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## EFFICIENCY OF FIELD FARMS SITUATED IN LESS-FAVORED AREAS (LFAS) AND BESIDE IN DOLNOŚLĄSKIE AND OPOLSKIE VOIVODESHIPS IN 2011–2013

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**Abstract.** The aim of this paper is to identify differences in production potential, organization of production, economic efficiency and investment abilities of two groups of Polish field farms with cereals, oilseeds and protein crops situated in Less Favoured Areas (LFA) and beside in Dolnośląskie and Opolskie voivodeship. In order to achieve this aim empirical data was used from 64 farms situated in 64 farms that was situated in LFA and from 348 remaining farms that collected data from 2011 to 2013 for Farm Accountancy Data Network (FADN) in 2011–2013. It was found that farms situated in LFA in comparison to remaining farms characterized larger utilized agricultural – area (UAA) and higher share of rented area. Moreover, worse technical equipment of labour and lower family farm income per 1 hectare of UAA is indicated.

**Keywords:** field farm, Less Favoured Areas (LFA), family farm income, Polish Farm Accountancy Data Network (FADN)

### INTRODUCTION

In Poland, financial support under the Common Agricultural Policy (CAP) has been granted since 2004 to farms engaged in agricultural activities in less-favored areas (LFAs). These include rural areas with poor quality soils, unfavorable climate conditions and difficult topography as well as areas threatened by depopulation

(PROW 2007–2013). The existence of above factors strengthens the uncertainty and risks of agricultural production. Also, they usually have an adverse impact on the economic situation and growth opportunities in agricultural holdings (Józwiak and Sobierajewska, 2009).

In Poland, this is a problem of great magnitude, because LFAs include rural areas in 1671 municipalities<sup>1</sup> (Rozporządzenie..., 2009, unpublished data of the Institute of Soil Science and Plant Cultivation – the National Research Institute (IUNG – PIB)). Furthermore, in 2013, as a part of measures 211 and 212 “Support for farming in mountain areas and other less-favored areas (LFAs)” under the 2007–2013 Rural Development Program (PROW 2007–2013, 2015), farmers applied for subsidies for LFAs representing an agricultural area of around 7,320,500 ha (50.2% of the total agricultural area in Poland). The largest share (85.5%) of agricultural areas reported for coverage by LFA subsidies was recorded in the Podlaskie voivodeship. Meanwhile, in the

<sup>1</sup> This analysis covers municipalities with rural areas classified as LFA located in at least one land registration district (Rozporządzenie..., 2009, unpublished data of the Institute of Soil Science and Plant Cultivation – the National Research Institute (IUNG – PIB)).

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Dolnośląskie and Opolskie voivodeships, the respective shares were 27.6% and 13.7% (GUS, 2014)<sup>2,3</sup>.

Therefore, it seems interesting to investigate the response of field farms (with an increasingly important role in the national agriculture sector) to less favorable farming conditions. Note that in 2002–2010, their share in the total population of farms classified by types of farming increased from 33.9% to 40.7%, i.e. by 6.8 percentage points<sup>4</sup>. The same is true for Dolnośląskie and Opolskie voivodeships where field farms had, respectively, a share of 61.8% and 50.4% in the total population of farms classified by types of farming in 2010. Compared to 2002, this means an increase by 10.3 and 7.0 percentage points, respectively (Zieliński, 2013).

The purpose of this paper is to deliver a comparative assessment of the production potential and organization, economic performance and investment capacities of two groups of field farms specializing in cereals, oilseeds and protein crops<sup>5</sup> in the Dolnośląskie and Opolskie voivodeships, who kept accounts for the Polish FADN on a continuous basis from 2011 to 2013. The first group are farms active in LFAs while the other ones are covered by the second group.

<sup>2</sup> In Poland, a process is underway to define the new delimitation of LFAs to be applicable as of 2018. Therefore, LFAs still include areas eligible for support pursuant to the Regulation of the Minister of Agriculture and Rural Development of March 11, 2009 regarding detailed conditions and procedure for the granting of financial aid as a part of the measure “Support for farming in mountain areas and other less-favored areas (LFAs)” covered by the 2007–2013 Rural Development Program (Rozporządzenie..., 2009).

<sup>3</sup> Pursuant to the Regulation (EU) No. 1305/2013 of the European Parliament and of the Council of December 17, 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No. 1698/2005, and to European Commission guidelines set out in Payments to areas facing natural or other specific constraints and Fine-tuning in areas facing significant natural and specific constraints (EC 2013 and 2014), the Ministry of Agriculture and Rural Development, the Institute of Soil Science and Plant Cultivation – the National Research Institute and the Institute of Agricultural and Food Economics – the National Research Institute are currently working on the new delimitation of LFAs in Poland (Niewęglowska et al., 2014; Pomianek, 2015).

