Shan *et al.*, 2007). The antibacterial and antifungal properties of herbs are increasingly appreciated, which successfully become a safe and natural food fixer (Bendahou *et al.*, 2008).

The growing market interest in raw materials from herbs makes it an area with very high development potential (Khan *et al.*, 2012). He also points out that cultivation of the species covering the largest area in the cropping structure is more mechanized than is herb cultivation and it therefore usually requires larger sums of money. Additionally, he also says it is important to choose a cultivation system that improves agricultural and economic efficiency. Therefore, research was undertaken the aim of which was to compare the profitability of growing four species of herbs, winter wheat, winter oilseed rape, pea, grain maize, sugar beet and edible potato.

A hypothesis was assumed that reads: In most cases growing herbs in the field is more profitable than is the case for other plant species.

## MATERIAL AND METHODS

The profitability of herbal production was calculated based on data obtained from two farmers operating in the Koronowo Gmina of the Kuyavian-Pomeranian Voivodeship. Farm A operated on an area of 37.50 hectares, of which 5.40 hectares in 2017, 5.90 hectares in 2018 and 6.80 hectares in 2019 were planted with garden dill and black caraway. In addition to herbs, spring wheat, winter oilseed rape, field pea and white mustard were grown. Farm B had a total area of 42.8 hectares, of which 2.4 hectares in 2017, 5.1 hectares in 2018 and 5.3 hectares in 2019 were planted with evening primrose and glandular plantain. The remaining acreage, due to concurrent pig farming, was intended for the cultivation of spring and winter cereals for feed purposes. Profitability calculations for four herb species were made based on the data provided by the individual farmers. The farmers paid lump-sum income tax; therefore, gross prices were used in the calculations.

Herb profitability calculations were based on data from the farm revenue and expense ledgers, and the sales value was based on the product yield and its

sale price plus a 7% VAT rate. Table 1 shows the yields and prices from cultivation contracts obtained in 2017–2019.

**Table 1.** Yields and prices of herbs obtained by farmers in 2017–2019

Species	2017		2018		2019	
	yield kg·ha <sup>-1</sup>	gross price PLN·ha <sup>-1</sup>	yield kg·ha <sup>-1</sup>	gross price PLN·ha <sup>-1</sup>	yield kg·ha <sup>-1</sup>	gross price PLN·ha <sup>-1</sup>
Black caraway	277	8.56	468	9.31	497	9.63
Garden dill	1.150	5.56	1.350	5.35	1.240	5.89
Glandular plantain	1.230	6.49	1.220	6.70	1.208	6.42
Evening primrose	250	8.56	340	7.49	353	7.49

Source: Compiled based on data from farmers

Information on the profitability of other plant species was taken from the calculation of agricultural gross margins and agricultural income made available by the Kuyavian-Pomeranian Agricultural Advisory Centre. These calculations included amounts rounded to the full PLN. The data used for the calculations was for high intensity level cultivation of these species. Additionally, the profitability index was calculated.

In each calculation the value of production per hectare including sales of raw materials, as well as the value of direct payments, was indicated. The calculation took into account the amount of subsidies, determined on the basis of the sum of the Single Area Payment, greening payments and additional payments. For the cultivation of pea and sugar beet this amount was increased by the value of payments related to the selected production. Based on the difference between the value of production and direct costs (purchase of seed, chemical protection agents, fertilizers), the gross margin was determined. The next part presents costs associated with production, included in indirect costs (the cost of depreciation of machinery, fuel, lubricants, own and hired labour, farm insurance of machinery, buildings and agricultural crops, agricultural tax and electricity consumed for work, e.g. dryer and cleaner).

Determining the difference between the gross margin and indirect costs made it possible to determine the amount of net agricultural income. In the last stage, the percentage profitability index was calculated based on the quotient of the value of production and the sum of direct and indirect costs.

## RESULTS AND DISCUSSION

The lower amounts of direct costs for growing herbs compared to growing other species is a result of their low plant fertilization needs and the low costs of chemical plant care and protection. The minimal differences in costs between individual years are a result of fluctuations in the prices of means of production. In the studied years, according to the conducted accounting, fertilizers were the most expensive in 2019. Indirect costs for herbal plants were comparable to the cultivation of some of the other species studied. Quite a large amount of the indirect costs were the result of expenses incurred for own and hired labour in the care of the plantations and for the need to purchase additional fuel to power the pump irrigating the fields of herbs.

