



*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

**Give to AgEcon Search**

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

## EFFICIENCY OF INVESTMENTS IN POLISH FARMS BEFORE AND AFTER ACCESSION TO THE EUROPEAN UNION

Roman Sass✉

Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego w Minikowie

**Abstract.** Assessment efficiency of investments realized in the years 1996–2003 with the use of the so-called preferential loans and after accession of Poland to the European Union is the purpose of this study. Using regression methods, the impact of selected elements of the production potential of farms on the value of investment expenditures after 2004 have been defined. Conclusively, the efficiency of investments was considerably higher in the pre-accession period than after accession of Poland to the European Union. It concerns both farms differing in the values of investment expenditures as well as the investment's direction. A particular high drop in the investment's efficiency occurred at farms investing the most in machines and equipment. The analysis of correlation with the use of the methods of regression indicates, that the area of a farm and fixed assets had a crucial impact on the value of investment expenditures in the years 2004–2011. The level of explanation of variability of investment expenditures by the production potential and factors covariant with it is high, and for the lineal function it amounts to more than 91%.

**Keywords:** investment expenditures, directions of investment, investment's efficiency, production potential of farms

### INTRODUCTION

There are many reasons why the Polish farms should demonstrate relatively high levels of investment activity (Czubak and Sadowski, 2014; Gospodarowicz and Karwat-Woźniak, 2009; Sobczyński, 2011). In a glo-

balized economy which increasingly affects the agriculture, to strengthen (or only to maintain) their agricultural market position and to meet the demand of buyers of agricultural primary products, the farms must take intensive investment activities that enhance the competitiveness of their products as regards both cost and quality aspects. Usually, this implies the use of an adequate process of investments in productive fixed assets, which generally are an essential way of conveying progress and innovation to the relevant manufacturing methods of agricultural primary products (Woś, 2004; Zwolak, 2010). Thus, investment processes are the source of progress and innovativeness in the agricultural production (especially as regards technological enhancements), which usually means increasing the profitability of agricultural activities (Czubak and Sadowski, 2014; Kisiel and Babuchowska, 2013; Ryś-Jurek, 2014).

The economic situation of Polish farms varies greatly. Over 80% of them do not fully renew their end-of-life productive assets. In Poland, enhanced reproduction of fixed assets is a procedure followed only by the largest commercial farms (around 90,000) (Józwiak, 2014). This is confirmed by the characteristics of the beneficiaries of Measure 121 “Modernization of farms” under the 2007–2013 RDP. While the average size of a beneficiary's farm was 55.7 ha, 80% of farms had an area ranging from 10 to 100 ha (32.0 ha on average) (Stabryła-Chudzio, 2014; Ryś-Jurek, 2014; Sass, 2014). According to a study by the Institute of Agricultural and Food Economics, only the farms with a size of 30 ha or

✉ dr inż. Roman Sass, Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego w Minikowie, 89-122 Minikowo, Poland, e-mail: [roman.sass@kpodr.pl](mailto:roman.sass@kpodr.pl)

more can be considered as having the ability to compete (Józwiak, 2014).

It is widely agreed that the Polish agriculture sector experienced a boost of investments after the Poland's accession to the EU. It should not be overlooked, however, that the modernization of Polish farms and of the entire agri-food sector started much earlier. It was initiated by the establishment of the Agency for Restructuring and Modernization of Agriculture which has been subsidizing the investment loans since 1994. By the end of 2014, the banks granted over 459,000 investment loans worth PLN 43,957.8. The support from EU funds enabled a considerable enhancement of the farms' production potential. A total of 172,800 agreements worth PLN 13,964.0 million were entered into under the SAPARD pre-accession instrument and the Sector Operational Program "Agriculture" covered by the 2004–2006 RDP and the 2007–2013 RDP. The funds applied for by the farmers went well beyond the envelop allocated to investment activities.

The purpose of this paper is to assess the effectiveness of investments implemented over the 1996–2003 period with the use of soft loans, and of investments implemented over the 2004–2011 period (after the Poland's accession to the EU) in farms with various capital expenditure and investment targets, based on experiences gained by farms from the former Bydgoskie voivodeship. Furthermore, regression methods were used to determine the effect of selected aspects of their production potential on the amount of capital expenditure after 2004.

