Stanisław KOKOSZKA

University of Agriculture in Krakow, Institute of Agricultural Engineering and Computer Science
ul. Balicka 116B, 30-149 Kraków, Poland
e-mail: Stanislaw.Kokoszka@ur.krakow.pl

ASSESSMENT OF THE LEVEL OF TRANSPORT SERVICES PROVIDED IN SELECTED FARMS

Summary

The research on the level of transport services in selected agricultural farms was carried out in the aspect of their size. It has been concluded that farms with the smallest crop area, provide transport services as a source of additional income. The volume of transport provided as services decreases as the farm size grows. In comparison with the smallest farms, the largest ones provide transport services at the level of only 25.47% (4.56 t·haAL^{-1} and 1.16 t·haAL^{-1}). The share of transport provided as service decreases from 24.50% to 4,66% as the farms size grows.
Keywords: transport, transport services, provided services, farm size

OCENA POZIOMU ŚWIADCZONYCH USŁUG TRANSPORTOWYCH W WYBRANYCH GOSPODARSTWACH ROLNICZYCH

Streszczenie

Badania poziomu świadczonych usług transportowych w wybranych gospodarstwach rolniczych przeprowadzono w aspekcie ich wielkości. Stwierdzono, że gospodarstwa o najmniejszym areale upraw, świadczenie usług transportowych traktują, jako źródło dodatkowego dochodu. Wielkość przewozów wykonywanych w formie usług maleje w miarę wzrostu powierzchni gospodarstwa. Gospodarstwa największe w stosunku do najmniejszych wykonują usługi transportowe na poziomie tylko 25,47% (4,56 t·haUR^{-1} i 1,16 t·haUR^{-1}). Udział przewozów wykonywanych jako usługa transportowa zmniejsza się w miarę wzrostu powierzchni z 24,50 do 4,66%.
Słowa kluczowe: transport, usługi transportowe, usługi świadczone, wielkość gospodarstwa

1. Introduction

The increase of transport in the agriculture results not only from the production growth and its seasonality, but also from development of increasingly efficient machines for harvesting, sowing and fertilization. The quantity and range of transport equipment used at a farm is greater, because their work significantly determines the production profitability [1, 2, 9, 11].

Changing conditions of farming, resulting mainly from market economy affect the level of demand for transport services. An important problem is the increase in the distance between the place of production and the place of sale. Difficulties result from the need to find new, often more profitable outlets to sale products [5, 6, 8].

Higher transport burden of farms and the growing share of transport in the total work at a farm, results in increased labour time and by energy consumption [3, 4, 12].

Because the farms revenues are decreasing, and especially the prices of agricultural products, some farms adequately equipped with transport means, provide such transport services outside the field works season. These farms seek to increase financial results through income from services and to improve the use of transport equipment to reduce their maintenance costs [7, 10, 13].

2. Purpose and scope

The studies aimed at determination of the size of services provided by agricultural farms in the aspect The results analysis was conducted to give the answer to the question if transport services for the agriculture (farms) are needed and at what size.

The studies encompassed 653 farms in 21 communes in southern provinces (Małopolskie, Podkarpackie, Świętokrzyskie, Śląskie).

The studies included all events – transport activities performed at farms. The farms providing transport services were selected from the interviewed group. The analysed group of farms constitutes 23.74% of the total sample of interviewed farms. It should be noted that in the entire sample of service providing farms 54.84% of the farms also use these services. The provided services are 100% neighbour services for the so-called work-off or are treated as a source of additional revenues.

3. Methodology

The studies were carried out in the form of a guided interview, mainly relating to the transport activities. The first part of the interview covered the general farm features (agricultural land structure, crops structure, livestock structure, structure and size of production), the second part was about the transport equipment and its utilization, the third covered the operation conditions of transport equipment and the level of using transport services.

The obtained results were used to determine the transport size and the share of haulage services depending on the farm size. The interviewed farms were divided into three area (hectares) groups:
- up to 10 ha AL – 63.23%, in AL area – 29.43%,
- 10.01 to 20.00 ha AL – 26.45%, in AL area – 35.79%,
- above 20.01 ha AL – 10.32%, in AL area – 34.78%.

