

## **COSTS OF MECHANICAL SERVICES IN ORGANIC FARMS**

### *Summary*

*The objective of the paper was to determine and evaluate the level of used and provided mechanical services in organic farms. The scope of the paper covered research in 50 organic farms located on the territory of Małopolskie, Podkarpackie and Śląskie Voivodeship. The costs of used mechanical services were on the average 1978.5 PLN annually. Per one hectare of agricultural land it was PLN 150.6. A low level of these services proves that the equipment of farm with a machinery park sufficed in many cases and farmers did not have to use these services. On the other hand, annual incomes from the provided mechanical services were on the average only PLN 578. Combine grain harvesting averaged at 49% and pressing and wrapping - 35%. The lowest participation was reported for tedding (2%).*

**Key words:** organic farms, mechanical services, costs of services

## **KOSZTY USŁUG MECHANIZACYJNYCH W GOSPODARSTWACH EKOLOGICZNYCH**

### *Streszczenie*

*Celem pracy było określenie i ocena poziomu kosztów pobieranych i świadczonych usług mechanizacyjnych w gospodarstwach ekologicznych. Zakres pracy obejmował badania w 50 gospodarstwach ekologicznych położonych na terenie województwa małopolskiego, podkarpackiego i śląskiego. Koszty pobieranych usług mechanizacyjnych w skali roku wynosiły średnio 1978,5 zł. Natomiast w przeliczeniu na hektar użytków rolnych było to 150,6 zł. Niski poziom tych usług może świadczyć o tym, że wyposażenie gospodarstw w park maszynowy było w wielu przypadkach wystarczające i rolnicy nie musieli korzystać z usług. Z kolei dochody roczne wynikające ze świadczonych usług mechanizacyjnych to średnio tylko 578 zł. W strukturze kosztów świadczonych usług dominował kombajnowy zbiór zbóż (49%) oraz prasowanie i owijanie (35%). Najmniejszy udział odnotowano dla przetrząsania siana (2%).*

**Słowa kluczowe:** gospodarstwo ekologiczne, usługi mechanizacyjne, koszty usług

### **1. Introduction**

Technical services mean this part of services, which is related to the use or service of technical means. Mechanical services have a particular position among technical services in the country. They enable full mechanization of production works in agricultural farms without the necessity of additional investment inputs, better use of existing resources of agricultural mechanization means and improvement of efficiency of expenditures on the mechanization of agriculture [6].

In the traditional farming the use of many services for agricultural production is justified by the possibilities of avoiding high costs of purchasing expensive modern machines and devices, the ownership of which is not always purposeful and desire to make the work in farm easier and less labour consuming. The structure of services in farms is determined by agricultural production conditions, inter alia, a defragmented area structure of agriculture, insufficiency of machines, frequent shortage of tractive force and in many farms a difficult financial situation of farmers [7].

Production services for agriculture constitute an important element of modern farming. They play multiple functions in agricultural farms. Both the use of services and their provision by farms causes the increase in their income, which is related to higher efficiency of farming and improvement of farmers' living conditions. The increase in the services usage level leads to the reduction of excessive burden of a farm with capital [1, 2].

In order to improve the production inputs efficiency, organic farms should aim at lowering the production costs for which mechanization costs are a material element. A farmer may increase the efficiency of mechanization inputs by providing mechanization services with own machines or by using a machinery park that he has not [8]. A farmer may increase the efficiency of mechanization inputs through conscious provision of mechanization services, owned machines or using the machinery park services [3, 4]. It is particularly significant in the organic farming system, where provided mechanization services may constitute an additional source of income.

### **2. Scope and objective of the paper**

The objective of the paper was to determine and assess the level of costs of used and provided mechanical services in farms which have a certificate of an organic farm. The study covered 50 organic farms on the area of Małopolskie, Podkarpackie and Śląskie Voivodeship.

The studies were in the form of a guided survey with a farm owner. The collected information concerned a farming year 2012/2013. Special attention was paid to the data concerning the scope of provided and used mechanical services. The farms were divided into four area groups in respect of the size of the area of agricultural land (AL):

- I group - up to 5.00 ha - 12 facilities,
- II group - from 5.01 to 10.00 ha - 17 facilities,
- III group - from 10.01 to 20.00 ha - 12 facilities.
- IV group - above 20.00 ha - 9 facilities.