## MATERIAL AND METHOD

The study covered the farms from the former Bydgoskie voivodeship who used soft loans<sup>1</sup> prior to the Poland's accession to the EU (1996–2003) and who held accounts within the FADN agricultural accounting system on a continuous basis from 2004 to 2011. The above criteria were met by 175 farms. Eventually, the study covered 156 of them due to exclusion of 14 farms (outliers) whose capital expenditure prior to the accession was more than two standard deviations above the average, and of 5 fruit-growing and horticultural holdings.

<sup>1</sup> Soft loans were granted since 1994. As there is no information on the beneficiaries of soft loans in 1994–1995, the earlier period could not be covered by this study.

In view of their small number, such farms may be considered atypical<sup>2</sup> and excluded from further considerations.

The farms were classified into five groups based on the amounts of capital expenditure in the 1996–2003 period (Table 1). This classification allows to analyze the scope and pace of changes to the farm's assets depending on the capital expenditure incurred<sup>3</sup>. The second classification criterion was the investment target. Five investment targets were identified (Table 1) based on the capital expenditure structure. Farms with one investment target identified (purchase of land and machinery, and construction projects) are those where the main investment accounted for 2/3 or more of the capital expenditure. The farms where the share of the leading investment was 50% or more (but less than 2/3) are those who invest in land and machinery in parallel. The last group is composed of farms where no leading investment target could be identified (multi-directional investments).

The effectiveness of investments means additional economic benefits (outcomes) resulting from the investment compared to the capital expenditure incurred (effectiveness = outcome/input) (Manteuffel, 1963).

From the microeconomic perspective, the effectiveness of investments is assessed twice: when making the decision (ex ante) and upon completing the investment (ex post) (Józwiak, 1998). Methods used to assess the

<sup>2</sup> Extending this study to cover a long term (16 years) implies the need to eliminate (or at least reduce) the impact of inflation on the capital expenditure in value terms. Therefore, the values of investments and of total assets were expressed in constant prices. The indicators of the evolution of prices of goods and services purchased by the farmers for investment purposes, as published by the Central Statistical Office, were used to convert the capital expenditure into constant 2011 prices. The total value of assets was expressed in constant 2011 prices based on the general inflation rate of the Central Statistical Office.

<sup>3</sup> In this paper, investments are defined otherwise than in standard FADN results. The capital expenditure was determined based on disbursements allocated to investment activities, as specified in the cash flow, provided in the farms' individual reports. Hence, it means the amount of funds spent in the financial year concerned on the purchase and production of fixed assets. This approach was adopted because in the 1996–2003 period it was impossible to determine the capital expenditure in a way similar to the FADN method (standard outputs). To ensure the greatest comparability of capital expenditure prior to and following Poland's accession to the EU, it was decided to determine the amounts of capital expenditure based on disbursement flows specified in the cash flow.

**Table 1.** Division of farms into groups depending on the value of investment expenditures and investment directions prior to Poland's accession to the European Union

**Tabela 1.** Podział gospodarstw na grupy w zależności od wielkości nakładów inwestycyjnych oraz kierunku inwestowania przed akcesją Polski do Unii Europejskiej

Value of investment expenditures in 1996–2003 (thous. PLN) Wielkość nakładów inwestycyjnych w latach 1996–2003 (tys. zł)	Number of farms Liczba gospodarstw	Directions of investment Kierunek inwestowania	Number of farms Liczba gospodarstw
< 100	43	purchase of lands zakup gruntów	30
100–200	45	purchase of machines zakup maszyn	40
200–300	29	construction investments inwestycje budowlane	31
300–400	17	purchase of lands and machines zakup gruntów i maszyn	29
400 >	22	multidirectional investments inwestycje wielokierunkowe	26
Total Ogółem	156	Total Ogółem	156

Source: own calculations on the basis of not published FADN's data.

