

MODERNISATION PLANS OF EQUIPPING THE SELECTED FARMS WITH TRACTORS

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Summary. The analysis covered 50 applications filed to The Agency for Restructuring and Modernisation of Agriculture within the operation concerning modernisation of farms. For 96% of applicants, the purpose of operation was to improve the production safety including improvement of work safety. Therefore, purchase of tractors was a prevailing objective of modernisation investments. In the researched farms, an average growth of tractors equipment of 0.7 item is planned at the already existing equipment of 1.5 item. In reference to arable land area the equipment rate will raise from 6.0 item·100 ha⁻¹ AL to 8.8 item·100 ha⁻¹ AL. At such low livestock and high share of grains in the sowing structure of average farms, such a high level of investment cannot be fully justified. Especially because the investments concern tractors of a higher class of towing power for which the work front is limited.

Key words: farm, tractor, modernization, investments

Introduction

The following, inter alia, are required from the family farms of the future: activities which aim at becoming an agricultural family enterprise that successively increases its acreage of own or leased arable land and that increases its plant and animal commodity production [Wójcicki 2011]. Ensuring high parity of agricultural incomes, the main source of which should be increasing work efficiency, is a superior aim of these activities. Achievement of such a superior aim is impossible without modernisation investments which are carried out rationally. They are related to incurring inputs on purchase of technical means, construction materials as well as to expenditures on construction and installation works and inputs on the land purchase [Wójcicki 2010]. The research which has been carried out so far prove [Wójcicki, Kurek 2011], that average investment inputs in development farms are on the level of 2-3 thousand PLN·ha⁻¹ AL. It is expected that to 2015, they will be on the level of up to 155% of the amortization value of fixed means, up to 29% of the value of the incurred expenditures and up to 22% of the value of the obtained incomes.

Too high level of incomes may effect in excessive loads in the form of costs, which limit efficiency of the activity which is carried out in a considerable degree. Moreover, without changes to the area of the usable land, it may positively influence the decrease of the machines use from agricultural point of view, which makes their purchase unjustified [Tabor, Cupiał 2005]. Careful actions taken by farmers concerning liquidation of already exploited technical means prove the above-mentioned applications. Very low indexes of the machinery park reconstruction, reported in the last 5 years, are the reflection of the above.

Purpose, scope and methodology of research

Taking up rational actions concerning modernisation of technical equipment of farms is directly related to prediction of changes in the agricultural production structure including limiting the area of arable land and decrease of the number of farms and the increase of average area of a farm [Szeptycki, Wójcicki 2004]. The presented forecasts confirm the changes which have been reported in the European Union countries and the results of the last common agricultural census [Pawlak 2007, 2011, 2012] and regional research [Kapela et al. 2010]. Development farms should have tractors of higher classes of towing power with four-wheel drive and more efficient machines of a new generation. In 2002-2010 a number of tractors in majority of voivodeships increased. As a result, in 2010, there were 7.3% more tractors in the country than in 2002. However, one should notice that in four voivodeships, where the biggest farms are located (inter alia Zachodniopomorskie and Opolskie voivodeship) the decrease in the number of tractors was reported. About half of the total number of the purchased tractors was within the power range from 60 to 100 kW. In a majority of voivodeships this group of tractors had a prevailing share in the purchase structure of the mechanical towing power.

Taking into consideration the predictions and the observed changes in the tractors equipment, the assessment of modernisation projects of farms within this scope was assumed as a purpose of this study.

50 applications filed in one of the branches of The Agency for Restructuring and Modernisation of Agriculture located in Świętokrzyskie voivodeships were analysed. The applications were filed within the operation concerning modernisation of farms. The smallest farm was of 2.5 ha of AL area and the biggest was almost 78.1 ha of AL. Production activity of these farms was varied. Field crops dominated in 16% of farms, milk production in 26% of farms, pigs production in 22% of farms, and the mixed production and other in the remaining 36% of farms. For the analytic purposes, the researched objects were divided into the area groups:

- up to 10 ha of AL – 7 farms (the smallest farms);
- 10.01-20 ha of AL – 20 farms (small farms);
- 20.0130 ha of AL – 6 farms (average farms);
- 30.01-40 ha of AL – 7 farms (average big farms);
- 40.01-50 ha of AL – 5 farms (bigger farms);
- above 50 ha of AL – 5 farms (the biggest farms).

