JEL: Q1, Q18, D91

Virginia Namiotko[1], Justyna Góral[2], Michał Soliwoda[2]

[1]*Lithuanian Institute of Agrarian Economics*
Lithuania
[2]*Institute of Agricultural and Food Economics – National Research Institute*
Poland

THE ECONOMIC SITUATION OF FARMS LOCATED IN LESS FAVOURED AREAS ON THE EXAMPLE OF LITHUANIA AND POLAND

The paper analyses economic characteristics of the farms, situated in the less favored areas of Lithuania and Poland. A comparative analysis of farms located in less-favored areas in Lithuania and Poland was conducted in terms of their income diversification and economic situation. In addition, a short description of the compensation payments, their types and rates, was provided in both countries. Using the panel models and correlation analyzes, we identified the most important determinants of agricultural income. The gross agricultural income per hectare of UR was estimated as variable. It was hypothesized that the location of farms in LFA areas determined the income of their owners in a statistically significant way. The impact of compensatory payments on the economic situation of the surveyed companies in Lithuania and Poland was also shown.

Key words: natural handicapped areas, Less Favored Areas payments, Lithuanian farms, Polish farms, economic results of farms, farm income

Introduction and review of literature. Certain rural areas are classified as Less Favoured Areas (LFA) because conditions for farming are more difficult due to natural constraints, which increase production costs and reduce agricultural yields. In the European Union, LFA is a term used to describe an area with natural handicaps (lack of water, climate, short crop season and tendencies of depopulation), or that is mountainous or hilly, as defined by its altitude and slope.

In the European Union (EU), the support of Less Favoured Areas has a long tradition as a part of the Common Agricultural Policy (CAP). The aid for the LFA in the European Union dates back to 1975 and has since then undergone several reforms from being focused on addressing rural depopulation towards increased focus of maintaining certain agricultural land use and environmental protection [24, pp. 260–272; 2]. LFAs benefit from area and headage compensatory allowances, and from a number of payments for structural adjustment. National governments designate their respective LFAs [8–15]. In the Czech Republic, these are areas with less favoured conditions for agricultural production. These areas benefit from specific area and headage payments, and additional interest rate subsidies to support investment [28–31]. In Hungary, these are areas with less favoured conditions for agricultural production (low quality land), which are defined in terms of the "Golden Crown Standard", reflecting its productive potential [14].

Above all, it is the objective of the subsidies to maintain the agricultural

production in LFAs, but also to consider the environmental aspects in LFAs and its funding schemes. The research has shown that agricultural practices within Less Favoured Areas are more environmentally friendly than in other areas.

The main objective of the LFA payments within the Rural Development Programme (RDP) is to equalize opportunities for development of farms located on areas where agricultural production is restrained due to unfavorable environmental conditions. The payments are intended to compensate for the loss of income (economic objective) due to natural difficulties and have to counteract the depopulation of rural areas and the loss of their agricultural character (social purpose). The evolution of the LFA subsidies changed its goals – from social to environmental ones. Social objectives and putting an end to depopulation of the rural areas were eliminated, and the payment is intended to preserve the landscape and biodiversity through environment-friendly sustainable farming [4].

The evaluation of LFA policy has received significant attention in recent years in the scientific literature. Nonetheless, there is some ambiguity on the effects of this support, in particular by analyzing in income context. It is recognized that LFA payments reduce the income gap between rural population, however, several studies highlighted that the impact of these payments is limited.

M. Stolbova et al. (2007) examined the impact of LFA payments on different rural structures in Poland and Czech Republic. The authors revealed that LFA payment had significant impact on income of Czech farms, however, there were no impact in Poland. The main reason for such results in Poland was relatively lower support for less favoured areas as compared to other measures, and digressive nature of payments. Similarly, in another study M. Stoblova and T. Hlavsa (2008) identified the positive effect of LFA payments to compensate the difference of economic results achieved by Czech LFA farms and farms operating outside LFA. The researchers even concluded that for some farms in mountain areas or areas affected by specific handicaps LFA payments were higher than is relevant to compensate the existing handicaps. M. Stoblova and J. Molcanova (2009) compared the impact of support on LFA farms in the Czech Republic and Slovakia. The research indicated that both the Czech Republic and Slovakia showed the same low level of economic results, suggesting substantial role of LFA payments.

G. Hovorka (2006) focused on analyzing the impact of agricultural policy on the structure of mountain farms in Austria. The author found that LFA payments contributed in offsetting high production costs and low production potential. These payments were also an important part of agricultural income and also made a substantial contribution in ensuring continued agricultural land use in LFAs. M. Schouten et al. (2008) carried out a research in the Netherlands in order to investigate whether there are differences in family farm income of LFA farms when compared to farms operating outside LFA. It was found that there were no significant differences in family farm income between LFA farms and farms operating outside LFA. The authors concluded that the size of compensatory payments was small and it has no significant effect of the family farm income of LFA farms.