<sup>4</sup> According to the Central Statistical Office, in 2013, the share of field farms in the total population of farms, classified by types of farming, was 50.2%. Therefore, in 2002–2013, their share in the total population of farms, classified by types of farming, increased by 16.3 percentage points (Zieliński, 2013; GUS, 2014).

<sup>5</sup> Type 15 in the Polish FADN classification (Wyniki..., 2011, 2012, 2014).

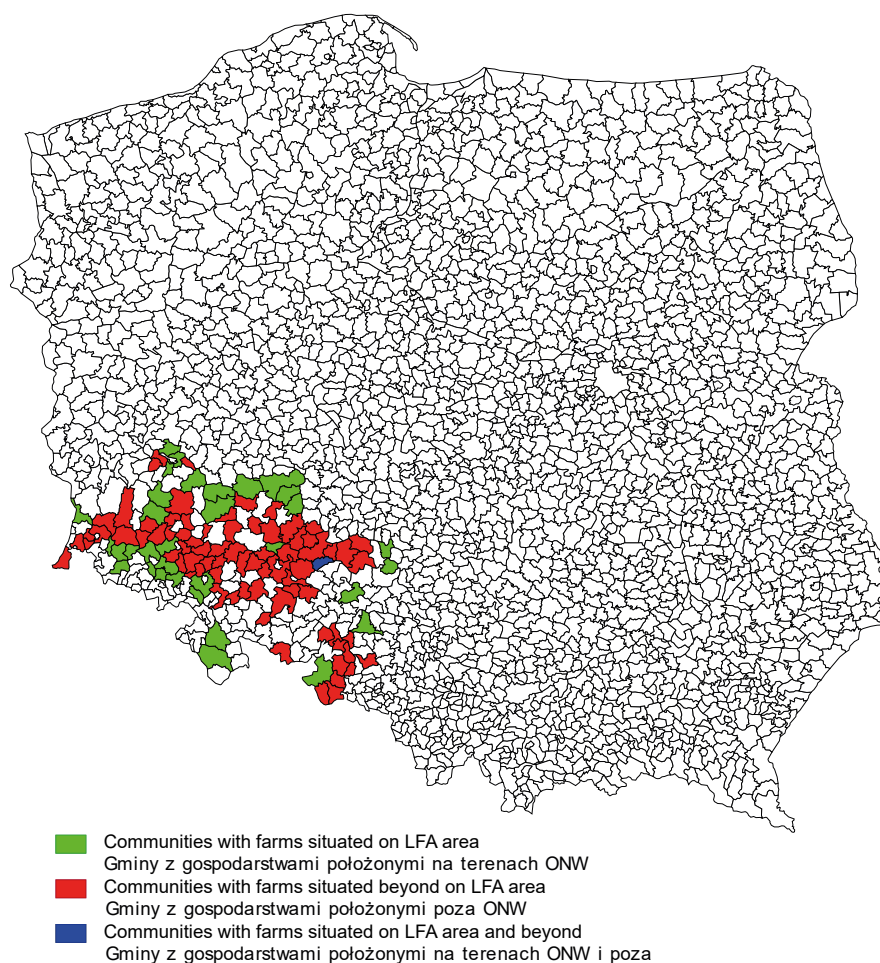
## METHOD

This analysis used data from 412 field farms specializing in cereals, oilseeds and protein crops in the Dolnośląskie and Opolskie voivodeships which kept accounts for the Polish FADN on a continuous basis from 2011 to 2013. The farms were classified into two groups: the first one consisted of 64 agricultural holdings (15.5%) active in LFAs while the second group covered 348 other farms (85.5%) (Fig. 1).

Information used to assess the functioning of the two identified farm groups included:

- 1) the production potential,
  - agricultural area (in ha) which includes: owned land; land leased for one year or more; land utilized under a crop share agreement; and fallow land,
  - share of leased land in %,
  - own soil valuation indicator,
  - total labor inputs per 1 ha of agricultural land, including total human labor as a part of the farm’s operations (in hours)<sup>6</sup>,
  - share of paid labor (%),
  - technical equipment of labor, expressed as the total value of assets, including agricultural land, farm buildings, planted forests, machines and equipment, animals (including non-breeding livestock), and working capital (stocks of agricultural products and other current assets per 1 AWU,
- 2) production organization,
  - share of arable land in agricultural land (%),
  - share of cereals in arable land (%),
  - share of green manure in arable land (%),
  - livestock density, expressed as livestock units per 1 ha of arable land (LU/ha),
- 3) production effects, productivity of inputs, and the farm’s economic performance, investment capacity and debt ratio,
  - wheat yield (dt/ha),
  - maize yield (dt/ha),
  - land productivity (PLN thousand/ha of agricultural area) defined as the ratio of the farm’s total production value to the agricultural area,
  - capital productivity (%) defined as the ratio of the farm’s total production value to the average value of capital,

<sup>6</sup> According to the Polski FADN methodology applicable as of 2011, one annual work unit (AWU/FWU) is equivalent to 2120 hours of work (Wyniki..., 2011, 2012, 2014).



