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Effectiveness of Greening in Poland

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Abstract

In 2015 greening requirements were implemented. Legal rules obliged farmers to more environmental friendly farms' organization. The aim of the paper is to present the first effects of greening implementation in FADN farms in Poland, in the context of requirements concerning crop production organization and the maintenance of ecological focus areas. The paper is based on the panel of 7.4 thousand private farms participated in Single Area Payment Scheme, that enabled to identify organizational changes in agricultural production after greening binding. The research results indicated farms' adaptation to greening requirements. Greening didn't cause negative productive and economic outcomes for farms in 2015.

Keywords: Greening, the Common Agricultural Policy, Effectiveness, FADN farms, Poland

Introduction

The European Union is directed towards sustainable development of agriculture and rural areas, which is reflected in the Common Agricultural Policy (CAP) instruments (Kociszewski, 2014; Krzyżanowski, 2015). The CAP has come under increasing criticism for not doing enough to limit the negative effect that certain farming practices have on the environment and climate, that justified undertaking the new direction of agriculture development and support (European Court of Auditors, 2017: 10).

Under the new direct payment scheme an obligation has been introduced since 2015 to apply agricultural practices favourable for climate and environment, the so-called greening. Greening is a major innovation brought in under the 2013 CAP reform, makes the direct payments system more environment-friendly. "It was designed to reward farmers for having a positive impact on the environment which would otherwise not be rewarded by the market" (European Court of Auditors, 2017b: 1). The introduction of the new greening measures within Pillar 1 of the CAP was a significant but controversial aspect of this reform (Hart, Baldock, Buckwell, 2016: 57).

Greening requirements have allowed farmers to get total support within the framework of direct payments. Farmers who use farmland in more sustainable way and care for natural resources as part of their everyday work benefit financially. As the European Commission (EC) justifies "Greening supports action to adopt and maintain farming practices that help meet environment and climate goals. Market prices do not reflect the effort involved in providing these public goods" (EC, 2017b). Agrienvironmental practices as a condition of obtaining additional support disseminated "provider gets principle" (Mauerhofer, Hubacek, Coleby 2013). According to the instrument assumption, the majority of farmers entitled to green payment, guaranteed popularisation of those practices on the majority of agricultural land.

Greening practices were specified in the European Commission regulations, which indicate the importance of crop diversification in the context of soil quality improvement, the maintenance of permanent grasslands in order to ensure the carbon sequestration, soil protection and biodiversity, as well as the maintenance of ecological focus areas that guarantee biodiversity at the farm level (EC reg. 1307/2013; EC reg. 639/2014). Under the greening rules, farmers receiving payments help conserve the environment and contribute to addressing greenhouse emissions by: making soil and ecosystems more resilient by growing a greater variety of crops; conserving soil carbon and grassland habitats associated with permanent grassland; protecting water and habitats by establishing ecological focus areas (EC, 2017b).

The requirement for farmers to satisfy specific agri-environmental requirements in order to be granted full direct payments is an incentive to identify the earliest effects of the new

agricultural policy. These effects are reflected by specific agricultural practices, and then in the organization of agricultural production, aimed at ensuring compliance with the current greening requirement. The **Effectiveness of this mechanism**, in other words efficient delivery of the intended political objectives, is determined by two issues: **(1) the extent to which the particular agricultural practices aimed at protecting the environment have spread; (2) institutional incentives encouraging farmers to reorganise their farms in a pro-environmental manner.** In the case of the former issue, it boils down to the assessment of the starting situation on farms just before greening was introduced, i.e. 2014, and the situation following the introduction of this requirements, i.e. 2015, including the evaluation of agricultural production organization in terms of its environmental friendliness or its change in respective years. As far as the latter issue is concerned, what should be regarded as significant is the incentives that determine the farmers' actions. Pro-environmental farm organization should result from both general trends related to farm development due to the Rural Development Programmes that had been implemented for many years, observance of cross-compliance rules, and the specific nature of direct payment to direct production support (primarily subsidies to soil-improving crops). Many effects measured in terms of the condition of and change to agricultural production organization in a more environmentally-friendly direction not necessarily can be attributed to greening. Nonetheless, greening could contribute to the sustaining of the favorable (as regards the legally adopted greening requirements) status quo in agricultural production (resulting from other mechanisms) or could be an additional factor enforcing the desired reorganization.

