Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 14, Issue 3, 2014
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ENDOGENOUS DETERMINANTS OF INVESTMENTS IN FARMS OF SELECTED COUNTRIES OF CENTRAL AND EASTERN EUROPE

Dariusz KUSZ[1], Stanisław GĘDEK[1], Maria RUDA[2], Stanisław ZAJĄC[2]

[1] Rzeszow University of Technology, al. Powstańców Warszawy 12, 35-959 Rzeszów, Polska, E-mail - dkusz@prz.edu.pl, E-mail : gedeks@prz.edu.pl
[2] State Higher Vocational School in Krosno, Rynek 1, 38-400 Krosno, Polska, E-mail - m.ruda@pwsz.krosno.pl**,** E-mail: zajacstanislaw@op.pl

Corresponding author: dkusz@prz.edu.pl

Abstract

The aim of this study is to identify endogenous factors that determine the level of investment in farms of economic size over 16 ESU in selected CEE countries belonging to the European Union. The empirical material were data from Farm Accountancy Data Network FADN for the years 2004-2009. Analysis of endogenous factors determining investment activity farms showed that the positive effect depends on the level of executed investment economic situation of agricultural holdings, especially the level of generated net farm income and profitability of agricultural production and the level of farm support under the agricultural policy of the European Union.

Key words: *farm, endogenous determinants, investment*

INTRODUCTION

Factors determining the investment activities of farms can be divided into two main groups. The first group is exogenous factors, located in the external environment farm buildings associated with the macroeconomic, political situation, demographic pressure, institutional arrangements and legal regulations. In turn, endogenous factors are associated with the production potential and economic power of agricultural farm, determined by the resources and relationships of factors of production (resources of land, labor and capital), the production technologies used, human capital, financial situation and the level of income received [4, 6, 7]. Households with higher production potential and economically stronger adopt new production technologies faster and easier. In addition, large agricultural holdings may acquire new technologies earlier because of easier access to external sources of financing, they may also provide better financial security and they are willing to accept higher risk and can not afford the costs of experimenting with new technologies [1, 2].

The level of the investments on the farm is the result of the impact of both exogenous and endogenous factors. In studies on the factors determining the level of the investments it is difficult to capture the role of a single factor, as these factors are interrelated and affect the investment decisions of farmers in a synergistic manner. The complexity and multifaceted determinants influencing the investment decisions of farmers requires a judgment value as to the validity of the individual factors. Exogenous factors are crucial. Only under a favorable perception by farmers of changes in further or closer external environment of agriculture risks associated with investments are taken. In turn, endogenous factors related to potential of agricultural farm have an impact on the willingness and farmers' ability of investment put a condition on initiation of the investment process. Even with very favorable external circumstances, it is difficult to imagine that the investments will be made in a farm of considerable internal constraints.

The aim of this study is to identify an endogenous factors determining the level of investment in farms of economic size over 16 ESU in selected countries of Central and Eastern Europe belong to the European Union.

MATERIALS AND METHODS

The empirical material were data from Farm Accountancy Data Network FADN for the years 2004-2009. However, due to the availability of data, information regarding Bulgaria and Romania included only the years 2007 to 2009. Analysis included all agricultural households from 10 countries and Cental Eastern Europe belonging to the European Union (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) represented in the FADN database from the three largest economic size classes (16 - <40 ESU ; 40 - <100 ESU ≥ 100 ESU).

To identify factors affecting the level of investment activity of farms EU countries multiple regression equation of the general form was used:

$$y_i = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij} + \sum_{j=1}^{k} \gamma_j x_{ij}^2 + \sum_{r=1}^{q} \zeta_r z_{ir} + \varepsilon_i \quad (1)$$

where: y_i - i-th observation on the explanatory variable (i = 1,2,..., n), x_{ij} - i-th observation on the j -th explanatory variable belonging to a set of variables characterizing the internal situation of households, z_{ir} - i-th observation on the r -th binary explanatory variable, taking the value of 1 for the data from the r- th country and zero for the other, β_0, β_j, γ_j, ζ_j - structural parameters of the regression equation.

Binary variables were introduced into the model, to make it possible to identify differences in the dependent variables between the countries included in the study. In the set of explanatory variables the binary variable relating to Poland is not present. This gives the effect that the regression coefficients at binary variables tell how much the average level of the explanatory variable differed from the average level of the variable in Poland. Squares of variables characterizing the internal situation of households (x_i) were included in the model, so that it would be possible to capture the non-linear dependence between a explained and the explanatory variables, if such dependence appeared.