Table 1. Area and structure of agricultural land and livestock  
 Tab. 1. Powierzchnia i struktura użytków rolnych oraz obsada inwentarza żywego

Farm group	Parameter	Area and structure of agricultural land							Livestock [LU·ha <sup>-1</sup> ]
		AL		Perennial grasslands		Perennial orchards and plantations		Total AL	
		[ha]	[%]	[ha]	[%]	[ha]	[%]	[ha]	
to 5.00 ha (12)	average	2.03	62.6	0.56	15.4	0.76	22.0	3.35	0.53
	standard deviation	1.32	-	0.64	-	0.91	-	0.98	0.41
5.01 – 10.00 (17)	average	4.24	62.3	1.97	26.2	0.71	11.5	6.92	0.72
	standard deviation	2.05	-	1.94	-	1.27	-	1.52	0.48
10.01 – 20.00 (12)	average	7.78	51.3	7.10	45.9	0.33	2.8	15.21	0.43
	standard deviation	6.74	-	7.05	-	0.74	-	3.41	0.49
area 20.00 ha (9)	average	9.69	29.8	22.43	70.2	-	-	32.12	0.77
	standard deviation	7.30	-	8.61	-	-	-	9.48	0.80
Total (50)	average	5.58	53.5	6.85	36.7	0.50	9.8	12.92	0.66
	standard deviation	5.39	-	9.62	-	0.96	-	11.45	0.46

Source: own work / Źródło: opracowanie własne

Table 2. Area and sowing structure according to the plant group  
 Tab. 2. Powierzchnia i struktura zasiewów według grup roślin

Farm group	Parameter	Plant group									
		Grains		Root crops		Fodder plants		Vegetables		Herbs	
		[ha]	[%]	[ha]	[%]	[ha]	[%]	[ha]	[%]	[ha]	[%]
up to 5.00 ha	average	1.10	55.7	0.09	4.5	0.66	25.8	0.07	11.4	0.11	2.6
	standard deviation	0.72	-	0.12	-	0.89	-	0.09	-	0.37	-
5.01 – 10.00	average	2.15	53.0	0.23	5.5	1.20	28.4	0.65	13.0	-	-
	standard deviation	1.75	-	0.25	-	1.38	-	1.45	-	-	-
10.01 – 20.00	average	3.95	44.7	0.50	13.5	1.31	20.3	1.34	16.3	0.69	5.2
	standard deviation	4.47	-	0.66	-	2.15	-	2.34	-	2.28	-
area 20.00 ha	average	1.15	15.8	0.19	3.4	8.33	80.6	0.03	0.2	-	-
	standard deviation	1.30	-	0.18	-	7.15	-	0.08	-	-	-
Total	average	2.10	44.3	0.25	6.6	2.52	36.6	0.54	10.7	0.18	1.8
	standard deviation	2.59	-	0.37	-	4.45	-	1.44	-	1.08	-

Source: own work / Źródło: opracowanie własne

### 3. Research results

The area and structure of agricultural land in the investigated organic farms was presented in table 1. The average area of AL was 12.92 ha and was within 3.35 ha in the group I to 32.12 ha in the IV group. Arable land was 53.5% in the general structure of agricultural land and perennial grassland - 36.7%. In the first three area groups there were also orchards and perennial plantations (i.e. raspberries, strawberries). They completed the agricultural land structure and their participation was the highest in the group I (22%) and the lowest in the group III (2.8). In the group of the biggest farms with the area of above 20 ha orchards and plantations were not reported and permanent grasslands constituted 70.2%. In this area group there is the highest livestock of 0.77 LU·ha<sup>-1</sup>.

The sowing area according to the plant group and the sowing structure in the investigated organic farms was shown in table 2. In this structure in total for 50 facilities

grains prevailed - over 44.3% , then fodder plants (clover, lucerne) - 36.6%, vegetables (carrot, beetroot, parsley root) - 10.7%, root crops (potatoes) - 6.6%. A marginal participation was in case of herbs because it was only 1.8% of the area. Farms from the group of farms with the area above 20 ha had fodder plants in a considerable part of sowing and it was as much as 80.6%. Fodder plants cultivated in this group constitute a supplement of fodder in the animal production carried out to a great scale.

