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Evaluation of productivity of fodder area in chosen dairy farms in Lublin voivodeship

Analiza produkcyjności powierzchni paszowej gospodarstw specjalizujących się w chowie bydła mlecznego w województwie lubelskim

Summary. The evaluation of productivity of fodder area in dairy farms localized in three regions differentiated by habitat conditions in Lublin voivodeship is presented in the paper. The method which was used during the research was a survey and the basic instrument was a questionnaire. The study was conducted in 145 farms. The productivity level of fodder area types, expressed by chosen indexes was regionally differentiated and dependent on the number of cows in a herd. Less productivity of the natural fodder area was achieved by farms in which grasslands area per 1 livestock unit was the biggest. The productivity of the basic forage area, measured in kg of protein, was mostly influenced by: cereal yields, grasslands area per 1 LU, their share in the agricultural acreage, the share of feed in a special area of arable land and their share in forage area in the agricultural acreage. Its level, however, expressed in MJ of energy was mainly affected by the area of farmland, the share of maize in the crop structure and the size of the non-economic forage area. The productivity of the forage area, expressed in units of cereal was mostly affected by the area linkage per 1 LU of their proportion in the agricultural acreage, grain yields, the share of feed in a special area of arable land and their share in the forage area in the agricultural acreage.

Key words: productivity of fodder area, dairy cattle breeding, region, Lubelskie voivodeship, habitat conditions

INTRODUCTION

Productivity of forage area, expressed by the size of crop production per unit of forage area is one of the basic measures indicating the effectiveness of land use on the farm activities. According to Jerzak [1974], feed production is not the final result of the farm. It is advisable to determine the productivity of forage area by an indirect method from

the results obtained in animal production. This assessment, however, involves some risk because the results of animal production depend not only on feed economy and the level of nutrition, but also on many environmental factors. Productivity of forage area depends on the selection of forage species with a specific crop yielding potential [Zuba 1990]. This has an impact on animal performance and the size of the forage area, and thus its productivity. However, growing opportunities for particular groups and species of plants and their productivity are determined by the quality of agricultural habitat in the region and the disposable resources of the earth. The realities of market economy enforce measures to ensure high production efficiency. In the case of farm-oriented livestock production, its final success is determined by the rational use of cheap feed in animal nutrition, so for example cattle breeding is based primarily on the cheapest pasture-meadow feed [Marks *et al.* 2001].

Lublin voivodeship is not a homogeneous area. There is a considerable variation in habitat conditions and organizational-economic farming on its territory. The differences include, among others, the structure of agricultural land, which is derived from the diversity of natural conditions. Grasslands represent 19% (national average 21.8%) and arable land 78.8% of the structure of UR [GUS 2008].

Lubelskie voivodeship is in the fourth place in Poland in terms of total grasslands area (277.963 ha) [GUS 2009], after the Mazowieckie, Warmia-Mazury and Podlasie, but due to their share in agricultural land, it occupies only 11th place (17.6%) [Harkot and Lipińska 2008, GUS 2009].

Opportunities to improve agricultural production potential of the Lublin region by obtaining higher yields are also limited due to the concentration of macronutrients in the soils and its pH [Igras and Lipiński 2006]. The percentage of soils with very acidic and sour pH in the region averaged 53% and was highest in its northern part. The percentage of the soils with a low and very low abundance of phosphorus and potassium shows a similar differentiation. The areas included in the Lubelskie are differentiated of all the environmental factors such as soil, agroclimate, and terrain and water conditions. The highest overall indicator of the quality of agricultural production area among the studied regions was found in the area of Krasnystaw (81.9 points) [GUS 2009]. However, in the Ryki and Radzyń Podlaski regions this indicator is at a considerably lower level than the average for the province. Lower index values are mainly the result of a low quality and relevance of agricultural soils of these areas.

