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TECHNICAL EQUIPMENT OF FARMS IN MAŁOPOLSKA AND LITHUANIA ON THE BASIS OF SURVEY RESEARCH

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Abstract: The aim of the research is to compare the level of farm equipment with agricultural machinery and devices improving production as well as to evaluate the quality of the equipment measured by its age, in Małopolska region and in south Lithuania. The empirical material constituted the results of the survey in 2017 in 144 farms in Małopolska and 70 farms in Lithuania. Questions taken into account in the research concerned power and age of tractors and combines, number of chosen machines and agricultural devices used according to the farm profile. The analysis of the material completed after the survey allows for the conclusion that the structure of technical equipment of farms both in Małopolska anf south Lithuania has undergone positive changes, especially in case of farms of average and large areas (15–20 hectares of arable land and >20 hectares of arable land). These farms, having the opportunity of easier access to credits and investment subventions, try to introduce general changes within machinery backup. At the same time the oldest equipment – often used more than 20 years, finds its place in farms of smallest areas of arable land.

Keywords: mechanization of agriculture, farm, structure

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INTRODUCTION

Bibliography covering the problem of technical equipment of farms in most cases depends on quantitative evaluation with no relation with the quality of the machinery and devices used in agriculture. There is a noticeable lack of the data concerning the age of the machinery, which is the basic determinant of the quality of technical equipment of farms. This fact make it difficult to estimate the level of farm equipment with mechanization means, which in turn may lead to misleading conclusions in the context of international comparisons. Specific information concerning farm equipment such as purchases of machinery regarding second hand market, age and technical condition can be obtained only by the way of survey carried out among farmers. The lack of information on machinery condition of Polish agriculture creates an awkward gap in the area of the research concerning agricultural equipment in Poland. The works referring to the analysis of the level of the equipment of farms with mechanization means were dedicated either to some chosen machinery [Muzalewski 2013] or concerned changes of technical equipment of farms within the area of the country [Piwowar 2012], as well as some international comparisons [Pawlak 2010]. The scope of these analyses was often restricted to quantitative evaluation. The survey research allows for multidimensional diagnosis regarding quantity, quality, finances corresponding machinery purchases, repairs and related costs.

The survey on the basis of which the analyses were carried out was conducted parallel within two areas: 144 farms located in Małopolskie voivodeship, in which the supposed successor is on the way to get qualifications at the University of Agriculture in Krakow, and 70 farms in South Lithuania, in which the supposed successor studies at Aleksandras Stulginskis University in Kaunas. The investigation was to answer the questions concerning the number and quality of farm equipment, in particular power and age of tractors and sophisticated combines, number of chosen machines and agricultural devices used accordingly to farm specialization.

Polish agriculture is known for its unfavorable areal structure of farms, with predominating number of small and very small units of the area less than 5 hectares, similar structure is observed in Romania, Portugal and Lithuania, therefore the area chosen for comparative investigation is Lithuania.

Lithuanian agriculture specializes mainly in milk and meat production. In 2014 there were about 171.5 thousand of farms of the average area of 6 hectares. The cultivations are mostly grains (wheat, rye, barley, corn), fodder beets, sugar beets, potatoes, while in farming he leading positions are taken by cattle, pigs and poultry [Greta, Lewandowski 2012].

In spite of many attempts to consolidate farm areas both in Poland and in Lithuania there is still a significant predomination of small farms [Burski, Sadkowski 2005]. The most numerous group – more than 50% - in both countries is constituted by farms of the area up to 5 hectares. Farms of the area not exceeding 20 hectares make up 30% while in other categories there are up to 7% of the total number of farms [Eurostat 2017].

Taking into account the information contained in Table 1, one can notice that Polish farmers are slightly better equipped with the machines for agricultural production. Both in

Poland and in Lithuania the most popular equipment used in farms is tractor. Regarding the character of the agriculture in these countries combines were also often used. Almost half of Polish farms were equipped with other sophisticated machinery while in Lithuania only 25% of the total number of farms were in the possession of such equipment.