The highest profitability indices in 2017 (Table 2) were found for glandular plantain and garden dill cultivation. The other herbal crops were characterized

by the even three times lower index in comparison to glandular plantain. This fact was due to poor yields, which were the result of a violent weather phenomenon that passed over the studied region in

August 2017. A storm caused damage to plants and seed shedding, which had a significant impact on the final agricultural income.

**Table 2.** Calculation of the profitability of growing 1 hectare of four species of herbs in 2017

Index	Herbs in 2017			
	black caraway	garden dill	glandular plantain	evening primrose
Amount, PLN·ha <sup>-1</sup>				
Production value [sales value + direct payments]	3,319.12	7,342.00	8,930.70	3,088.00
Sales of raw materials	2,371.12	6,394.00	7,982.70	2,140.00
Direct payments	948.00	948.00	948.00	948.00
Direct costs	700.00	824.00	749.00	690.00
Gross margin [production value – direct costs]	2,619.12	6,518.00	8,181.70	2,398.00
Indirect costs	2,300.00	2,800.00	1,900.00	1,980.00
Net agricultural income [gross margin – indirect costs]	319.12	3,718.00	6,281.70	418.00
Overheads [direct costs + indirect costs]	3,000.00	3,624.00	2,649.00	2,670.00
Profitability index, % [(production value / overheads)x100]	110.6%	202.6%	337.1%	115.7%

Source: authors' own study based on data from farmers

In 2018, the cultivation of glandular plantain and garden dill was again characterized by the highest profitability index (Table 3). The profitability index for black caraway was higher by 70% compared to the analysis from 2017, and for evening primrose by almost 20%.

On the farm of farmer A studied in 2019 (Table 4), a gross margin of PLN 5,111.11 was obtained from cultivation of black caraway, and the net agricultural

income was estimated at PLN 2,811.11. This profitability index was the highest of the three analyzed years for this herb. A disadvantage of the cultivation of this herb can be the late harvest period, which in this year was carried out in the last ten days of September. Due to the weather conditions, the plants ripened unevenly, causing some of the seeds to shed.

**Table 3.** Calculation of the profitability of growing 1 hectare of four species of herbs in 2018

Index	Herbs in 2018			
	black caraway	garden dill	glandular plantain	evening primrose
	Amount, PLN·ha <sup>-1</sup>			
Production value [sales value + direct payments]	5,302.00	8,167.50	9,119.00	3,491.60
Sales of raw materials	4,357.00	7,222.50	8,174.00	2,546.60
Direct payments	945.00	945.00	945.00	945.00
Direct costs	700.00	824.00	765.00	700.00
Gross margin [production value – direct costs]	4,602.00	7,343.50	8,354.00	2,791.60
Indirect costs	2,200.00	2,700.00	1,900.00	1,900.00
Net agricultural income [gross margin – indirect costs]	2,402.00	4,643.50	6,454.00	891.00
Overheads [direct costs + indirect costs]	2,900.00	3,524.00	2,665.00	2,600.00
Profitability index, % [(production value/ overheads)x100]	182.8%	231.8%	342.2%	134.3%

Source: authors' own study based on data from farmers

A net agricultural income of PLN 4,705.60 was obtained from the cultivation of one hectare of garden dill on farm A. The higher costs were offset by the higher income from sales. In the studied year, the farm achieved a very high profitability index of over 230%, which was very similar to that of 2018. The worst financial result from growing garden dill was in 2017 and this was due to a higher amount of rainfall during the growing season, which contributed to plant infection by diseases and a decrease in seed yield.

Analysis of data obtained from farm B showed that for the third time the profitability index for glandular plantain was significantly higher than for the other herb species. Of all the studied herbal plants, it was also the simplest to grow. By forming a compact stand it was very competitive against weeds and did not require manual labour related to weed

removal. This reduced the indirect cultivation costs. It was also characterized by a short growing period as it was sown in April and its two-stage harvesting took place in July, which at the same time reduced the number of cultivation practices necessary to be performed.

In evening primrose cultivation the profitability index in 2019 was 137% and this was the largest from all of the analyzed years. When analyzing the economic results from the multiannual period this plant turned out to be the least profitable herb. This was mainly due to relatively low yields, which were the result of uneven and delayed plant emergence in this region of Poland. Moreover, similarly to black caraway cultivation, there were large losses associated with seed shedding in the field before the mechanical harvest of seeds in October.