Milk production in Poland is significant for economy. Therefore, there is a need for an effective organization of the production of feed for dairy cattle in terms of volume and productivity of the land designated for this production. It is a very diverse and complex problem, but at the same time important and one which continues to be valid. The location of the studied groups of farms in three different areas of the region gives grounds to the conclusions on the influence of diversification of conditions on the productivity of forage area. Presented characteristics gives the background for the analysis of the surveyed households specializing in the production of milk. These households are representative only for a selected group of commercial farms of Lublin.

The aim of this study was to evaluate the productivity of forage area in the selected farms specializing in dairy cattle in three regions of Lubelskie voivodeship differentiated of habitat conditions.

MATERIAL AND METHODS

The study was conducted on 145 farms specializing in dairy cattle in the Lubelskie voivodeship in three regions (Ryki, Krasnystaw, Radzyń Podlaski) with different habitat, economic and organizational conditions. The research covered the period of calendar year 2006. Selection of farms to study was based on a sample target. Selection criterion was the location in the Lublin region, and their specialization in production, determined on the basis of the share of gross final production of milk in the value of final gross production of the whole farm. Milk production on the evaluated farms constituted over 60% of the whole final production. The research material was gathered by carrying out interviews with the owners of dairy farms on the basis of a prepared questionnaire. For analytical purposes, farms in each of the regions were divided into four groups differing in the scale of farming cows: 1–020, 21–30, 31–40, more than 40 items. Forage area was calculated according to the methodology proposed by Jerzak [1969] (Fig. 1).

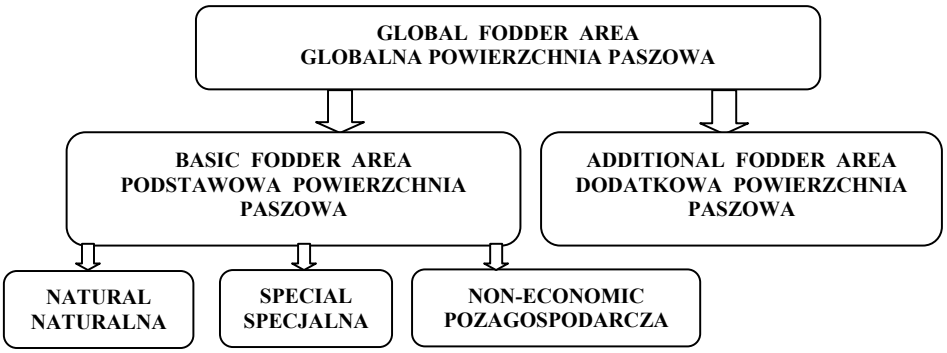

Fig. 1. The structure of global fodder area [Jerzak 1969]
Ryc. 1. Struktura globalnej powierzchni paszowej [Jerzak 1969]

Productivity of forage area was represented by a number of basic nutrients (protein and energy) from 1 ha of grain and in cereal units from 1 ha of forage area. The contents of net energy and protein in the feed produced on the farm and in the purchased feed was based on tables of feed values included in the Standards for feeding cattle, sheep and goats [Normy… 2001]. The calculations of the applied feed into cereal units, which constitute a bio-technological measure used to expressing the value of different agricultural products were made using the conversion factors.

Indicator of productivity of forage area was determined by following the formula:

$$\mathbf{PPP = OR/PP}$$

where:

PPP – indicator of productivity of forage area, expressed in protein, energy or cereal units per 1 ha of forage area,
OR – total selected components (protein, energy or cereal units derived from a specific area of the feed at the farm (kg, MJ, j. zb.);
PP – size of a selected feed area on the farm (ha).

This index inform the content of protein, energy or cereal units from plant production of forage area.

Using the correlation analysis, statistical correlates between forage area productivity and the level of individual explanatory variables were investigated. In correlation analysis, agreed on terms of force of interdependence were used on the basis of IRI, using evaluative concepts such as: dependency: weak, moderate, strong (big, powerful), very strong (very powerful) [Filipiak and Wilkos 1998].