J. Giesecke et al. (2010) evaluated the regional economic consequences of LFA support in Poland. They showed that LFA support helped to increase farmers' income. However, LFA scheme's contribution in reducing land abandonment was small. As the authors noted, in the intermediate rural-predominantly agricultural regions, where the scheme appeared the most effective in promoting continued land use, LFA payments caused total land use was by 3 % higher than it would have been otherwise, while in predominantly urban-intermediate agricultural regions this effect was even smaller. A. Sadlowski (2012) analyzed the relationship between the farm net income and the location of agricultural activity as well as the importance of LFA payments in equalizing the profitability farms located in different regions of Poland. The research showed that there was a weak relationship between the farm net income and the location of farm. The LFA payments did not reduce the strength of this relationship.

I. Pilvere and I. Sikunova (2013) examined the LFA payments in the regions of Latvia over the period of 2004–2010. The research indicated that over the entire period of 2004–2010 Latvian farmers received great sums of LFA payments. However, during the period of 2004–2010, the LFA payments were relatively stable and the rates of other payments increased, thus reducing a significance of LFA support. A. Veveris et al. (2014) investigated the impact of LFA payments on Latvian farms. They found that LFA payments facilitated significant growth of farms income. In the authors' opinion, a significant advantage of these payments was their availability to small farms. The research also showed that LFA payments had a big impact on crop farms as well as on livestock farms.

I. Krisciukaitiene and A. Galnaityte (2008) analyzed the impact of support on LFA farms in Lithuania. The research showed that gross margin with subsidies of LFA farms was about 3 times higher as compared to gross margin without subsidies. The same tendencies were also observed among farms operating outside LFA. The authors concluded that LFA payments were not able to promote intensification of agricultural production and to ensure the efficient use of land, labour and capital. The main reason for such results was farmers' unwillingness to invest and increase production in these areas. In another study I. Krisciukaitiene et al. (2010) compared the implementation of rural development programmes in Lithuania and Scotland. They found that over the RDP period of 2007–2013 in both countries great sums of support was allocated to LFA payments. According to them, this suggests that these payments should maintain the income of rural community. V. Vitunskiene and A. Novikova (2013) examined the impact of LFA measure on income of family farms in Lithuania. The analysis showed that after Lithuania's accession to the EU, Lithuanian family farms have used the advantages of the EU support under the CAP. At the beginning of EU membership, the incomes of LFA farms were lower as compared to farms operating outside LFA. However, later incomes of LFA farms were growing very fast and exceeded incomes of farms operating outside LFA.

The purpose of the article is an assessment of impact of compensatory payments on the level of farm profit. To evaluate the importance of the subsidies in

relation to income, we selected some indicators. Chosen time horizon from 2007 to 2013 also allows assessment of the progress of the importance of LFA subsidies in terms of ability to make a profit.

Results and discussion. *Compensatory payments in Less Favoured Areas.* In this areas, agricultural production is more difficult because of natural handicaps, e.g. difficult climatic conditions, steep slopes in mountain areas, or low soil productivity in other less favoured areas. Due to the handicap to farming there is a significant risk of agricultural land abandonment and thus a possibility of loss of biodiversity, desertification, forest fires and the loss of highly valuable rural landscape. Nearly 57% of the overall Utilized Agricultural Area in the EU is classified as Less Favoured Area. Despite the wide percentage of surface designated as LFA, only a limited proportion of farmers benefit from a compensatory allowance.

LFA beneficiaries are required to undertake to farm for at least five years from the first payment and to farm a minimum area fixed at the Member State level. In addition, Member States apply a range of specific eligibility criteria. LFA payments are granted annually per hectare of utilised agricultural area. The level of the payment can vary between a minimum of 25 euro/hectare and a maximum of 200 euro/hectare [10].

EU states have been using a compensatory payment system since 1975. The idea to support farmers in less favoured areas (LFA)[1] originated in 1946 in England, where farmers raising sheep and cattle in hilly regions were supported. The idea of compensatory payments remained the same throughout its history, but the criteria of calculation of payments for farm owners changed slightly. The basic purpose of this measure (under Rural Development Programme – RDP[2]) is to compensate for smaller opportunities of farms located in areas where agricultural production is more difficult due to unfavourable environmental conditions[3].

Rates of LFA payments in the European Union are very different. For example, in 2007–2013 summary LFA payments in Poland (EUR 41.2 per ha/year) were much lower than in Austria (164.8 euro per ha/year), France (100.8 euro per ha/year) and Italy (83.0). Figure 1 shows the indicators of income for farms in LFA areas (mountain and non-mountain) and those in non-LFA areas. Income was higher in the non-LFA, despite the LFA subsidies made.

During the period of 2007–2013, 43.5 % of the overall utilized agricultural areas in Lithuania were classified as less favoured areas. According to the Farm Accountancy Data Network data, the average farm size in Less Favoured Areas was

---

[1] LFAs have been divided into 3 groups: lowlands, mountains and areas with specific handicaps. The division has been done according to characteristic features.

[2] The financial support to LFAs amounted to 8 billion euro, approximately 18% of the Community funding for Rural Development for 2000-2006. In the programming period 2007-2013, the allocation of the European Agricultural Fund for Rural Development (EAFRD) dedicated to the scheme is 12.6 billion euro or 13.9% of the total Community funding allocation [10].