Źródło: obliczenia własne na podstawie niepublikowanych danych FADN.

effectiveness of investments on an ex ante basis fall into two groups: simple methods (Nowak et al., 1999) and discounted methods (Jajuga and Jajuga, 1999).

They are mainly used to assess the planned investments at the preparation and financing stage. They cannot be used if the investments are already complete; the outcomes of the investment are difficult to estimate because of the length of the analysis period and the existence of multiple overlapping factors. Also, a series of internal (balancing) links exist in the farms, making it difficult to determine the investment effectiveness. In this situation, the outcomes of the investment may be looked at only from the perspective of the entire farm.

In this paper, the effectiveness of investments is analyzed as a process (investments) from the functional point of view, and is expressed as changes to fixed assets in farms demonstrating various amounts of capital expenditure and investment targets prior to Poland's accession to the European Union.

$$\text{Investment effectiveness} = \frac{\Delta \text{ of fixed assets value within a specific period}}{\sum \text{ of capital expenditure within a specific period}}$$

Regression methods were used to determine the strength of relationships between the factors describing the farms' production potential and the amount of capital expenditure. The first step was the linear regression equation where subsequent increments of the independent variable are accompanied by identical changes (in terms of strength and direction) to the dependent variable. Also, a quadratic function was used as it matches quite well the curves describing the relationships in the agriculture sector.

The stepwise regression algorithm, which optimizes the selection of independent variables based on Student's t-test, was used to estimate the models describing the relationship between the production potential and the amount of capital expenditure.

## RESULTS OF THE STUDY

The value of investments varied greatly in the years concerned. Although 8-year periods were analyzed in both cases (prior to and following Poland's accession to the EU), the farmers invested much more in the second one (Czubak and Sadowski, 2014; Kisiel and Babuchowska, 2013; Mikołajczyk, 2009; Sass, 2014). From 2004 to 2011, the investment spending of an average farm covered by this study was PLN 677,000, i.e. three times more than prior to the accession (1996–2003) (cf. Tables 2 and 3). Although soft loans for the modernization of farms were generally available prior to Poland's accession to the EU, the investment financing conditions under the CAP are much more favorable and mainly include subsidies covering up to 60% of the investment. After 2004, this was the most popular form of finance for investments made by the farmers (Bułkowska, 2011; Czubak, 2012).

When analyzing the investments made prior to and following Poland's accession to the EU, the following patterns can be observed. The highest increase of activity was demonstrated by farms with the lowest levels of investments (PLN 50,000 per farm, on average) in the 1996–2003 period. Following Poland's accession to the

EU, they became the most active ones among the farms covered by this study (Tables 2 and 3). In that group, the value of investments increased almost six times (5.96) compared to the previous period.

The farms' assets are a highly important productive input with considerable impact on their production and economic status and on their ability to grow. In the Polish farms, the structure of assets is dominated by fixed assets. In the group covered by this study, fixed assets demonstrated a share of 83–85% and a very low coefficient of variation (10–12%).

When comparing the effectiveness of investments prior to and following Poland's accession to the EU, it is evident that the levels recorded prior to the accession were significantly higher (Tables 2 and 3). On average, there was an increase in fixed assets value of PLN 496.5 per PLN 1,000 of capital expenditure (compared to PLN 286.3 following the accession). This means a 42.3% decrease in effectiveness. After 2004, the absolute net value of fixed assets has grown faster than prior to the accession. In 2004–2011, the average increment of the assets value was PLN 193,900 (compared to PLN 104,700 in the period prior to the accession). However, after 2004, the ratio of asset increments to the amount of capital expenditure has declined. The

**Table 2.** The increment of fixed assets in 1996–2003 and 2004 depending on the value of investment expenditures prior to accession (PLN)

**Tabela 2.** Przyrost majątku trwałego w latach 1996–2003 oraz 2004 w zależności od wielkości nakładów inwestycyjnych przed akcesją (zł)