The results of studies commissioned by the European Commission, which involve international comparison, present the problem of the effectiveness of greening¹. Therefore, there is a need to precisely examine practices related to the implementation of greening in individual Member States taking account of the organization of agricultural production both on farms under greening obligation and farms exempted from it, and factors that determine it, also prior to the introduction of this mechanism². The evaluation of the effectiveness of greening is the basic determinant for the continuation and possible modification of this mechanism in the next Common Agricultural Policy programming period.

The aim of the paper is to present the first effects of greening implementation in FADN farms in Poland, in the context of requirements concerning crop production organization and the maintenance of ecological focus areas (EFA). The paper presents the organization and outcomes of farms before and after greening introduction, both those entities that were obliged to comply with this, and those that were exempted from new requirements. Popularization of greening practices indicates the efficiency of agricultural policy implementation.

Greening requirements

All farmers entitled to the Single Area Payment Scheme in 2015 are obliged to implement greening, depending on agricultural surface and structure. Presently, 30% of the national financial envelope is connected with greening³. In 2015, the rate of greening payment in Poland amounted to about 70 EUR/ha (MRiRW, 2015).

Depending on the area of arable land used and the share of permanent grassland, farmers are required to follow one, two or three greening practices. Greening practices in Poland include:

¹ Comparison of greening effects in different European countries is presented in: (EC 2016; EC, 2017d; Hart, Baldock, Buckwell, 2016).

² Papers that concern the implementation of greening in Poland in 2015, see e.g. (Wrzaszcz 2017, Wrzaszcz 2017b).

diversification of crops (applicable to farms with an arable land area of 10 ha or more), (b) maintenance of Ecological Focus Areas (EFA) on at least 5% of arable land (applies to farms with an arable land area of 15 ha or more), (c) maintenance of permanent grassland⁴ (the ratio of grassland to total agricultural area may not decrease by more than 5% compared to the reference ratio) (MRiRW, 2015).

The greening mechanism involves many equivalent pro-environmental practices selection of which is left to the individual farmer (Hart 2015). Such a mechanism has allowed farmers to choose practices that are relevant to the specific character of their farms, including their location and the landscape (including valuable landscape elements within the farm), and the agricultural production.

The requirement of crop diversification binds farmers to grow at least 2-3 different crops on arable land (depending on its area) and defines their percentage in the cropping pattern. Crops may also be diversified by using an equivalent practice applied as part of the agri-environment and climate measure under the RDP 2014-2020 (MRiRW, 2017b). As regards the EFA maintenance requirement, its fulfilment entails the maintenance of landscape, forest and agricultural features. Agricultural features include fallow land and the cultivation of plants that favorably affect soil condition, including the cultivation of nitrogen-fixing plants in the main crop, also in the form of catch crops and companion crops⁵.

EU regulations also provide for a number of exemptions from the greening obligation. Farms where over 75% of agricultural land is permanent grassland or farms with a high percentage (over 75%) of arable land used for production of grass or other green fodder crops or fallowed due to the favourable environmental impact are exempted from the crop diversification obligation or the obligation to maintain ecological focus areas⁶. Farms that participate in the small farms scheme are allowed to receive the greening payment despite the exemption from the greening obligation. The greening payments is automatically granted to farmers who operate their farms in line with organic farming principles (ARiMR, 2015; DPB, 2016; MRiRW, 2015).

Is greening effective?

“The purpose of introducing a green direct payment scheme into the Pillar 1 of the CAP is to ensure that all EU farmers in receipt of support go beyond the requirements under cross-compliance and deliver environmental and climate benefits as part of their agricultural activity. In this context, **it should be stressed that the introduction of greening practices does not necessarily entail changing all practices in all farms. Where these sustainable agricultural practices are already implemented, the application of the green direct payment scheme guarantees the preservation of these practices.** In all cases, the scheme ensures that the required practices are applied on all concerned farms” (EC, 2016: 4-5). According to the EC, the

⁴The reference ratio is calculated as a ratio of the permanent grassland area (declared in 2012 and new permanent grassland area, not included in 2012 but declared in 2015) to the total agricultural land declared in 2015 (ARiMR, 2015b). As indicated in the announcement of the Minister of Agriculture and Rural Development (Dz. U. of 30/11/2015, item 1163), the reference ratio was 18.75%.

