

Land as a Primary Factor in Determining the Value of Agricultural output in the Farms of Middle Pomerania

Danuta Zawadzka, Agnieszka Strzelecka*

Abstract: The primary objective of the study is to determine the significance of land for agricultural output value generated by the farms of Middle Pomerania. Empirical verification of the factors determining the value of agricultural output in the region of Middle Pomerania was conducted using logistic regression model. The study used data on 933 farms. It was found that four independent variables had a statistically significant positive impact on the phenomenon: the number of employees on farms, agricultural area, specialization in animal production and the amount of the production volume which was intended for official sale. In contrast, specialization in the production of crops had a statistically significant negative effect on the analyzed probability. Furthermore, it has been shown that a model containing only the variable of agricultural land used in the production process was characterized by the values of statistics (LR, AIC, AUC, McFadden's R^2) which indicate a better fit to the observed data than the model containing only the other variables included in the analysis. This demonstrates the importance of land in the process of creating the value of agricultural output on farms. The best model was obtained when all the (statistically significant) variables that have been adopted for the study were taken into account.

Keywords: value of agricultural output, production factors, farms, Middle Pomerania Region, logistic regression

Introduction

Land, next to labor and capital, is one of the basic factors of agricultural production. It is characterized by scarcity and immobility. Its stores in Poland amount to 31,268 thousand. ha and farmland constitutes 60.35% of its surface (as of 1 January 2011, *Rocznik statystyczny...* 2012: 73). Of the 2,277,613 farms, the highest percentage (31.4%) are the entities with the agricultural area of 0–1 hectares, followed by: 15.4% – farms with an area of 5–10 hectares and 15.0% – farms with an area of 1–2 hectares (data from the Agricultural Census 2010, *Rocznik statystyczny...* 2012: 97). These characteristics confirm the fragmentation of agriculture in Poland in terms of area. This undoubtedly has an impact on the value of agricultural output produced by farms in the country. The literature examines the value of agricultural output

* dr hab. Danuta Zawadzka prof. PK, Koszalin University of Technology, The Economic Science Faculty, ul. Kwiatkowskiego 6e, 75-343 Koszalin, danuta.zawadzka@tu.koszalin.pl; mgr Agnieszka Strzelecka, Koszalin University of Technology, The Economic Science Faculty, ul. Kwiatkowskiego 6e, 75-343 Koszalin, e-mail: agnieszka.strzelecka@tu.koszalin.pl.

in the light of its profitability for the farm. Its value is dependent on a number of factors: the size of the resources held by the farm, rational and efficient use of resources, the structure of sales prices, the prices of elements of production, the climate, and the macro-economic policy of the government (Myszczyzyn 2001: 319). In previous studies, based on the results of Polish FADN data analyzes, we concluded that the scale of production is a factor in determining the profitability of individual farms in Poland. Horticulture and granivorous livestock breeding are characterized by the highest value of production and the scale of the surplus. Farms specializing in permanent crops have relatively high economic efficiency. The lowest efficiency characterizes mixed farm with a multi-output structure (Szafraniec-Siluta, Zawadzka, Strzelecka 2011: 379–383). The purpose of this study is to determine the significance of land for agricultural output in the context of creating its value by agricultural holdings of Middle Pomerania. Therefore, we look at the problem of agricultural output from a different perspective – from the point of view of the production factors, with particular reference to the importance of land. We will try to answer the question of whether land is a determinant of the value of output produced by the farms of Middle Pomerania.

The problem of land use in order to increase agricultural production has not only a microeconomic dimension, in terms of creating income from the farm, but also regional and global aspect – in respect of, among others, security and food self-sufficiency. Currently, there is a trend of converting agricultural land into plots for buildings and for creation of urban infrastructure. The potential of returning to the original land use is thus inevitably lost. In the era of developing economies, due to the lack of sustainability of such a basic factor in agricultural production that is land – the question of its development is becoming not only a regional but also a global problem (Erickson, Lovell, Mendez 2013: 29–39).

1. Data sources and research methods

The study was conducted within the framework of the project funded by the National Science Centre. The project was entitled *Growth and allocation of financial and tangible assets of Middle Pomerania farmers (agricultural enterprises and households)* (contract No. 3577/B/H03/2011/40).