Expenditures (thous. PLN) Inwestycje (tys. zł)	Investment expenditures in 1996–2003 Nakłady inwestycyjne w latach 1996–2003	Fixed assets Majątek trwały		Increase of fixed assets Przyrost majątku trwałego	
		1996–2003	2004	in 2004 – (1996–2003) w okresie 2004 – (1996–2003)	per 1000 PLN of invest- ment expenditures na 1000 zł nakładów inwestycyjnych
< 100	56 910	408 027	408 032	5	–
100–200	148 632	513 156	562 129	48 973	329.49
200–300	241 886	533 908	578 168	44 260	182.98
300–400	342 469	705 263	931 324	226 061	660.09
> 400	517 943	637 125	1 090 310	453 185	874.97
Total – Ogółem	210 818	526 965	631 634	104 669	496.49

Source: own calculations on the basis of not published FADN's data.

Źródło: obliczenia własne na podstawie niepublikowanych danych FADN.

**Table 3.** The increment of fixed assets in 2004–2011 depending on the value of investment expenditures prior to accession (PLN)  
**Tabela 3.** Przyrost majątku trwałego w latach 2004–2011 w zależności od wielkości nakładów inwestycyjnych przed akcesją (zł)

Expenditures (thous. PLN) Inwestycje (tys. zł)	Investment expenditures in 2004–2011 Nakłady inwestycyjne w latach 2004–2011	Fixed assets Majątek trwały		Increase of fixed assets Przyrost majątku trwałego	
		2004	2011	in 2011–2004 w okresie 2011–2004	per 1000 PLN of invest- ment expenditures na 1000 zł nakładów inwestycyjnych
< 100	339 387	408 032	464 173	56 141	165.42
100–200	572 207	562 129	735 075	172 946	302.24
200–300	594 789	578 168	709 263	131 095	220.41
300–400	1 319 486	931 324	1 472 511	541 187	410.15
> 400	1 242 055	1 090 310	1 449 219	358 909	288.96
Total – Ogółem	677 057	631 634	825 488	193 854	286.32

Source: own calculations on the basis of not published FADN's data.

Źródło: obliczenia własne na podstawie niepublikowanych danych FADN.

groups of farms with varying amounts of capital expenditure demonstrate notoriously different levels of investment effectiveness. In the 1996–2004 period, the farms with the lowest investments (up to PLN 100,000; PLN 56,900 on average) did not experience any increase in the value of their fixed assets. The investments made by these farms were only enough to ensure simple reproduction of fixed assets. In the farms with investments ranging from PLN 100,000 to PLN 300,000, the fixed assets value grew by PLN 44–49 thousand, accompanied by various levels of investment effectiveness. Farms with average investments accounting for PLN 150,000 reported higher effectiveness rates than those who invested around PLN 240,000 (Table 2). In accounting terms, the differentiation of the effectiveness rate is quite obvious. Farms with investments ranging from PLN 100,000 to PLN 200,000 and those having invested an amount ranging from PLN 200,000 to PLN 300,000 recorded a similar increase in the value of their assets. However, in the second group, the capital expenditure was higher by PLN 93,000. This pattern can be explained by the investment targets. The purchase of land represented a significant share in the investments ranging from PLN 200,000 to PLN 300,000. This is because land was much cheaper than machinery or construction projects before the accession to the EU (cf. Table 4).

When comparing the effectiveness of investments in function of capital expenditure, it becomes obvious that the highest increase in value of assets and the highest effectiveness rates were only attained by farms which spent more than PLN 300,000 on investments. In the case of farms who invested an average amount of PLN 350,000, the value of fixed assets grew by PLN 226,000 over the 1996–2004 period, which means an increase of PLN 660 per PLN 1,000 of capital expenditure. In turn, as regards the farms with the highest investment levels (PLN 518,000 on average), the value of fixed assets grew by PLN 453,000, which means an increase of PLN 875 per PLN 1,000 of capital expenditure. This group demonstrated the highest effectiveness of investments in the pre-accession period.

