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ASSESSMENT OF FARMS FROM HIGH NATURE VALUE FARMLAND AREAS IN POLAND

Key words: High Nature Value farmland areas, farm, production results, economic situation

ABSTRACT. The objective of the study is to assess production potential and structure and the economic situation of farms pursuing their activity in areas (in municipalities) with various saturation of High Nature Value farmland (HNVf) areas in Poland. The first part of the study presented a method of designating HNVf areas, designated by the Institute of Soil Science and Plant Cultivation National Research Institute (ISSPC-NRI) and the Institute of Agricultural and Food Economics National Research Institute (IAFE-NRI), in cooperation with the Institute of Technology and Life Sciences (ITLS), the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences (IAFE-PAS), and the Polish Society for the Protection of Birds (PSPB) upon the request of the Ministry of Agriculture and Rural Development (MARD) and the European Commission (EC). HNVf areas have been designated on the basis of the adopted criteria of characteristics of extensive agriculture and high nature value areas. On the other hand, the second part of the paper consisted of the organisational and economic assessment of farms from municipalities with various saturation of HNVf areas in Poland, uninterruptedly keeping accounts for the Polish FADN in the years 2016-2018. It was determined that farms from municipalities with a high saturation of HNVf areas, when compared to farms from municipalities with a lower saturation of such areas, being a reference point, have a lower production potential of soils and achieve worse production results. They have, *inter alia*, a smaller UAA size, smaller labour inputs and smaller capital value, including machinery and equipment. In addition, they have lower income per 1 ha of UAA, which limits their development opportunities.

INTRODUCTION

In the literature, it is increasingly stressed that agriculture is one of the key factors – after the development of infrastructure and climate change – limiting biodiversity in rural areas [EC 2008, Gała 2017]. It is estimated that the risks to biodiversity of areas related to farming primarily result from processes of intensification of agricultural production or the abandonment of agricultural activity on soils with worse natural conditions for farming[1]

[1] It should be added that excessive grazing of animals or its abandonment, over-fertilization, the application of pesticides, as well as the absence of crop rotation and the removal of valuable natural landscape elements are a particular threat posed by farming [Bołtromiuk, Kłodziński 2011].

[EEA 2015, Henle et al. 2008, Stoate et al. 2009, Roszkowska-Mądra 2018]. Therefore, what is becoming more and more important for preserving biodiversity in the rural landscape and maintaining various ecological and health functions for humans is extensive farming on semi-natural utilized agricultural areas with a low fertilization intensity and a large mosaic of land use structure [Baldock et al. 1993, Beaufoy, Cooper 2008].

The concept of creating High Nature Value farmland (HNVf) areas in the European Union (EU), as a part of environmental protection and biodiversity on utilised agricultural areas, has been developed since the early 90s of the 20th century [Baldock et al. 1993, Bignal, McCracken 1996, EEH 2016]. The multidirectional meaning of this term refers to natural and agricultural, socio-economic, economic and legal aspects [Strijker 2005, Zomeni et al. 2018, Keenleyside et al. 2014, Zielińska 2013]. It is also worth stressing that the HNVf indicator is currently one of the 32 agri-environmental indicators developed by Eurostat to monitor the environmental impact of agriculture and one of the indicators monitoring the effects of activity under the Common Agricultural Policy (CAP) [Eurostat, Zomeni et al. 2018].

According to the definition proposed in 2003 by E. Andersen's team [Andersen et al. 2003] and modified by Maria Paracchini [Paracchini et al. 2006], HNVf areas include agricultural areas, characterized by a high share of natural and semi-natural vegetation, extensive agriculture with natural and structural elements in the landscape, such as: permanent grassland, agricultural wasteland, woodlots, thicket, watercourses, wetlands, etc., and the presence and breeding of species of rare and protected fauna and flora on a European and global scale. It should be highlighted that the characteristics of HNVf areas has been presented in detail in European Commission (EC) Guidelines entitled "The Application of the High Nature Value Impact Indicator", which allows for the identification of basic HNVf components at a Member State and regional level [EC 2009].