The level completed investments in farms of the Member States of the European Union has been characterized by three variables whose variation is described by the model (1):

Y_1 - net investment outlays per farm [EURO],

Y_2 - fixed assets reproduction calculated as the ratio of net capital expenditures in relation to the value of fixed assets [multiplicity],

Y_3 - net investment per total labor input [EUR/AWU].

A set of potential explanatory variables belonging to a set of variables characterizing the internal situation of households included:

x_1 - economic size of farms [ESU], x_2 - total utilised agricultural area [ha], x_3 - full-time person per 100 ha of AL [AWU/100 ha AL], x_4 - total output/total input [multiplicity], x_5 - balance subsidies & taxes on investments [EURO], x_6 - net farm income [EURO], x_7 - farm net value added [EURO/AWU], x_8 - net farm income family labor [EURO / FWU], x_9 - total assets [EURO], x_{10} - total fixed assets [EURO], x_{11} - cash flow (1)[2] [EURO], x_{12} - cash flow (2)[3] [EURO], x_{13} - cash flow (2)/total farm capital [multiplicity], x_{14} - balance current subsidies & taxes [EURO], x_{15} - total debt ratio[4] [%], x_{16} - technical equipment of the agricultural land[5] [EURO/ha], x_{17} - technical equipment of labor[6] [EURO / AWU], x_{18} - labor productivity[7] [EURO/AWU].

Assessments of the structural parameters of the model (1) describing the variation of each of the dependent variables were calculated using the least squares method using the procedure of *a prori* selection. This procedure allowed the removal from the set all explanatory variables of the model (1), and those that did not affect significantly the formation of the dependent variables.

[2] cash flow (1)=sales of products+other receipts+sales of livestock-all costs paid-purchases of livestock+farm subsidies-farm taxes+VAT balance+subsidies on investments-taxes on investments

[3] cash flow (2)=cash flow (1)+sales of capital-investments+closing valuation of debts-opening valuation of debts

[4] Debt ratio is calculated as the ratio of total liabilities to total assets

[5] Technical equipment of land calculated as the ratio of current assets (excluding land, permanent crops and production quotas) to 1 ha

[6] Technical equipment of labor calculated as the ratio of the value of machinery, equipment and means of transport to one full-time employee

[7] Labour productivity is calculated as the ratio of total production to the number of full-time

RESULTS AND DISCUSSIONS

The characteristics of the explanatory variables are shown in Table 1. It is worth to pay attention to the production potential of the analyzed farms. The highest level of economic size were characterized by farms from Romania and the Czech Republic, while the lowest level of farm equipment were in Slovenia. Similarly, the lowest agricultural area was noted in farms in Slovenia. In the case of workforce equipment of farms analyzed, the highest level of the indicator of full-time person per 100 ha of AL was in agricultural holdings in Slovenia, Poland and Bulgaria. In other countries, this ratio is at a level of 2.0 - 2.8 ha AWU/100 AL. On the other hand, in the case of equipment of analyzed farms in total assets the greatest value was recorded in farms in Slovakia and the Czech Republic, the lowest value was in farm equipment from Bulgaria, Slovenia and Poland. Indicator of technical equipment of agricultural land was the highest in Slovenia. Similarly, the agricultural farms of Slovenia were characterized by the highest value of the indicator technical equipment of labor, but also for the farms of Lithuania, the Czech Republic, Estonia, this ratio was at a similar level. The lowest value of the technical equipment of labor was reported on the farms of Bulgaria and Slovakia.

The investment activity of agricultural holdings with economic size over 16 ESU in the analyzed countries is shown in Table 2. The highest level of investment per one farm occurred in Latvia, Lithuania and Estonia, and a negative value was recorded in Slovakia. Similarly, the rate of reproduction of fixed assets has reached the highest level in Latvia, Lithuania and Estonia, but also in Bulgaria. In turn, the lowest rate of interest reproduction of fixed assets was recorded in the Czech Republic and Slovakia.

Factors affecting the level of net investment realized in farms analyzed countries were identified using multiple regression analysis (Table 3). Net investment are gross investment less amortization. Net investment value indicates a real increase of agricultural farm production assets. The condition for the development of agricultural farm is not just reproduction of the productive assets (simple reproduction), but most of all development investments (extended reproduction). If the net investment are negative, this indicates a depreciation of wealth.