The target population were farms in the region of Middle Pomerania. The area of the Middle Pomerania region is not recognized for the purposes of classification in the context of public statistics and covers the area of the former province of Koszalin and Słupsk provinces (Zawadzka 2008: 247–248). According to the methodology of the Central Statistical Office, are located on the territory of the Koszalin subregion and the Słupsk subregion. Data for the analyzes by region was obtained in the course of the research conducted using direct survey techniques (1004 farms in the region of Middle Pomerania). The research was conducted in the months of May–June 2012. 933 correctly completed questionnaires were obtained (amount of surveys returned: 92.93%). Respondents were asked to provide

information for the year 2011; in some select questions the time range covered the years 2004 to 2011.

It was assumed that the empirical verification of factors determining the value of agricultural output in the region of Middle Pomerania will be performed using logistic regression model. The use of this type of model can assess the impact of several variables on a dichotomous dependent variable. Logistic regression models belong to the class of models of quality and are used to determine the causal relationship between the intensity of the stimulus (the cause – independent variables), and the response to this stimulus (effect – dependent variable) (Zawadzka, Ardan 2010: 605). The study assumed that the dependent variable (explanatory) is the probability of obtaining the value of the output of a minimum of 50,000 PLN in 2011, it is, therefore, a dummy variable – variable of a dichotomous type (Zawadzka, Ardan 2011: 526). In case the value of output in the analyzed farm reached a minimum of 50,000 PLN in 2011, the variable was set to 1, in the opposite situation – it was given the value 0.

The adoption of the above minimum level of agricultural output is based on the average value of production on the basis of statistical data and is a result of the primary ranges of output values reached by the tested farms in 2011 assumed during data gathering process. The value of agricultural output per 1 ha of agricultural land in Poland in 2010 amounted to 5,450 PLN (*Rocznik statystyczny...* 2012: 133). Taking into account the fact that the most common in our sample of farms in Middle Pomerania were entities with agricultural land about the size of 10 ha, based on data on the average value of agricultural output per 1ha in Poland in 2010 (PSR), it was assumed that the value of agricultural output should be higher than 50,000 PLN per year.

In the logistic model, the probability can be written in the following form (Zawadzka 2009: 200):

$$Prob(Y_i = 1) = \Lambda (\beta_1 x_{1i} + \dots + \beta_k x_{ki} + \beta_0)$$

where:

$\Lambda(x) = \frac{e^x}{1 + e^x}$ – distribution function of the logistic distribution,

$Prob(Y = 1)$ – the probability that the dependent variable for an individual with characteristics x_i takes the value 1.

k – the number of independent variables.

To verify the relevance of the parameters of the model, Wald's z^2 statistics was used (Danieluk 2010: 204). AIC (*Akaike Information Criterion*) index was analyzed as the criterion for optimality of the model. Due to the fact that one should choose such a model for which the AIC index is minimal (Stanisz 2007: 794), the construction of the model was completed after obtaining the minimum value of AIC. The significance of the resulting model was verified using likelihood ratio statistics – *Likelihood Ratio* (Maddala 2006: 156). Fit of the model to the observed data was analyzed using McFadden's R^2 statistic (Hu, Shao, Palta

Table 1

Hypothetical effect of independent variables adopted for the model of factors determining the value of agricultural output in the region of Middle Pomerania.

Variables used in analysis	Estimated influence of the variable on the value of output
<i>Y</i> Dummy variable indicating whether the annual value of output on a farm in 2011 reached a level of at least 50,000 PLN. If so, the variable takes the value = 1, otherwise it takes the value = 0.	
Independent variables	
x_1 Dummy variable indicating whether it is a commodity farm. If so, the variable takes the value = 1, otherwise it takes the value = 0.	Variable refers to the production of agricultural products to sell on the market. Market activities are conducive to making decisions about the pursuit of growth of output value. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.
x_2 The variable indicating the age of the farm (years).	It was assumed, that the operating time of the agricultural holding contributes to improving the market position and increasing the value of output. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.
x_3 The variable indicating the number of employees on the farm – including the owner, if he works on the farm (people).	A measure of the scale of farm activities. The larger the farm, the higher the potential value of output. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.
x_4 The variable indicating agricultural area of the farm (in hectares).	A measure of the scale of farm activities. The larger the farm, the higher the potential value of output. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.
x_5 Dummy variable indicating whether the farm specializes in crop production. If so, the variable takes the value = 1, otherwise it takes the value = 0.*	Research shows that farms specializing in crop production (e.g. commodity farms specializing in horticultural crops (Cf.: Zawadzka, Strzelecka, Szafraniec-Siluta 2012: 231–241) reached the highest level of gross margin. Hence the assumption that agricultural activity based on crop production is positively associated with the likelihood of achieving income above 50,000 PLN/year.
x_6 Dummy variable indicating whether the farm is specialized in animal production. If so, the variable takes the value = 1, otherwise it takes the value = 0.	Research shows that farms specializing in livestock production reach a relatively lower level of gross margin (excluding commodity farms specializing in granivorous livestock breeding (Cf.: Zawadzka, Strzelecka, Szafraniec-Siluta 2012: 231–241; Zawadzka, Strzelecka, Szafraniec-Siluta 2013: 398). Hence the assumption that agricultural activity based on animal production is negatively associated with the probability of achieving the production more than 50,000 PLN/year.
x_7 Dummy variable indicating the part of the generated production, which has been earmarked for official sale on the market (in %).	It was assumed, that farms selling more production volume on the market have a higher generated output value. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.
x_8 Variable indicating the participation of debt in the financing of agricultural activities in 2011 (in %).	It was assumed that a high share of debt in the financing structure is linked with the pursuit of development of tangible investments in order to increase the value of production. The sign of the parameter with this variable should be, according to the assumptions of the model, positive.