RESULTS AND DISCUSSION

The researched farms, in comparison to the national average, were characterized a ignificantly larger area of agricultural acreage. The average farm size was from 36.5 ha in the Ryki area to 43.6 ha in the region of Krasnystaw (Tab. 1). In the analyzed farms due to the direction of the production, grasslands had a significant share in the structure of agricultural acreage (Tab. 1). Its share in the structure of the surveyed farms in the UAA of Radzyń Podlaski area was 45.6%, which is associated with its lower soil quality (Tab. 1). This dependence is confirmed by Gajda and Zawiślak [1988]. However, in a study conducted by Jankowski and Jodełka [1995] in Siedlce, no correlation between the above parameters was found [Jankowski and Jodełka 1995]. The smallest share of permanent pasture was found on the farms of Krasnystaw area (15.8%), forcing the farmers to the production of roughage on arable land. A high share of permanent grassland in the forage area shows that they play a significant role in animal production [Gajda 1987].

Table 1. The characteristic of researched farms according to regions
Tabela 1. Charakterystyka badanych gospodarstw w poszczególnych regionach

Specification Wyszczególnienie	Region – Rejon		
	Ryki	Krasnystaw	Radzyń Podlaski
Number of farms – Liczba gospodarstw	37	59	49
Farm's area (ha) – Powierzchnia gospodarstwa (ha)	36.5	43.6	41.6
Agriculture acreage (ha) – Powierzchnia UR (ha)	31.2	40.4	40.0
Grasslands area (ha) – Powierzchnia TUZ (ha)	10.7	6.4	18.2
Arable land area (ha) – Powierzchnia GO (ha)	20.4	33.9	21.7
Share of grasslands in agriculture acreage (%) Udział trwałych użytków zielonych w strukturze UR %)	34.3	15.8	45.6
Share of arable land in agriculture acreage (%) Udział gruntów ornych w strukturze UR (%)	65.4	83.9	54.2
Share of soil (%) – Udział gleb (%)			
very good and good – bardzo dobre i dobre	0	22	0
mean – średnie	83	78	42
weak – słabe	17	0	58

On the analyzed farms, crop production was subordinated to livestock production. In all areas, grain occupied a significant share of production. Its largest share was found in the area of Krasnystaw (71.4%). This is mainly the result of the soil-climatic conditions of this region (Tab. 1). In the area of Ryki, the share of cereals in crop structure was by 50% lower than on the farms in Krasnystaw area. Maize grown for silage constituted a significant share of the crop structure on the surveyed farms. The largest share of this species was found on the farms in the region of Ryki (46.3%), while the smallest on the farms in the area of Krasnystaw (18.9%). There was also a positive correlation between the share of fodder crop structure and the stock of cattle. A similar relation was observed in the study by Rudnicki *et al.* [2008].

On researched farms, fodder area productivity was expressed, among others yields of fodder crops in dt per ha. The important fodder source were grasslands, from raw material were used as for hey production as direction feed on pasture. The highest yields of hey and green matter from pasture were obtained in farms in Radzyń Podlaski region (Tab. 2). The yield level as hey, as green forage was differentiated in individual farms in this region. The highest yields were achieved by farms raising the bigger herd of cows (more than 40 items). The lowest productivity of pasture and the lowest yields of hey were observed on the smallest farms, raising from 21 to 30 cows in herd (relatively: 302.5 dt/ha and 46.6 dt/ha). Variation coefficient for this characteristic equaled over than 40%. In regional point, the lowest yields of hay and green forage were obtained on farms in Ryki region (relatively: 48 i 320 dt/ha). It is caused by extensively production on grasslands. The study about the differentiation of grasslands productivity showed that relatively the favorable soil conditions in Krasnystaw region did not express grasslands yielding. The higher fodder area productivity was in farms in Radzyń Podlaski region.

Yields of fodder crop species don't showed the degree of utilization production potential of fodder area. The wider results are obtained by estimation of productivity expressed by number of basic nutrients. Calculation of direct elementary efficiency on basic nutrients as protein, energy allowed to estimation of productivity from fodder area [Kania and Zając 1989, Zuba 1990].