The level of net capital expenditures attributable to the agricultural farm has been explained with the help of the ten variables. With the increase of farm income, cash flow (1), total assets, square of relationship between total output/total input increased level of realized net investment (Table 3). It is worth to pay attention to the importance of net farm income and total output/total input relation in the creation of farmers' investment activity. These two variables indicating the economic situation of the agricultural farm and the profitability of agricultural production, determine the possibility of the creation of investment funds, but also are important as part of the farmers' perception of the economic situation in the sector. Also the value of cash flow (1) has positive impact on the level of the investments. But square of cash flow (1) adversely affects the level of realized net investments, which shows a non-linear relation. cash flow (1) shows the ability of agricultural farm self-financing its operations and create savings in operating activities, at the same time it is also the result of the profitability of agricultural production and the direct support of agriculture in agricultural policy. Therefore, the income situation of agricultural holdings is particularly important from the point of view of investment activities, since it allows to take pro-development activities, the essence of which is the creation of an investment fund that converts to turn in investment demand.

Negative impact on the level of implemented net investments was recorded in the case of cash flow (2), farm net value added/AWU, economic size, total debt ratio, the square of the total fixed assets and square of technical equipment of the land (Table 3). The negative relationship between cash flow (2) and the level of implemented net investment was due to the fact that the cash flow (2) takes into

account not only flows from operating financing activities.
activities, but also from investing and

Table 1. The explanatory variables (average for years 2004 – 2009)

Parameter	Bulgaria	Czech Republic	Estonia	Hungary	Lithuania	Latvia	Poland	Romania	Slovakia	Slovenia
Economic size of farm [ESU]										
$\bar{x}$	128,2	207,9	102,2	165,5	101,1	138,1	117,0	217,4	157,3	41,8
sd	126,4	240,2	87,3	177,7	85,0	138,4	112,4	311,8	164,6	18,3
Total utilised agricultural area [ha]										
$\bar{x}$	459,7	443,2	505,6	372,1	415,9	453,4	192,1	567,2	698,9	35,4
sd	427,7	458,9	376,8	364,8	316,5	342,0	202,7	501,7	628,5	13,4
Full-time person per 100 ha AL [AWU/100 ha AL]										
$\bar{x}$	4,3	2,8	2,0	2,7	2,0	2,7	4,7	2,8	2,6	9,1
sd	1,8	0,6	0,5	0,5	0,7	0,9	1,5	1,0	0,6	2,8
Total output/total input [multiplicity]										
$\bar{x}$	0,98	0,94	0,98	0,98	1,19	0,93	1,23	1,03	0,72	1,15
sd	0,13	0,10	0,10	0,08	0,19	0,08	0,15	0,13	0,11	0,08
Balance subsidies & taxes on investments [thousand EURO]										
$\bar{x}$	1,82	3,96	17,35	7,37	18,36	19,47	-0,20	4,54	10,25	5,59
sd	1,69	6,06	14,94	10,80	13,70	18,69	1,56	4,61	16,97	5,81
Farm net income [thousand EURO]										
$\bar{x}$	52,31	40,78	66,27	53,07	105,34	74,15	53,63	129,80	-45,59	39,71
sd	57,05	33,25	55,01	52,48	74,87	61,45	39,08	175,33	116,20	23,43
Farm net value added [thousand EURO/AWU]										
$\bar{x}$	74,25	12,98	12,51	15,51	17,40	10,08	13,63	13,57	5,53	13,19
sd	29,31	29,26	38,56	4,13	6,71	3,11	3,61	7,02	2,93	7,28
Farm net income family labor [thousand EURO/FWU]										
$\bar{x}$	52,85	20,65	49,34	39,83	73,31	46,65	32,16	51,53	20,14	15,76
sd	52,57	12,47	38,49	23,20	53,37	38,75	25,30	42,41	38,26	8,75
Total assets [thousand EURO]										
$\bar{x}$	444,65	1348,58	824,08	865,12	757,84	869,16	638,28	843,40	1637,44	496,98
sd	342,48	1505,73	721,91	836,87	642,26	947,55	589,72	810,31	1954,63	160,54
Total fixed assets [thousand EURO]										
$\bar{x}$	260,31	998,61	628,32	500,38	459,36	536,64	478,78	506,55	1039,20	461,57
sd	179,31	1090,64	552,76	423,82	372,56	589,68	405,70	458,57	1321,56	144,59
Cash flow (1) [thousand EURO]										
$\bar{x}$	69,27	88,35	100,82	88,29	129,15	113,99	73,59	142,95	68,45	53,97
sd	67,98	69,95	69,71	73,43	91,07	94,35	54,40	175,39	74,41	27,89
Cash flow (2) [thousand EURO]										
$\bar{x}$	19,91	30,68	38,82	58,27	69,11	45,0	34,42	98,84	-3,88	18,22
sd	39,99	20,88	39,42	62,99	55,47	40,56	40,78	150,45	58,43	16,37
Cash flow(2)/farm total capital [multiplicity]										
$\bar{x}$	0,0252	0,0629	0,0652	0,0871	0,1162	0,087	0,0729	0,1020	0,0150	0,0344
sd	0,0849	0,041	0,0354	0,042	0,0525	0,049	0,0326	0,0690	0,0430	0,0249
Balance current subsidies & taxes [thousand EURO]										
$\bar{x}$	58,32	105,08	68,47	87,64	56,47	85,40	31,12	1020,08	137,66	19,21
sd	59,49	109,08	55,84	91,48	42,08	76,88	33,56	998,82	139,37	9,40
Total debt ratio [%]										
$\bar{x}$	26,31	17,59	32,34	30,84	23,74	37,82	20,28	12,76	9,66	4,83
sd	9,94	7,40	6,16	7,29	3,77	10,37	7,09	6,66	4,61	1,53
Technical equipment of the agricultural land [EURO/ha UR]										
$\bar{x}$	557,93	1737,30	1011,82	1032,77	800,24	736,32	2547,59	700,91	1058,36	8426,30
sd	187,17	393,24	221,40	82,02	226,58	324,83	855,51	77,10	614,16	1005,45
Technical equipment of labor [thousand EURO/AWU]										
$\bar{x}$	7,73	29,54	26,03	20,70	30,71	17,83	22,52	14,98	9,49	30,03
sd	2,90	5,97	12,36	6,16	12,77	5,89	4,86	5,98	3,25	12,26
Labor productivity [thousand EURO/AWU]										
$\bar{x}$	15,69	34,50	36,42	40,59	34,94	28,21	35,43	27,63	22,52	33,52
sd	5,30	4,94	8,92	9,82	10,55	9,37	10,22	11,80	4,66	14,53