* Farms without explicit specialization, due to the largest number in the sample, were selected as the base group, therefore, the variable representing whether the holding is not specialized and is conducting multi-production (MIESZ) is not included in the explanatory variables. Leaving this variable would imply a linear correlation of variables x_5 , x_6 and the variable MIESZ and multiple correlation problem would occur.

Source: own study.

2006: 848). To assess the goodness of fit of the obtained model, ROC curve – *Receiver Operating Characteristic* (Haran 2010: 79) was also used. On this basis the value of the AUC – *Area Under Curve* ratio (Basil 2010: 74) was also determined. To interpret the results of the obtained logistic model, odds ratio – *Odds Ratio* (Gruszczyński 2010: 67–68) was used.

The construction of the logistic regression model included four stages. In the first stage, broad set of explanatory variables (for the output model) was selected. Then, measurement of the correlation between the variables adopted for analysis was performed, using the Pearson correlation coefficient (Rószkiewicz 2002: 143–145). Subsequently, the selection of the independent variables was carried out using a reverse elimination method. The last stage included assessing the significance of the final model and the significance of the impact of land compared to the impact of other factors on the likelihood of achieving the production of a minimum of 50,000 PLN by the surveyed farms in the region of Middle Pomerania.

Calculations, the results of which are presented in this paper, were performed using *Statistica 10* and *Statistica Plus* software.

2. Sample characteristics

The analyzed sample of farms is diverse in terms of the purpose of agricultural production, 66.88% of the surveyed companies were commercial farms (considered as agricultural enterprises). Subsistence farms accounted for 33.12% of the sample (309 farms). 43.52% of the studied population is clearly focused on crop production, 10.61% – on the production of livestock, other farms declare no leading specialization. The average size of land holdings analyzed was 50.9 ha (dominated by farms with an area of 15 ha). 55.31% of farms were characterized by the value of agricultural production in 2011 of less than 30,000 PLN, only 3.97% – over 500,000 PLN. Of the 933 farms, 716 were characterized by the production value of less than 500,000 PLN, and 217 entities – above this value. The abovementioned factor of the purpose of agricultural production distinguishes the studied sample in terms of financial decisions. In the sample of farms from Middle Pomerania, 471 subjects (50.48% of the sample) declared that in 2004–2010 they benefited from outside sources of financing. In 2011, the proportion of these farms fell by 4.71 percentage points. The average share of outside capital in the financing structure in 2004–2010 amounted to 17.29%, in 2011 this share fell by 2.05 percentage points. 31% of the entities declared in 2011 the use of both deferred payment date and discounts offered by suppliers. For comparison, 14.47% of the surveyed farms declared use of commercial loans in the financing of agricultural activities in 2004–2010. This percentage fell by 1.61 percentage points in 2011. Increased use of outside capital is indicated by owners of commercial farms, compared with farms producing for their own needs. 56.09% of commercial farms declared the use of outside sources of funding in 2004–2010, in 2011 – 50% of the analyzed entities. The average declared participation of outside capital in the structure of financing sources amounted to 20.42% in the period 2004–2011 (in subsistence farms 11%); this proportion decreased in the following year by

2.85 percentage points (in subsistence farms by 0.47 percentage points). Fewer relations of subsistence farms with both trade and financial market are also reflected in the relatively lower rates of liabilities from commercial and trade loans. Disparities in this area are not, however, large in both groups. 16.03% of commercial farms surveyed said they use commercial loans as a source of financing for the years 2004 to 2010, 14.26% in 2011. The same declarations in the group of subsistence farms were respectively 11.33% and 10.03%. Conclusions from the analysis of data from the farms of the Middle Pomerania to some extent confirm the observations in sectors. Equity is the main source of funding for agricultural activities. A larger number of respondents declared the use of trade credit offered by suppliers to a greater extent than bank loans.

