

STATE AND CHANGES IN PODKARPACIE AGRICULTURE ON THE BASIS OF THE AGRICULTURAL CENSUSES 2010 AND 2020

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ABSTRACT

Agriculture in the Podkarpackie region is characterised by a large number of small family farms, which limits its development and ability to compete on the national and international stage. The Agricultural Censuses 2010 and 2020 allowed us to capture the changes that took place over the decade. The share of farms with 1-2 ha and 2-3 ha of agricultural land decreased, while the number of farms in the 30-50 ha area group increased. In farms, the average total land area increased to 5.93 ha and agricultural land to 5.03 ha. The area sown to rape and colza, ground vegetables and cereals increased, while the area sown to potatoes and sugar beet decreased. The consumption of mineral fertilisers increased by 19.3 kg per hectare of agricultural land, and of lime fertilisers by more than 4 times. The change in the sowing structure contributed to changes in the technical equipment of farm.

Key words: number of farms, farm size, land use structure, fertilisation

1. Introduction

Podkarpackie is the southeasternmost region of Poland. At the same time, it is a border region, the eastern border of the EU with many restrictions on the free movement of people, capital, goods. It is characterized by great diversity and high spatial differentiation of natural conditions (Ślusarz G., et al., 2022).

It is a sparsely urbanized area with one of the highest percentages of population living in rural areas at 58.9% (CSO, 2022), with large agricultural land resources and a high percentage of people working in agriculture. It is one of the peripheral areas due to its geographic location and low level of economic development (Ślusarz G., 2005). In addition, many municipalities are characterized by

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relatively poor spatial accessibility and poor housing conditions of the population, with an unfavorable demographic structure of residents (Rosner A., Wesołowska M., 2022).

In Podkarpackie Voivodship agriculture is of great importance, which is due to the historical, socio-economic and geographical conditions of the area. However, the agrarian structure and technical equipment are limiting factors for the productivity of farms, and changes may contribute to an increase in the importance of Podkarpackie agriculture. This importance is significant in relation to ensuring food self-sufficiency, sustainable development of rural areas, cultivation of cultural values, preservation of the landscape and protection of its selected resources. Agriculture remains a significant sector in the national economy. At the same time, this is accompanied by a steady increase in output and commodity economic surplus in agriculture, indicating that the agricultural sector is not declining (Bear-Nawrocka A., Poczta W., 2022).

The aim of the study is to present the status and changes that took place in agriculture in the Podkarpackie Voivodship over the last decade on the basis of the 2010 and 2020 agricultural censuses.

2. Number and area of farms

Podkarpackie Voivodship is characterised by a large number of small farms compared to other regions in Poland. There were changes in the number and size of farms over the decade. In 2020, the number of total farms decreased by 18.9% compared to 2010. This was influenced by a decrease in the number of farms covering an area of 1 ha to 10 ha, with the number of farms with an area of 1-2 ha decreasing by as much as 30.9%. On the other hand, in the area groups above 10 ha, an increase in the number of farms was recorded in a wide range from 4.7% in the 10-15 ha area group to 85.7% in the 30-50 ha area group.

Individual farms in Podkarpackie accounted for 99.9% in the total number of farms in 2010, and in 2020 for 99.5% (Table 1). There was a 19.2% reduction in the number of individual farms. The number of the smallest farms with an area of 1-2 ha decreased by 31.0%. On the other hand, the number of individual farms with an area of 50-100 ha increased by 85.9%.

Table 1. Number of farms in Podkarpackie by area group in 2010 and 2020

Area groups of agricultural farms	Total farms			Individual farms		
	2010	2020	2010=100	2010	2020	2010=100
	in ha		in %	in ha		in %
1	2	3	4	5	6	7
Total	140 465	113 873	81.1	140 293	113 326	80.8
up to and including 1 ha	2 470	2 630	106.5	2 466	2 610	105.8
1 - 2 ha	49 453	34 161	69.1	49 453	34 125	69.0

1	2	3	4	5	6	7
2 - 3	31 189	27 509	88.2	31 183	27 464	88.1
3 - 5	31 844	25 900	81.3	31 837	25 805	81.1
5 - 10	19 128	15 674	81.9	19 116	15 565	81.4
10 - 15	3 219	3 369	104.7	3 205	3 309	103.2
15 - 20	1 075	1 310	121.9	1 070	1 289	120.5
20 - 30	857	1 195	139.4	844	1 158	137.2
30 - 50	567	1 053	185.7	557	1 022	183.5
50 - 100	394	717	182.0	369	686	185.9
100 and over	269	355	132.0	193	293	151.8

Source: Own work based on Statistics Poland data.