Stanisław KOKOSZKA 36 *„Journal of Research and Applications in Agricultural Engineering” 2019, Vol. 64(1)*

4. Subject and results of studies

The studies comprised 155 agricultural farms in southern provinces of Poland. The interviewed farms represent various types, from general-type farms without specialization, to specialized farms in e.g. growing potatoes or vegetables, dairy farms, or horticultural farms. Hence, the transport includes different cargo, at varying transport size and the single cargo size. The mean transport size per 1 ha AL is 28.03 tonnes, and the variation is from 6.62 to 171.46 tonnes per 1 ha AL.

Within the farm size groups, the transport size was from 22.08 t in the group up to 10 ha AL, 37.59 tonnes in the 10.01-20.00 AL group, and 39.34 tonnes in the group above 20.01 ha AL. The increase of unit transport rate proves that as the farm size grows, the intensity and marketable output of agricultural production grows as well. The transport services burden, measured both as the unit transport (t per ha AL) and the total transport, increases as the farm size grows. In the group of the smallest farms, the total transport is 112.1 tonnes, while in the group of the largest farms it is 1446.9 tonnes, that gives the transport burden almost 13 times higher than in the smallest farms.

The basic features of interviewed farms in terms of transport are presented in Table 1. The basic factor affecting the transport size (except for production intensity) is the farm area. In this regard, at the mean for the interviewed population equal to 10.92 ha AL, there is a large variation between the area groups. Still, differentiated needs of tested farms are proved by a very high variability within the separated groups. In this context, the highest variability is within the group of the smallest farms, where the difference in the hectares is 1000%. The farm area and the size of one-time transported loads are both factors affecting the size of the transport weight, as well as the source of decisions on the use of transport services.

The low level of services provided was found for farms that have low-load transport means. Distance, the other important element of transport services (mean distance is 4.08 km), does not depend on the farm area. It was found that the shortest freight route concerned farms with the smallest crop area, and the longest farms of medium size. This is a normal phenomenon as the distance in internal transport is a consequence of the farm configuration (fields layout in relation to the farmstead).

The variation within the area groups is very high. The mean transport distance for the farm with the most favourable configuration and location in relation to markets and supplies is only 0.34 km, while for the farm with the most unfavourable conditions it is 29.19 km.

The amount of transport equipment grows along with the increasing farm area. The more than sevenfold (7.24) farm area increase between groups' results in a 201% increase in transport equipment. Similarly to the size, the variation within the area groups is much greater, being from 1 pc to 10 pcs per farm and the largest variation is in the group of the smallest farms. In the context of size of interviewed farms, i.e. per 1 ha AL, this index has a correct tendency – it decreases as the area decreases. The smallest farms have 0.46 t per 1 ha AL, and the largest – 0.13 t per ha AL. At significantly growing number of unit haulages per 1 ha AL, it is the result of increased quality equipment (average payload) and also probably of better organization and utilization of resources. The quality of transport equipment at a farm (measured by its payload) is not strongly correlated with the farm area. Most likely, it depends on the size of transported cargo that in turn depends on the field size and the crop structure.

Table 1. Selected features of interviewed farms
Tab. 1. Wybrane charakterystyki badanych gospodarstw

Parameter		Area group			
		Mean	Up to 10	10-20	Above 20
Farm area [ha AL]	mean	10.92	5.08	14.77	36.78
	min.	1.00	1.00	10.15	21.00
	max.	155.00	10.00	19.50	155.00
Average transport distance [km]	mean	4.08	3.33	5.56	4.90
	min.	0.34	0.34	1.28	1.03
	max.	29.19	28.22	16.47	29.19
Number of transport equipment per farm [pcs]	mean	2.92	2.35	3.49	4.94
	min.	1.00	1.00	2.00	2.00
	max.	10.00	6.00	10.00	8.00
Average equipment payload [tonnes]	mean	2.89	2.47	3.71	3.33
	min.	0.80	0.80	1.75	1.52
	max.	8.00	8.00	7.73	5.10
Share of trucks in the equipment [%]	mean	7.27	6.55	7.15	11.99
	min.	0.00	0.00	0.00	0.00
	max.	100.00	100.00	50.00	40.00
Share of external transport [%]	mean	29.11	26.40	30.06	43.27
	min.	0.89	3.05	0.89	2.09
	max.	99.03	96.74	99.03	97.59
Sales of produce tonnes per ha AL	mean	5.66	3.42	8.39	12.35
	min.	0.00	0.00	0.00	0.00
	max.	50.51	28.00	50.51	40.65