Table 2 shows the basic descriptive statistics of variables adopted for the model (excluding dummy variables: x_1 , x_5 and x_6).

Table 2

Descriptive statistics of variables in the model adopted

Variable	Average	Median	Dominant	Standard deviation
x_2	48.30	46.00	65.00	68.38
x_3	2.09	2.00	2.00	1.55
x_4	46.49	18.00	10.00	198.31
x_7	47.76%	50.00%	0.00%	36.81%
x_8	15.27%	0.00%	0.00%	21.53%

Source: own study based on a questionnaire survey conducted in the region of Middle Pomerania.

The average operation time of the agricultural farm (x_2) in the sample was 48 years. Farms employed an average of 2 people in the course of agricultural activities (x_3), but the actual employment differed from the average value by ± 1.55 person. The average value of the area of agricultural land (x_4) of the farms in the Middle Pomerania was 46.49 ha, however farms that used an area of 10 hectares in the production process dominated. However, half of the surveyed population conducted its activities with the use of agricultural land with an area exceeding 18 hectares, and the actual agricultural area differed from the average value by $198.31 \pm$ acres. Tested farms allocated on average 47.76% of the manufactured crops or livestock for the official sale on the market (x_7), and half of the population allocated for this purpose more than 50% of agricultural production produced. It is worth noting that debt (x_8) accounted for an average of 15.27% financing sources used by the surveyed farms; however, half of the population does not make use of external sources of financing in its agricultural activities.

3. Results and Discussion

Prior to the construction of a logistic regression model, correlations existing between the variables adopted for the analysis were examined. For this purpose, the Pearson correlation coefficient was used (Table 3).

Table 3

Correlation coefficients between chosen variables

Variable	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
Y	1.00	0.32	-0.06	0.21	0.24	0.01	0.10	0.38	0.26
x_1	0.32	1.00	-0.06	0.08	0.11	0.15	0.07	0.75	0.16
x_2	-0.06	-0.06	1.00	0.00	-0.04	-0.13	0.01	-0.08	-0.06
x_3	0.21	0.08	0.00	1.00	0.38	-0.12	0.02	0.06	0.11
x_4	0.24	0.11	-0.04	0.38	1.00	0.06	-0.03	0.14	0.09
x_5	0.01	0.15	-0.13	-0.12	0.06	1.00	-0.30	0.25	-0.01
x_6	0.10	0.07	0.01	0.02	-0.03	-0.30	1.00	0.07	0.09
x_7	0.38	0.75	-0.08	0.06	0.14	0.25	0.07	1.00	0.16
x_8	0.26	0.16	-0.06	0.11	0.09	-0.01	0.09	0.16	1.00

The significance level adopted for the study: 5%.

Source: own study.

The analysis of correlation coefficients between the dependent variable and the adopted independent variables showed that there was no very strong correlations between the value of agricultural output on the farm and the variables adopted for the analysis. It has been observed that there is a positive statistically significant (at the 5% significance level) linear relationship between the value of output and: being a commodity farm (x_1), the number of people employed on the farm (x_3), the area of agricultural land used in the production process (x_4), specializing in animal production (x_6), the amount of the production volume which was intended for official sale on the market (x_7) and the share of debt in financing agricultural activities (x_8). There were no statistically significant negative correlations between the output value and the independent variables adopted for the analysis.

Based on the research assumptions adopted, a model was constructed containing all accepted explanatory variables (model output). Then, further predictors were eliminated from the model and an assessment of changes in the criteria to assess the quality of the model was undertaken (backward elimination method). A total of 3 independent variables were eliminated. Finally, five predictors remained in the model. The results obtained for the final model of factors determining the value of agricultural production in the region of Middle Pomerania are shown in Table 4.