The structure of farms (Table 2) continues to be dominated by farms with 1-2 ha of agricultural land, which accounted for 30.0% of total farms in 2020. Their share decreased by 5.2 pp compared to 2010. The second group of farms with the largest share in 2020 in the structure of total agricultural farms were farms with 2-3 ha of agricultural land - 24.2%. The increase in the share in this group was 2.0 pp. The share of farms with an area of 3-5 ha remained stable. The share of farms with an area of more than 5 ha of agricultural land increased over the decade by 0.1-0.7 pp, and the largest increase in the share was recorded in the 10-15 ha area group.

Individual farms were characterised by the largest share of farms in the 1-2 ha of agricultural land area group - 30.1%. In this area group of farms, as in the case of total farms, their share decreased in relation to 2010 by 5.1 pp. An increase in the share of individual farms was marked in the 3-5 ha and 5-10 ha area groups by 0.1 pp, 2-3 ha of arable land by 2.0 pp, and for farms in the 30-50 ha of agricultural land area group by 0.5 pp.

Table 2. Structure of agricultural farms in Podkarpackie by agricultural census 2010 and 2020

Agricultural area groups	Total farms		Individual farms	
	2010	2020	2010	2020
Total	100.0	100.0	100.0	100.0
up to and including 1 ha	1.8	2.3	1.8	2.3
1 - 2 ha	35.2	30.0	35.2	30.1
2 - 3	22.2	24.2	22.2	24.2
3 - 5	22.7	22.7	22.7	22.8
5 - 10	13.6	13.8	13.6	13.7
10 - 15	2.3	3.0	2.3	2.9
15 - 20	0.8	1.2	0.8	1.1
20 - 30	0.6	1.0	0.6	1.0
30 - 50	0.4	0.9	0.4	0.9
50 - 100	0.3	0.6	0.3	0.6
100 and over	0.2	0.3	0.1	0.3

Source: Own work based on Statistics Poland data.

The 2020 agricultural census showed an increase in the average size of total farms in Podkarpackie Voivodship (Table 3). Taking into account the total land, the size of an agricultural farm increased by 15.1% and amounted to 5.93 ha, while taking into account the total agricultural land, the average size of a farm increased by 15.9% to 5.03 ha. The largest increase in the area of farms took place in the case of agricultural land in good condition, which amounted to 0.86 ha, i.e. by 21.4%. Agricultural land in good condition in 2020 reached an average size per farm of 4.88 ha.

Table 3. Average farm size in Podkarpackie Voivodship in 2010 and 2020

Years	Total land	Total agricultural land	Agricultural land in good condition
total agricultural farms in ha			
2010	5.15	4.34	4.02
2020	5.93	5.03	4.88
2010=100	115.1	115.9	121.4
individual farms in ha			
2010	4.87	4.11	3.83
2020	5.68	4.83	4.68
2010=100	116.6	117.5	122.2

Source: Own work based on Statistics Poland data.

On individual farms, there was an increase over the ten years in the average total land area to 5.68 ha (by 16.6%), agricultural land to 4.83 ha (by 17.5%) and agricultural land in good condition to 4.68 ha (by 22.2%).

Analysing the structure of the number of farms in Podkarpackie in 2020 by the type of agricultural activity carried out, it was found that farms engaged exclusively in crop production accounted for 46.9% of all farms (Figure 1).

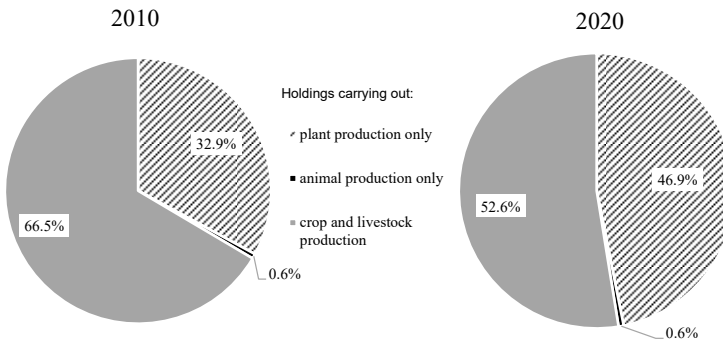


Figure 1. Structure of the number of farms by type of activity

Source: Own work based on Statistics Poland data.