The level of productivity of individual type of fodder area expressed by productivity indexes was differentiated as regional as a number of cows in herd. The highest level of natural fodder area productivity expressed by protein was in farms in Ryki region raising the bigger herds of cow (from 31 to 40 and over than 40 items) (at about 223 kg of protein) and in the smaller farms (from 10 to 20 and from 21 to 30 items) in Krasnystaw region (228 kg of protein). Definitely less productivity of this fodder were characterized the farms in Radzyń Podlaski region, especially those with bigger scale of cattle breeding (raising over than 40 cows). In those farms, the productivity surpassed the level of 140 kg of protein (Tab. 3). The lowest natural fodder area productivity were obtained by farms characterized the biggest grasslands area per one livestock unit. Farms in Radzyń Podlaski region, in which number of cows in herd surpassed 40 units and the grasslands area per one livestock unit were obtained about 144 kg of protein and 6240 MJ of energy from natural fodder area. The higher productivity of natural fodder area expressed by MJ of energy was on farms in Ryki region raising from 21 to 30 cows in her (approximately 22300 MJ) and the least one in Krasnystaw region in farms with 31–40 cows in herd (approximately 6500 MJ).

Table 2. The yields of hey and green mass in dependence on region and number cows in herd (dt per ha)
Tabela 2. Plony siana i zielonej masy w zależności od rejonu i liczby krów w stadzie (dt/ha)

Region Rejon	Number of cows in herd (units) Liczba krów w stadzie (szt.)	Statistical characteristic Charakterystyki statystyczne	Hey (dt per ha) Siano z łąk trwałych (dt/ha)	Green mass (dt per ha) Zielona masa z pastwisk naturalnych (dt/ha)
1	2	3	4	5
Ryki	10–20	mean – średnia	43.2	317.7
		variation coefficient (%) współczynnik zmienności (%)	6.0	45.0
	21–30	mean – średnia	49.6	326.0
		variation coefficient (%) współczynnik zmienności (%)	8.0	15.0
	31–40	mean – średnia	34.7	321.7
		variation coefficient (%) współczynnik zmienności (%)	87.0	67.0
	over – ponad 40	mean – średnia	49.0	316.7
		variation coefficient (%) współczynnik zmienności (%)	9.0	87.0
Krasnystaw	10–20	mean – średnia	52.2	348.9
		variation coefficient (%) współczynnik zmienności (%)	42.0	77.0
	21–30	mean – średnia	42.5	387.0
		variation coefficient (%) współczynnik zmienności (%)	47.0	89.0
	31–40	mean – średnia	32.5	396.2
		variation coefficient (%) współczynnik zmienności (%)	7.0	3.0
	over – ponad 40	mean – średnia	50.5	408.3
		variation coefficient (%) współczynnik zmienności (%)	4.0	3.0
Radzyń Podlaski	10–20	mean – średnia	46.8	332.2
		variation coefficient (%) – współczynnik zmienności (%)	9.0	15.0
	21–30	mean – średnia	46.6	302.5
		variation coefficient (%) współczynnik zmienności (%)	0.1	6.0
	31–40	mean – średnia	50.2	319.4
		variation coefficient (%) współczynnik zmienności (%)	4.0	9.0
	over – ponad 40	mean – średnia	50.5	337.0
		variation coefficient (%) współczynnik zmienności (%)	7.0	14.0

The highest productivity of special fodder area expressed by kg of protein was in farms in Ryki and Krasnystaw region raising from 31 to 40 and over 430 cows in herd. The most favorable level of special fodder productivity expressed by MJ of energy was

in farms in Ryki and Krasnystaw region. It is caused by high share of maize in cropping pattern in those farms. Maize is the main source of energy of bulky feed. The level of maize cropping area per one livestock units amount 0.19–0.27 hectare. Productivity of fodder area was higher by about 30% relatively to farms in Radzyń Podlaski region. In farms characterized the higher fodder area productivity, on every kilogram of protein was about 109 MJ of energy. According to norm of nutrient of animals relative protein to energy for dairy cows must be 90 MJ per 1 kg of protein.