The possibility of providing and purchasing mechanical services depends on the equipment with tools and tractor machines. Also, equipment with specialistic machines is of great importance [9]. Therefore, in order to show the possibilities related to the use of owned machines in mechanical services table 3 presents equipment of the investigated farms with agricultural machines, equipment of farms with cultivation machines set i.e. ploughs, spike-tooth harrows, cultivators and cultivation aggregates (on the average 3.54 items per a farm). Also the equipment with machines for

harvesting forage is sufficient (on the average 3.1 item and in the group of farms above 20 ha – it is even as much as 6 items per a farm). Rotational mowers, various types of tedders and rake tedders, square and rolling balers and wrapping machines, which were in the biggest farms were included in these groups. On the other hand, the situation in case of specialistic machines for grain harvesting and harvesting of root crops (potatoes) is unfavourable (table 3) In this case there is 0.74 items on the average per a farm. (at least in the I group - 0.42 items, the biggest number in the III group - 1.09 item).

Costs related to the purchased mechanical services in the investigated organic farms were presented in table 4. They were referred to the area of cultivation in the plant and land group as well as to the area of agricultural land and the entire year. The annual costs were on the average PLN 1978.5 and per 1 ha of agricultural land it was 150.6 PLN·ha<sup>-1</sup>. When assessing the purchased mechanical services referred to the plant and land group one should note that for grains, root crops and perennial grassland they occurred in all separated area groups.

In grain production the combine harvesting and hay pressing were the most popular. For comparison, in the investigated 198 organic farms (average area of 47.3 ha) located on the area of Zachodniopomorskie, Pomorskie and Kujawsko-Pomorskie Voivodeship, harvesting grain with a combine harvester and straw pressing were the most often used [8].

The level of the purchased mechanical services for the investigated farms was within PLN 38.2 per one hectare of meadows and pastures to PLN 3,163 per one hectare of herbs where in this case practically all agri-technical treatments were carried out as a part of the purchased services.

On the other hand, owners of the investigated farms from the group 10.01-20.00 ha did not purchase the services related to the cultivation of vegetables. In perennial orchards and plantations services were purchased only in the smallest farms up to 5 ha.

The service providers' benefits consist in reduction of costs of machines maintenance due to their better use. A higher degree of machines use means also a shorter exploitation period of a machine. As a result, in a farm which

Table 3. Equipment of farms with agricultural machines in the system of farm groups

Tab. 3. Wyposażenie gospodarstw w maszyny rolnicze w układzie grup gospodarstw

Farm group	Parameter	Utility group of farms									
		Cultivation machines		Fertilization and plant care machines		Sowing and planting machines		Green forage harvesting machines		Grain and root crops harvesting machines	
		(item·farm <sup>-1</sup> )	[item·haAL <sup>-1</sup> ]	(item·farm <sup>-1</sup> )	[item·haAL <sup>-1</sup> ]	(item·farm <sup>-1</sup> )	[item·haAL <sup>-1</sup> ]	(item·farm <sup>-1</sup> )	[item·haAL <sup>-1</sup> ]	(item·farm <sup>-1</sup> )	[item·haAL <sup>-1</sup> ]
up to 5.00 ha	average	3.17	0.95	1.33	0.40	0.50	0.15	1.17	0.35	0.42	0.12
	standard deviation	2.29	0.56	1.78	0.42	0.80	0.19	1.03	0.28	0.51	0.14
5.01 - 10.00 ha	average	3.41	0.49	2.00	0.29	1.41	0.20	2.41	0.35	0.76	0.11
	standard deviation	1.46	0.25	1.27	0.19	0.87	0.15	1.54	0.19	0.75	0.13
10.01 - 20.00 ha	average	3.73	0.25	3.00	0.20	1.18	0.08	3.64	0.24	1.09	0.07
	standard deviation	1.27	0.12	1.79	0.15	0.87	0.07	2.77	0.17	0.54	0.06
pow. 20.00 ha	average	4.00	0.12	3.30	0.10	1.20	0.04	6.00	0.19	0.70	0.02
	standard deviation	1.41	0.06	1.57	0.05	0.79	0.03	2.26	0.05	0.67	0.02
Total	average	3.54	0.27	2.32	0.18	1.10	0.09	3.10	0.24	0.74	0.06
	standard deviation	1.63	0.41	1.71	0.25	0.89	0.15	2.53	0.20	0.66	0.11