⁵ The selection of specific EFA-eligible elements is to be made by individual Member States (EC, 2017d). EFA elements in Poland: EFA1. fallow land, EFA2. hedges, EFA3. single trees, EFA4. trees in line, EFA5. trees in group, EFA6. field margins, EFA7. ponds, EFA8. ditches, EFA9. buffer strips, EFA10. land strips without production along forest, EFA11. land strips qualified for the payment, located along forest edges, EFA12. short-rotation coppice, EFA13. afforested areas, EFA14a. stubble catch crops, EFA14b. winter catch crops, EFA 14c. undersown grasses, EFA15. nitrogen-fixing crops, see: (ARiMR, 2015).

⁶Provided that the arable land area does not exceed 30 ha.

green direct payment scheme is meant to achieve a greater effectiveness of the CAP in delivering environmental and climate objectives (notably for soil, water, biodiversity and climate) by: explicitly acknowledging and **supporting farmers for their joint provision of private and public goods; introducing a basic layer of environmental and climate measures on a very large scale**, additional to the existing rules under cross-compliance; and **raising the level of ambition for environmental and climate measures in rural development** and/or making funds available for these more targeted measures (EC, 2016: 4-5).

The European Commission has assessed implementation and effectiveness of the various greening measures in 2015 and 2016. The first review was focused on issues such as the implementation of greening measures and whether they created a level-playing field, as well as their production potential (EC, 2017b). In 2015, agricultural land subject to at least one green direct payment obligation amounted to 72% of the total EU agricultural area. In the case of Poland, this indicator amounted to over 80%. This area demonstrates the potential of green direct payments in delivering of environmental and climate benefits on a large share of the EU farmland. “The proportion of farmers under at least one greening obligation stands at around 36% of direct payment beneficiaries” (EC, 2016: 5). In 2015, the most frequently declared EFA types were those linked to productive or potentially productive agricultural areas: nitrogen-fixing crops and catch crops that reached 54% of the total weighted EFAs (39% and 15% respectively, after applying the weighting factors), and fallowland. This was 5.4 % of the arable land under the EFA obligation (EC, 2017: 8). In 2016, in the second year of greening implementation, the data suggested little change in comparison to 2015. Looking the other way from the level of difficulty for specific greening requirements fulfilment – the actual environmental improvement depends on the environmental ambition of the measures, that are diverse in the EU Member States⁷.

The evaluation based on international research (carried out after only two years of implementation of the greening measures, looking at the effects of the greening measures compared with the situation in 2014) indicated, that overall the greening measures have led to only small changes in management practices, beside a few specific areas. Greening mechanism resulted in low contribution towards promoting more sustainable farming practices and a negligible effect on production or economic viability of farms (EC, 2017). “As currently implemented, it is unlikely to enhance the CAP’s environmental and climate performance significantly” (European Court of Auditors, 2017: 1). Taking into account the significant agricultural land area covered by the greening mechanism, it can be stated that the management of agricultural land in the EU in 2014 complied with the greening requirements that have been applicable from 2015. This indicated the low difficulty level of the adopted greening requirements. The European Court of Auditors found that the European Commission had not developed a complete intervention logic for greening payments, nor did it set clear, sufficiently ambitious environmental targets for greening to achieve (European Court of Auditors, 2017: 1).

An important issue is the relationship between greening and the production potential of agriculture. Preliminary studies indicated, that the effect of green direct payments on land use and agricultural production is generally projected to remain very low over the medium term, with the noticeable exception of a slight increase in the share of permanent grassland, fallow land and protein grain production compared with a situation without green direct payments (EC, 2016: 15). This is the basis for the claim that at present there is no competitive relationship between environmental and production purposes of greening mechanism.

⁷ See (EC, 2017d).

In the light of the adopted greening requirements, European farmers obliged to comply with them operated their farms in line with the existing legal standards on the majority of agricultural land area, to a large extent maintaining the status quo in 2015 comparing with 2014. The effectiveness of the greening mechanism, however, does not mean that there is a need for change if the starting point is in line with the goals and it is maintained. In order to achieve greater environmental effects due to appropriate agricultural activities, the greening requirements should pose a greater challenge for an agricultural producer. With such a larger agricultural land area covered by greening, even the slightest adjustment in practice towards environmental friendliness produces a measurable environmental effect. It is reasonable to continue the academic debate on the environmental effectiveness of greening in the context of the biodiversity protection, maintenance of the water retention capacity of the soil, adequate protection and use of water resources, greenhouse gas emissions volume, and adaptation of agriculture to climate change (Angileri, et al., 2017; EC, 2017c, Kart, Baldock, Buckwell, 2016; Zeijts, et al. 2011). In the case of environmental impact assessment, an important role will be played by the regional diversity of the European agriculture intensity (Zeijts, et al. 2011).