In recent years, attempts have been made to spatially designate HNVf areas in EU countries using data from various sources with a diversified resolution and scale [Mądry et al. 2020, Zomeni et al. 2018, Hazeu et al. 2014]. The results of this work point to the possibility of a differentiated interpretation of the definition and methodology of designating HNVf areas [Lomba et al. 2014, 2015, Zomeni et al. 2018]. It is also worth noting that the ISSPC-NRI and IAFE-NRI, in cooperation with the Institute for the Agricultural and Forest Environment of the Polish Academy of Sciences (IAFE-PAS), the Institute of Technology and Life Sciences (ITLS) and the Polish Society for the Protection of Birds (PSPB), upon request of the MARD and the EC designated three scenarios for HNVf areas in Poland, using certain methodological assumptions used during the first attempt to designate HNVf areas in Poland in 2009 [IGiK 2009, Jadczyszyn 2017].

The objective of the study is to assess the production potential and structure and economic situation of farms pursuing their activity in areas (municipalities) with various saturation of HNVf areas in Poland. The assessment has been carried out for farms located in municipalities with the lowest (quartile 1) and highest (quartile 4) HNVf UAA share in total UAA in municipalities. For this purpose, spatial data from, *inter alia*, ISSPC-NRI and data from farms uninterruptedly keeping accounts for the Polish FADN in the years 2016-2018 was used.

RESEARCH MATERIAL AND METHODS OF STUDIES

HNVf areas in Poland have been designated in accordance with the concept of protection of high nature value areas and biodiversity developed in Europe since the early 90s of the 20th century [Baldock et al. 1993, Beaufoy et al. 1994, Paracchini et al. 2008, Bignal, McCracken 2000] taking environmental and economic conditions occurring in rural areas in Poland into account. Environmental components have been assigned weights of 3 to 10 points corresponding to their importance and function in preserving biodiversity in rural areas [Jadczyszyn 2017].

According to the adopted methodology, the preliminary designation of HNVf areas in Poland has been carried out based on three scenarios differing in terms of value of high nature value areas. This value is expressed by the value of an average maximum weight within the following ranges: 3.0-10.0, 3.5-10.0 and 4.0-10.0 points [Jadczyszyn 2017]. An increase in the average maximum weight means that areas of the lowest value are excluded from HNVf areas. For example, the use of a scenario where the weight is 3.5-10.0 points means areas with an average maximum weight lower than 3.5 points are excluded. As a result of the analyses carried out, the continuous layer of UAA with an assigned value of the average maximum weight has been obtained on a national scale and combined with the layer of geodetic regions meeting the criteria for extensive agriculture[2]. Ultimately, UAA meeting both the criteria of extensive agriculture and the criteria for high nature value areas defined according to the scenarios of the average maximum weight, hereinafter referred to as areas with the weight of 3.0-10.0; 3.5-10.0 and 4.0-10.0 (Figure 1-3)[3], have been incorporated as HNVf areas.