Source: own research / Źródło: opracowanie własne

The share of trucks in transport equipment grows along with growing hectarage from 6.55 to 11.99% - a 1.83 growth rate. The variation in the groups is from 0 (no trucks) to 100%. At interviewed farms, the share of transport – external haulage as the best suited for performing transport services is strongly correlated with the farm size. At the mean equal to 29.11%, the growth rate between the groups is 1.64, from 26.40 to 43.27%. This means that the largest farms are the most commercial, they sell the most produce and buy the most means of production. It is a particularly important piece of information from the point of view of this research, as external transport due to its features is best suited for being performed as a service. The sales expressed as the weight of sold produce per ha AL also grows significantly as the farm size increases. In the largest farms it is 3.61 times higher than in the smallest ones, However, the sales volume in units of weight has a very high variation within the interviewed farms: from 0 (no sales) to over 50% of haulage are produce for sale. The effect of the aforementioned indices – transport characteristics in the interviewed farms – is the characteristics of provided services presented in Table 2.

Generally, the size of haulage performed as provided services – cargo tonnes per ha AL – decreases as the farm size increase. The largest farms transport (per ha AL) only 25.47% of cargo in relation to the smallest farms (4.56 t·haAL⁻¹ and 1.16 t·haAL⁻¹). Consequently, the share of haulage performed as provided services decreases from 24.50% to 4.66%, the mean being 17.89%. The haulages performed as services are at much longer distances than the mean haulage distance. The freight transport is on average distance 4.08 km, and the mean distance for haulage services is 7.01 km, a 1.72 growth ratio. The decrease of level of performed services along with the farm area increase is anormal phenomena for a number of reasons. The basic reason, confirmed by respondents, is financial affluence. The smallest, least affluent farms treat transport service as an element of financial improvement. The largest farms, with the best transport equipment in the quantitative and qualitative aspect, provide services outside the field works season, most often for the so-called work-off during the season when the labour is at peak demand.

The impact of the farm size on the size of service activity was determined by correlation, assuming as an independent variable the farm area, and the dependent size of the provided service activity. This correlation is presented in Fig. 1.

Table 2. Size of transport services provided by interviewed farms
Tab. 2. Wielkość usług - przewozów świadczonych przez badane gospodarstwa

Parameter		Area group			
		Mean	Up to 10	10-20	Above 20
Tonnes of cargo per ha AL	mean	3.61	4.56	2.32	1.16
	min.	0.10	0.15	0.20	0.11
	max.	30.00	30.00	13.60	1.43
Share of service haulage [%]	mean	17.89	24.50	7.23	4.66
	min.	0.00	0.00	0.00	0.00
	max.	40.96	40.96	24.18	8.04
Service haulage distance [km]	mean	7.01	7.17	6.56	7.18
	min.	0.10	0.25	0.05	0.10
	max.	100.00	100.00	15.00	11.10

Source: own research / Źródło: opracowanie własne
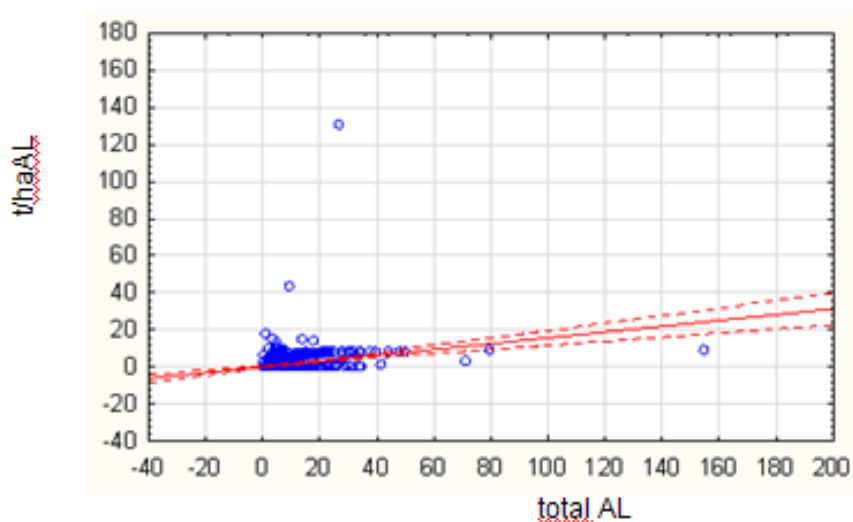
Source: own research / Źródło: opracowanie własne