For the distinguished groups, comparative analysis of average accepted indexes and estimated values was carried out.

The fact that from among applications as much as 72% of them were filed by young farmers to 40 years of age should be emphasised. Consequently, 26% of applicants were granted a premium within PROW 2007-2013 [Rural Areas Development Project] within the scope of the operation "Facilitating the start for young farmers". For 96% of applicants, the purpose of operation was to improve the production safety including improvement of work safety. The applicants did not show that inter alia, differentiating agricultural activity was the purpose of modernisation activities. It indicates strong relations with the researched farms' owners with agricultural activity, which they intend to modernise and develop.

Results of the research

Table 1 presents data which describe agricultural production of the researched farms. Average area of the agricultural land (AL) was there 24.81 ha. A high share of arable land, which was 91.2% was very noticeable. Permanent grasslands were 8.4% and orchards and perennial plantations only 0.4%. In case of perennial plantations, the highest acreage was reported in the group of the smallest farms. At the average, it was 0.36 ha, what constituted 4.5% in the structure of the land use. It should be mentioned that farms which had a raspberry plantation of the area of 2.50 ha were included in the area group. Only in case of one farm, this activity constituted the only source of agricultural income. In the remaining farms, the share of orchards and perennial plantations and the value of their production were marginal.

Table 1. Agricultural production characteristics (average value of the area groups)
Tabela 1. Charakterystyka produkcji rolniczej (wartości średnie w grupach obszarowych)

Group	Agricultural land				Livestock [LSU·ha ⁻¹]	Economic size [ESU]
	Total	including:				
		arable land	grasslands	orchards and plantations		
[ha]	[ha]	[ha]	[ha]			
up to 10 ha	8.08	6.78	0.94	0.36	1.45	9.9
10.01-20 ha	14.60	11.90	2.66	0.04	0.88	12.4
20.01-30 ha	23.87	21.32	2.55	-	0.43	12.1
30.01-40 ha	31.96	30.64	1.09	0.23	0.56	19.9
40.01-50 ha	45.16	42.63	2.53	-	0.26	31.8
Above 50 ha	59.87	58.11	1.76	-	0.06	38.0
Average	24.81	22.63	2.08	0.10	0.48	17.6

Source: Author's own research

In the researched farms, the area of arable land increased along with the acreage of arable land. This trend constitutes reflection of the high share of arable land in the structure of using the land. Big and the biggest farms were characterised by the highest share of arable land. In the group of 30.01-40 ha area it was 95.9%, in the group of 40.01-50 ha – 94.4% whereas in the group above 50 ha it was as much as 97.1%. While, the smallest and

small farms were characterised with the lowest share of arable land. In the group of farms of area up to 10 ha it was 83.9% and in the group of 10.01-20 ha – 81.5%

In comparison to bigger and the biggest farms, the smallest and small facilities were characterised by a higher share of permanent grasslands. Higher livestock accompanied a higher share of these lands since in such conditions, cattle was a dominating species of a breeding stock. In the researched farms average livestock was 0.48 LSU·ha⁻¹AL. In the smallest farms of the area of 10 ha it was 1.45 LSU·ha⁻¹AL while in the group of farms of the area of 10.01-20 ha – 0.88 LSU·ha⁻¹AL. The lowest livestock was reported in big and the biggest farms. In the group of farms of the area of 40.01-50 ha it was 0.26 LSU·ha⁻¹AL, and in the group of 50 ha area it was only 0.06 LSU·ha⁻¹AL.

The average economic size of the researched farms was 17.6 ESU. It is noticeable that not in the full scope of the analysed area groups, it showed a rising trend. In the group of farms of the area 10.01-20 ha it was 12.4 ESU while in the group of farms of the area of 20.01-30 ha of 0.3 ESU it was less, i.e. 12.01 ESU. In case of the second group, low livestock (0.43 SD·ha⁻¹AL) and very disadvantageous sowing structure influenced the low index – table 2.