Table 1. Utilization of agricultural machinery in farms in Poland and Lithuania in 2013 [%]

Specification		area [ha]					
		<2	[2, 5)	[5, 10)	[10, 20)	[20, 50)	>=50
tractors	Poland	31.73	58.73	82.24	91.39	94.47	90.89
	Lithuania	13.73	21.56	41.36	65.62	82.45	91.21
combines	Poland	10.87	27.47	53.28	74.61	85.34	80.68
	Lithuania	0.00	0.18	2.03	9.87	28.64	61.55
cultivators	Poland	2.79	5.51	7.74	8.98	9.99	13.52
	Lithuania	0.82	0.70	3.12	5.03	7.78	10.12
other machines	Poland	8.08	18.71	33.13	45.85	47.80	66.91
	Lithuania	6.06	3.20	8.53	16.64	24.67	26.79

Source: own calculations on the basis of Eurostat

MATERIAL AND METHODOLOGY OF THE RESEARCH

The analysis was based on the results of the survey carried out in January 2017, covering 144 farms situated in Małopolska and 70 farms located in South Lithuania. The subject of the investigation was the level of farm equipment as well as plans concerning modernization of the machinery being in the possession of the farm. The respondents were also asked about financial sources for investments planned in connection with equipment modernization. The basic grouping criteria were farm area and specialization. Six areal groups were distinguished. Due to significant fragmentation of farms in Małopolska farms of the area up to 2 hectares constituted a separate group. Within specialization farms of plant production, livestock production and multidirectional were distinguished.

Table 2. Characteristics of farms under investigation in Małopolska and Lithuania [%]

Characteristics		Małopolska	Lithuania
area [ha]	<2	5.56	0.00
	[2, 5)	25.69	2.86
	[5, 10)	30.56	14.29
	[10, 20)	20.14	5.71
	[20, 50)	11.81	17.14
	>=50	6.25	60.00
specialization	plant production	44.44	34.29
	livestock production	10.42	11.43
	multidirectional production	45.14	54.29

Source: own calculations on the basis of Eurostat data

The most numerous group out of farms in Małopolska was the group of farms of the area from the interval 5-10 ha (30.56%), and 2-5 ha (25.69%). In Lithuanian group the predominating majority constituted farms of the area more than 50 hectares while the smallest representation had farms of the area less than 5 hectares. In Małopolska the most numerous group constituted farms with multidirectional and plant production while in Lithuania the majority of farms was those with multidirectional production. Farms with specialization of livestock production constituted 10-11% of the total number of farms in both countries.

In most farms investigated in Małopolska with plant specialization there is a significant predomination of cereals in crop structure. Root plants were cultivated by 40% of respondents and vegetables – by 30% of respondents. In case of farms with predomination of livestock production most respondents declared milk cattle farming, 30% of respondents - pigs and similar percentage of respondents – poultry. In Lithuanian farms with plant production specialization similar to Małopolska there was a noticeable predomination of cereal cultivation and 40% of farms specialized in fodder plant production. Farming of cattle for slaughter and milk cattle predominated in the group of Lithuanian respondents.

RESEARCH RESULTS AND DISCUSSION

The most popular equipment both in Małopolska and in Lithuania were agricultural tractors (almost 90% of respondents in both samples declared having one) and agricultural trailers that constituted the equipment of 70% of farms in each group. Vast majority of farms in Małopolska (79.86%) declared having plough, while 59% of respondents among Rother agricultural machines listed field seeders, which is the basic equipment in case of farms with cereal cultivation specialization. In Poland most popular were distributors of fertilizer and sprayers – they appeared in more than a half of farms being surveyed, while in Lithuania distributors of fertilizer occurred only in 31.14% of farms and sprayers – in % of farms under investigation. Almost 70% of respondents in Lithuania have got in their farms tillage units. Many farms there (60%) are equipped with telescopic self-propelled loaders. Every third farm in both samples has got harvester combine. Almost a half of the Lithuanian respondents (45.71%) declared having potato harvester while automatic planters are used in the group of 37.14% of farms surveyed.

One of the objectives of the research was to determine the age of the machines and devices used in farms in Małopolska and Lithuania. It seems obvious that the equipment of farms needs modernization and adaptation to new production technologies that are friendly to environment. This in most cases concern agricultural tractors – it turns out that almost 60% of machines being in the posession of Polish farmers hale been used for more than 15 years and 38% - for more than 20 years. The average combine harvester-thresher age in the group under investigation is more than 15 years and 30% of this type of machinery is more than

20 years old. The survey confirms the results of the investigation carried out by Muzalewski [Muzalewski 2013], who in 2005 estimated the average combine harvester-thresher age to be 21 and in turn the average agricultural tractor age in farms investigated by Wójcicki [2013] was estimated to be about 14.5 years.