Following Poland's accession to the European Union, there was a significant decline (Table 3) in the effectiveness of investments. Also, the effectiveness ratio significantly varies from one farm to another depending on the investment amount. The farms with investments of up to PLN 300,000 report effectiveness levels comparable to those recorded prior to the accession (this is true for investment amounts ranging from PLN 100,000 to PLN 300,000). In turn, farms with the lowest capital expenditure in the pre-accession period (PLN 57,000), experienced the highest investment growth rate among all farms under consideration in

**Table 4.** The increment of fixed assets in 1996–2003 – 2004 depending on the direction of investment prior to accession (PLN)  
**Tabela 4.** Przyrost majątku trwałego w latach 1996–2003 – 2004 w zależności od kierunku inwestowania przed akcesją (zł)

Directions of investment Kierunki inwestowania	Investment expenditures in 1996–2003 Nakłady inwestycyjne w latach 1996–2003	Fixed assets Majątek trwały		Increase of fixed assets Przyrost majątku trwałego	
		1996–2003	2004	in 2004 – (1996–2003) w okresie 2004 – (1996–2003)	per 1000 PLN of investment expenditures na 1000 zł nakładów inwestycyjnych
Purchase of lands Zakup gruntów	138 452	629 910	654 749	24 839	179.41
Purchase of machines Zakup maszyn	156 121	499 656	599 849	100 193	641.77
Construction investments Inwestycje budowlane	264 286	546 826	623 329	76 503	289.47
Purchase of lands and machines Zakup gruntów i maszyn	239 437	471 244	688 947	217 703	909.23
Multidirectional investments Inwestycje wielokierunkowe	282 794	488 667	599 839	111 172	393.12
Total Ogółem	210 818	526 965	631 634	104 669	496.49

Source: own calculations on the basis of not published FADN's data.

Źródło: obliczenia własne na podstawie niepublikowanych danych FADN.

the post-accession period. In this group, the fixed assets value increased by PLN 56,000, and the growth rate was PLN 165 per PLN 1000 of capital expenditure. The highest decline in investment effectiveness was experienced by farms with the highest investment levels (the last groups of farms). In the 2004–2011 period, they invested PLN 1,242,000 while increasing the net value of fixed assets by PLN 359,000. This means a growth rate of PLN 289 per PLN 1,000 of capital expenditure. The farms with the highest investment levels were those with the largest areas (their average sizes in 2004 and 2011 were 80.3 ha and 94.2 ha, respectively). They mainly invested in machinery and tractors, i.e. assets with high rates of depreciation. Thus, 50–60% of their lifecycle elapsed within 8 years (2004–2011). This is why, despite the high investment levels, the increase of the net value of fixed assets was relatively low. Two processes are overlapping: the first one is the growth of the assets value triggered by new investments; the second one is the depreciation of assets. Note also that the depreciation rates for the aforesaid investment targets are quite high.

The second criterion for analyzing the effectiveness of investments was the investment target. The first pattern found in the farms grouped by investment targets is that the amount of capital expenditure incurred is less diversified between the groups of farms than between farms with different amounts of capital expenditure. The equalization process became particularly intense following Poland's accession to the EU (Tables 4 and 5). In the pre-accession period, the lowest capital expenditure was incurred by farms which invested only in the purchase of land (Table 4). Those who invested in machinery also incurred lower capital expenditure than the farmers who invested in buildings and in expanding their holdings in addition to purchasing machinery. The highest investment levels were reported by farms where no leading investment target could be identified. After 2004, the diversification of capital expenditure has been significantly reduced compared to the pre-accession period. This is because the farms were grouped based on their investment targets in the 1996–2003 period, whereas after 2004, 90% of investments were allocated to tractors and machinery.

**Table 5.** The increment of fixed assets in 2004–2011 depending on the direction of investment prior to accession (PLN)  
**Tabela 5.** Przyrost majątku trwałego w latach 2004–2011 w zależności od kierunku inwestowania przed akcesją (zł)