Table 4

Assessment of model of factors determining the value of agricultural production in the region of Middle Pomerania – final model

Variable	Parameter for the variable	Standard error	Wald's z^2 statistic	Significance level	Odds ratio
Intercept	-4.376	0.356	151.155	0.000	0.013
x_3 – Number of employees on the farm (people)	0.236	0.092	6.626	0.010	1.267
x_4 – Agricultural land area (ha)	0.034	0.003	101.256	0.000	1.035
x_5 – The farm specializes in crop production	-0.585	0.243	5.819	0.016	0.557
x_6 – The farm specializes in animal production	0.660	0.301	4.821	0.028	1.935
x_7 – The part of the production volume, which was intended for official sales (in %)	2.492	0.374	44.414	0.000	12.087

AIC = 630.177
 McFadden's $R^2 = 0.389$
 LR = 393.902 df = 5 p = 0.0000000

Source: own study.

The estimated model is:

$$Prob(Y = 1) = A(0,236x_3 + 0,034x_4 - 0,585x_5 + 0,660x_6 + 2,492x_7 - 4,376),$$

where: $A(x) = \frac{e^x}{1+e^x}$ – distribution function of the logistic distribution.

The value of McFadden's R^2 is equal to 0.389. The model is significant at the 1% significance level. The value of the LR-statistics is 393.902 (the critical value of this statistic for 5 degrees of freedom is 15,086).

ROC curve for the final model obtained factors determining the value of agricultural production in the Middle Pomerania region is presented in Figure 1.

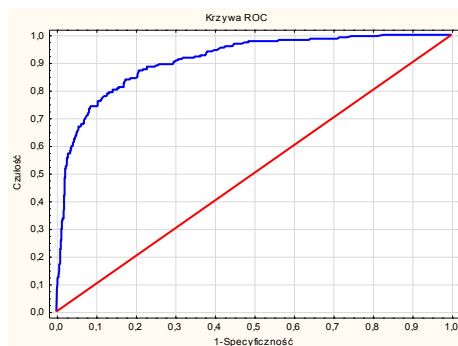


Figure 1. ROC curve for the final model of factors determining the value of agricultural production in the region of Middle Pomerania

Source: own study.

The area under the ROC curve (AUC) is 0,909. Since the obtained field is greater than 0.5 and close to 1, it indicates a good quality of the constructed model.

Based on the estimated parameters of the final model, it was established that four independent variables had a statistically significant positive impact on the likelihood of the annual value of agricultural output exceeding 50,000 PLN by the surveyed farms in the region of Middle Pomerania: the number of employees on the farm (x_3), the area of agricultural land (x_4), farm specializing in animal production (x_6) and the amount of the production volume which was intended for official sale (x_7). The influence of the variables x_3 , x_4 and x_7 is consistent with the assumptions adopted in the model. In contrast, a statistically significant negative effect on the probability was shown for one independent variable: farm specialization in crop production (x_5). The impact of this variable is different than expected. Preparation of plant production reduces the probability of obtaining the value of production at the analyzed level in farms of Middle Pomerania.

The results indicate that increasing the number of people employed on the farm by a unit (x_3 , *ceteris paribus*) will increase the chance of getting an annual production value equal to or exceeding 50,000 PLN by 26.7%. In turn, expanding the area of agricultural land by a unit (x_4 , *ceteris paribus*) will contribute to increasing the chance of achieving the minimum level of annual production value (50,000 PLN) by 3.5%. It was also observed that the probability that the farm will produce products with an annual value of at least 50,000 PLN was by 44.3% lower in farms specializing in crop production (x_5), and about 93.5% higher in farms specializing in animal production (x_6) than in farms engaged in multi-agricultural activities (MIESZ, *ceteris paribus*). The results also show that, theoretically, an increase in the amount of production that is spent on official sale by a unit (x_7 , *ceteris paribus*), will increase the chance (by 1,108.7%) that the farm will produce vegetable and animal output of the minimum annual value of 50,000 PLN.

In the last stage of the study, the importance of land as a factor in determining the value of production was assessed, in comparison with other factors selected in the present study. For this purpose, two separate logistic regression models were built: 1) model, which takes into account only the variable relating to the area of agricultural land used by the farm in the production process (x_4); 2) model, which takes into account other (statically significant) variables adopted for the analysis of (x_3 , x_5 , x_6 , x_7). The parameters of these models are shown in Table 5.