Over the decade, there was no change in the share of farms involved only in livestock production, while the share of farms involved in crop and animal production decreased to 52.6% (by 13.9 pp).

Depending on the type of production carried out, the average size of the farm increased (Table 4). In Poland, there was an increase in total farm size to 11.4 ha, i.e. by 16.3% in 2020. This trend also took place in Podkarpacie, where the average farm size increased to 5.0 ha.

Table 4. Average farm size by type of production carried out

Specification	Total	Holdings carrying out		
		plant production only	animal production only	crop and livestock production
in hectares				
2010				
POLAND	9.8	8.3	3.8	10.9
PODKARPACKIE	4.3	4.2	2.4	4.4
2020				
POLAND	11.4	9.8	1.8	13.5
PODKARPACKIE	5.0	5.0	2.3	5.1

Source: Own work based on Statistics Poland data.

Farms with a plant production profile in Poland increased their average utilised agricultural area by 1.5 ha, i.e. to 9.8 ha, and those engaged in plant and animal production by 2.6 ha, i.e. to 13.5 ha. On the other hand, the area of farms involved only in livestock production decreased by 2.0 ha, i.e. to 1.8 ha.

In Podkarpacie, the average area of a farm engaged in crop production increased by 0.8 ha to 5.0 ha, and crop and livestock production by 0.7 ha to 5.1 ha. Farms carrying out only livestock production in Podkarpacie decreased their area to 2.3 ha.

3. Structure of agricultural land and sown area

In 2020, an increase in the share of land in good agricultural condition was recorded in the agricultural area to 96.9%. Compared to 2010, the increase was 4.3 pp. Sown area continued to occupy the dominant position in the structure of agricultural land, with their share increasing by 5.2 pp to 53.8% (Figure 2).

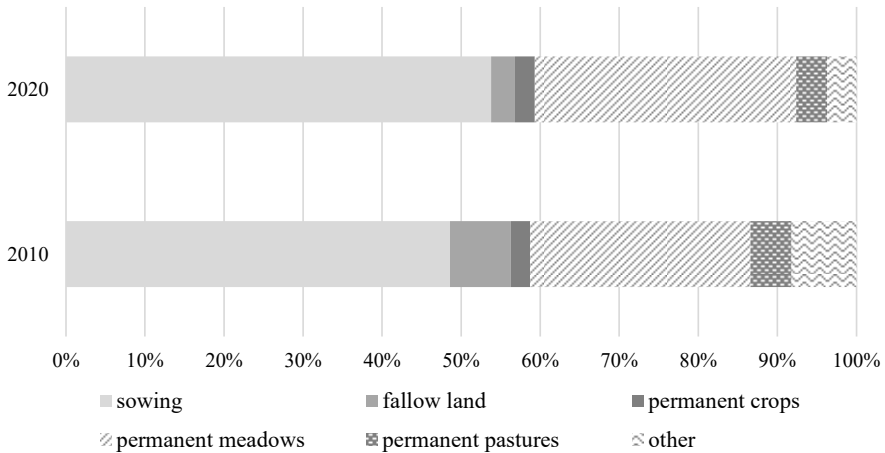


Figure 2. Structure of agricultural land

Source: Own work based on Statistics Poland data.

Permanent grassland was invariably in the second place in 2020, with its share increasing to 33.1%. An increase in the share of farmland in 2020 also took place for permanent crops to 2.5%. In contrast, the share of permanent pasture in agricultural land decreased by 1.3 pp to 3.9% and fallow land by 4.7 pp to 3.0%.

The sown area in Podkarpackie has increased by 4.1% over the ten years (Table 5). The largest increase in the area of sown crops took place in the case of rape and colza, by 62.5%, and ground vegetables by 36.0%. The area of total cereals also increased by 6.4%, with the area of basic cereals increasing by only 110 ha or 0.1%.

Table 5. Sown area by crop group in 2010 and 2020

Years	Total sown area	Of which					
		Cereals		potatoes	sugar beets	rape and colza	ground vegetables
		total	of which basic				
ha							
2010	296266	219277	169551	29760	4529	16094	2431
2020	308327	233354	169661	13659	3520	26156	3306
2010=100	104.1	106.4	100.1	45.9	77.7	162.5	136.0

Source: Own work based on Statistics Poland data.

In contrast, there was a reduction in the area under sugar beet and potatoes in 2020. The beet area decreased by 22.3% and the potato area by as much as 54.1%.