Differences of productivity fodder area, especially special fodder area were occupied between farms. In smaller farms, productivity level was less by about 60% than in farms raising over 40 cows. Achieved results showed on better fodder area utilization in farms with bigger herd of cows. The estimation of fodder area productivity in researched farms in all regions showed that feed from natural fodder area characterized the low amount of nutrient, especially the protein. The basic fodder area productivity expressed by those indexes in farms in Lubelskie voivodeship in researched period was differentiated in individual regions. The farms owned better soil quality were characterized of the higher level of special and non-economic fodder area expressed by cereal units (Krasnystaw region – relatively: 51.7 and 45.2 cereal units per ha).

Natural fodder productivity obtained in farms in Ryki and Krasnystaw region was on the similar level (34.5 cereal units per ha) and was higher by about 41% in comparison to farms in Radzyń Podlaski region. The achieved results connected to fodder area productivity allowed to conclusion that farms in Radzyń region, which owned worse quality of soil had significantly less productivity of all type of fodder area.

The importance share of protein and energy (approximately 45 and 55%) showed on the importance of special fodder area in researched farms (Tab. 4). Special fodder area gave the highest amount of protein for fodder balance in Ryki region (46.9%). The second important source of protein was non-economic fodder area, which were produced 30.7 % of protein and 28.7% of energy. The highest amount of protein (36.6%) and energy (35.4%) was obtained form non-economic fodder area in Krasnystaw region, especially in farm raising small herd of cows. Feed produced on grasslands characterized less content of nutrient. It cause that the percentage of protein and energy from those feed was less.

Statistic analyzes showed that the strongest influence on productivity of basic fodder area expressed in protein kg had: grasslands area (-0.62), cereal yields (0.62), grasslands area per one livestock unit (0.64), share of grasslands area in agriculture acreage (-0.60), share of special fodder area in arable land (0.64) and share of own fodder area in agriculture acreage (-0.65) (Tab. 5). It means that increasing of grasslands area, its share in structure of agriculture acreage and grasslands area per one livestock unit caused decreasing of fodder area productivity expressed by protein. The similar correlations were observed in researches other authors [Kania and Zając 1989]. Yield of cereals and share of special fodder area in arable land area caused increasing of fodder area productivity level. The strongest influence on fodder area productivity expressed by MJ energy had mainly: agriculture acreage (-0.50), share of maize in cropping pattern (0.49) and non-economic fodder area (0.48). Maize, which is crop of main source of energy in feed was the basic factor improved the productivity measured by MJ of energy. Farms owned the bigger area of maize cropping (Ryki and Radzyń Podlaski regions) characterized the better results of fodder area productivity. The similar results of researches conducted in regions of Lubelszczyzna and Bieszczady were obtained by Zuba [2009].

Table 3. The productivity of basic fodder area depend on region and number of cows in herd (in kg of protein per ha, MJ per ha and cereal units per ha)
Tabela 3. Produkcyjność rodzajów podstawowej powierzchni paszowej badanych gospodarstw w zależności od rejonu oraz liczby utrzymywanych krów w stadzie (w kg białka/ha, MJ/ha oraz j. zb.)