Source: own work / Źródło: opracowanie własne

Table 4. Costs of purchased mechanical services for the group of plants and land

Tab. 4. Koszty pobieranych usług mechanizacyjnych dla grup roślin i użytków

Farm group	Parameter	Plant group					Land group		Costs of purchased mechanical services	
		Grains	Root crops	Fodder crops	Vegetables	Herbs	Perennial grassland	Orchards and plantations	[PLN·year <sup>-1</sup> ]	[PLN·ha <sup>-1</sup> AL]
		[PLN·ha <sup>-1</sup> crop area]								
up to 5.00 ha	average	542.6	315.8	124.8	285.7	-	37.1	254.5	975.0	291.3
	standard deviation	608.4	662.3	186.1	288.7	-	53.1	1045.6	818.7	395.7
5.01 - 10.00	average	245.8	347.5	182.8	21.2	-	114.6	-	1070.9	154.9
	standard deviation	307.3	833.4	151.0	26.0	-	116.5	-	1179.6	136.8
10.01 - 20.00	average	133.3	36.3	69.6	-	3695.4	28.8	-	3376.4	222.0
	standard deviation	144.0	301.5	236.7	-	1114.2	39.1	-	8517.6	561.1
area 20.00 ha	average	538.3	802.1	184.2	1769.2	-	30.1	-	3188.0	94.3
	standard deviation	391.4	2371.7	477.8	559.5	-	299.0	-	9356.4	442.9
Total	average	271.0	277.4	167.2	35.0	3163.3	38.2	89.5	1978.5	150.6
	standard deviation	408.8	1194.4	265.6	284.9	522.6	151.5	516.2	5723.6	386.2

Source: own work / Źródło: opracowanie własne

provides machine services the machinery park is more often renewed which as a result gives a chance to introduce the technical progress. Additionally, it is related to the improvement of production quality, reduction of unit costs of works. Besides, mechanical services provided by the farm owners are additionally treated as an additional source of income for farmers whose farms are well equipped with a machinery park. This equipment allows making decision on provision of services. Labour inputs and costs of provided mechanical services in the assessed 50 farms were presented in table 5. On the other hand, the structure of these costs for particular treatments was presented in fig. 1.

The provided mechanical services in the investigated organic farms included: combine harvesting, straw and hay pressing, meadows mowing and hay tedding and pressing and wrapping in the haylage production. Labour inputs related to the provided services per a statistical farm is annually at the average 4 man-hour, and the costs of these services and incomes are annually at average only PLN 578.

The smallest farms (up to 5 ha) did not provide any mechanical services despite the fact they rarely used the equipment which they had. It results from the fact that hav-

ing such machines as, e.g. combine harvesters of straw and hay pressing machines in a small farm is unprofitable.

Only farms from the area group from 5 to 10 ha provided their services related to the grain harvesting, straw and hay pressing, meadows' mowing and hay tedding incurring thus labour inputs on the average from 2.1 to 0.9 man-hour-year<sup>-1</sup>. Annual incomes from services in this area group are on the average PLN 773.5 While, the farms which offered hay and straw pressing service and meadows mowing obtained annual incomes from these services in the amount of PLN 117.6 and in case of hay tedding it was 35.3 PLN-year<sup>-1</sup>.

Providing services related to pressing and wrapping green forage (in the haylage production) was reported only in the biggest area group above 20 ha. Labour inputs in this case were 7.1 man-hour-year<sup>-1</sup> and annual incomes from the service were the highest among all mechanical services (PLN 1000). It should be mentioned here that this group had the highest number of such machines. It was related directly to the activity in these objects, which was milk production oriented. Haylage production in these farms constituted a fodder base for the owned dairy cows at the highest livestock in this group (table 1).