[3] When applying for LFA payments, an agricultural producer is obliged to: (1) conduct agricultural activity on the area reported for payment for at least 5 years from the day the first payment is received; (2) apply normal good agricultural practice according to the need to protect the environment and maintain rural areas, particularly through sustainable agriculture.

47 ha during the research period, whereas in normal areas it constituted 40 ha. Average farm net income of these two farm groups was 338 euro/ha and 322 euro/ha, respectively. The major factor causing the increase in farm net income was the annually augmenting subsidies from both the EU and national budget funds. In 2007–2014, subsidies in the general structure of farm net income on average amounted to 93 % and 65 %, respectively.
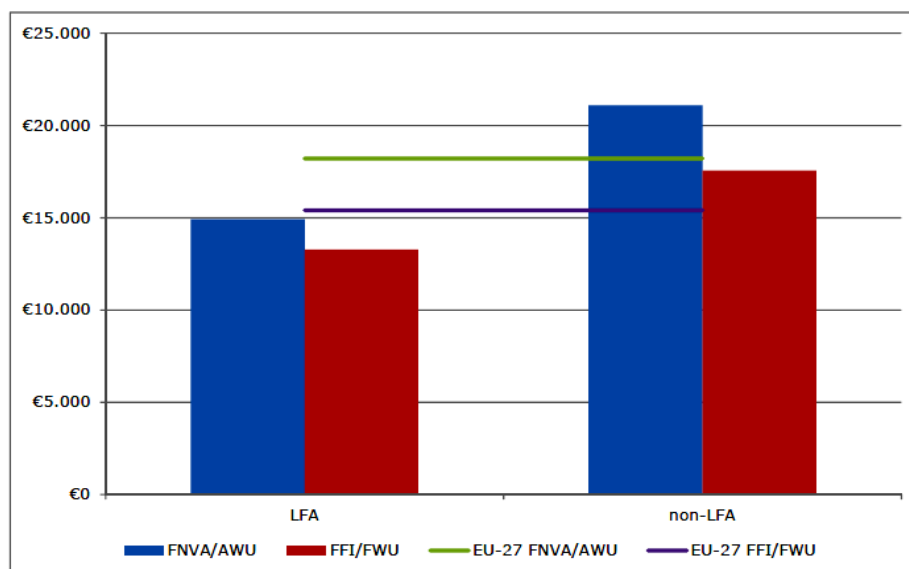
Fig. 1. Indicators of farm income by Less Favoured Area status (EU-27, 2010–2012)

Note. Family farm income/Family Work Unit = FFI/FWU; Farm net value added/Annual Work Unit = FNVA/AWU.

Source: B. Hill, B.D. Bradley, Comparison of farmers' incomes in the EU Member States, University of London, 2015.

Looking at LFA payments in Lithuania in 2007–2014, one can notice that support per eligible LFA hectare ranged in between 56.5 euro/ha in less unfavoured areas to 75.3 EUR/ha in highly unfavoured areas. The compensatory payments were also differentiated according to farm size: up to 150 ha – 100 %, 151–250 ha – 85 %, 251-500 ha – 70 %, above 500 ha – 50 %. According to the data of the National Paying Agency, more than 107 thousand farm holdings were supported in Lithuania during 2007–2013. This number accounted for 90 % of the targeted number of farm holdings to receive support for the period 2007–2013. Within the entire period under analysis, the area under this support totalled 1.24 million ha and constituted 113 % of the targeted area to receive support for the period 2007–2013.

In Poland, the following categories of less favoured areas have been distinguished: (1) mountains (2.1 %), (2) areas with specific handicaps (5.3 %), (3) lowland type I and II (92.6 % of LFAs). In total, LFA payments in Poland cover nearly 11 million hectares, which constitutes about 60 % of agricultural land in the country[4]. It is worth stressing, that 98 % of the Podlaskie Voivodeship is situated in

---

[4] In Poland, a beneficiary may be an agricultural producer managing the total area of agricultural land of at least 1 ha (arable land, orchards, grassland) situated in areas classified as Less Favoured Areas under the RDP and following the normal good agricultural practice (a set of a few tens of standards related to rational fertiliser and sewage

such areas. The lowest percentage of LFAs has been reported in the Opolskie Voivodeship (26 %). So far, the beneficiaries of this instruments were farmers from 823,000 farms (including nearly 60,000 farms that have been classified as mountain LFAs). It is also worth emphasising that nearly 80 % of beneficiaries are farmers who manage agricultural area of up to 15 hectares [4; 11; 15] . The average Polish LFA payment amounts to about 60 % of the average EU LFA payment. However, it should be mentioned that about 2.3 million hectares of agricultural land classified as LFAs is omitted in these payments due to the size of farms (area smaller than 1 ha)[5]. Table 1 shows current rates of compensatory payments in Poland, which do not differ much from the rates of 2007–2014 (only the mountain LFA payments rose by about 40 %). It should be stressed that the LFA payments are degressive at the farm level and are awarded where the area does not exceed 75 ha.