The type of fodder area Rodzaj powierzchni paszowej	Unit sof measure Jednostki miary	Region – Rejon											
		Ryki				Krasnystaw				Radzyń Podlaski			
		cattle stock – skala chowu				cattle stock – skala chowu				cattle stock – skala chowu			
		10–20	21–30	31–40	pow. 40	10–20	21–30	31–40	pow. 40	10–20	21–30	31–40	pow. 40
Natural – Naturalna	protein kg kg białka	183.0	208.6	223.2	222.4	226.1	230.6	181.2	202.5	185.9	186.8	191.2	143.7
Mean for region Średnia dla rejonu		209.3				210.1				176.9			
Special – Specjalna		344.0	371.6	488.4	588.1	436.3	413.1	487.3	581.7	305.3	329.6	340.9	384.1
Mean for region Średnia dla rejonu		448.0				479.6				339.9			
Non-economic Pozagospodarcza		226.7	302.2	308.1	318.3	352.9	341.9	364.7	361.6	235.8	242.1	255.4	254.7
Mean for region Średnia dla rejonu		288.8				355.3				247.0			
Natural – Naturalna	MJ per ha MJ/ha	9433.1	22331.9	13134.8	10299.9	11795.8	12545.3	3250.0	10170.7	17478.1	9746.5	9556.0	6239.4
Mean for region Średnia dla rejonu		13780.0				9440.3				10755.0			
Special – Specjalna		39675.8	43524.3	51189.3	61958.8	39127.0	41545.4	52829.4	63970.9	33115.1	38341.8	39494.8	49115.4
Mean for region Średnia dla rejonu		49087.1				49368.2				40016.8			
Non-economic Pozagospodarcza		20300.0	25062.4	27596.8	28512.0	31609.6	30624.0	32736.0	32384.0	21964.8	21683.2	21472.0	22809.6
Mean for region Średnia dla rejonu		25367.8				31838.4				21982.4			
Natural – Naturalna	cereal units per ha j. zb./ha	34.2	41.1	35.4	30.3	34.7	35.5	34.2	32.1	26.8	20.9	22.0	28.0
Mean for region Średnia dla rejonu		35.2				34.1				24.4			
Special – Specjalna		40.0	43.5	3.6	56.0	48.0	45.8	53.9	59.2	36.5	38.3	39.6	42.8
Mean for region Średnia dla rejonu		45.8				51.7				39.3			
Non-economic Pozagospodarcza		28.8	35.6	39.2	40.5	44.9	43.5	46.4	46.0	31.2	30.8	32.5	32.4
Mean for region Średnia dla rejonu		36.0				45.2				31.6			

Table 4. The share of fodder area type in production of structure of nutrient resources for cattle in researched farms (%)
Tabela 4. Udział rodzajów powierzchni paszowej w produkcji składników pokarmowych dla bydła w badanych gospodarstwach według regionów (w %)

Region Rejon	Number cows in herd Liczba krów w stadzie	Structure of fodder source (%) – Struktura pochodzenia pasz (%)								
		Fodder area – Powierzchnia paszowa								
		natural naturalna	special specjalna	non-economic pozagospodarcza	natura naturalna	special specjalna	non-economic pozago-podarcza	natura naturalna	special specjalna	non-economic pozagospodarcza
		% protein białko, %			% energy energia, %			% cereal units jednostki zbożowe, %		
1	2	3	4	5	6	7	8	9	10	11
Ryki	10–20	24.3	45.6	30.1	13.6	57.2	29.2	33.2	38.8	28,0
	21–30	23.6	42.1	34.3	24.6	47.9	27.5	34.2	36.2	29,6
	31–40	21.9	47.9	30.2	14.3	55.7	30.0	29.9	36.9	33,2
	over 40 ponad 40	19.7	52.1	28.2	10.2	61.5	28.3	23.9	44.2	31,9
Mean for region Średnia dla rejonu		22.4	46.9	30.7	15.7	55.6	28.7	30.3	39.0	30.7
Krasnystaw	10–20	22.3	43.0	44.7	14.3	47.4	38.3	27.2	37.6	35,2
	21–30	23.4	41.9	34.7	14.8	49.0	36.2	28.4	36.7	34,9
	31–40	17.5	47.2	35.3	3.7	59.5	36.8	25.4	40.1	34,5
	over 40 ponad 40	17.7	50.8	31.5	9.5	60.1	30.4	23.4	43.1	33,5
Mean for region Średnia dla rejonu		20.2	45.7	36.6	10.6	54.0	35.4	26.1	39.4	34.5
Radzyń Podlaski	10–20	25.6	42	32.4	24.1	45.6	30.3	28.4	38.6	33
	21–30	24.6	43.5	31.9	14	55	31	23.2	42.6	34,2
	31–40	24.3	43.3	32.4	13.6	56	30.4	24.4	42.1	34,5
	over 40 ponad 40	18.4	49.1	32.5	8	62.8	29.2	27.1	41.5	31,4
Mean for region Średnia dla rejonu		23.2	44.5	32.3	14.9	54.8	30.2	25.8	41.2	33.3