Table 5. Work inputs and costs of provided mechanical services

Tab. 5. Nakłady pracy i koszty w ramach świadczonych usług mechanizacyjnych

Farm group	Parameter	Provided mechanical services										Total		
		Combine harvesting		Hay and straw pressing		Meadows mowing		Hay tedding		Pressing and wrapping - production of haylage				
		A	B	A	B	A	B	A	B	A	B	A	B	
up to 5.00 ha	average	-	-	-	-	-	-	-	-	-	-	-	-	-
	standard deviation	-	-	-	-	-	-	-	-	-	-	-	-	-
5.01 - 10.00	average	2.1	502.9	1.2	117.6	1.5	117.6	0.9	35.3	-	-	5.6	773.5	
	standard deviation	5.9	1431.8	4.9	485.1	6.1	485.1	3.6	145.5	-	-	15.2	1733.7	
10.01 - 20.00	average	1.4	340.9	-	-	-	-	-	-	-	-	1.4	340.9	
	standard deviation	4.5	1130.7	-	-	-	-	-	-	-	-	4.5	1130.7	
area 20.00 ha	average	2.0	200.0	-	-	-	-	-	-	7.1	1000.0	9.1	1200.0	
	standard deviation	6.3	632.5	-	-	-	-	-	-	10.3	1487.7	10.7	1472.7	
Total	average	1.4	286.0	0.4	40.0	0.5	40.0	0.3	12.0	1.4	200.0	4.0	578.0	
	standard deviation	4.8	1021.0	2.8	282.8	3.5	282.8	2.1	84.9	5.3	754.8	10.6	1351.8	

Notice: A- Labour inputs [man-hour-year<sup>-1</sup>]; B –Costs of provided mechanical services [PLN-year<sup>-1</sup>]

Source: own work / Źródło: opracowanie własne

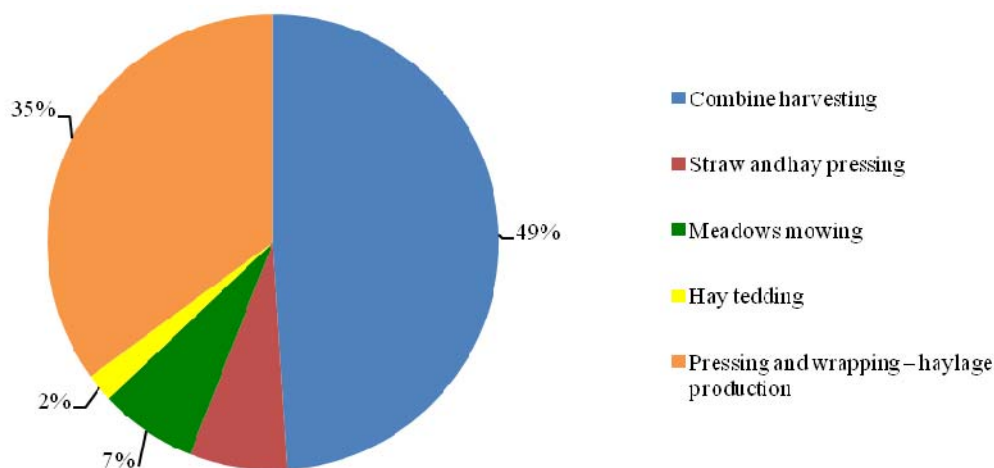


Fig. 1. Cost structure of provided mechanical services

Rys. 1. Struktura kosztów świadczonych usług mechanizacyjnych

Source: own work / Źródło: opracowanie własne

In the structure of costs of provided mechanical services in all farms (figure 1) the highest participation was in case of a combine harvester (49%) and pressing and wrapping related to haylage production (35%). On the other hand, the lowest participation (2%) was characteristic for hay tedding.

#### 4. Conclusions

1. The costs of purchased mechanical services in the investigated organic farms with the average area of 12.92 ha within one year was on the average of PLN 1978.5. While per one hectare of agricultural land it was PLN 150.6. A low level of these services may prove that the farm equipment with the machinery park was sufficient in many cases and farmers did not have to use these services.

2. Assessing the type and level of costs of particular area groups one may note that the highest income was generated by combine harvesting. The costs of this technological treatment were respectively from 200 PLN·year<sup>-1</sup> in the biggest farms (above 20 ha) to 502.9 PLN·year<sup>-1</sup> in farms with the area of 5-10 ha.

3. Labour inputs as a part of provided mechanical services were on the average 4 man-hour·year<sup>-1</sup>. On the other hand, annual incomes resulting from the provided services were on the average only PLN 578. In the structure of provided services, combine harvesting prevailed (49%) as well as pressing and wrapping (35%). The lowest participation was reported for hay tedding (2%).

4. Generally, it may be said that farmers- the owners of the investigated organic farms did not look for ways of improving the material welfare of their families by providing mechanical services to a big scale.

#### 6. References

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*The research was funded from the subsidy granted by the Ministry of Science and Higher Education for the statute operation.*