Source: own study based on Farm Accountancy Data Network

Table 2. The level of investment outlays in farms with economics size from 16 ESU in selected countries (average for years 2004 – 2009)

Country	Net investments per farm [euro]		Fixed assets reproduction ratio [%]		Net investment per total labor input [EURO/AWU]	
	$\bar{x}$	*sd*	$\bar{x}$	*sd*	$\bar{x}$	*sd*
Bulgaria	38456,4	76,80	15,29	65,13	2906,31	73,59
Czech Republic	9053,78	184,86	0,65	192,95	481,55	209,41
Estonia	62520,22	112,10	11,00	52,33	6102,81	55,19
Hungary	15066,89	165,57	2,17	104,03	1293,04	98,66
Lithuania	64500,28	77,65	15,87	31,39	9175,02	45,26
Latvia	94716,39	130,81	16,58	59,40	5462,10	64,94
Poland	17174,61	115,15	3,72	60.74	2820,66	65,32
Romania	25503,78	128,60	2,57	225,53	983,73	187,16
Slovakia	-39609,7	255,60	0,81	705,67	-698,60	363,41
Slovenia	18381,75	81,37	3,33	65,83	5986,61	74,22

Source: own study based on Farm Accountancy Data Network

Table 3. Regression summary of depend variables: Y_1 – net investment outlays per farm [EURO]