Table 2. Area under crop
Tabela 2. Powierzchnia zasiewów

Group	Crops					Total
	grain	root	fodder	industrial	vegetables	
	[ha]	[ha]	[ha]	[ha]	[ha]	[ha]
up to 10 ha	4.97	0.26	1.22	0.07	0.26	6.78
10.01-20 ha	9.89	0.49	1.14	0.10	0.28	11.90
20.01-30 ha	18.41	0.50	2.05	0.25	0.11	21.32
30.01-40 ha	23.21	0.29	5.61	1.24	0.29	30.64
40.01-50 ha	35.43	0.62	1.41	5.17	-	42.63
Above 50 ha	41.35	0.14	8.76	5.47	2.39	58.11
Average	17.79	0.41	2.67	1.32	0.44	22.63

Source: author's own study

It should be mentioned that in crops of all the analysed farm groups, grains dominated to a great extent. At the average area of 17.79 ha, their share was 78.7%. For fodder crops, the average arable area was 2.67 ha and its share was 11.8%. Whereas for industrial crops, the average arable area was 1.32 ha and its share was 5.8%. The acreage of root crops and vegetables was considerably lower. In case of root crops it was 0.41 ha and in case of vegetables – 0.44 ha which respectively constituted: 1.8% and 1.9%. The most disadvantageous sowing structure was reported in the above-mentioned farm group of 20.01-30 ha area. Grains share in this case was the highest and it was as much as 86.4%. As a result, share of the plant group of a higher productivity, inter alia, root crops, industrial crops and vegetables were low – in total only 4.0%. In the remaining analysed farm groups, a characteristic regularity in the sowing structure is noticeable. In bigger and the biggest farms, a higher share of acreage of industrial crops occurs and also vegetables in the biggest farms. While, in the smallest and smaller farms, the share of acreage of root crops and

vegetables is higher. These plants are characterised by higher productivity which usually translates into increased incomes and enables running the investments in a rational way.

In farms, farm tractors are the basic source of mechanical towing power. Table 3 presents equipment of the researched farms in those technical means (per 1 farm) with specification of basic towing powers.

Table 3. Equipment with farm tractors
Tabela 3. Wyposażenie w ciągniki rolnicze

Group	Towing power class of farm tractors				Total		Average age
	0.6	0.9	1.4	2.0	[item]	[item · 100 ha ⁻¹]	[years]
	[item]						
up to 10 ha	0.29	0.42	0.43	-	1.14	14.1	19.6
10.01-20 ha	0.35	0.70	0.20	0.15	1.40	9.6	19.0
20.01-30 ha	0.17	0.50	0.50	0.17	1.34	5.6	17.4
30.01-40 ha	0.29	0.29	0.85	0.29	1.72	5.4	17.0
40.01-50 ha	0.20	-	1.00	0.40	1.60	3.5	5.5
Above 50 ha	0.80	0.20	0.20	1.00	2.20	3.7	12.5
Average	0.34	0.46	0.44	0.26	1.50	6.0	16.2

Source: author's own study

At the average 1.5 item of a farm tractor was per 1 farm. Per 100 ha of AL it was 6.0 item of tractors and the average age of a tractor was over 16 years. In the group of farms of 10 ha area equipment with farm tractors was at the average 1.14 items. In the groups of 10.01-20 ha and 20.01-30 ha it was comparable and was respectively 1.40 and 1.34 items. A comparable equipment was reported also in groups 30.01-40 ha and 40.01-50 ha where it was respectively 1.72 and 1.60 items. The highest was in the group of the biggest farms, where it was 2.20 items.

When we refer equipment to the area of arable land, we face a reverse trend. The highest equipment was reported in the smallest farms, where 14.1 tractors were per 100 ha of AL. While, in the group of farms of the area of 10.01-20 ha it was 9.6 items. In the groups of 20.01-30 ha and 30.01-40 ha it was comparable and was respectively 5.6 and 5.4 items. Comparable equipment was reported also in bigger and the biggest groups, where it was respectively: group 40.01-50 ha – 3.5 items, while the groups above 50 ha – 3.7 items.