Directions of investment Kierunki inwestowania	Investment expenditures in 1996–2003 Nakłady inwestycyjne w latach 1996–2003	Fixed assets Majątek trwały		Increase of fixed assets Przyrost majątku trwałego	
		2004	2011	in 2011–2004 w okresie 2011–2004	per 1000 PLN of investment expenditures na 1000 zł nakładów inwestycyjnych
Purchase of lands Zakup gruntów	760 572	654 749	853 889	199 140	261.83
Purchase of machines Zakup maszyn	601 005	599 849	736 214	136 365	226.89
Construction investments Inwestycje budowlane	647 802	623 329	819 308	195 979	302.53
Purchase of lands and machines Zakup gruntów i maszyn	636 236	688 947	864 738	175 791	276.30
Multidirectional investments Inwestycje wielokierunkowe	778 167	599 839	893 653	293 814	377.57
Total Ogółem	677 057	631 634	825 488	193 854	286.32

Source: own calculations on the basis of not published FADN's data.

Źródło: obliczenia własne na podstawie niepublikowanych danych FADN.

Despite the small differentiation of capital expenditure prior to Poland's accession to the European Union, the effectiveness of investments varied strongly between the farms in the 1996–2003 period. The highest effectiveness rates were achieved by farms having invested in the purchase of land and machinery, i.e. those who invested in comprehensive projects (Czubak and Sadowski, 2014). In this case, the growth of fixed assets value was PLN 909.2 per PLN 1,000 of capital expenditure. High effectiveness rates were also reported by farms who invested only in machinery (a growth of PLN 641.8 per PLN 1,000 of capital expenditure) (Pietrzykowski and Wicki, 2011; Ziętara, 2008). As demonstrated by the analyses, investments in machinery brought high effectiveness levels in that period. In the late 1990s, the farmers were provided with favorable conditions for financing the modernization of their farms. However, although in the pre-accession period such investments were financed with soft loans, the conditions for investment financing were less favorable than following Poland's accession to the European

Union when investments in machinery and tractors became the easiest option (Stabryła-Chudzio, 2014). After 2004, the farms who invested in machinery experienced a 70% decline in investment effectiveness. This is because of the shorter lifecycles and higher depreciation rates of machinery and tractors. The high initial value of new tractors and machinery results in high depreciation (amortization) rates. In turn, the farms which extend their area and invest in construction projects have experienced a slight improvement of investment effectiveness after 2004.

The investments are the condition for the renewal and enhancement of the farm's productive assets (Grzelak, 2015). Therefore, an essential question arises: to what extent does the production potential (productive inputs) of these farms affect the amount of capital expenditure? Regression methods were used to determine the impact of the farm's area (UR\_2004–2010), fixed assets other than land (AkTr\_2004–2010) and total labor inputs (AWU\_2004–2010) on the amount of investment expenditure (Y, the dependent variable) in 2004–2011:



$$Y = -0.5825AkTr\_04 - 4.002,6216UR\_05 - 8552,7264UR\_07 - 0.3854AkTr\_08 + 6893.4973UR\_08 + 0.7917AkTr\_09 + 0.8795AkTr\_10 + 9387.5533UR\_10 - 65692.9475 + x$$

$$100R^2 = 90.83$$

$$S-W = 0.9595 \text{ (} p = 0.0003 \text{)}$$

$$D-W = 2.0002 \text{ (} d_L = 1.45946; d_U = 2.03140 \text{)}$$

The interdependence analysis based on regression methods suggests the existence of the following relationships:

- In this model, the regression coefficients are significant at  $p < 0.05$ .
- The hypothesis of normal distribution of residuals has to be rejected at  $p = 0.0003$ ; the critical value of the S-W test is 0.963, and therefore the regression model should be interpreted conditionally.
- Absence of autocorrelation in random effects (the calculated D-W value falls between  $d_L = 1.45946$  and  $d_U = 2.03140$ ).
- The variation of the dependent variable is explained to a high degree by independent variables and their covariates (in the case of linear function, the explanation degree is 90.83%).
- The area of agricultural land (UR\_2004–2010) in 2005, 2007, 2008 and 2010, and the value of fixed assets (AkTr\_2004–2010) in 2004, 2008, 2009 and 2010 were of great importance for the explanation of the variation of capital expenditure. In turn, the total labor inputs (AWU\_2004–2010) are insignificant.
- The degree of explanation of the variation of capital expenditure by a quadratic polynomial function was 92.34%. This model was rejected due to presence of autocorrelation, absence of normal distribution of residuals, a much more difficult interpretation of curvilinear functions, and the fact that the variation was explained only slightly better than in the case of the linear function.