Herbs grown on both studied farms were characterized by a high profitability index. The highest values for the multiannual period were obtained for glandular plantain and garden dill (Fig. 1). Similar results were demonstrated in a study on the cultivation of common caraway (Kozera *et al.*, 2018). Regardless

of the choice of an equivalent plant in the two-year cultivation of common caraway (Kozera *et al.*, 2018), where in a two year period a profitability index of 234.9–319.6% was obtained. Weaker economic results were obtained for evening primrose and black caraway cultivation, especially in 2017 due to a storm.

**Table 4.** Calculation of the profitability of growing 1 hectare of four species of herbs in 2019

Index	Herbs in 2019			
	black caraway	garden dill	glandular plantain	evening primrose
	Amount, PLN·ha <sup>-1</sup>			
Production value [sales value + direct payments]	5,731.11	8,248.60	8,700.36	3,588.97
Sales of raw materials	4,786.11	7,303.60	7,755.36	2,643.97
Direct payments	945.00	945.00	945.00	945.00
Direct costs	720.00	843.00	782.00	720.00
Gross margin [production value – direct costs]	5,011.11	7,405.60	7,918.36	2,868.97
Indirect costs	2,200.00	2,700.00	1,900.00	1,900.00
Net agricultural income [gross margin – indirect costs]	2,811.11	4,705.60	6,018.36	968.97
Overheads [direct costs + indirect costs]	2,920.00	3,543.00	2,682.00	2,620.00
Profitability index, % [(production value / overheads)x100]	196.3%	232.8%	324.4%	137.0%

Source: author's own study based on data from farmers

Tables 5–7 present the calculations of the Kuyavian-Pomeranian Agricultural Advisory Centre for gross margins and net agricultural income per hectare of several plant species. In addition the profitability index was calculated for comparison to show to what extent the production value obtained covers the total costs. Mathematical calculations showed that none of the species brought losses, but the profitability indices are in most cases lower than for herbs. In the

case of crops of the most common plant species, occupying the largest area in the cropping structure, the lower financial results were primarily determined by very high overheads and particularly the costs directly related to the establishment of a plantation as well as chemical protection and fertilization. Compared to the group of herbs, in which direct costs ranged from PLN 700.00 to PLN 843.00, for the other species they ranged from PLN 1,476.00 to PLN

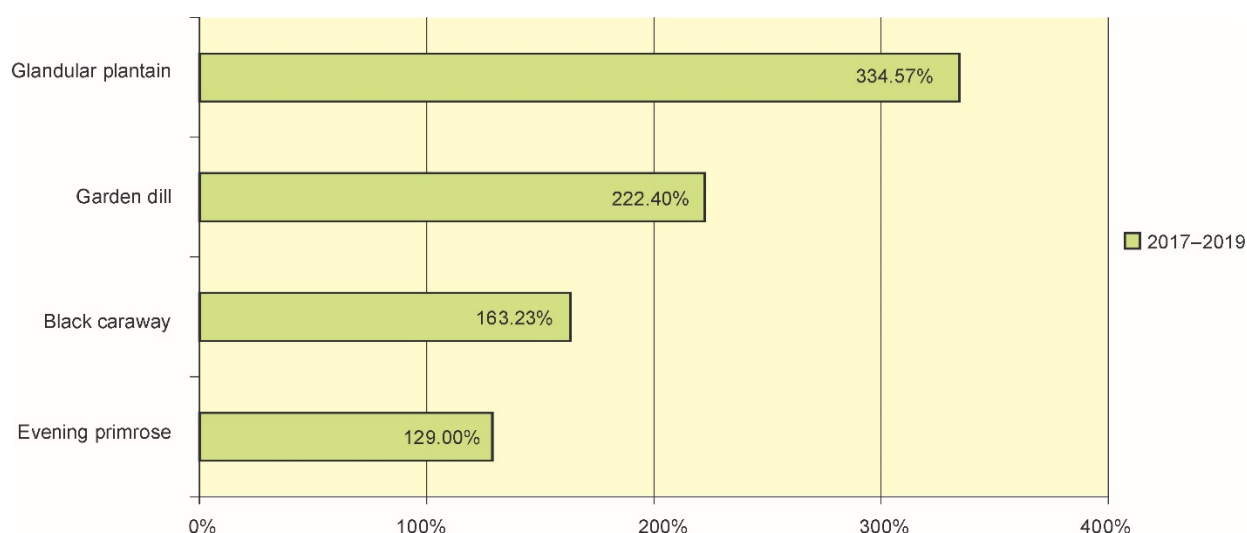
5,755.00. This is also due to the fact that the species selected for the study were at a high intensity level of cultivation. The study by Skarżyńska (2011) shows that cultivation at the highest level causes a greater increase in costs than in the value of production. According to them better financial results were obtained when cultivating at an average intensity level, where the value of production was increasing faster than the increase in costs.