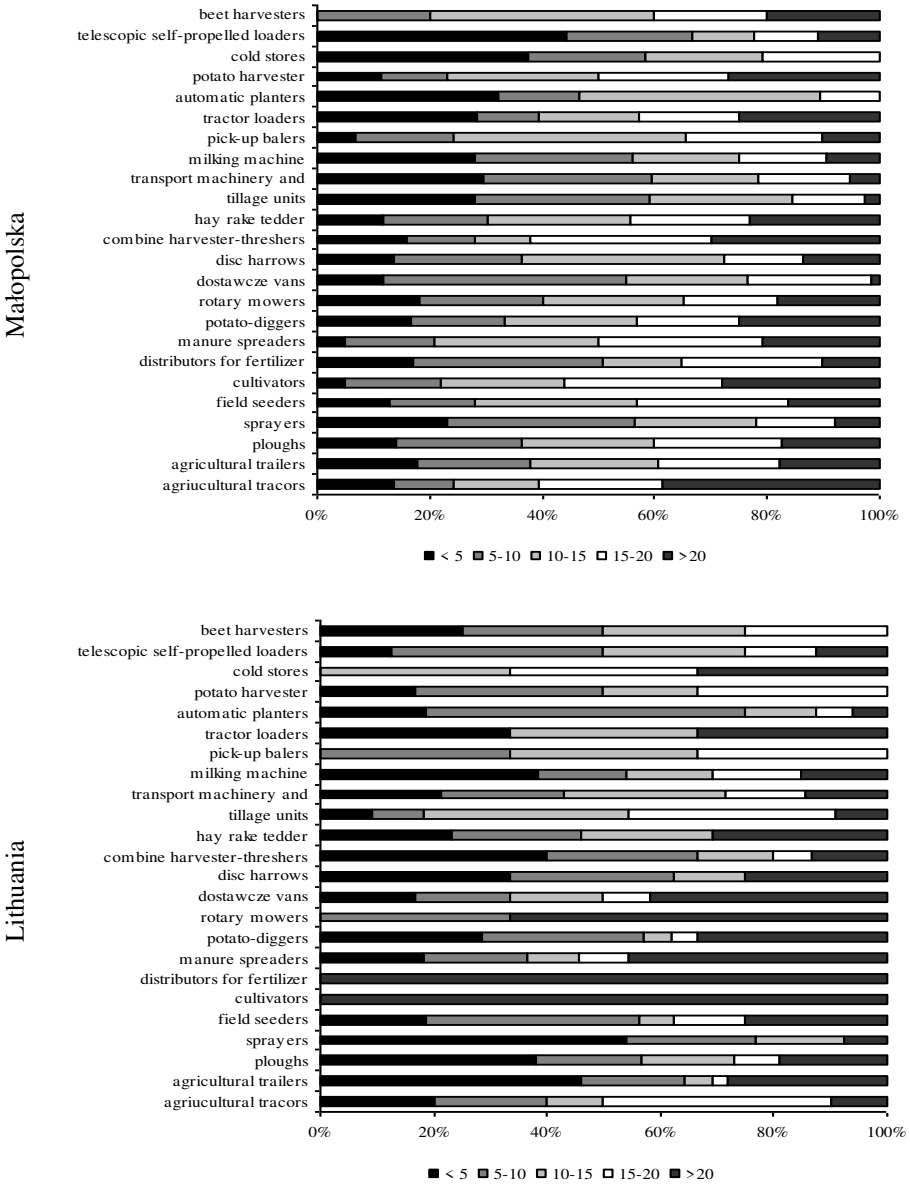
Table 3. Frequency* of occurrence of chosen agricultural equipment in the samples of farms investigated in Małopolska and Lithuania [%]

Equipment type	Małopolska	Lithuania
vans	41.67	28.57
agriucultural tracors	89.58	88.57
agricultural trailers	74.31	71.43
combine harvester-threshers	34.72	37.14
potato harvester	18.06	45.71
beet harvesters	3.47	5.71
disc harrows	40.28	2.86
cultivators	56.94	31.43
telescopic self-propelled loaders	6.25	60.00
tractor loaders	19.44	8.57
ploughs	79.86	34.29
tillage units	27.08	68.57
hay rake tedder	29.86	42.86
manure spreaders	43.06	37.14
distributors for fertilizer	53.47	31.43
field seeders	59.72	40.00
automatic planters	19.44	37.14
sprayers	60.42	8.57
pick-up balers	41.67	8.57
potato-diggers	20.14	45.71
milking machine	41.67	17.14
cold stores	22.22	8.57
transport and handling machinery	16.67	22.86

Source: own elaboration, *percentage of farms having at least one machine of the type