## CONCLUSIONS

- In the pre-accession period, the effectiveness of investments was much higher than following Poland's accession to the EU. On average, there was an increase in fixed assets value of PLN 496.5 per PLN 1,000 of capital expenditure (compared to PLN 286.3 following the accession). The groups of farms

with varying amounts of capital expenditure demonstrate notoriously different levels of investment effectiveness. In 1996–2003, the investments made by farms with the lowest capital expenditure levels (up to PLN 100,000) were only enough to ensure simple reproduction of fixed assets. Only the farms which spent more than PLN 300,000 on investments recorded the highest growth of assets value and the highest effectiveness rates.

- In the pre-accession period, the lowest capital expenditure was incurred by farms which invested only in the purchase of land and machinery. The highest investment levels were reported by farms where no specific investment target could be identified. The highest effectiveness rates were achieved by farms having invested in the purchase of land and machinery, i.e. those who invested in comprehensive projects. In these farms, there was an increase in fixed assets value of PLN 909.2 per PLN 1,000 of capital expenditure. After 2004, the farms who invested in machinery experienced a 70% decline in investment effectiveness. In turn, the farms which extend their area and invest in construction projects have experienced a slight improvement of investment effectiveness after 2004.
- The area of the farm and the fixed assets have a significant impact on the amount of capital expenditure incurred in the 2004–2011 period by the farms under consideration. In turn, the labor inputs (AWU) per farm are statistically insignificant. The linear regression coefficients are significant at  $p < 0.05$ . The variation of the dependent variable is explained to a high degree by independent variables and their covariates (in the case of linear function, the explanation degree is 90.83%).

## REFERENCES

- Bułkowska, M. (2011). Efekty WPR w odniesieniu do rolnictwa. In: M. Wigier (Ed.), *Analiza efektów realizacji polityki rolnej wobec rolnictwa i obszarów wiejskich* (p. 56–80). Warszawa: IERiGŻ – PIB.
- Czubak, W. (2012). Wykorzystanie funduszy Unii Europejskiej wspierających inwestycje w gospodarstwach rolnych. *J. Agribus. Rural Dev.*, 2(25), 60–63.
- Czubak, W., Sadowski, A. (2014). Wpływ modernizacji wspieranych funduszami UE na zmiany sytuacji majątkowej gospodarstw rolnych w Polsce. *J. Agribus. Rural Dev.*, 2(32), 45–46.