In 2017, the lowest profitability indices among the analyzed plant species occupying the largest acreage in the cropping structure were calculated for winter wheat and maize for grain (Table 5). In the cultivation of pea, the sales value was lower than for the previously indicated monocotyledons, but the significantly lower overheads caused the pea profitability index to exceed 140%. Similar profitability as in the case of the pea was obtained for sugar beet. However, its cultivation is associated with very high direct and indirect costs. Winter oilseed rape and edible potato had the highest indices. The choice of species for cultivation should be dictated by their adaptation to the possessed soil quality classes on a farm.

The economic calculations for 2018 (Table 6) showed that in most cases higher profitability indices

were obtained than in the first year studied. Only for winter oilseed rape and sugar beet were these indices lower, although the difference in rape was minimal (1.4%). Lower yields resulting from a small amount of rainfall in 2018 and a greater amount of costs resulted in a more than 20% decrease in the sugar beet profitability index.

Winter wheat cultivation at a high intensity level in 2019 (Table 7) brought the best financial result expressed as the profitability index of all the analyzed years. In 2019 it was slightly higher than in 2018. Skarżyńska (2011), however, obtained a similar index on the profitability of winter wheat as is shown here for 2017. They found that in 2006 at a high level of intensity it amounted to 117.3% and was 3.6% lower than in the most favourable variant of cultivation at a medium level of intensity, while a slightly higher profitability index was obtained for 2008, equal to 121.6% and 135.2%, respectively, for the high and the medium level of cultivation intensity. Gugała *et al.* (2015), on the basis of long-term calculations regarding winter wheat cultivation, emphasize that this process is characterized by very high variability in respect of yields, purchase prices and costs incurred, which in turn determines the profitability index in a given year.



**Fig. 1.** Comparison of herbal profitability indices from 2017–2019

Source: authors' own study based on data from Tables 2–4

**Table 5.** Calculation of the profitability of 1 hectare of plant species that cover the largest area in the sown structure in 2017

Index	Plant species in 2017					
	winter wheat	grain maize	pea	winter rape	sugar beet	edible potato
	Amount, PLN·ha <sup>-1</sup>					
Production value [sales value + direct payments]	4,968.00	6,618.00	4,675.00	7,428.00	10,636.00	16,548.00
Sales of raw materials	4,020.00	5,670.00	3,120.00	6,480.00	8,125.00	15,600.00
Direct payments	948.00	948.00	1,555.00	948.00	2,511.00	948.00
Direct costs	2,198.00	1,987.00	1,492.00	2,714.00	3,174.00	5,891.00
Gross margin [production value – direct costs]	2,770.00	4,631.00	3,183.00	4,714.00	7,462.00	10,657.00
Indirect costs	2,137.00	3,654.00	1,770.00	1,888.00	4,384.00	5,891.00
Net agricultural income [gross margin – indirect costs]	597.00	977.00	1,413.00	2,826.00	3,078.00	4,766.00
Overheads [direct costs + indirect costs]	4,371.00	5,641.00	3,262.00	4,603.00	7,558.00	9,704.00
Profitability index, % [(production value / overheads)x100]	113.7 %	117.3 %	143.3 %	161.4%	137.1 %	170.5%

Source: based on data of ODR Minikowo

**Table 6.** Calculation of the profitability of 1 hectare of plant species that cover the largest area in the sown structure in 2018