Variable	Variable name	b_j	$S(bj)$	t	p
x_0	Constant	8939,38	14477,6	0,6174	0,5379
x_6	Farm net income	1,17	0,1	13,096	0,000
x_{11}	Cash flow (1)	1,18	0,3	3,5609	0,0005
x_{11}^2	Square of cash flow (1)	-0,001	0,0	-5,430	0,000
x_{12}	Cash flow (2)	-0,65	0,1	-5,282	0,000
x_{12}^2	Square of cash flow (2)	0,001	0,0	3,2811	0,0013
x_9	Total assets	0,07	0,0	6,0310	0,000
x_7	Farm Net Value Added/AWU	-5,01	0,8	-6,2877	0,000
x_1	Economic size	-714,79	138,7	-5,153	0,0001
x_1^2	Square of economic size	0,64	0,2	3,437	0,0007
x_{15}	Total debt ratio	-374369,66	109987,2	-3,403	0,0008
x_{15}^2	Square of total debt ratio	1101707,23	199327,5	5,527	0,0000
x_{10}^2	Square of total fixed assets	-0,001	0,0	-5,704	0,000
x_4^2	Square of total output/total input	26947,43	9574,2	2,814	0,0055
x_{16}^2	Square of technical equipment of the agricultural land	-0,00001	0,0	-2,275	0,024

R^2 = 0,7984 corrected R^2 = 0,7784

Source: own study based on Farm Accountancy Data Network

Therefore, the cash flow (2) reflects the investments made and the financial burden resulting from this fact, and is not a factor stimulating farmers to invest. At the same time a square of cash flow (2) is positively correlated with the level of investment which proves the non-linear relation. Also, with increasing values of total debt ratio investment activity of farmers decreased, the relationship was not linear (positive impact of squared variable of total debt ratio). This is due to the fact that the increase in the debt level of an agricultural farm reduces its credit rating. With the increase in the value of the

square of technical equipment of land, the square of the total fixed assets and labor productivity index calculated farm net value added/AWU the level of investments made is reduced.

Table 4. Regression summary of dependent variables: Y_2 – fixed assets reproduction [%]

Variable	Variable name	b_j	$S(bj)$	t	p
x_0	Constant	-0,561	0,095	-5,9092	0,000
x_{15}	Total debt ratio	0,3461	0,045	7,62560	0,000
x_4	Total output/total input	0,9799	0,184	5,32042	0,000
x_4^2	Square of total output/total input	-0,363	0,086	-4,2239	0,001
x_{10}	Total fixed assets	-0,0001	0,00	-6,0545	0,000
x_5	Balance subsidies & taxes on investments	0,0001	0,00	6,89202	0,000
x_5^2	Square of balance subsidies & taxes on investments	-0,0001	0,00	-6,0488	0,000
x_7	Farm Net Value Added/AWU	-0,0002	0,00	-2,4272	0,016
x_9^2	Square of total assets	0,0001	0,00	4,95765	0,001
x_{14}	Balance current subsidies & taxes	0,00001	0,00	2,57657	0,010
x_{14}^2	Square of balance current subsidies & taxes	-0,0001	0,00	-3,4782	0,001
x_{13}	Cash flow (2)/farm total capital	-0,7674	0,14	-5,4599	0,000
x_{13}^2	Square of cash flow (2)/farm total capital	3,842	0,79	4,83102	0,001
Binary variables that identifies countries where the level of Y_2 is different from the average in Poland	Hungary	-0,078	0,013	-5,7449	0,000

R^2 = 0,8386 corrected R^2 = 0,7032
Source: own study based on Farm Accountancy Data Network

This would indicate that the farms that are better equipped with fixed assets and higher labor productivity have a better, more modern production workshop which reduces investment needs.

Comparing the level of net implemented investment by farm in Poland to farms in the rest of the countries surveyed showed no statistically significant differences. Matching of determined model to empirical data is 78,94 % (Table 3). Another analyzed dependent variable is the rate of reproduction of fixed assets (Table 4). The rate of reproduction of fixed assets indicates a degree of property reproduction. If the value of this ratio is in the range 0 - 0.99 %, this means a simple reproduction, the rate of value above 0.99 % points to expanded reproduction, and less than 0 % to negative reproduction [11]. The rate of reproduction of fixed assets for the analyzed farms has been explained with the help of eight explanatory variables. With the increase in total debt ratio, total output/total input, Balance subsidies and taxes on investments, balance current subsidies and taxes, square of cash flow (2)/total farm capital increased, the rate of reproduction of fixed assets increased. At this point, special attention should be paid to the positive role of balance subsidies & taxes on Investments and balance current subsidies & taxes to stimulate investment activity for farmers. These two quantities are dependent on the level of support in agricultural policy both in operations and investment and play an important role due to reducing investment risk and in ongoing activities, and also allow for reduction of the costs associated with financing investments from external sources. In addition, the allow for reduction of the impact of credit constraints [10]. Square of balance subsidies & taxes on Investments and

square of balance current subsidies & taxes take negative values which indicates the existence of non-linearity. On the other hand, with the increase in total fixed assets, farm net value added/AWU and cash flow (2) / total farm capital, the rate of reproduction of fixed assets decreased (Table 4).