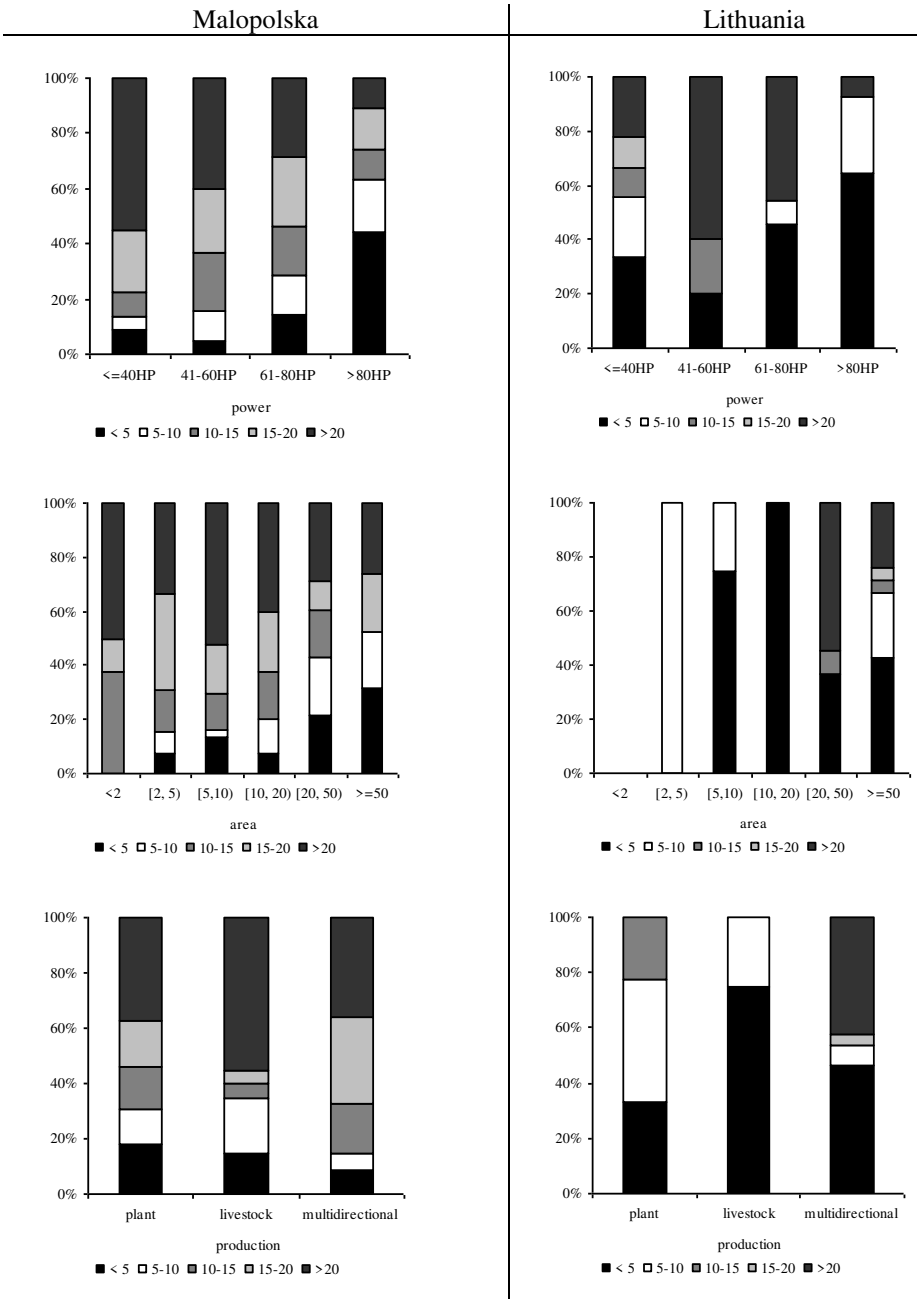
After the integration with the EU there was a noticeable progression within investment in Polish agriculture, many farmers bought tillage units, the age of which do not exceed 10 years at the present moment, they replaced long serving cultivators, disk harrows and rotary tillers. Almost 60% of transport and handling machinery, cold stores and vans in the farms surveyed in Małopolska are new, bought not later than 10 years before. Relatively new – not older than 10 years are sprayers and fertilizer distributors.