Index	Plant species in 2018					
	winter wheat	grain maize	pea	winter rape	sugar beet	edible potato
	Amount, PLN·ha <sup>-1</sup>					
1	2	3	4	5	6	7
Production value [sales value + direct payments]	5,565.00	7,335.00	5,266.00	7,305.00	8,766.00	26,445.00
Sales of raw materials	4,620.00	6,390.00	3,600.00	6,360.00	6,326.00	25,500.00
Direct payments	945.00	945.00	1,666.00	945.00	2,441.00	945.00



**Table 6 continue**

	1	2	3	4	5	6	7
Direct costs		2,347.00	2,200.00	1,514.00	2,867.00	3,781.00	9,121.00
Gross margin [production value – direct costs]		3,218.00	5,135.00	3,753.00	4,439.00	4,985.00	17,324.00
Indirect costs		1,951.00	2,686.00	1,606.00	1,698.00	3,746.00	2,770.00
Net agricultural income [gross margin – indirect costs]		1,267.00	2,449.00	2,147.00	2,741.00	1,240.00	14,554.00
Overheads [direct costs + indirect costs]		4,298.00	4,886.00	3,119.00	4,564.00	7,526.00	11,891.00
Profitability index [%] [(production value / overheads)x100]		129.5%	150.1%	168.8%	160.0%	116.5%	222.4%

Source: based on data of ODR Minikowo

**Table 7.** Calculation of the profitability of 1 hectare of plant species that cover the largest area in the sown structure in 2019

Index	Plant species in 2019					
	winter wheat	grain maize	pea	winter rape	sugar beet	edible potato
	Amount, PLN·ha <sup>-1</sup>					
Production value [sales value + direct payments]	5,685.00	7,155.00	5,266.00	6,865.00	8,766.00	18,045.00
Sales of raw materials	4,740.00	6,210.00	3,600.00	5,920.00	6,325.00	17,100.00
Direct payments	945.00	945.00	1,666.00	945.00	2,441.00	945.00
Direct costs	2,365.00	2,174.00	1,476.00	2,901.00	3,291.00	5,755.00
Gross margin [production value– direct costs]	3,790.00	4,981.00	3,790.00	3,964.00	5,475.00	12,290.00
Indirect costs	1,916.00	2,654.00	16,060.00	1,666.00	3,746.00	3,813.00
Net agricultural income [gross margin – indirect costs]	1,874.00	2,327.00	2,184.00	2,298.00	1,729.00	8,477.00
Overheads [direct costs + indirect costs]	4,281.00	4,828.00	3,082.00	4,567.00	7,037.00	9,568.00
Profitability index, % [(production value / overheads)x100]	132.8%	148.2%	170.9%	150.3%	124.6%	188.6%

Source: based on data of ODR Minikowo

In calculating the profitability of growing maize for grain the indirect costs are crucial, including mainly the costs of renting specialized sowing and harvesting machines. For many farms their purchase price is too high a financial burden or is economically unjustified due to the small acreage of maize cultivation. Despite this the profitability index of maize for grain was higher in all individual years than it was for winter wheat. In 2019 it had an intermediate value of 148.2%.

Sugar beet cultivation makes it possible to obtain an additional payment under direct subsidies. This significantly increases the value of the gross margin. Both direct and indirect costs are high due to the high requirements of this species. Sugar beet requires large expenditures on fertilization and plant protection products. Often farmers commission sowing to external service providers and sugar beet harvesting is carried out with a specialized combine harvester, which both increase indirect costs. The profitability index value for sugar beet in 2019 was the lowest (124.6%) of all the analyzed species, including herbs. A similar situation took place in 2018. This is the result of water shortages in these years. In the study by Skarzyńska (2011) a higher index (137%) was obtained at a low level of sugar beet cultivation intensity. What is more this value was higher than for high-intensity production. This is confirmed by the significant impact of weather conditions on production results in individual years and the need to incur costs depending on the course of the weather (e.g. additional chemical treatments).