**Fig. 1.** Location of field farms specializing in cereals, oilseeds and protein crops (in LFAs and elsewhere) in the Dolnośląskie and Opolskie voivodeships which kept accounts for the Polish FADN on a continuous basis from 2011 to 2013

Source: own elaboration based on Rozporządzenie..., 2009, unpublished data from IUNG – PIB and Polski FADN.

**Rys. 1.** Położenie gospodarstw z uprawami polowymi specjalizujących się w uprawie zbóż, roślin oleistych i białkowych na terenach ONW i poza w gminach w województwie dolnośląskim i opolskim oraz prowadzących nieprzerwanie rachunkowość dla Polskiego FADN w latach 2011–2013

Źródło: opracowanie własne na podstawie Rozporządzenie..., 2009, danych niepub. IUNG – PIB oraz danych Polskiego FADN

- labor productivity (PLN thousand/AWU) defined as the ratio of the farm's total production value to number of FTEs,
- farm income (PLN thousand) per 1 ha of agricultural area,
- farm income (PLN thousand) per 1 ha of agricultural area without direct payments for LFA farming,
- fixed assets reproduction ratio (%) defined as the ratio of net investments to fixed assets including agricultural land, farm buildings, planted forests, machines and equipment, and livestock,
- debt ratio (%) defined as the ratio of the total short-term and long-term debts to the total asset value.

## RESULTS

The basic driver of the production potential of field farms specializing in cereals, oilseeds and protein crops is the agricultural area, which is larger in the case of farms located in LFAs. The agricultural area of LFA farms was 82.4 ha, i.e. 8.1% more than in other holdings. Leased land was another factor of relevance for the farming business in both groups. In LFA farms, the share of leased land was 37.3% while lower levels (29.2%) were reported by other holdings.

There was a clearly noticeable difference between the farm groups under consideration as regards the own soil valuation indicator. LFA farms were the disadvantaged group, reporting an average value of 0.8 which is 33.3% less compared to the soil valuation indicator for the other holdings. Thus, the quality of soils farmed in LFAs was at the national average level (0.8)<sup>7</sup>.

<sup>7</sup> According to the Central Statistical Office, in Poland, the average soil valuation indicator is 0.8 (GUS, 2012).

Another determinant of the farm's production potential are the labor inputs. LFA farms had smaller labor inputs per 1 ha of agricultural land, reaching a level of 44.7 hours which is 10.8% less compared to other holdings. Also, the reported levels of technical equipment of labor were lower by 9.6% in the case of LFA farms. Therefore, as regards LFA farms, the buildings, machines and agricultural equipment provided less support for the workforce.

The economic activity of both groups was mainly based on the work performed personally by the manager and his/her family members. However, there was a noticeable share of paid labor, reaching a level of 8.0% in LFAs and 6.1% in other farms.

In both groups, the agricultural area was composed almost entirely of arable land, with a share of 99.1% and 99.5%, respectively (Table 2). However, there were differences in the land utilization patterns. Compared to other holdings, LFA farms had a larger share of cereal crops in their arable land. Worryingly, in the case of LFA

**Table 1.** Production potential of field farms with cereals, oilseeds and protein crops situated in less favoured areas (LFA) and beside in Dolnośląskie and Opolskie voivodeships in 2011–2013

**Tabela 1.** Potencjał produkcyjny gospodarstw z uprawami polowymi specjalizujących się w produkcji zbóż, roślin oleistych i białkowych oraz funkcjonujących na terenach ONW i poza w województwie dolnośląskim i opolskim w latach 2011–2013

Specification Wyszczególnienie	j.m.	Farms – Gospodarstwa	
		situated in LFA na ONW	beside of LFA pozostałe
Number of farms Liczba gospodarstw	–	64	348
Total Utilised Agricultural Area (UAA) Powierzchnia użytków rolnych (UR)	ha	82.4	76.2
– share of rented area – w tym udział gruntów dzierżawionych	%	37.3	29.2
Indicator of own soil quality Wskaźnik bonitacji gleb własnych	points pkt.	0.8	1.2
Total labour input per 1 hectare of UAA Nakłady pracy ogółem na 1 ha UR	godz.	44.7	50.1
– share of paid labour input – w tym udział pracy najemnej	%	8.0	6.1
Technical equipment of labour Techniczne uzbrojenie pracy	tys. zł AWU	366.2	404.9

Source: own elaboration based on Polish FADN.