4. Fertiliser consumption in Subcarpathia

Over the ten years between 2010 and 2020, the consumption of mineral fertilisers on farms in general increased by 19.3 kg per ha of agricultural land (Table 6). Analysing the consumption of individual types of mineral fertilisers, the greatest changes were recorded for potassium fertilisers, the consumption of which increased by 10.9 kg and amounted in 2020 to 27.0 kg per 1 ha of agricultural land. Phosphorus fertiliser use increased in this period by 3.4 kg to 17.7 kg, and nitrogen fertiliser use by 5.1 kg to 39.8 kg per ha of agricultural land. On individual farms, total mineral fertiliser consumption increased at the same level as on farms in general. By type of fertiliser, the increase was for potassium fertilisers by 11.1 kg to 27.2 kg, phosphate fertilisers by 3.5 kg to 17.8 kg. Nitrogen fertilisers were applied at 39.6 kg per ha of agricultural land in 2020, an increase of 4.8 kg compared to 2010.

Table 6. Mineral and lime fertiliser consumption per ha of agricultural land in 2010 and 2020

Specification	2010		2020		2010=100	
	total	of which individual farms	total	of which individual farms	total	of which individual farms
	in kg					
Mineral fertilisers	65.1	65.3	84.4	84.6	129.6	129.6
Nitrogen	34.7	34.8	39.8	39.6	114.7	113.8
phosphorus	14.3	14.3	17.7	17.8	123.8	124.5
Potassium	16.1	16.1	27.0	27.2	167.7	168.9
Calcium fertilisers	17.0	15.9	69.8	70.3	410.6	442.1

Source: Own work based on Statistics Poland data.

The biggest change in the amount of fertiliser used in 2020 was for calcium fertiliser. On farms in general, consumption increased from 17.0 to 69.8 kg per ha of agricultural land (more than 4 times). On individual farms, consumption increased from 15.9 to 70.3 kg per ha of agricultural land (more than 4 times).

5. Tractors and agricultural machinery in farms of the Podkarpackie region

As the size of farms and the type of production carried out changed, the machinery on farms changed.

In 2020, tractors of 15-25 kW continued to dominate the structure of the number of tractors and obtained a share of 41.1% (Table 7). Tractors of 40-60 kW accounted for 22.4% and those of 25-40 kW for 20.1%. Tractors of 100 kW and above accounted for the smallest share. When analysing the share of agri-

cultural tractors in total farms, there was a decrease in the share of tractors up to 15 kW by 1.2 percentage points, 15-25 kW by 8.6 percentage points and 25-40 kW by 6.2 percentage points.

Table 7. Structure of the number of agricultural tractors by engine power in 2010 and 2020

Specification	2010		2020	
	total	of which individual farms	total	of which individual farms
Total tractors	100	100	100	100
up to 15 kW	6.4	6.4	5.2	5.2
15 to 25	49.7	49.9	41.1	41.3
25 to 40	26.3	26.3	20.1	20.1
40 to 60	12.8	12.7	22.4	22.3
60 to 100	4.1	4.0	8.6	8.5
100 kW and above	0.7	0.6	2.7	2.6

Source: Own work based on Statistics Poland data.

On the other hand, the share of tractors with a power output of 40-60 kW increased by 9.6 pp, 60-100 kW by 4.5 pp, as well as of 100 kW and above by 2.0 pp. On individual farms, tractors with a power output of 15-25 kW still accounted for the largest share, although this decreased by 8.6 pp compared to 2010, while the share of tractors with a power output of 40-60 kW increased by 9.6 pp and amounted to 22.3%. In 2020, one fifth of tractors on individual farms were 25-40 kW. Tractors with a power of 100 kW on individual farms accounted for the smallest share, at only 2.6%, but their share increased by 2.0 pp compared to 2010.

The number of agricultural machines equipped on farms in total changed, which is related to the nature of the changes in production and the acreage of individual crops in the sowing structure (Table 8).

Table 8. Number of agricultural machinery on farms in 2010 and 2020

Specification	2010		2020		2010=100	
	total	of which individual farms	total	of which individual farms	total	of which individual farms
	in pcs.					
Combine harvesters	5192	5068	6609	6542	127.3	129.1
Beet harvesters	586	580	242	236	41.3	40.7
Potato harvesters	2346	2336	2338	2330	99.7	99.7
Silisokombayns	206	191	102	95	49.5	49.7
Field sprayers	24253	24124	22629	22528	93.3	93.4
Orchard sprayers	1107	1093	802	791	72.4	72.4

Source: Own work based on Statistics Poland data.