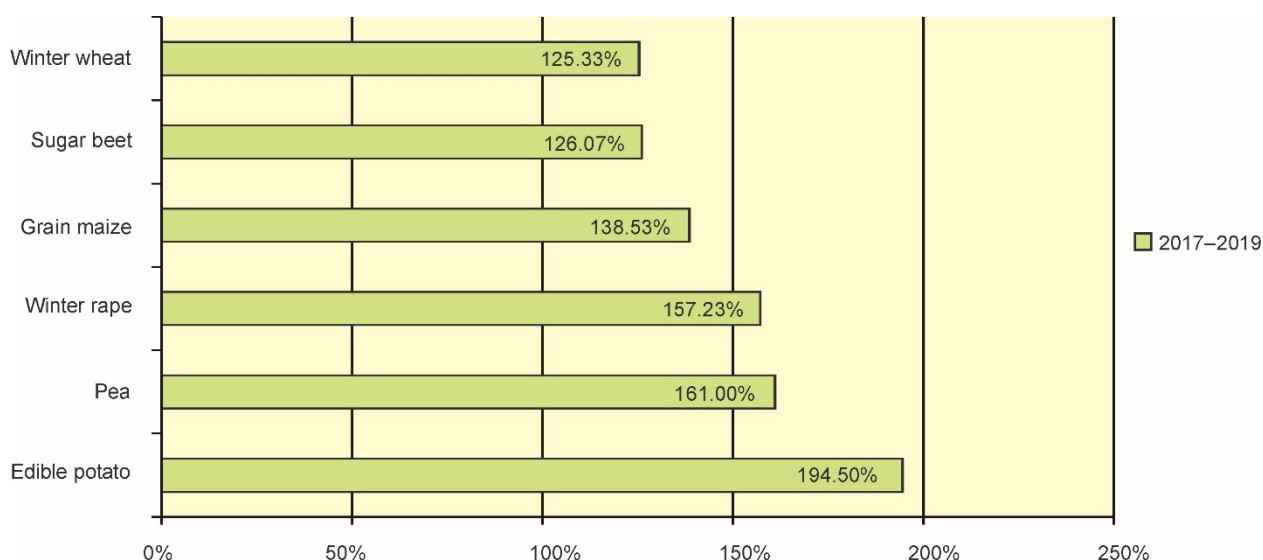
Growing edible potatoes is associated with record high direct costs. This is due to the need to purchase a large amount of certified seed potatoes as well as expenditure on fertilizers and cultivation. Moreover, the indirect costs of potato cultivation in the studied year were more than twice as high as the costs incurred for winter oilseed rape. However, the interest in this raw material on the market and its high price observed in 2019 meant that the profitability index of potato cultivation was the highest among the analyzed dominant species of crops (188.6%). The economic results in individual years are very competitive with herbs.

The benefits of growing pea are additional payments, for meeting the condition of the greening of agricultural land, and also the smaller direct costs

that result from their biological ability to fix atmospheric nitrogen thereby eliminating part of the cost of fertilization. Pea achieved a very high profitability index (170.9%) in 2019 and apart from the financial benefits they brought excellent soil conditions for successive crops. The economic justification for growing legumes should be dictated by the production value obtainable in comparison to the possibility of buying vegetable protein from foreign sources. The profitability of growing pea on large-scale farms is ensured only by high yields, otherwise the cost of producing protein is too high (Majchrzycki *et al.* 2002).

Growing oilseed rape, although very profitable according to the calculated profitability index, is very demanding in agricultural and economic terms. Numerous chemical treatments and high nutritional requirements generate significant direct costs. Their height is also determined by the type of seed selected. The yield obtained in 2019 allowed for covering overheads and obtaining a large net agricultural income (nearly PLN 2,300), very similar to that of maize or pea. According to Skarzyńska 2011 the largest of the calculated profitability indices for low, medium and high levels of intensity of winter rape production intensity in 2008 was shown for the most intensive cultivation. However, they found a lower level than in the currently studied year of 2019 and it amounted to 138.3%.

The profitability indices for species that are most often grown in Poland ranged from 125.33% for winter wheat to 194.5% for edible potato for the multiannual period (Fig. 2). In each studied year potatoes had the highest income and it was a few times higher than the income for the other species. High values of profitability indices in all the years were demonstrated for winter oilseed rape and pea. Sugar beet, as a plant widely recognized as normally very profitable, only reached the index values close to winter wheat in the studied years. The analyzes show that especially the years 2018 and 2019 were not favourable for sugar beet cultivation. Compared to 2017, a higher profitability for wheat, maize and pea was reported in the other two years. The data concerning winter oilseed rape showed the highest stability.