Comparing the level of the rate of reproduction of fixed assets by farm in Poland to farms in other countries analyzed, it was found that it was statistically significantly lower only in Hungary. This ratio did not differ significantly in the farms of other analyzed countries. Matching of determined model to empirical data is 83.86 % (Table 4).

The last analyzed the dependent variable is net investment per total labor input. This indicator is important because of the observed changes in prices of agricultural production means, the prices of agricultural production, prices of production factors and their mutual relationships. Observed trends in changes to the price level during long periods are particularly important for the processes of modernization. Analyzing the changes in the prices of agricultural products and prices of products purchased by farmers (in real terms) in the U.S., J.P. Chavas [3] and W. E. Huffman and R. E. Evenson [5] noted a permanent separation of the price scissors and a worsening of the income of farmers. Similarly, in studies by H. Runowski and W. Ziętara [9] it was found that labor costs have the largest dynamics of increase, then come the costs of prices of goods purchased by farmers. In contrast, the lowest growth trend is seen for the prices of agricultural products sold by farmers. Appearing trend causes a decrease in unit profitability of agricultural production. In the context of rapid increase in labor costs in agriculture, there is need to improve the efficiency factor of production which is work. Achieving this is difficult, but it is slowly becoming the only possibility [8]. Due to the rapid growth of labor costs compared to other factors of production it becomes necessary to implement the cost-effective production technology resulting in an increase in capital-labor relations.

The level of net investment per total labor input for the analyzed farms has been explained with the help of eleven explanatory variables (Table 5).

With the increase in total output/total input, balance subsidies & taxes on investments, square of farm net value added/AWU, net farm income, labor productivity, square of economic size and square of total net assets the level of investment per total labor input increased. In the case of the dependent variable it can be also noted that among the endogenous factors the net farm income, profitability of agricultural production and the level of subsidies & taxes balance on investments are important. However, the square of total output/total input and square of Balance subsidies & taxes on investments are negative which indicates the presence of non-linearities. This analysis points to the importance of the economic situation of agricultural holdings as an important element for the adoption of the investment effort, but also stresses the importance of financial support for public investment activity. Improving the economic situation of agricultural farm allows for financing the investment, and the possibility of obtaining financial assistance from public funds further enhances the ability to fund capital expenditures or increase the range of investment size. In turn, negative correlation was observed between the net investment per labor total input and total utilised agricultural area, full-time person per 100 hectares of agricultural area, cash flow (2)/total farm capital and square of cash flow (1).

Comparing the level of net investment per total labor input on farms in Poland to farms in other countries analyzed, it was found that it was statistically significantly lower only in Hungary and the Czech Republic, and agricultural holdings in Bulgaria achieved a higher rate of it. In the farms of other analyzed countries, this ratio did not differ significantly. Matching of determined model to empirical data is 87.13 % (Table 5).

Table 5. Regression summary of dependent variables: Y_3 – net investment per total labor input [EURO/AWU]

Variable	Variable name	b_j	$S(bj)$	t	p
x_0	Constant	-20077,3	4613,7	-4,35	0,001
x_4	Total output/total input	33832,0	9123,9	3,71	0,003
x_4^2	Square of total output/total input	-14070,4	4261,0	-3,3	0,001
x_5	Balance subsidies & taxes on investments	0,4385	0,04	9,554	0,000
x_5^2	Square of balance subsidies & taxes on investments	-0,00001	0,00	-6,355	0,000
x_2	Total utilised agricultural area	-6,9531	1,06	-6,51	0,000
x_7^2	Square of farm net value added/AWU	0,00001	0,00	5,57	0,000
x_6	Farm net income	0,0214	0,01	4,31	0,001
x_3	Full-time person per 100 ha AL	-352,704	124,2	-2,83	0,005
x_{18}	Labor productivity	0,3621	0,11	3,22	0,001
x_{18}^2	Square of labor productivity	-0,00001	0,00	-4,0	0,001
x_{13}	Cash flow (2)/farm total capital	-19468,9	5688,6	-3,42	0,008
x_1^2	Square of economic size	0,0079	0,004	2,01	0,045
x_{11}^2	Square of cash flow (1)	-0,00001	0,000	-4,93	0,002
x_9^2	Square of total assets	0,00001	0,000	4,10	0,007
Binary variables that identifies countries where the level of Y_3 is different from the average in Poland	Hungary	-3402,13	656,5	-5,18	0,001
	Czech Republic	-4008,8	690,0	-5,80	0,000
	Bulgaria	2372,02	987,6	2,40	0,017