Fig. 1. Impact of farm size (ha AL) on the level of performed services per 1 ha AL
Rys. 1. Wpływ wielkości gospodarstwa (ha UR) na usług transportowych na 1 ha UR

The correlation coefficient reached r = 0.25976 at the 0.95 confidence level. The value proves a rather weak correlation between the variables, but it enables the trend determination. The regression equation is follows:

$$Y = 0,29226 + 0,15561x$$

Characteristics of x and y variables at n = 653 is as follows:

	X	Y
mean	9.749678	1.809441
std. Deviation	10.072978	6.034434
max.	155.00000	130.370370
min.	0.8000000	0.0000000.

Despite a low correlation coefficient, the equation can be used to determine which portion of haulages performed as services can be taken over the farms from the transport companies. Particularly when a significant portion of farm owners has indicated the neighbour services as the best transport services.

5. Summary and conclusions

The largest farms have the best transport equipment in the quantitative and qualitative aspect. The fact undoubtedly affects the potential to provide transport services. The other element affecting the volume of performed services, especially external ones, is the financial affluence of interviewed farms. The smallest, least affluent farms treat transport service activity as an element of financial improvements. Hence, the size of haulages performed as services decreases as the farm hectarage grows. The largest farms transport, as external service, (per ha AL) only 25.47% of cargo in relation to the smallest farms (4.56 t·haAL^{-1} and 1.16 t·haAL^{-1}). Consequently, the share of haulage performed as provided services decreases from 24.50% to 4.66%, the mean being 17.89%. The haulages performed as services are at much longer distances than the mean haulage distance.

6. References

[1] Gorzelany J.: Koszty i energochłonność procesów produkcji buraków cukrowych. Inżynieria Rolnicza, 2010, 1(119), 191-197.
[2] Gollin D., Rogerson R.: Productivity, transport costs and subsistence agriculture. Journal of Development Economics, 2014, 107.
[3] Jabłonka R., Kapela K.: Zapotrzebowanie na usługi mechanizacyjne w gospodarstwach indywidualnych powiatu wysokomazowieckiego. Inżynieria Rolnicza, 2010, 1(119), 215-221.
[4] Kallas S.: Launch of the Green Freight Europe Initiative – Speech, 2012, 12, 203.
[5] Kokoszka S., Kuboń M., Roczkowska-Chmaj S., Borcz J.: Analiza i uwarunkowania rynku usług i urządzeń w transporcie wiejskim. PTIR Kraków, 2001, 23-139. ISBN 83-905219-6-2.
[6] Kokoszka S.: Odległość i wielkość przewozów w zależności od rodzaju ładunku i wielkości sprzedaży produkcji. Problemy Inżynierii Rolniczej, 2009, 4, 29-35.
[7] Kokoszka S.: Wielkość gospodarstw rolniczych a opinie ich właścicieli o potrzebie i formie obsługi transportowej. Journal of Research and Applications Agricultural Engineering, 2013, Vol. 58(2), 69-72.
[8] Kokoszka S., Maternowska W.: Wielkość gospodarstwa rolniczego a jego infrastruktura transportowa. Infrastruktura i ekologia terenów wiejskich, 2012, 2/III, 197-206.
[9] Kokoszka S., Sęk S., Tabor S.: Koszty przewozów rolniczych różnymi środkami transportowymi. Problemy Inżynierii Rolniczej, 2006, 4, 101-107.
[10] Kokoszka S., Tabor S.: Education of farm owners and their opinions on a need and forms of transportation services. Journal of Research and Applications Agricultural Engineering, 2016, Vol. 61(1), 38-40.
[11] Parafiniuk S.: Nakłady transportowe w badanych gospodarstwach rodzinnych. Inżynieria Rolnicza, 2006, 13, 377-383.
[12] Pawlak J.: Usługi mechanizacyjne w rolnictwie polskim. Problemy Inżynierii Rolniczej, 2005, 3, 23-30.
[13] Szuk T.: Usługi maszynowe w wybranych gospodarstwach rolnych Dolnego Śląska. Inżynieria Rolnicza, 2009, 8(117), 207-213.