**Fig. 2.** Comparison of profitability indices of the other studied plant species from 2017–2019

Source: compiled based on Tables 5–7

## CONCLUSIONS

In the study years 2017–2019 glandular plantain and garden dill were characterized by the highest profitability indices. Growing herbal plants enables a large agricultural income to be obtained. Herb cultivation, however, requires specialist knowledge, a machine base and a large amount of human labour, thus the crop acreage cannot be too large. This makes herbs a good alternative for small farms. In favourable years, as was the case in 2018 and 2019, the profitability index of black caraway was much higher than for the plants covering the largest area in the Polish crop structure and from among these plants only the values for edible potatoes were similar to its. The choice of black caraway or edible potatoes for cultivation should be determined by the location of herbal enterprises and the ability to collect edible potatoes, as well as soil and machine conditions and the possibility of obtaining labour.

Growing some herb species for seed, which is harvested in early autumn, is associated with the risk of crop damage due to adverse weather phenomena, as was the case in 2017. This can significantly reduce financial results. The cultivation of cereals, legumes,

root crops or industrial crops requires higher overheads than is the case with herbs. However, their specification enables the whole process to be mechanized, which is often impossible with herbs.

The high values of the profitability ratios for herbs, compared to commonly cultivated species, is a result of the stability of the market that is based on contractual agreements and the purchase prices guaranteed therein. The high prices of herbal raw materials is a consequence of close cooperation in the international market and the large exports of herbs produced in Poland. In the case of edible potato cultivation in Poland, the factor that determines the high profitability of this species is the relatively high demand for this vegetable. The edible potato still enjoys recognition as the main dinner vegetable.

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## **ANALIZA OPŁACALNOŚCI UPRAWY ZIOŁ ORAZ NAJCZĘŚCIEJ UPRAWIANYCH GATUNKÓW ROŚLIN ROLNICZYCH**

### **Streszczenie**

Celem badań było określenie wskaźnika opłacalności ziół (wiesiołka dziwnego, babki płesznik, czarnuszka siewnej i kopru ogrodowego) oraz porównanie go ze wskaźnikami gatunków dominujących w strukturze zasiewów Polski. Analiz ekonomicznych dokonano na podstawie ksiąg rachunkowych udostępnionych przez właścicieli dwóch gospodarstw rolnych położonych w gminie Koronowo, w województwie kujawsko-pomorskim, oraz danych udostępnionych przez Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego. Kalkulacje dotyczyły lat 2017–2019 i uwzględniały wartość produkcji, kwotę nadwyżki bezpośredniej, dochód rolniczy netto oraz wskaźnik opłacalności. Przeprowadzone kalkulacje potwierdziły hipotezę, iż w większości przypadków uprawa ziół w warunkach polowych jest bardziej opłacalna niż pozostałych gatunków roślin. Analiza pokazała, że najwyższymi wskaźnikami opłacalności cechowała się babka płesznik oraz koper ogrodowy. Uprawa ziół o słabszym wskaźniku opłacalności pozwala uzyskiwać dochód podobny jak w przypadku buraka cukrowego, grochu siewnego lub rzepaku ozimego. Największą opłacalnością wśród pozostałych gatunków cechuje się ziemniak jadalny. Decyzja rolnika dotycząca wyboru roślin do uprawy w gospodarstwie powinna być uzależniona od możliwości sprzedaży surowców na lokalnych rynkach oraz zaplecza maszyn i urządzeń. Badania pokazały, że uprawa roślin z grup, które zajmują największy areal w strukturze zasiewów, cechuje się koniecznością ponoszenia bardzo dużych kosztów ogólnych. Wybrane zioła cechuje duży, nawet kilkakrotnie przewyższający wskaźnik opłacalności w porównaniu z powszechnie uprawianymi gatunkami roślin rolniczych. Niektóre gatunki pozwalają jednak na uzyskanie dochodów na zbliżonym poziomie jak z uprawy roślin, które

zajmują największy areał w Polsce. Wybór ziół do uprawy jest szansą szczególnie dla gospodarstw o niewielkiej powierzchni. Ich uprawa pozwala na uzyskiwanie dużych dochodów rolniczych dzięki stosunkowo niskim, w porównaniu z innymi gatunkami, kosztom ogólnym. Zielarstwo jest jednak bardzo specyficzną gałęzią rolnictwa, wymagającą większego nakładu pracy ludzkiej.

**Słowa kluczowe:** dochód rolniczy netto, nadwyżka bezpośrednia, struktura zasiewów, wskaźnik opłacalności, zielarstwo