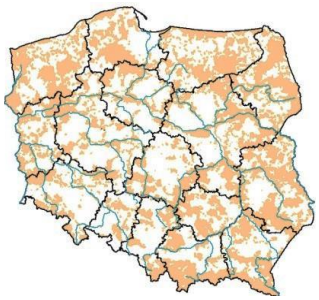

Figure 1. HNVf areas by weight 3-10

Source: own study based on by the ISSPC-NRI data

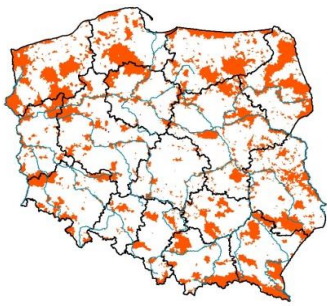

Figure 2. HNVf areas by weight 3.5-10

Source: own study based on by the ISSPC-NRI data

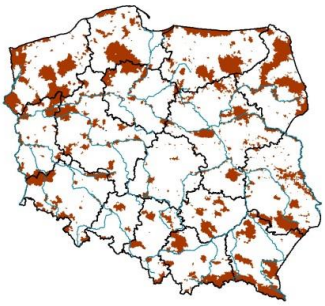

Figure 3. HNVf areas by weight 4-10

Source: own study based on by the ISSPC-NRI data

[2] It has been adopted that the criteria describing extensive agriculture in HNVf areas – in line with the European Commission's guidelines – will be the appropriate threshold values for the share of cereals in the sowing area, stocking density of animals fed with roughage and the presence of permanent grassland (PG) in UAA [Zieliński et al. 2017]

[3] It should be added that the proposed method also refers to the initial methodology for identifying HNVf areas in Poland developed in 2009 [IKiG 2009].

The study presented the assessment of the functioning of farms in HNVf areas in Poland at a municipal level. Following the identification of municipalities with HNVf areas, the area of UAA meeting this criterion was calculated, so was its share in total UAA in the municipality. Subsequently, the database of municipalities incorporated as HNVf areas has been organized by quartiles of the share of UAA meeting HNVf criteria according to three adopted scenarios.

In order to achieve the objective of the analysis, the subchapter made a comparative description of farms from municipalities with a various saturation of HNVf areas, various UAA weight and share in relation to total UAA. In the first step, 6,608 farms were selected for analysis, including 1,929 farms with field crops and 1,722 farms rearing dairy cows, from municipalities with a weight of 3.0-10.0 points of HNVf, 5,373 farms, including 1,539 farms with field crops and 1,418 farms rearing dairy cows from municipalities with a weight of 3.5-10.0 points of HNVf and 4,195 farms, including 1,243 farms with field crops and 1,144 farms rearing dairy cows from municipalities weighing 4.0-10.0 points of HNVf. All selected farms uninterruptedly kept accounts for the Polish FADN in the years 2016-2018. It should be added that the analysis separately covered farms with field crops and those rearing dairy cows, as they are of great importance in the structure of farms in Poland. In the second step of the analysis, each group of farms was additionally divided by quartiles of the HNVf share in the total UAA of municipalities. To make the analysis clear, in the study, a detailed comparative analysis covered farms from quartile 1 and 4 municipalities of the HNVf share with a weight of 3-10, 3.5-10 and 4-10 points in total UAA (Table 1).

In a comparative assessment of selected groups of farms from quartile 1 and 4 municipalities of the HNVF share with a weight of 3.0-10.0; 3.5-10.0 and 4.0-10.0 points in total UAA, account was taken of their potential and production organization, as well as their production intensity, economic situation and investment opportunities.

Table 1. Description of quartile 1 and 4 municipalities of the HNVf share with a weight of 3.0-10.0; 3.5-10.0 and 4.0-10.0 points in total UAA

Municipalities with a weight of HNV UAA [points]	HNVf share in total UAA of municipalities in the quartile [%]	
	1	4
3.0-10.0	0.1-11.4	74.4-100.0
3.5-10.0	0.1-6.8	50.6-100
4.0-10.0	0.1-6.3	49.7-100

Source: own study based on IAFE-NRI and ISSPC-NRI data

THE STRUCTURE OF TYPES OF FARMING OF THE ANALYSED FARMS FROM MUNICIPALITIES BY QUARTILES OF THE HNVF SHARE WITH VARIOUS WEIGHTS IN TOTAL UAA

The distribution of the percentage structure of basic types of farming (TF8) of analyzed farms in quartile 4 municipalities, regardless of HNVf weight, differed from that of quartile 1 farms (Table 2). In fact, quartile 4 municipalities had a lower share of farms with crop production and a higher share of farms rearing dairy cows and other ruminants. In addition, in quartile 4 municipalities with a weight of 3 and 4 of HNVf, the share of farms with mixed production was also higher. This situation is understandable, as one of the important conditions for conducting profitable agricultural production in HNVf areas, where PG areas are still of great importance, is the rearing of animals fed with roughage. In addition, it should be added that HNVf arable land usually contains light soils with a low content of organic matter, where the use of natural fertilizers of animal origin is needed to increase organic matter resources in the soil. The increase in the share of organic matter, especially on such soils, clearly improves their structure, increases the content of nutrients available to plants and enhances water capacity.