Productivity of basic fodder area expressed by cereal units was significantly depend on grasslands area (-0.48), its area per livestock unit (-0.62), share of grasslands in agriculture acreage (-0.55), cereal yields (0.69), the share of special fodder area in arable land (0.49), the share of own fodder area in agriculture acreage (-0.56).

It means that less grasslands area in farms caused the higher of fodder area productivity expressed by cereal units. Increasing of cereal yields caused the increasing of fodder area productivity. The positively correlation on fodder area productivity but less significant exerted the influence of soil quality. Correlation showed on favorable utilization of natural potential of agricultural habitation.

Table 5. Correlation coefficient (r) between chosen variable characterized the organizational and natural conditions and the fodder area productivity expressed by kg protein, MJ energy and cereal units
Tabela 5. Współczynniki korelacji (r) między wybranymi zmiennymi charakteryzującymi warunki organizacyjne i przyrodnicze a produkcyjnością powierzchni paszowej wyrażoną w kg białka, MJ energii, j. zb.

x_i	Chosen variable Zmienne objaśniające	Fodder area productivity expressed in: Produkcyjność podstawowej powierzchni paszowej wyrażona w:		
		protein kg kg białka	energy MJ MJ energii	cereal unit j. zb.
x_1	Agriculture acreage (ha) – Powierzchnia UR (ha)	-0.30	-0.50*	-0.18
x_2	Arable land area (ha) – Powierzchnia GO (ha)	-0.03	-0.37	0.06
x_3	Grasslands area (ha) – Powierzchnia TUZ (ha)	-0.62*	-0.31*	-0.48*
x_4	Share of good and very good soil (%) Udział gleb bardzo dobrych i dobrych (%)	0.31*	0.30*	0.35*
x_5	Share of cereals in cropping pattern (%) Udział zbóż w strukturze zasiewów (%)	0.05	-0.02	0.04
x_6	Share of fodder plants in cropping pattern (%) Udział roślin pastewnych w strukturze zasiewów (%)	-0.26	0.25	-0.19
x_7	Share of maize in cropping area (%) Udział kukurydzy w strukturze zasiewów (%)	-0.36*	0.49*	-0.29*
x_8	Cereals yield in dt per ha – Plony zbóż w dt/ha	0.62*	-0.12	0.69*
x_9	Grasslands area per 1 livestock unit (LU) Powierzchnia TUZ na 1 SD	0.64*	-0.08	-0.62*
x_{10}	Share of special fodder area in arable land (%) Udział specjalnej powierzchni paszowej w GO (%)	-0.54*	0.18	0.49*
x_{11}	Non-economic fodder area (ha) Pozagospodarcza powierzchnia paszowa (ha)	-0.11	0.48*	-0.37*
x_{12}	Share of non-economic fodder area in basic fodder area (%) Udział pozagospodarczej pow. paszowej w podstawowej pp (%)	0.01	0.38*	-0.26*
x_{13}	Share of additional fodder area in global fodder area (%) Udział dodatkowej powierzchni paszowej w globalnej pow. pasz. (%)	0.28*	0.02	0.28*
x_{14}	Basic fodder area per 1 livestock unit (LU) Podstawowa powierzchnia paszowa na 1 SD	-0.23	-0.22	-0.54*
x_{15}	Share own-farm fodder area in agriculture acreage (%) Udział własnej powierzchni paszowej w pow. UR (%)	-0.65*	-0.32*	-0.56*
x_{16}	Cattle density in livestock unit (LU) per 100 ha agriculture acreage Obsada bydła w SD na 100 ha UR	-0.40*	-0.44*	-0.44*
x_{17}	Milk production per 1 ha agriculture acreage (thousand liters) Produkcja mleka na 1 ha UR (tys. l)	-0.07	-0.06	-0.31*
x_{18}	Milk production per 1 ha agriculture acreage (thousands zloty) Produkcja mleka na 1 ha UR (tys. zł)	-0.09	-0.04	-0.29*
x_{19}	Milk production per 1 ha basic fodder area (thousand liters) Produkcja mleka na 1 ha podstawowej pow. pasz. (tys. l)	0.22	0.12	0.01
x_{20}	Intensivity of animal production (points) Intensywność produkcji zwierzęcej (pkt)	-0.06	-0.01	0.07
x_{21}	Milk yield (liter/year) – Wydajność mleczna (l/rok)	0.13	0.00	-0.03
x_{22}	Mean price (zloty/liter) – Średnia cena (zł/litr)	-0.21	0.22	-0.47*
x_{23}	The share of grasslands area in agriculture acreage (%) The share of grasslands area in agriculture acreage (%)	-0.60*	0.01	-0.55*