R^2 = 0,8713 corrected R^2 = 0,7592
Source: own study based on Farm Accountancy Data Network

CONCLUSIONS

The investment decision is the process in which the information from different sources is processed. A farmer's decision to invest in physical capital might be the result of economic considerations regarding to the external environment factors, farm buildings and internal factors inherent in the farm, the characteristics of the farmer or the objectives pursued. Together, all these factors contribute to making specific investment decisions, which in turn translates into capital expenditure.

The ex-post analysis of endogenous factors affecting the investment activity of agricultural farms of economic size over 16 ESU in the countries of Central and Eastern European Union showed that in the case of net investment outlays per farm, fixed assets investment and net reproduction per total labor input the economic situation of agricultural holdings, particularly the level of farms generated net income and profitability of agricultural production has positive impact the level of realized investment. Good economic situation of agricultural farm allows for the financing of investment activities on the basis of its own resources, but also allows the obtaining of funds from external sources. It also allows more optimistically assess the future and take risks associated with investments. The analysis also pointed out the importance of agricultural policy in shaping the investment activity of farmers. The level achieved by holding agricultural subsidies was positively correlated with the value of the investments evaluated by indicators: fixed assets reproduction and net investment per total labor input. The role of subsidies, due to the fact that they share a certain level of confidence (do not depend on the market situation, their level is quite sure in a certain period of time resulting from the financial perspective of the EU agricultural policy), should be assessed as a factor mitigating the risks associated with ongoing investments.

REFERENCES

[1]Barrett, C.B., Carter, M.R., Timmer, C.P., 2010, A Century–Long Perspective on Agricultural Development. American Journal of Agricultural Economics 92 (2): 447 – 468
[2]Carter, M., 1988, Equilibrium Credit Rationing of Small Farm Agriculture. Journal of Development Economics 28: 83 – 103
[3]Chavas, J. P., 2011, Agricultural Policy in a uncertain world. European Review of Agricultural Economics, Vol. 38(3): 383 – 407
[4]Gallerani V., Gomez y Paloma S., Raggi M., Viaggi D., 2008, Investment behaviour in conventional and emerging farming systems under different policy scenarios. European Commission JRC Scientific and Technical Report Institute for Prospective Technological Studies
[5]Huffman, W.E., Evenson R.E., 2001, Structural and productivity change in US agriculture, 1950 – 1982. Agriculture Economics 24: 127 – 147
[6]Kusz D., Gędek S., Ruda M., 2013, Endogeniczne uwarunkowania działalności inwestycyjnej gospodarstw rolniczych w Polsce. Roczniki Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich, Tom 100 – Zeszyt 1, PAN Wydział Nauk Humanistycznych i Społecznych – Komitet Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich, Wydział Nauk Ekonomicznych SGGW w Warszawie: 52 – 61 (in Polish)
[7]Kusz, D., 2009, Procesy inwestycyjne w praktyce gospodarstw rolniczych korzystających z funduszy strukturalnych Unii Europejskiej, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów (in Polish)
[8]Rembisz, W., Bezat-Jarzębowska, A., 2013, Microeconomics of agricultural producers' income. LAP Lambert Academic Publishing
[9]Runowski, H., Ziętara, W. 2011, Future role of agriculture in multifunctional development of rural areas. APSTRACT: Applied Studies in Agribusiness and Commerce, Vol. 5, Numbers 1 – 2: 29 – 38
[10]Sckokai, P. 2005, Modelling the impact of agricultural policies on farm investments under uncertainty: the case of the CAP arable crop regime. Working Paper AGR/CA/APM(2005)13/FINAL, OECD, Paris
[11]Sobczyński, T., 2007, Wpływ wielkości ekonomicznej gospodarstw rolniczych UE na ich możliwości rozwojowe. Zeszyty Naukowe SGGW w Warszawie, Problemy Rolnictwa Światowego, Tom 9 (XXIV), Wydawnictwo SGGW w Warszawie, Warszawa: 159 – 168 (in Polish)