Table 2. The distribution of the percentage structure of types of farming of analysed farms from municipalities with a various HNVf share and weight in total UAA according to Polish FADN data for the years 2016-2018

Specification	Farms in total from municipalities with an HNVf weight [pts]					
	3.0-10.0		3.5-10.0		4.0-10.0	
	Quartile					
	1	4	1	4	1	4
	Structure [%]					
Field crops	32.9	23.2	31.3	27.7	34.0	29.6
Horticultural and permanent crops	4.7	4.3	4.8	4.0	6.0	4.0
Dairy cows	23.6	26.9	26.8	29.8	28.3	30.2
Other ruminants	4.6	7.7	4.8	10.5	4.8	11.7
Animals fed with concentrated feed	5.5	3.8	6.0	2.9	3.8	1.7
Mixed production	27.7	34.1	26.3	25.3	23.1	24.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: own study based on Polish FADN data

DESCRIPTION OF THE ANALYSED FARMS FROM MUNICIPALITIES WITH VARIOUS HNVF SHARES AND WEIGHTS IN TOTAL UAA

Any potential differences among farms from municipalities with various HNVf shares and weights in total UAA should be looked for, in first place, in various level of their being equipped with basic production factors.

On the farm, the size of UAA is an important production factor. As results from the figures presented in Table 3, regardless of HNVf weight, all farms from quartile 4 municipalities had a smaller average size of UAA than those from quartile 1 municipalities (Table 3). The same direction of differences in the size of UAA also occurred in the case of farms selected by farming type. In addition, taking the quality of land owned into account, as measured by the soil quality index rate (SQI) – regardless of HNV UAA weight – farms from quartile 4 municipalities definitely had worse soils.

In addition to land, important factors determining the production potential of farms are also labour inputs incurred and capital value. Regardless of HNVf weight, all farms from quartile 4 municipalities, compared to farms used for comparison purposes, incurred slightly lower total labour inputs per farm and had a significantly lower value of capital, including agricultural machinery and equipment. As a consequence, this resulted in their worse capital-labour ratio measured by the ratio of the value of capital to total labour inputs incurred. It is worth mentioning that among types of farming of farms selected for analysis, this situation was identical (Table 3).

The production organization on a farm may be characterized by many indicators. Only three of them were included for the purposes of this analysis. From the data submitted (Table 3), it appears that, regardless of HNVf weight, in all farms from quartile 4 municipalities, cereals were less important in UAA while fodder crops were more important. However, it should be added that all quartile 4 farms, despite the higher share of fodder crops in UAA, often had a lower stocking density per 1 ha of UAA, which attests to their less intensive organization of agricultural production. It is worth noting that the same situation occurred on farms rearing dairy cows. On the other hand, on farms with field crops, the share of fodder crops in total UAA and stocking density were not significant for production.

One of the more important pieces of information concerning the analyzed farms from municipalities with various HNVf shares and weights in total UAA concerns production results. It turned out that, regardless of HNVf weight, all farms, including those with field crops and rearing dairy cows from quartile 4 municipalities, had lower wheat yields than reference farms. The same trend took place in the context of maize yield and co milk yield. It is worth stressing that this situation was both determined by poorer soil quality and a worse level of agricultural machinery and equipment, as well as lower total costs, including direct costs per 1 ha of UAA (Table 3).