Table 1

Rates of payment for particular LFA types in 2014–2020

LFA type		Rate [PLN/ha/year]
Mountains		450 (previous: 320)
Lowland	Lowland zone I	179
	Lowland zone II	264
Specific		264

Source: http://www.minrol.gov.pl/Wsparcie-rolnictwa/Program-Rozwoju-Obszarow-Wiejskich-2014-2020/Aktualnosci/Platnosci-ONW (retrieved on 20/06/2016).

Descriptive statistics, comparative analysis and panel models were used. With respect to panel models, the following approaches were used: (1) Fixed Error Models (FEM) with Arrelano correction (robust standard errors); (2) Random Error Models (REM); (3) FEM with Arrelano correction (robust standard errors) with the effect of time; (4) Random Error Models with the effect of time.

Models of FEM and REM may generally be written as follows:

$$y_{it} = m_i + bx_{it} + e_{it},$$

where:

m_i – intercept;

b – structural parameter expressing the impact of explanatory variable X;

x_{it} – explanatory variable realisation for *i-th* object in the *t-th* period;

e_{it} – residual value.

In addition, the results of the Farm Accountancy Data Network (FADN) were used for Lithuania and Poland. FADN has been used in the European Union since 1965 as an agricultural accounting system. Its main purpose is to assist in the programming and evaluation of individual instruments of the Common Agricultural Policy. The implementation of this system is mandatory for each EU aspiring country.

---

management, soil and water protection, plant protection agent storage, preservation of valuable habitats and species present in agricultural areas, and protection of landscape beauty).

[5] Farms that do not receive such payments dominate in the most problematic areas, such as the Małopolskie and Podkarpackie Voivodeships.

Data covered the years 2007–2013. Pigs, horticultural, orchard and horticultural farms were removed from fields of observation, due to the specificity of production and the different cost structure. Two panels of farms – beneficiaries of the LFA and non- LFA farms were created in each country. In the case of Lithuania, the LFA farms panel had 637 farms each year, the non-LFA farms panel consisted of 1162. Similarly, the Polish panel of recipients of compensation payments counted 2706 households each year, while the non-LFA household panel – 2093 entities each year. The following is a brief description of the surveyed farms based on descriptive statistics. The comparative analysis is shown in Table 2.

Table 2

Characteristic of farms – comparative analysis (average for 2007–2013)

Items		Lithuania				Poland			
Variables / years	LFA or non-LFA	2007	2010	2013	2013/ 2007	2007	2010	2013	2013/ 2007
Average farm area	LFA	40.20	46.85	53.05	1.32	32.03	35.63	35.86	1.12
	Non-LFA	46.34	36.31	42.51	0.92	30.79	34.97	35.56	1.15
Farmer's age	LFA	47.00	47.00	45.00	0.96	41.50	43.66	44.23	1.07
	Non-LFA	43.00	46.00	48.00	1.12	41.68	44.17	44.76	1.07
Sales revenue per 1 ha [euro]	LFA	353.05	360.00	369.56	1.05	403.50	407.20	412.70	1.02
	Non-LFA	553.75	617.47	764.02	1.38	592.90	599.50	609.10	1.03
Direct costs per 1 ha [euro]	LFA	170.46	158.51	218.57	1.28	598.69	600.76	593.48	0.99
	Non-LFA	240.80	303.92	386.82	1.61	459.06	472.68	464.51	1.01
Farm income per 1 AWU [euro]	LFA	2806.13	787.53	-1047.51	-0.37	3 023.75	3 915.04	3 726.04	1.23
	Non-LFA	5219.32	1549.55	2140.41	0.41	4 249.10	4 765.40	4 957.74	1.17
Farm income per 1 ha UAA [euro]	LFA	127.04	28.91	-35.15	-0.28	194.50	235.27	250.22	1.29
	Non-LFA	211.75	74.68	89.12	0.42	288.05	297.26	299.14	1.04
Share of subsidies in farm income	LFA	66.00	92.00	115.00	1.74	78.00	82.00	88.00	1.13
	Non-LFA	43.00	75.00	67.00	1.56	41.00	52.00	62.00	1.51
ROA	LFA	15.68	13.91	4.77	0.30	1.59	1.00	0.54	0.34
	Non-LFA	14.54	6.86	3.89	0.27	2.62	1.32	0.09	0.04

Source: own calculation.

The panel models for the net farm income per farm annual work unit are shown below (Table 4–5). The list of variables, included in the estimation of the panel models, was added in Table 3. The set of independent variables in Table 4 was similar in both cases (LFA beneficiaries and non-LFA farms). Net income per capita in the panel of LFA beneficiaries in Lithuania was determined by the growing value of the following variables: the share of rented UAA (mean share of rented areas amount to 55 % and median = 59 %), the amount of interest paid, the purchase of fertilizers, non-farm income, plant and animal production and LFA compensation. The value of fixed assets in total assets, indirect consumption, depreciation and the elapse of time were affected adversely.