- Gospodarowicz, M., Karwat-Woźniak, B. (2009). Zmiany w technikach i organizacji produkcji gospodarstw wysokotowarowych oraz ich wpływ na kondycję ekonomiczną tych jednostek. Program Wieloletni 2005–2009, nr 159 (p. 7–15). Warszawa: IERiGŻ-PIB.
- Grzelak, A. (2015). Determinanty zasobowe procesów reprodukcji majątku gospodarstw rolnych prowadzących rachunkowość rolną (FADN). *Rocz. Nauk. SERiA*, XVII(2), 69–74.
- Jajuga, K., Jajuga, T. (1999). Inwestycje. Instrumenty finansowe. Ryzyko inwestowania. *Inż. Fin.*, 40–42.
- Józwiak, W. (1998). Efektywność inwestycji w agrobiznesie. In: *Encyklopedia Agrobiznesu* (p. 149–151). Warszawa: Fundacja Innowacja.
- Józwiak, W. (Ed). (2014). Efektywność, koszty produkcji i konkurencyjność polskich gospodarstw rolnych obecnie i w perspektywie średnio- oraz długoterminowej. Program Wieloletni 2011–2014, nr 144 (p. 19–25). Warszawa: IERiGŻ-PIB.
- Kisiel, R., Babuchowska, K. (2013). Nakłady inwestycyjne w gospodarstwach rolnych – ujęcie regionalne. *Rocz. Ekon. Roln. Rozw. Obsz. Wiej.*, 100(1), 62–63.
- Manteuffel, R. (1963). Efektywność inwestycji rolniczych (p. 38–40). Warszawa: PWRiL.
- Mikołajczyk, J. (2009). Nakłady inwestycyjne w gospodarstwach indywidualnych według wielkości ekonomicznej w świetle polskiego FADN. *Rocz. Nauk Roln. Ser. G*, 96(3), 182–189.
- Nowak, E., Pielichaty, E., Poszwa, M. (1999). Rachunek opłacalności inwestowania (p. 245–255). Warszawa: PWE.
- Pietrzykowski, R., Wicki, L. (2011). Regionalne zróżnicowanie wykorzystania środków z programów wspólnej polityki rolnej na modernizację gospodarstw. *Rocz. Nauk Roln. Ser. G*, 98(4), 11–12.
- Ryś-Jurek, R. (2014). Ocena procesów inwestycyjnych w gospodarstwach rolnych w Polsce po integracji z Unią Europejską. *J. Agribus. Rural Dev.*, 3(33), 217–238.
- Sass, R. (2014). Wpływ inwestycji przed i po akcesji Polski do Unii Europejskiej na potencjał produkcyjny gospodarstw rolnych. *J. Agribus. Rural Dev.*, 2(32), 158–165.
- Sobczyński, T. (2011). Ocena możliwości rozwojowych gospodarstw rolniczych Unii Europejskiej na podstawie inwestycji netto w latach 1998–2008. *Folia Pomer. Univ. Technol. Stetin. Oecon.*, 291(65), 145–156.
- Stabryła-Chudzio, K. (2014). Modernizacja gospodarstw rolnych w Polsce w kontekście wykorzystania środków z budżetu Unii Europejskiej. *Rocz. Ekon. KPSW.*, 257–258.
- Woś, A. (2004). W poszukiwaniu modelu polskiego rolnictwa (p. 84–92). Warszawa: IERiGŻ.
- Zwolak, J. (2010). Kierunki zmian w środkach trwałych po wejściu do UE. *Zesz. Nauk. SGGW Ekon. Org. Gosp. Żywn.*, 85, 69–80.
- Ziętara, W. (2008). Wewnętrzne uwarunkowania rozwoju polskiego rolnictwa. *Rocz. Nauk Roln. Ser. G*, 94(2), 80–94.

## EFEKTYWNOŚĆ INWESTYCJI W GOSPODARSTWACH ROLNYCH W POLSCE PRZED AKCESJĄ DO UNII EUROPEJSKIEJ I PO AKCESJI

**Streszczenie.** Celem pracy była ocena efektywności inwestycji realizowanych w latach 1996–2003 z wykorzystaniem tzw. kredytów preferencyjnych oraz inwestycji po akcesji Polski do Unii Europejskiej. Ponadto stosując metody regresji, określono wpływ wybranych elementów potencjału produkcyjnego tych gospodarstw na wielkość nakładów inwestycyjnych po roku 2004. Z przeprowadzonych badań wynika, że efektywność inwestycji była znacznie wyższa w okresie przedakcesyjnym niż po wstąpieniu Polski do Unii Europejskiej. Dotyczy to zarówno gospodarstw różniących się wielkością nakładów inwestycyjnych, jak i kierunkiem inwestowania. Szczególnie duży spadek efektywności inwestycji wystąpił w gospodarstwach najczęściej inwestujących w maszyny i urządzenia. Z analizy współzależności z wykorzystaniem metod regresji wynika, że powierzchnia gospodarstw oraz majątek trwały miały istotny wpływ na wielkość nakładów inwestycyjnych w latach 2004–2011. Poziom wyjaśnienia zmienności nakładów inwestycyjnych przez potencjał produkcyjny i czynniki z nim współzmiennie jest wysoki i wynosi dla funkcji linowej 91%.

**Słowa kluczowe:** nakłady inwestycyjne, kierunek inwestowania, efektywność inwestycji, potencjał produkcyjny gospodarstw

Accepted for print – Zaakceptowano do druku: 21.09.2016