The farms located in quartile 4 municipalities with the largest HNVf share in total UAA, regardless of weight, had a lower income per 1 ha of UAA than farms in quartile 1 municipalities (Table 3). This, consequently, resulted in their lower propensity to make new investments, as informed by the lower net investment rate. Yet, it should be added that in these terms, all analyzed groups of farms with field crops were in a particular situation,

Table 3. Description of farms from municipalities with various HNVf weights and shares in total UAA in the years 2016-2018

Specification	Unit	All farms from municipalities with an HNVf weight [pts]						Farms with field crops from municipalities with an HNVf weight [pts]						Farms rearing dairy cows from municipalities with an HNVf weight [pts]					
		3-10		3.5-10		4-10		3-10		3.5-10		4-10		3-10		3.5-10		4-10	
		Quartile																	
		1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
UAA	ha	39.9	29.3	39.4	38.0	36.3	35.7	56.7	38.5	55.1	47.1	45.7	42.8	33.7	28.8	32.6	31.3	33.9	31.6
Soil quality index (SQI)	pts	0.84	0.68	0.80	0.65	0.80	0.64	1.0	0.88	0.96	0.85	0.95	0.85	0.68	0.50	0.63	0.48	0.63	0.48
Labour inputs	AWU	1.90	1.88	1.83	1.80	1.91	1.78	1.70	1.58	1.63	1.53	1.77	1.63	2.03	2.01	1.98	1.95	2.01	1.95
Value of capital:	PLN thousand	747.7	557.2	714.2	603.7	687.2	586.3	693.5	456.1	645.2	467.8	602.4	500.5	932.5	710.6	905.3	736.4	888.1	716.6
– including the value of machinery and equipment	PLN thousand	263.1	202.3	268.7	220.6	251.8	215.9	311.0	215.0	298.8	218.2	274.8	230.3	303.9	247.5	301.7	260.8	303.9	256.2
Share of cereals in UAA	%	54.8	49.3	54.3	45.8	51.5	45.2	61.0	59.5	62.4	57.1	59.5	58.3	31.3	26.0	31.1	25.3	31.5	24.6
Share of fodder crops in UAA	%	21.5	32.5	23.7	35.0	26.4	35.5	4.7	8.2	4.7	8.4	6.2	8.0	65.1	71.6	65.6	71.6	64.6	72.2
Stocking density	LU/ha	0.82	0.80	0.73	0.63	0.69	0.65	0.06	0.04	0.06	0.08	0.06	0.09	1.36	1.19	1.35	1.16	1.25	1.10
Wheat yield	dt/ha	44.7	40.7	44.3	41.4	44.2	41.8	49.3	44.8	47.8	41.9	47.7	40.3	39.2	33.2	38.4	31.7	38.7	32.8
Maize yield	dt/ha	69.3	61.7	69.9	58.9	69.1	61.2	75.0	64.9	72.2	65.6	74.4	66.7	56.0	47.0	61.8	43.5	60.9	42.9
Cow milk yield	thousand kg/year	4.84	4.41	4.89	4.61	4.84	4.59	-	-	-	-	-	-	5.73	5.30	5.61	5.16	5.54	5.19
Total costs	PLN thous/ha	5.53	5.02	5.23	4.44	5.39	4.37	3.71	3.42	3.53	3.11	3.85	3.21	6.85	5.60	6.58	5.35	6.29	5.35
– including direct costs	PLN thous/ha	2.96	2.58	2.83	2.28	2.79	2.15	1.74	1.53	1.64	1.43	1.74	1.49	3.70	2.86	3.50	2.59	3.33	2.57
Farm income	PLN thous/ha	2.7	2.5	2.6	2.3	2.7	2.3	1.8	1.7	1.8	1.7	2.0	1.7	4.3	3.8	4.3	3.5	4.1	3.5
Net investment rate	%	16	6.9	7.7	4.1	4.9	-1.0	-2.5	-7.3	-1.6	-15.2	-5.2	-13.3	30.2	22.9	30.0	17.3	27.8	15.9

Source: own study based on ISSPC-NRI and Polish FADN data

regardless of the analyzed quartile and HNVf weight in municipalities with a negative net investment rate, although it should be added that a larger scale of depreciation of fixed assets took place on farms from quartile 4 municipalities. It is also worth noting that the most favorable situation in terms of net investment rate applied to farms rearing dairy cows, including those from quartile 4 municipalities of HNVf with a weight of 3, 3.5 and 4, which achieved a clearly positive net investment rate (Table 3).