Figure 1. Structure of age [years] of agricultural machinery in farms under investigation in Małopolska and Lithuania



Source: own investigation

Figure 2. Structure of age [years] of agricultural tractors in farms under investigation in Małopolska (A) and Lithuania (B)



Source: own investigation

Large farms completing the basic machinery for years at present renew it by supplementing the equipment with transport and handling machinery and devices for work automation. In case of other machines listed in the survey questionnaire the age was very much differentiated in the group of farms surveyed in Małopolska and oscillated from 10 to 20 years, there were few new machines – up to 5 years old and few very old machines – more than 20 years.

Referring to the age estimation of agricultural equipment following from the Lithuanian survey one should emphasize that the age of beet harvesters and disc harrows in all of the farms under investigation is more than 20 years. Lithuanian farmers have been investing their financial means mainly in combine harvester threshers and tractors, 50% of the Lithuanian respondents declared that the age of the agricultural machines in their possession does not exceed 5 years. The age of more than 60% tillage units, pick-up balers, hay rake tedders working in Lithuanian farms is not more than 10 years.

The research carried out within Małopolska region showed that agricultural tractors of less than 40 horsepower were used mostly in farms of the area less than 2 ha and the age of most of the machines did not exceed 20 years. It turned out that the owners of farms of the area up to 2 ha did not make any investments as far as new equipment was concerned, since they had been using the machinery they had possessed for years. The age of almost 40% of tractors of the power of 60 was over 20 years. The owners of large and average farms of the area more than 20 ha got the financial means from the European funds and used it for purchasing tractors of the more than 80 horsepower. In the group of farms under investigation more than 45% of agricultural machines of this type was of the age less than 5 years. In case of the survey carried out in Małopolska the age of the machines was much more differentiated and the farm production specialization seemed to have no connection with it.

Figure 2 presenting the structure of the age of agricultural tractors indicates that the Lithuanian agricultural equipment is newer than those in Poland. The owners of farms of the area up to 10 ha directed their financial means into purchases of new equipment and the age of agricultural tractors used in this areal group did not exceed 10 years. Significant investment were made in the direction towards machines of big power, more than 80 horsepower, 64.29% of tractors was of the age under 5 years.

CONCLUSIONS AND REMARKS

Because of the changing situation in agricultural market and in the surroundings of agriculture there is a constant need for current research within changes in farm equipment with tractors and agricultural machines.

Large number of farms, especially in case of Małopolska region, taking advantage of beneficial possibilities for acquiring agricultural machinery after the liquidation of state-owned farms, purchased the property. Tractors, frequently

after 30 years of exploitation, of joint capacity far above the needs of farms of small area, in combination with old machinery, do not meet the demands of sophisticated technologies of livestock and plant production. In case of the analyses carried out this concerned mostly tractors of the power up to 40, in this case 55% of farms in Małopolska had tractors older than 20 years, while 40% of farms had tractors of the power from 40 to 60 older than 20 years.

Anyway, it follows from the survey that the structure of technical equipment of farms in Małopolska has been undergoing positive changes, especially in case of average and large farms (15–20 hectares of arable land and >20 hectares of arable land). These farms basing on easy access to credits and investment subventions try to modernize their technical equipment, although it often happens afterwards that they do not use or are not able to use its full potential.

The evaluation of farm equipment with tractors and agricultural machines is difficult and often has an approximate character. There is a lack of reliable data on production and sale of agricultural machines, especially it concerns of purchases on secondary market. Only in case of agricultural tractors the information is available thanks to the necessity of registration of these machines. The largest influence on the level of sale follows from the situation in agriculture and the level of income obtained by farmers.

The most popular machinery both in Małopolska and Lithuania were agricultural tractors and agricultural trailers (nearly 90% of farms declared having one). The owners of average and large farms above 20 hectares both in Małopolska and in Lithuania, got the financial means for the purchase of tractors of more than 80 horsepower from European Union, in Małopolska 45% of farms declared having such machines for the time period less than 5 years while in case of z Lithuania it was 64.29 farms.

On average every third farm in both samples was equipped with combine harvester-thresher, with relatively newer machines working in Lithuanian farms. Potato combines are much more frequently used in Lithuania, more than half of the farms surveyed declared having such machinery while in case of Lithuania every fifth farm was in the possession of it.

In farms of Małopolska the crop of potatoes is often proceeded traditionally with the use of potato diggers, due to which there were 42% respondents that declared having such devices while in Lithuanian farms there were only 17%.

Significant differences in frequency of occurring concern the machinery for fertilizing and plant protection.

The newest equipment working in farms of Małopolska are cold stores and telescopic self propelled loaders, while in case of Lithuanian farms relatively higher percentage is observed in case of combine harvester threshers.

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