Źródło: opracowanie własne na podstawie danych Polskiego FADN.

**Table 2.** Organization of production of field farms with cereals, oilseeds and protein crops situated in less favoured areas (LFA) and beside in Dolnośląskie and Opolskie voivodeships in 2011–2013

**Tabela 2.** Organizacja produkcji gospodarstw z uprawami polowymi specjalizujących się w produkcji zbóż, roślin oleistych i białkowych oraz funkcjonujących na terenach ONW i poza w województwie dolnośląskim i opolskim w latach 2011–2013

Specification Wyszczególnienie	j.m.	Farms – Gospodarstwa	
		situated in LFA na ONW	beside of LFA pozostałe
Share of arable land in utilized agriculture area Udział gruntów ornych w użytkach rolnych w UR	%	99.1	99.5
Share of cereals in arable land Udział zbóż w gruntach ornych	%	77.3	69.1
Share of green manure in arable land Udział nawozów zielonych w GO	%	6.9	6.4
Livestock unit per hectare of arable land Obsada zwierząt wyrażona w sztukach przeliczeniowych na 1 ha GO	LU/ha GO	0.06	0.03

Source: own elaboration based on Polish FADN.

Źródło: opracowanie własne na podstawie danych Polskiego FADN.

farms, the share of cereals in arable land reached 77.3% (Table 2) which is beyond the acceptable limit (75%)<sup>8</sup>. This means that LFA farms failed to comply with the proper crop rotation practices. Probably, less favorable soil conditions were a major contributing reason because of the restricted ability to properly choose precursor crops in the case of poor soils. In turn, farms with higher-quality soils reported a lower share (69.1%) of cereal crops in arable land.

In the farm groups under consideration, the low density of livestock per 1 ha of arable land (Table 2) seems worrying in the context of ensuring sufficient quantities of organic fertilizers. Under these circumstances, cultivation of green manure to be dug in becomes an advantage. Digging in green manure is a way to improve the structure and water-holding capacity of the soil, and to increase the concentration of nutrients. On top of that, it has an effect on carbon sequestration (Faber et al., 2012; Mocek, 2015).

LFA farms reported lower levels of production (Table 3). Compared to other holdings, the yields of wheat and maize were lower by 21.6% and 30.1%, respectively. The same applies to the productivity of specific

inputs. Indeed, the productivity of land, labor and capital reported by LFA farms was lower by 32.6%, 24.6% and 10.0 percentage points, respectively.

Agricultural income per 1 ha of agricultural land differed between the groups. In LFA farms, it was on average lower by PLN 700 (29.2%) than in other holdings. Note that without compensatory aid, that difference would rise to PLN 800 (33.3%). This means that compensatory aid received by LFA farms fails to fully compensate for the loss of income compared to income earned by farms located outside LFAs.

In LFA farms, the disadvantageous farming conditions have a restricting effect not only on the economic performance but also on the development capacity. Indeed, LFA farms reported a fixed assets reproduction ratio of 0.0%. This means that the only investments made by LFA farms were those necessary to maintain the current level of fixed assets. Nevertheless, it is a positive sign that despite the disadvantageous farming conditions, the users have no intention of abandoning the measures aimed at the continued operation of their farms. In that context, other farms demonstrated a better performance. Due to more favorable economic standing, they were able to adopt a bolder approach to investments (Table 3).

<sup>8</sup> According to Harasim (2006), the maximum acceptable share of cereals in the crop structure is 75%.