Table 3

List of variables (FEM, REM panel models)

Y	farm net income/ net farm income per farm annual work unit in euro;
X1	utilized agricultural area (UAA) in ha;
X2	rented land / utilized agricultural area in %;
X3	total assets minus agricultural land, permanent crops and quota / annual work unit in euro;
X4	subsidies to agricultural operational activities / total output minus intermediate consumption in euro;
X5	tangible fixed assets/AWU in euro;
X6	total intermediate consumption / UAA in euro;
X7	depreciation/UAA in euro;
X8	animal production / total production in %;
X9	other production (dummy variable);
X10	off farm income (dummy variable);
X11	farmer's age in years;
X12	costs of fertilizers/total variable costs in %;
X13	fixed costs / total costs in %;
X14	crop production (dummy variable);
X15	animal production (dummy variable);
X16	mixed production (dummy variable);
X17	LFA payments / total subsidies in %;
X18	other output (dummy variable: 1 when other production (SE256) exists, 0 – otherwise);
X19	soil quality index;
X20	age of farm operator;
X21	higher educational background (1 – if so, 0 – otherwise);
X22	agricultural type of educational background (1 – if so, 0 – otherwise);
X23	Region_1 in Poland (FADN no. 785) Pomorze i Mazury (1 – if the farm is located; 0 > –otherwise);
X24	Region_2 in Poland (FADN no. 790) Wielkopolska i Śląsk (1 – if the farm is located; 0> –otherwise);
X25	Region_3 in Poland (FADN no. 795) Mazowsze i Podlasie (1 – if the farm is located; 0 otherwise);
X26	Region_4 in Poland (FADN no. 800) Małopolska i Pogórze ((1 – if the farm is located; 0 –otherwise);
X27	TYPE_ED – agricultural type of educational background (1 – if so, 0 – otherwise);
X28	dummy variable: 1 – if the farm is located on mountainous areas, 0 – otherwise (only for models for LFAs).

Source: own list.

It was a kind of confirmation of conclusions and researches made by M. Toth (2011). To evaluate the importance of subsidies in relation to income, he selected two indicators. The first one was a proportional indicator of profit per hectare of agricultural land and the second one was the (profit minus subsidy) per hectare of agricultural land. Chosen time horizon from 1993 to 2008 also allows assessment of the progress of the importance of subsidies in terms of ability to make a profit.

Table 4

FEM and REM models for Lithuanian farms
(Y = net farm income per farm annual work unit)

Variable	Coefficient	Str. error	t-Statistic	p-value
FEM – LFA payments beneficiaries in Lithuania				
Constant	*1274.96*	*1169.92*	*0.01*	*0.99*
Share of rented UAA	299.84	225.43	1.33	0.18
Tangible assets in total assets	-207.86	409.02	-0.51	0.62
Subsidies to agricultural operational activities	-0.24	0.53	-0.45	0.65
LFA payments to total subsidies	61.09	284.26	0.21	0.83
Tangible fixed assets	0.46	0.13	3.47	0.00
Total intermediate consumption	-71.73	24.52	-2.92	0.00
Depreciation to utilized arable areas	-73.73	41.73	-1.76	0.08
Interests paid	438.02	8915.34	0.05	0.96
Cost of usage of fertilisers	329.99	297.77	1.11	0.27
Off farm income	9302.92	6204.36	1.49	0.13
Age of farm income	1871.28	1638.83	1.14	0.25
Crop producton	2183.12	7811.72	0.28	0.78
Animal production	12872.66	9371.11	1.37	0.17
Soil quality index	-1124.29	2302.35	-0.49	0.63
dt_2	-5680.43	8905.17	-0.64	0.52
dt_3	23581.72	9317.87	-2.53	0.01
dt_4	-13715.82	10528.91	-1.30	0.19
dt_5	16158.12	11833.65	-1.36	0.17
dt_6	-5356.	12569.59	-0.43	0.67
dt_7	14115.91	13437.53	-1.05	0.29
Number of obserwations	637			
R-squared	0.49			
Stat. Durbin-Watson	2.25			
FEM – non-LFA farms in Lithuania				
Constant	*20043.35*	*189841.45*	*0.11*	*0.92*
Share of rented UAA	431.01	386.27	1.11	0.26
Tangible assets in total assets	942.69	449.06	2.09	0.04
Subsidies to agricultural operational activities	1.18	4.18	0.28	0.77
Total intermediate consumption	23.77	29.15	0.82	0.41
Depreciation to utilized arable areas	27.60	55.03	0.50	0.61
Interests paid	15177.02	11171.36	1.36	0.17
Cost of usage of fertilisers	-358.11	408.71	-0.87	0.38
Off farm income	-8475.75	8234.16	-1.03	0.30
Age of farm income	1705.11	1486.21	1.15	0.25
Crop producton	-5049.10	8264.02	-0.61	0.54
Animal production	9677.07	14319.59	0.67	0.49
Soil quality index	-1764.53	3682.45	-0.48	0.63
Number of obserwations	1162			
R-squared	0.55			
Stat. Durbin-Watson	1.91			

Note. A high standard error in comparison with the parameter values point out a higher uncertainty in parameter estimation which question the stability of the model. The model is adequate if it meets the following criteria: Parameter value/Standard error > 2.

Source: own calculation.

In the case of non-LFA farms (Table 4), the direction of interaction of the same variables X was different (opposite). For example, tangible assets in total assets ratio and value of depreciation per ha had positive impact on variable Y. Share of crop production had negative impact on dependent variable (net farm income per farm annual work unit).