In 2020, there was an increase in the number of combine harvesters on total and individual farms compared to 2010, by 27.3% and 29.1% respectively. There was a decrease in the number of potato harvesters, field and orchard sprayers, silage harvesters and beet harvesters compared to 2010 in both groups of farms. The dynamics of change of individual machines was at a similar level in total and individual farms. The greatest reduction was recorded in the number of beet harvesters, down by around 59%, and in the number of silage harvesters, down by more than 50%.

6. Summary

Over the ten years between the 2010-2020 Agricultural Censuses, there was an increase in the number of farms in area groups above 10 ha of agricultural land. An increase of 82.0% was recorded for farms with an area of 50-100 ha, which was reflected in the other agricultural production parameters of the region. The share of farms with 1-2 and 2-3 ha of arable land decreased, while the number of farms in the 30-50 ha of agricultural land area group increased. The average size of a farm increased from 5.15 ha to 5.93 ha when analysing the total area of land, and in the case of agricultural land from 4.34 ha to 5.03 ha. Individual farms in Podkarpackie Voivodship increased their average size to 5.68 ha for total land and to 4.83 ha for agricultural land. In Podkarpackie, the average size of farms engaged in crop production increased to 5.0 ha and crop and livestock production to 5.1 ha. In contrast, farms engaged in livestock production decreased in average size to 2.3 ha. Changes in the number and structure of individual farms promote differentiation in the economic sphere, as well as in the environmental sphere. On the other hand, the declining trend in the percentage of bi-directional farms, i.e. those combining crop and livestock production, and the reduction in the area of farms engaged exclusively in livestock production should be regarded as an unfavorable phenomenon (Zerag J.S., 2022). The above changes in agriculture in the Podkarpackie region had an impact on other aspects of agricultural production including the structure of agricultural land and the equipment of farms with tractors and agricultural machinery.

An increase in the share of sown land to 53.8 per cent and permanent grassland to 33.1 per cent was found in the structure of agricultural land. The share of fallow land and permanent pastures decreased. Analysing the sown area over the decade, an increase of 62.5% in the area under rape and colza and 6.4% in the area under total cereals was found. At the same time, the area under cultivation of staple cereals increased by only 110 ha, indicating an increase in the share of other cereals. The cereal whose cultivated area increased threefold in the analysed period was maize grown for grain, which is a result of a change in the livestock diet, involving a reduction in the feeding of potatoes to livestock (Slusarz G., et al., 2022).

The area under ground vegetables increased in Podkarpackie by 36.0%. However, the area under sugar beet decreased by 22.3% and the area under potatoes by 54.1% compared to 2010. The decrease in the area under root crops and the increase in the share of cereal crops in the sowing structure limit the possibilities for proper crop rotation and crop rotation. Soil productivity decreases, physical and chemical properties, water properties, biological activity deteriorate (Kiryluk A., 2016).

Over the decade, the use of mineral fertilisers on farms in general increased by 19.3 kg per ha of agricultural land, with the largest increase occurring in the case of potassium fertilisers by nearly 11 kg. There was also an increase in the use of calcium fertilisers to 69.8 kg per hectare of agricultural land on farms in general and to 70.3 kg per hectare of agricultural land on individual farms. The increase in the consumption of lime fertilisers is justified due to the acid reaction of 81% of soils in Podkarpackie Voivodship (Strategy for the development of agriculture and rural areas in Podkarpackie Voivodship until 2030). The increase in the consumption of lime fertilisers in 2020 was undoubtedly due to the introduction by the Voivodship Fund for Environmental Protection and Water Management of a priority programme entitled: 'Nationwide programme for environmental regeneration of soils through their liming' providing subsidies for lime fertilisers for farms, which was very popular with farmers (Report on the activities of the Voivodship Fund for Environmental Protection and Water Management in Rzeszów, 2020 and 2021).

Over the decade, the share of low-powered tractors (15-25 kW) decreased in Podkarpackie, although they still accounted for 41.3% in the structure of individual farms. However, the share of tractors with a power of more than 40 kW increased, which accounted for 33.7% in total farms and 33.4% in individual farms. In 2020, there was an increase in the number of combine harvesters on total and individual farms compared to 2010, by 27.3% and 29.1% respectively. This was due to an increase in the share of cereal and oilseed rape and colza area in the sowing structure over the years analysed. On the other hand, there was a decrease in the number of potato harvesters (by 0.3%), field sprayers (by 6.7%) and orchard sprayers (by 27.6%), silage harvesters (by 50.5%) and beet harvesters (by 58.7%). The above changes reflect an increase in the acreage of cereal crops and oilseed rape and colza, while at the same time a decrease in the acreage of potatoes and beet in the sowing structure. At the same time, service companies began to be engaged to a greater extent in harvesting crops. The decrease in the number of silage harvesters was the result of a decrease in the livestock population in the Podkarpackie region and a change in the livestock feeding technology (Slusarz et al., 2022).