In the researched farms the structure of farm tractors equipment was highly varied. However, along with the increase of arable land acreage, the increase of share of higher classes of towing power is reported. In the group of farms of area up to 10 ha and 10.01-20 ha, tractors of 0.6 and 0.9 class dominated, where their total share was respectively 62.2% and 75.0%. In the group of farms of 20.01-30 ha area and 30.01-40 ha tractors of 0.9 and 1.4 class dominated. In this case, their total share was respectively 74.6% and 66.2%. In bigger farms, tractors of the highest classes dominated i.e. 1.4 and 2.0 where their total share was 87.5%. The biggest farms, where tractors of the lowest and the highest classes of towing power dominated, diverge from this trend. Class 0.6 constituted 36.4% and class 2.0-45.4%. Therefore, in these farms, diverge from universal tractors, which may be used

for wide range of field works, is observed. We see a clear division between tractors of lower power – auxiliary and tractors of higher power – basic.

Table 4. Planned purchase of farm tractors
Tabela 4. Planowane zakupy ciągników rolniczych

Group	Total	including the classes:			The investment value	
		1.4	2.0	3.0 and 5.0.	[thousand PLN]	[thousand PLN·item. ⁻¹]
	[item]	[item]				
up to 10 ha	0.58	0.29	0.29	-	65.56	113.03
10.01-20 ha	0.80	0.10	0.55	0.15	125.60	157.00
20.01-30 ha	0.84	0.17	0.50	0.17	145.99	173.80
30.01-40 ha	0.86	-	0.29	0.57	224.71	261.29
40.01-50 ha	0.60	0.20	0.40	-	120.00	200.00
Above 50 ha	0.20	-	-	0.20	88.00	440.00
Average	0.70	0.12	0.40	0.18	129.19	184.56

Source: author's own study

Using the funds for modernisation of farms, the researched farms increase their equipment with tractors at the average of 0.70 item – table 4. In the structure of this equipment, tractors of class 2.0 of towing power which constitute 57.2% of the total number of the tractors intended for purchase, will dominate. Weaker 1.4 class tractors will constitute 17.1% while tractors of higher classes 3.0 and 5.0 – 25.7%. Average value of the investment will be PLN 129.19 thousand and in reference to 1 item of a tractor – 184.56 thousand PLN·item.⁻¹. It is noticeable that along with the increase of the farm area the towing power class of tractors intended for purchase increases. Therefore, the planned investments in the biggest farms prove further departure from universal tractors. They include only tractors of the highest class of towing power, i.e. 3.0 and 5.0. The increase of 0.20 item was planned and its total value will be PLN 88.00 thousand, i.e. as much as 440.00 thousand PLN·item.⁻¹. It should be mentioned that in this case, purchase of tractors of 150 kW power is planned.

Except for the biggest farms, the increase of equipment with tractors lower than average is planned in the group of bigger farms of the area of 40.01-50 ha and in the smallest farms of 10 ha area. In the first mentioned group it will be 0.60 item, including 33.3% of class 1.4 tractors and the remaining 66.7% of class 2.0 tractors. While, in the smallest farms, the planned increase of equipment will be 0.58 items. However, in this case, the share of towing power class 1.4 and 2.0 will be the same – each 50%. At the similar level of growth, diversity of the equipment structure influences considerable differences of the value of the planned investments. In bigger farms, this value will be PLN 120.00 thousand, i.e. 200.00 thousand PLN·item.⁻¹. While, in smallest farms it will be PLN 65.56 thousand, i.e. 113.03 thousand PLN·item.⁻¹.