In the case of Polish panel of farms, LFA payments had strong negative impact on dependent variable (Table 5). Share of tangible assets, LFA payments, depreciation and time negative influenced on net farm income per farm annual work unit in the set of LFA beneficiares. Very important and positive impact had: share of rented areas, type and level of education and soil quality index. In the case of the non-LFA group, the share of plant production influenced more strongly and more favorably on Y value.

I. J. Terluin, F. E. Godeschalk, H. Meyer, J. H. Post, D. Strijker (1995) were examined the agricultural income situation in the less favoured areas (LFA) by using an agricultural typology of EC regions. This typology was based on the relationship of regional gross domestic product per inhabitant and farm net value added per annual work unit. In this typology, three main geographical areas could be distinguished: Northwest, Central and South. Farm income in LFA was below that in normal areas within each main geographical area. Quite large differences existed in the income gap between normal areas and LFA – in Northwest and Central the income gap is larger than in South. Moreover, the level of farm income in Northwest and Central was considerably above that in South.

L. Latruffe has written a lot of publications about impact different kind of subsidies on efficiency and productivity of farms [20–22]. The world pioneers in this field were mainly L. Lachaal (1994) and A. D. Hennessy (1998), who analyzed the various aid programs directed to agriculture in the context of improvement of the efficiency, productivity and growth. Many Polish publications has prepared The Institute of Soil Science and Plant Cultivation (IUNG) and The Institute of Agricultural and Food Economics – National Research Institute (IAFE-NRI).

Table 5

FEM and REM models for Polish farms
(Y = net farm income per farm annual work unit)

Variable	Coefficient	Str. error	t-Statistic	p-value
REM – LFA payments beneficiaries in Poland				
Constant	*27767.90*	*7883.89*	*3.52*	*0.00*
Share of rented UAA	52551.31	4501.29	11.67	0.00
Tangible assets in total assets	-9747.67	6364.42	-1.53	0.12
Subsidies to agricultural operational activities	3.83928	3.68	1.04	0.29
LFA payments to total subsidies	-4922.44	6634.81	-0.74	0.46
Tangible fixed assets per AWU	0.23	0.01	27.37	0.00
Total intermediate consumption	0.14	0.54	0.26	0.79
Depreciation to utilized arable areas	-18.5369	1.84	-10.06	0.00
Other output	2517.81	1230.13	2.04	0.04

Continuation of Table 5

Interest Paid	11404.9	1501.54	7.59	0.00
Cost of usage of fertilisers	-20071	5361.07	-3.74	0.00
Type of education	7697.18	2373.09	3.24	0.00
Level of education	14956.52	4406.96	3.39	0.00
Crop producton	11950.12	2593.46	4.60	0.00
Animal production	9179.07	2011.77	4.56	0.00
Soil quality index	34182.41	4693.51	7.28	0.00
LFA payment (mountain)	-4712.34	6723.62	-0.70	0.48
Off farm income	-1837.14	2091.17	-0.87	0.38
Age of farm income	282.62	102.231	2.7645	0.01
dt_1	-16237.53	2886.91	-5.62	0.00
dt_2	-34042.62	2882.13	-11.81	0.00
dt_3	-32557.51	1666.62	-19.53	0.00
dt_4	-7783.76	1635.57	-4.75	0.00
dt_5	6270.46	1574.71	3.98	0.00
dt_6	5041.98	1554.76	3.24	0.00
Number of obserwations	2706			
Log-likelihood	-243007.72			
Akaike criterion	486065.41			
REM – non-LFA farms in Poland				
Constant	*23946.8*	*10017.7*	*2.39*	*0.02*
Share of rented UAA	50290.21	5895.1	8.53	0.00
Tangible assets in total assets	-954.49	8186.67	-0.12	0.91
Subsidies to agricultural operational activities	-74.35	27.82	-2.67	0.01
Tangible fixed assets per AWU	0.18	0.01	20.30	0.00
Total intermediate consumption	-1.47	0.67	-2.19	0.03
Depreciation to utilized arable areas	-23.37	2.20	-10.61	0.00
Interests paid	7458.21	1571.82	4.74	0.00
Cost of usage of fertilisers	12129.32	1949.31	6.22	0.00
Type of education	-31657.41	6845.72	-4.62	0.00
Level of education	18008.53	3189.85	5.64	0.00
Crop producton	20365.18	5021.1	4.05	0.00
Animal production	6330.06	2582.28	2.45	0.01
Soil quality index	8412.11	3461.65	2.43	0.01
Off farm income	-6598.04	2757.87	-2.39	0.02
Age	86.55	134.821	0.64	0.52
dt_2	-21845.14	1999.82	-10.92	0.00
dt_3	-25535.94	3218.35	-7.93	0.00
dt_4	8361.37	3256.55	2.56	0.01
dt_5	23893.72	3295.73	7.25	0.00
dt_6	34223.24	3410.72	10.03	0.00
dt_7	13462.23	3535.82	3.81	0.00
Number of obserwations	2093			
Log-likelihood	-189571,33			
Akaike criterion	379188,52			

Source: own calculation.