Analysis of the state and changes in the agriculture of the Podkarpackie region over the decade indicate favorable changes manifested in a decrease in the number of the smallest farms, an increase in the average area of farms and farmland in good agricultural condition, an increase in calcium fertilization improv-

ing soil properties and an improvement in the technical equipment of farms resulting from the increasing specialization of production. On the other hand, the decrease in the share of bi-directional farms, the decrease in the share of root crops and the increase in mineral fertilization, which may worsen environmental conditions, are unfavorable. It seems necessary to apply various mechanisms, including financial and organisational ones, in order to reconstruct agriculture in Podkarpackie and improve its importance for the economy.

References

- Bear-Nawrocka, A., Poczta, W., 2022, Nowe szanse i zagrożenia dla polskiego rolnictwa wynikające z polityki unijnej i sytuacji globalnej [w:] polska Wieś 2022. Raport o stanie wsi, Wydawnictwo Naukowe SCHOLAR, Warszawa, pp. 84-88.
- GUS, (2022). Retrieved from: <https://bdl.stat.gov.pl/bdl/dane/podgrup/tablica> (accessed on 26.02.2024)
- Kiryłuk, A., (2016). Zmiany w technologii uprawy roli i roślin w województwie podlaskim i ich wpływ na środowisko przyrodnicze. *Ekonomia i Środowisko* 2(57), pp. 288-301.
- Rosner, A., Wesołowska, M., 2022. Zmiany zaludnienia obszarów wiejskich w Polsce a ich poziom rozwoju społeczno-gospodarczego. *Przegląd Geograficzny*, 2022, 94, 2, pp. 175-198.
- Sprawozdanie z działalności Wojewódzkiego Funduszu Ochrony Środowiska I Gospodarki Wodnej w Rzeszowie w 2019 roku. Rzeszów, 2020, pp. 59-60. Retrieved from: <https://www.bip.wfosigw.rzeszow.pl/bip/dzialalnosc-funduszu/sprawozdania-z-dzialalnosci/86-sprawozdanie-za-rok-2019>
- Sprawozdanie z działalności Wojewódzkiego Funduszu Ochrony Środowiska I Gospodarki Wodnej w Rzeszowie w 2020 roku. Rzeszów, 2021, pp. 62-65. Retrieved from: <https://www.bip.wfosigw.rzeszow.pl/bip/dzialalnosc-funduszu/sprawozdania-z-dzialalnosci/116-sprawozdanie-za-rok-2020>
- Strategia rozwoju województwa podkarpackiego i obszarów wiejskich w województwie podkarpackim do 2030 r. pp. 119-121. Retrieved from: <https://www.gov.pl/web/uw-podkarpacki/strategia-rozwoju-rolnictwa-i-obszarow-wiejskich-w-wojewodztwie-podkarpackim-do-2030-r-przyjeta-uchwala-nr-12019-ze-spolu-analizujacego-szanse-i-zagrozenia-oraz-potencjalne-kierunki-rozwoju-obszarow-wiejskich-w-wojewodztwie-podkarpackim>

- Ślusarz, G., (2005). Studium społeczno-ekonomicznych uwarunkowań rozwoju obszarów wiejskich w świetle zagrożeń marginalizacji: na przykładzie województwa podkarpackiego, Wydawnictwo Uniwersytetu Rzeszowskiego, Rzeszów, pp. 140.
- Ślusarz, G., Cierpiał-Wolan, M., Leniart, E., Ziomek-Niedzielska, B., (2022). Rolnictwo i obszary wiejskie Podkarpacia w II dekadzie XXI wieku w świetle Powszechnego Spisu Rolnego 2020, pp. 15-18, 45-57.
- US Rzeszów, (2022). Powszechny Spis Rolny 2020. Charakterystyka gospodarstw rolnych w województwie podkarpackim w 2020 r. Retrieved from: <https://rzeszow.stat.gov.pl/>
- Zegar, J.S., (2022). Zrównoważenie rolnictwa w świetle wyników powszechnych spisów rolnych z lat 2010 i 2020. Wiadomości Statystyczne, vol. 67, 6. pp. 55-57.