SUMMARY AND CONCLUSIONS

Farms located in areas with the highest HNVf UAA saturation (quartile 4) and large biodiversity in Poland show some limitations regarding agricultural production. These limitations result from, *inter alia*, a lower production potential of soils, as their SQI (soil quality index) is significantly lower when compared to farms with the lowest HNVf UAA share (quartile 1). In municipalities with a dominance of HNVf areas, there are farms with a smaller UAA size, which increases the spatial mosaic structure of crops and positively affects the diversity of the rural landscape and contributes to increasing biodiversity. Farms using permanent grassland and involved in breeding ruminants as well as in the production of milk are of a greater importance in these areas. The crop-livestock production type, while maintaining a smaller stocking density, promotes the preservation of high environmental values and increases biodiversity in UAA, *inter alia*, through greater possibilities of using organic fertilization when compared to the typical crop production type. Utilized agricultural areas on crop-livestock farms provide a larger food base for wild fauna and wild birds. Lower stocking density, lower labour inputs and significantly lower yields in these areas attest to less intensive production and the rational use of the natural environment.

The effects of agricultural activity, unfavorable to farms in municipalities with a high HNVf area share (quartile 4) are visible in economic indicators. The lower economic efficiency may, in the long term, pose a threat to the stability of farms and the continuity of agricultural use in these areas.

The results of the conducted studies point to a need for additional economic support for farms operating in areas with the highest HNVf UAA share. Especially since the Polish FADN data refer to farms that are economically stronger than average farms in Poland. Therefore, it can be presumed that, in relation to all farms in this country, the economic situation, particularly of farms from areas with the highest HNVf UAA saturation, can be even worse.

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OCENA GOSPODARSTW Z OBSZARÓW ROLNICZYCH O WYSOKICH WARTOŚCIACH PRZYRODNICZYCH W POLSCE

Słowa kluczowe: obszary High Nature Value farmland, gospodarstwo rolne, wyniki produkcyjne, sytuacja ekonomiczna

ABSTRAKT

Celem opracowania jest ocena potencjału produkcyjnego, organizacji produkcji oraz sytuacji ekonomicznej i możliwości rozwojowych gospodarstw rolnych, prowadzących działalność w Polsce na terenach (w gminach) o różnym nasyceniu obszarów rolniczych o wysokich wartościach przyrodniczych (High Nature Value farmland – HNVf). W pierwszej części przedstawiono sposób wyznaczania obszarów HNVf. Wyznaczono je na zlecenie Ministerstwa Rolnictwa i Rozwoju Wsi i Komisji Europejskiej przez Instytut Uprawy Nawożenia i Gleboznawstwa – PIB oraz Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej – PIB przy współpracy z Instytutem Technologiczno-Przyrodniczym, Instytutem Środowiska Rolniczego i Leśnego – PAN oraz Ogólnopolskim Towarzystwem Ochrony Ptaków. Obszary HNVf wyznaczono, opierając się na przyjętych kryteriach cech rolnictwa ekstensywnego i obszarów o wysokich wartościach przyrodniczych. W drugiej części opracowania dokonano oceny organizacyjno-ekonomicznej gospodarstw rolnych z gmin o różnym nasyceniu HNVf w Polsce, które prowadziły nieprzerwanie rachunkowość dla Polskiego FADN w latach 2016-2018. Ustalono, że gospodarstwa z gmin o dużym nasyceniu HNVf na tle gospodarstw z gmin o mniejszym nasyceniu, będących punktem odniesienia, charakteryzują się mniejszym potencjałem produkcyjnym gleb, osiągają gorsze wyniki produkcyjne. Posiadają m.in. mniejszą powierzchnią UR, mniejsze nakłady pracy oraz mniejszą wartość kapitału, w tym maszyn i urządzeń. Ponadto mają mniejszy dochód w przeliczeniu na 1 ha UR, co ogranicza ich możliwości rozwoju.

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