The regression coefficients posses large standard errors which implies that the coefficients cannot be estimated with great accuracy. Multicollinearity has significant effect on the standard error of regression coefficients. Multicollinearity may cause serious difficulties in Regression analysis. Standard error of parameter estimates may be unreasonably large, parameter estimates may not be significant and a parameter estimate may have a sign different from what is expected. However, researchers should be aware that complete elimination of multicollinearity is not possible.

Conclusions. The implementation of the CAP instruments changed relationships between the factors of production. Investment expenditures improved the technical equipment of farmland. The better technical equipment operation also resulted from a decrease in the number of employees in this sector. It help to get better financial results. By analyzing literature from this range, it can be said that the ways in which subsidies influence (including LFA payments) can be very large. They affect the growth of demand for agricultural land and rent, the cost of capital in agriculture and the improvement of creditworthiness of farmers (better credit scoring). They also reduce farmers' aversion to risk and motivate them to take pro-development long-term investments.

G. Blaas (2006) says that European farmers would not survive without support. The globalization causes a need for the support of European agriculture. The main reason is that agriculture in some parts of the world has great advantages compared with the European one, which allows the production at lower costs. There are the countries which have almost unlimited production resources, especially land. Today, agricultural subsidies are seen not as support of production but as a reward to the farmers for producing public goods. Profit without subsidies is decreasing, which results in increasing importance of government funds flowing through the CAP (entering the EU brought an increase in subsidies per hectare, but also a significant reduction in profit or loss without subsidy per hectare).

In the case of LFA payments we can see ambiguous impact on dependent variable (net farm income per farm annual work unit). This payments positively influenced on Lithuanian farm's income. In Poland the situation was just the opposite. Lithuanian LFA beneficiares were more stronger dependent on this subsidies. The share of LFA payments in total subsidies (25 %) was there higher than in the case of Polish LFA beneficiaries (15 % in the case of examined panel). Lithuanian and Polish non-LFA farms had better economic situation.

References

1. Balcombe, K., Davidova, S. Latruffe, L. and Zawalińska, K. (2004), Determinants of technical efficiency of crop and livestock farms in Poland. *Applied Economics*, no. 36(12), pp. 1255–1263. https://doi.org/10.1080/0003684042000176793.

2. Commission of the European Communities, Annex to the Commission Staff Working Document accompanying the Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions. Towards a better targeting of the aid to farmers in

areas with natural handicaps, Brussels, 21.04.2009.

3. Giesecke, J., Horridge, M. and Zawalińska, K. (2010), *The regional economic consequences of Less Favoured Area support: a spatial general equilibrium analysis of the Polish LFA program* in General Paper No. G-211, Centre of Policy Studies and the Impact Projects, Melbourne: Monash University.

4. Góral, J. (2016), LFA payments as the instrument of achieving both competitive and social targets, *Competitiveness of the economy in the context of social policy measures:* conference IAFE-NRI, Jachranka, 22–24 June.

5. Hennessy, A. D. (1998), The production effects of agricultural income support policies under uncertainty. *American Journal of Agricultural Economics*, vol. 80, no. 1, pp. 46–57. https://doi.org/10.2307/3180267.

6. Hovorka, G. (2006), The influence of agricultural policy on the structure of mountain farms in Austria, [in:] *Contribution to the 96th EAAE-Seminar Causes and Impacts of Agricultural Structures,* available at: http://lib.icimod.org/record/12196/files/712.pdf.

7. Jambor, A. (2015), Rising Agricultural Incomes in Europe, available at: http://capreform.eu/rising-agricultural-incomes-in-europe.

8. Matthews, A. (2016), The dependence of EU farm income on public support, available at: http://capreform.eu/the-dependence-of-eu-farm-income-on-public-support.

9. Agriculture and rural development (2017), available at: http://ec.europa.eu/agriculture/rural-development-previous/2007-2013/less-favoured-areas-scheme_en.

10. Serwisu Obszary o Niekorzystnych Warunkach (2017), available at: http://www.lfa.iung.pulawy.pl/gminy.htm.

11. Wathern, P., Young S.N., Brown, I. W. and Roberts, D. A. (1986), The EEC less favoured areas directive: Implementation and impact on upland land use in the UK. *Land Use Policy*, vol. 3, is. 3, pp. 205–212. https://doi.org/10.1016/0264-8377(86)90062-1.

12. Zawadzka, D., Ardan, R. and Strzelecka, A. (2011), Determinanty dochodów gospodarstw rolnych w Polsce. *Zeszyty Naukowe SGGW – Ekonomika i Organizacja Gospodarki Żywnościowej,* no. 88, pp. 71–82.

13. Website The OECD Glossary of Statistical Terms (2017), available at: https://stats.oecd.org/glossary/detail.asp?ID=1520.

14. Website Ministerstwo rolnictwa i rozwoju wsi (2017), available at: https://www.minrol.gov.pl/.../Zalacznik_1_PROW_2007_2013_w_3_21122009.pdf.