In the remaining groups of farms, the planned increase of equipment will exceed average indexes and will be respectively: group 10.01-20 ha - 0.80 item, group 20.01-30 ha – 0.84 item and group 30.01–40 ha – 0.86 item. In the groups of area 10.01-20 ha and 20.01–30 ha purchase of 2.0 class tractors will dominate with the share of respectively: 68.7% and 59.6%. While in the group of the area of 30.01-40 ha purchase of 3.0 and

5.0 class tractors will prevail, and they constitute 66.3% of the investment. Also, in case of these groups of farms at the similar level of growth, diversity of the equipment structure influences considerable differences of the value of the planned investments. In the group of farms of 10.01-20 ha area, they will constitute PLN 125.60 thousand, i.e. 157.00 thousand PLN·item⁻¹. It will be only higher of 18% in the group of farms of 20.01-30 ha area where PLN 145.99 thousand was allotted for the investment i.e. 173.80 thousand PLN·item⁻¹. The highest value of the investment was planned in the group of farms of 30.01-40 ha area. In this case, a total value of the investment will be PLN 224.71 thousand i.e. 261.29 thousand PLN·item⁻¹.

Summary and conclusions

A possibility of obtaining subsidy for purchase of farm tractors in many cases is a basis for planning the investment not always fully economically justified. It concerns mainly the purchase of farm tractors which in the perspective of the next few years will result in the purchase of farm machines which cooperate with those tractors. In the researched farms, an average increase in tractors equipment of 0.7 item is planned at the already existing equipment of 1.5 item. Therefore, in reference to the used area, the index of equipment will rise from 6.0 items – 100 ha⁻¹ AL to 8.8 item·100 ha⁻¹ AL. That is why, in an average farm the value of the planned investment will be PLN 129.19 thousand i.e. 5.20 thousand PLN·ha⁻¹ AL. In the group of bigger and the biggest farms it will be respectively: group 40.01-50 ha – 2.66 thousand PLN·ha⁻¹ AL, and the group above 50 ha – 1.47 thousand PLN·ha⁻¹ AL. While, in the smaller and the smallest farms group it was respectively: group up to 10 ha – PLN 8.11 thousand PLN·ha⁻¹ AL, and the group above 10.01–20 ha – PLN 8.60 thousand PLN·ha⁻¹ AL. In the group of average farms, these indexes will be slightly lower and will be: group 20.01–30 ha – 6.11 thousand PLN·ha⁻¹ of AL, and the group above 30.01–40 ha – 7.03 thousand PLN·ha⁻¹ AL. At such low livestock and high share of grains in the structure of sowing of average farms, such a high level of investment cannot be fully justified. Especially because the investments concern tractors of a higher class of towing power for which the work front is limited. Therefore, in these farms, changes leading mainly to the increase of the acreage of the usable land and changes concerning the structure of agricultural production, including animal production are necessary. Increase of the share of branches which are characterised by higher productivity and higher incomes, including mainly share of industrial and leguminous plants intended for seeds is necessary.

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PLANY MODERNIZACJI WYPOSAŻENIA W CIĄGNIKI ROLNICZE WYBRANYCH GOSPODARSTW ROLNICZYCH

Streszczenie. Zakresem analizy objęto 50 wniosków złożonych do ARiMR w ramach działania modernizacja gospodarstw rolnych. Dla 96% wnioskodawców celem działania była poprawa bezpieczeństwa produkcji, w tym także poprawa bezpieczeństwa pracy. Dlatego dominującym celem inwestycji modernizacyjnych był zakup ciągników rolniczych. W badanych gospodarstwach planowany jest średni wzrost wyposażenia w ciągniki rolnicze o 0,7 szt., przy posiadanym już w gospodarstwach wyposażeniu wynoszącym średnio 1,5 szt. W odniesieniu do powierzchni UR, wskaźnik wyposażenia wzrósł z 6,0 szt.·100 ha⁻¹ UR do 8,8 szt.·100 ha⁻¹ UR. Przy niskiej obsadzie inwentarza żywego i wysokim udziale zbóż w strukturze zasiewów gospodarstw średnich, tak wysoki poziom inwestycji nie może być uznany za w pełni uzasadniony. Szczególnie, że inwestycje dotyczą także ciągników wyższych klas uciążu, dla których front pracy jest ograniczony.

Słowa kluczowe: gospodarstwo rolne, ciągnik rolniczy, modernizacja, inwestycje

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