**Table 3.** Production effects, productivity, effectivity and investment ability of field farms with cereals, oilseeds and protein crops situated in less favoured areas (LFA) and beside in 2011–2013

**Tabela 3.** Efekty produkcyjne, produktywność czynników produkcji, efektywność ekonomiczna oraz możliwości inwestycyjne i stopa zadłużenia gospodarstw z uprawami polowymi specjalizujących się w produkcji zbóż, roślin oleistych i białkowych oraz funkcjonujących na terenach ONW i poza w latach 2011–2013

Specification Wyszczególnienie	j.m.	Farms Gospodarstwa	
		situated in LFA na ONW	beside of LFA pozostałe
Yield of wheat Plon pszenicy	dt/ha	40.3	52.8
Yield of maize Plon kukurydzy na ziarno	dt/ha	54.7	78.2
Productivity of land Produktywność ziemi	tys. PLN/ha UR	3.1	4.6
Productivity of capital Produktywność kapitału	%	42.6	52.6
Productivity of labour Wydajność pracy	tys. PLN/AWU	146.8	194.7
Family farm income per 1 hectare of UAA Dochód z gospodarstwa rolnego na 1 ha UR	tys. PLN/ha UR	1.7	2.4
Family farm income per 1 hectare of UAA without of LFA payments Dochód z gospodarstwa rolnego na 1 ha UR bez dopłat ONW	tys. PLN/ha UR	1.6	2.4
Rate of fixed assets reproduction Stopa reprodukcji majątku trwałego	%	0.0	2.9
Rate of liabilities Stopa zadłużenia	%	14.9	25.9

Source: own elaboration based on Polish FADN.

Źródło: opracowanie własne na podstawie danych Polskiego FADN.

Both farm groups made their investments with the use of borrowed and own capital. In LFA farms, the share of borrowed capital in total assets was 14.9%. Meanwhile, the other farms financed more than ¼ of their total assets with borrowed capital (Table 3).

## SUMMARY AND CONCLUSIONS

This paper was a comparative analysis of two field farm groups specializing in cereals, oilseeds and protein crops in the Dolnośląskie and Opolskie voivodeships who kept accounts for the Polish FADN on a continuous basis from 2011 to 2013. The first one consisted of 64 agricultural holdings active in LFAs while the second

group covered 348 other farms. The comparative analysis took account of the following: production potential, production organization, economic performance and investment capacity.

As demonstrated by the analysis, compared to other holdings, LFA farms:

- Have a larger agricultural area and rely on leased land to a greater extent. However, they use lower quality soils. Also, they demonstrate lower employment levels per 1 ha of agricultural land and lower rates of technical equipment of labor. This means LFA farms have less machines, agricultural equipment and buildings. For them, inferior rates of technical equipment of labor are likely to hamper the

deployment of technologies that would be more able to restrict or counteract the adverse effects of less favorable farming conditions.

- Have a low livestock density per 1 ha of arable land. However, from the perspective of preserving or enhancing the fertility of soil, the cultivation of green manure to be dug in represents an advantage for them. In addition to improving the structure and water-holding capacity of the soil, this helps increase the concentration of nutrients and has a favorable effect on carbon sequestration from the atmosphere.
- Demonstrate inferior production rates and lower productivity ratios of land, labor and capital. The basic reason for this are the less favorable farming conditions.
- Have lower incomes per 1 ha of agricultural land. However, that gap is reduced with compensatory aid. Despite lower incomes per 1 ha of agricultural land, LFA farms are able to invest so as to maintain the current level of fixed assets. This means that, in spite of less favorable farming conditions, the owners believe their businesses will continue to be viable.

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## EFEKTYWNOŚĆ FUNKCJONOWANIA GOSPODARSTW ROLNYCH SPECJALIZUJĄCYCH SIĘ W UPRAWACH POŁOWYCH POŁOŻONYCH NA TERENACH ONW I POZA W WOJEWÓDZTWIE DOLNOŚLĄSKIM I OPOLSKIM W LATACH 2011–2013

**Streszczenie.** W artykule dokonano oceny porównawczej potencjału produkcyjnego, organizacji produkcji, efektywności ekonomicznej i możliwości inwestycyjnych dwóch grup gospodarstw rolnych z uprawami polowymi specjalizujących się w uprawie zbóż, roślin oleistych i białkowych, w województwie dolnośląskim i opolskim, które nieprzerwanie prowadziły rachunkowość dla Polskiego FADN w latach 2011–2013. Pierwszą grupę stanowiły 64 gospodarstwa, prowadzące działalność rolniczą na terenach o niekorzystnych warunkach gospodarowania (ONW), zaś drugą – 348 gospodarstw pozostałych. Stwierdzono, że gospodarstwa położone na terenach ONW na tle gospodarstw pozostałych miały większą powierzchnię użytków rolnych i w większym stopniu korzystały z dzierżawy ziemi. Miały natomiast gorsze techniczne wyposażenie pracy i mniejszy dochód na 1 ha użytków rolnych (UR).

**Słowa kluczowe:** tereny o niekorzystnych warunkach gospodarowania (ONW), Polski Farm Accountancy Data Network (FADN), gospodarstwo specjalizujące się w uprawach polowych, dochód z gospodarstwa rolnego

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