15. Krisciukaitiene, I., Galnaityte, A. and Schwarz, G. (2010), Variations in the emphasis of rural development programmes in the eu: the cases of Lithuania and Scotland. *Management Theory and Studies for Rural Business and Infrastructure Development*, no. 20(1), pp. 77–86.

16. Kriščiukaitienė, I. and Galnaitytė, A. (2008), Paramos įvertinimas ūkiams, esantiems mažiau palankiose ūkininkauti vietovėse. *Management Theory and Studies for Rural Business and Infrastructure Development*, no. 12(1), pp. 68–75.

17. Lachaal, L. (1994), Subsidies, endogenous technical efficiency and the measurement of productivity growth. *Journal of Agricultural and Applied Economics*, vol. 26, no. 1, pp. 299–310. https://doi.org/10.1017/S1074070800019386.

18. Latruffe, L. and Minviel, J. J. (2017), Effect of public subsidies on farm technical efficiency: a meta-analysis of empirical results. *Applied Economics*, vol. 49, is. 2, pp. 213–226. https://doi.org/10.1080/00036846.2016.1194963.

19. Latruffe, L., Bakucs, L., Bojnec, S., Ferto, I., Fogarasi, J., Gavrilescu, C., Jelinek, L., Luca, L., Medonos, T. and Toma, C. (2008), Impact of public subsidies on farms' technical efficiency in New Member States before and after EU accession, *12th Congress of the European Association of Agricultural Economists – EAAE*, Ghent, Belgium, August 26–29, available at: https://ageconsearch.umn.edu/bitstream/44142/2/228.pdf.

20. Latruffe, L. and Bojnec, S. (2013), Farm size, agricultural subsidies and farm performance in Slovenia. *Land Use Policy*, vol. 32, no. 1, pp. 207–217. https://doi.org/10.1016/j.landusepol.2012.09.016.

21. Pilvere, I. and Sikunova, I. (2013), Less Favoured Area Payments in the Regions of Latvia, [in:] *Economic Science for Rural Development Conference Proceedings*, no. 31, Jelgava, Latvia, available at: http://llufb.llu.lv/conference/economic_science_rural/2013/Latvia_Economic_Science_Rural_2013_31.pdf.

22. Rudow, K. (2014), Less Favoured Area payments – impacts on the environment, a German perspective. *Agricultural Economics*, vol. 60, no. 6, pp. 260–272.

23. Sadlowski, A. (2012), Płatności ONW a regionalne zróżnicowanie dochodu z rodzinnego gospodarstwa rolnego w Polsce. *Problemy Rolnictwa Światowego*, no. 12(1), pp. 149–157.

24. Schouten, M. A., Gaaff, A. and Heijman, W. J. (2008), Less Favoured Area Measure in the Netherlands: a welcome or negligible addition? International Congress *of the European Association of Agricultural Economists – EAAE*, Ghent, Belgium, August 26–29, available at: http://ageconsearch.umn.edu/bitstream/49223/2/2Less%20favoured%20area%20measure%20in%20the%20Netherlands.pdf.

25. Sobczyński, T. (2008), Zmiany udziału dopłat w dochodach gospodarstw rolniczych UE w latach 1989-2005, [in:] Polityka Unii Europejskiej. D. Kopycińska ed., Szczecin 2008, pp. 36–50.

26. Stolbova, M., Niewęgłowska, G., Voicilas, D. M. and Tudor, M. (2007), The Impact of LFA payments in different rural structures-an example of the Czech Republic and Poland [in:] *Rural Areas and Development*, vol. 5, pp. 277–292.

27. Štolbová, M. and Hlavsa, T. (2008), The impact of the LFA payments on the FADN farms in the Czech Republic. *Agricultural Economics*, vol. 54(10), pp. 489–497.

28. Štolbová, M. and Molčanová, J. (2009), Evaluation of support for farms in less-favoured areas in the Czech Republic and Slovakia [in:] *Rural Areas and*

Development, vol. 6, pp. 285–301.

29. Tóth, M. (2011), Impact of CAP subsidies on profit in agricultural enterprises in Slovakia. *Polityki Europejskie, Finanse i Marketing,* no. 5(54), pp. 208–214.

30. Veveris, A., Lakovskis, P. and Benga, E. (2014), Economic aspects of lfa and organic farming payments in Latvia. *Management Theory and Studies for Rural Business and Infrastructure Development*, no. 36(3), pp. 679–687. http://dx.doi.org/10.15544/mts.2014.065.

31. Vitunskienė, V. and Novikova, A. (2013), Significance of Less Favoured Area Measures for Income Generation of Family Farm in Lithuania. *Rural development 2013: the 6th international scientific conference*, Aleksandras Stulginskis university, Akademija, Kaunas district, Lithuania, vol. 6, book 1, November 28–29.

32. Volkov, A. and Drożdż, J. (2016), Evaluating impact of the Common Agricultural Policy 2004–2013 direct payment scheme on economic sustainability of agriculture in Lithuania. *Zagadnienia Ekonomiki Rolnej*, no. 3(348), pp. 93–105. http://dx.doi.org/10.5604/00441600.1218280.

How to cite this article? Як цитувати цю статтю?