CONCLUSIONS

1. The level of productivity of different types of forage area, expressed by indicators of productivity varied regionally, as well as due to the scale of breeding cows. The highest level of productivity of natural forage area, expressed in kg of protein was observed on the farms in the area of Ryki breeding larger herds of cattle, and also on smaller farms in the area Krasnystaw. The lowest productivity of natural fodder area was found on the farms in which the largest area of grassland per 1 LU of cattle was recorded.

2. The productivity of basic forage area, measured in kg of protein, was mostly influenced by: cereal yields, grasslands area per 1 LU, their share in the agricultural acreage, the share of feed in a special area of arable land and their share in forage area in the agricultural acreage. Its level, however, expressed in MJ of energy was mainly affected by: the surface of farmland, the share of maize in the crop structure and the size of non-economic forage area. The productivity of forage area, expressed in units of cereal was mostly affected by: the surface linkage per 1 LU of their participation in the agricultural acreage, grain yields, the share of feed in a special area of arable land and their share in forage area in the agricultural acreage.

3. A variety of factors determining the productivity of forage area, confirmed by statistical analysis, indicate the necessity of adjusting the organization of farm activities to local environmental conditions.

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Streszczenie. W pracy przedstawiono ocenę produkcyjności powierzchni paszowej w 145 gospodarstwach mlecznych w trzech rejonach województwa lubelskiego o zróżnicowanych warunkach siedliskowych. Metodą, którą się posłużono, były badania ankietowe, a podstawowym narzędziem kwestionariusz wywiadu. Poziom produkcyjności poszczególnych rodzajów powierzchni paszowej, wyrażony przy pomocy wskaźników produkcyjności, był zróżnicowany regionalnie oraz skalą chowu krów. Najmniejszą produkcyjność naturalnej powierzchni paszowej uzyskiwały gospodarstwa, w których zanotowano największą powierzchnię trwałych użytków zielonych przypadającą na 1 SD. Na produkcyjność podstawowej powierzchni paszowej, mierzonej w kg białka, najsilniej wpływały: powierzchnia TUZ, plony zbóż, powierzchnia TUZ przypadająca na 1 SD, ich udział w strukturze użytków rolnych, udział specjalnej powierzchni paszowej w powierzchni gruntów ornych. Natomiast na jej poziom wyrażony w MJ energii oddziaływały przede wszystkim: powierzchnia UR, udział kukurydzy w strukturze zasiewów oraz wielkość pozagospodarczej powierzchni paszowej.

Słowa kluczowe: produkcyjność powierzchni paszowej, chów bydła mlecznego, region, warunki siedliskowe