The results show that both groups of adopted variables significantly impact (at a significance level of 1%) the likelihood that a farm annual production value will exceed 50,000 PLN (LR test). However, a comparison of the results obtained for the adopted indicators and tests, it is noted that the model containing only the variable of the area of agricultural land used in the production process is characterized by the values of statistics indicating a better fit to the observed data than the model containing only the other variables included in the analysis.

Table 5

Parameters characterizing the final model, the model with the farmland variable and the model with other variables determining the value of agricultural production in the region of Middle Pomerania

Specification	Final model	Model which includes only:	
		farmland variable (x_4)	other variables (x_3, x_5, x_6, x_7)
McFadden's R^2	0.389	0.315	0.201
LR	393.902	318.56	203.19
Degrees of freedom	5	1	4
Significance level	0.0000000	0.0000000	0.0000000
AUC	0.909	0.902	0.794
AIC	630.177	697.527	818.891

Source: own study.

It should be noted, however, that only taking both groups of variables into account made it possible to obtain a model that has the best fit to the data obtained for the studied farms in the Middle Pomerania region.

Conclusions

Features of the use of land, as a primary factor in agricultural production, are decisive in its importance for determining the value of agricultural production. The research problem posed sought to prove the relationship between the acreage of the owned agricultural land, and the value of agricultural output produced by the farms of Middle Pomerania. Based on empirical data from 2011, parameters of the model for the probability of producing agricultural production of 50,000 PLN and more were estimated. Among the variables, for which a statistically significant effect on these probability was assumed, the following parameters for the variables proved to be significant (positive effect): the number of employees on farms, agricultural area, specializing in animal production and the amount of the production volume which was intended for official sale. A statistically significant negative effect on the probability was found for one independent variable: the farm's specialization in plant production. Preparation of plant production thus reduces the probability of obtaining the value of production at the analyzed level on the farms in Middle Pomerania. This is due to the fact that the studied farms are small entities, possessing mostly agricultural area of 10 hectares, thus obtaining the value of agricultural production at 50,000 PLN or more is more difficult. Please note that at this stage of the study, we did not focus on the costs and profitability of agricultural production, thus our results can only be indirectly associated

with these categories. Recognizing the specificity of the types of farms (focused on crop production, livestock, without a specified specialization), and the resulting type of relationship with the land, we adopted the direction of further studies seeking to verify the thesis of the importance of determining the value of land for agricultural production in different types of farms, distinguished in terms of specialization of agricultural production.

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ZIEMIA JAKO PODSTAWOWY CZYNNIK DETERMINUJĄCY WARTOŚĆ PRODUKCJI GOSPODARSTW ROLNYCH POMORZA ŚRODKOWEGO

Streszczenie: Podstawowym celem opracowania jest określenie znaczenia ziemi dla wartości produkcji rolniczej wytwarzanej przez gospodarstwa rolne Pomorza Środkowego. Weryfikację empiryczną czynników determinujących wartość produkcji gospodarstw rolnych w regionie Pomorza Środkowego przeprowadzono przy wykorzystaniu modelu regresji logistycznej. W badaniu wykorzystano dane dotyczące 933 gospodarstw rolnych. Ustalono, że statystycznie istotny dodatni wpływ na badane zjawisko miały 4 zmienne niezależne: liczba zatrudnionych w gospodarstwie rolnym, powierzchnia użytków rolnych, specjalizacja gospodarstwa w produkcji zwierzęcej oraz część wytworzonej produkcji, która została przeznaczona na oficjalną sprzedaż. Natomiast statystycznie istotny ujemny wpływ na analizowane prawdopodobieństwo miała: specjalizacja gospodarstwa w produkcji roślinnej. Wykazano ponadto, że model zawierający wyłącznie zmienną dotyczącą powierzchni użytków rolnych wykorzystywanych w procesie produkcji charakteryzuje się wartościami statystyk (LR, AIC, AUC, R^2 McFadden) wskazującymi na lepsze dopasowanie do obserwowanych danych, niż model zawierający wyłącznie pozostałe zmienne uwzględnione w analizie. Dowodzi to istotnego znaczenia ziemi w procesie tworzenia wartości produkcji rolniczej przez gospodarstwa rolne. Najlepszy model uzyskano uwzględniając wszystkie (statystycznie istotne) zmienne, które zostały przyjęte do badania.

Słowa kluczowe: wartość produkcji rolniczej, czynniki produkcji, gospodarstwa rolne, Pomorze Środkowe, regresja logistyczna

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