Research method

The paper is based on the panel of 7.4 thousand private farms included in the Farm Accountancy Data Network (FADN), both in 2014, and 2015. All analysed farms participated in Single Area Payment Scheme. The study omitted agricultural holdings exempted from greening on the basis of general principles (e.g. organic farms, farms with high share of permanent grassland, etc.) and those applying the equivalent practices. Greening mechanism focuses on production organization on arable land, hence the studied farms' population does not include entities without this land type.

Farms' panel selection made it possible to identify organizational changes in agricultural production after the introduction of greening in 2015, compared with 2014, that is the year when the greening mechanism was not in force. The farms' panel was divided into two groups, namely: **small farms, not obliged to greening fulfilment (below 10 ha of arable land) and those farms, obliged to greening (with an area of at least 10 ha of arable land).** The second group was additionally divided into two sub-groups, namely **smaller farms (10-15 ha), which are required to crop diversification, as well as larger farms (15 ha or more),** which in addition to diversification of crops, should also ensure adequate surface of EFA. Classifying the analysed farms' panel made it possible to indicate agricultural production changes, mainly organizational, depending on the scope of the existing administrative requirements related to the mechanism of greening. **Both farms obliged to greening and those exempted from the obligation (the control group) were analysed in the scope of agricultural production organization to identify the actual impact of the administrative instrument and symptoms of those changes, beyond the formal requirements.** Identification of agricultural production organization in farms exempted from greening allows to assign observed changes (or the maintenance of *the status quo*) to other conditions of farms' operation, beyond the administrative mechanism of greening. As a complement to the study, there were illustrated the production and economic results of analysed farms' groups. Precise evaluation of farms' results requires further analysis based on the data from subsequent years.

Due to the fact that since 2015, the FADN system has been registering the practices that are applied on farms under the greening mechanism in order to identify actual farming practices related to EFA maintenance, a population of farms with at least 15 ha of arable land that are

covered with this requirement has been singled out. The 2015 population of farms with EFA area amounted to 4,700, while the population of farms keeping agricultural accounts consisted of 12,105 private farms.

Farms' number and land use

The studied population of 7,392 farms was dominated by those that were under the greening obligation (77%, Figure 1, left). The population of farms under the greening requirements amounted to 5,705, and the majority of these farms were larger farms, i.e. farms with the minimum of 15 ha of arable land. Larger farms are obliged to comply with the greening requirements in regard to both crop diversification and maintenance of ecological focus areas. The importance of this group of farms results from their total area. In the case of the studied panel, the farms with at least 15 ha of arable land held over 90% of area.

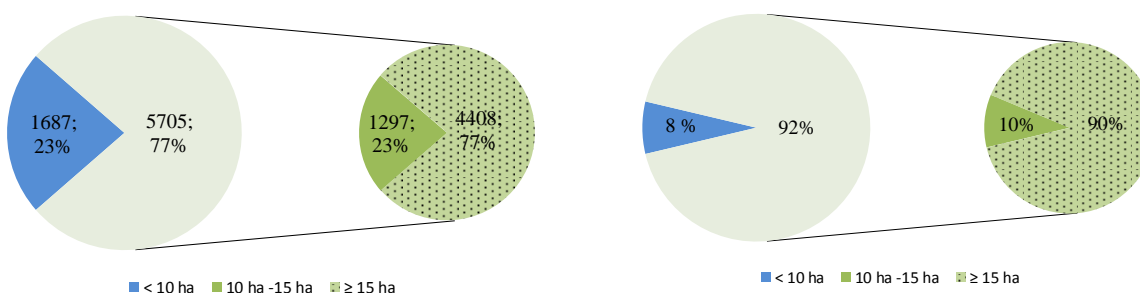


Figure 1. Structure of farms' number (left) and agricultural land (right) by area farms' groups in 2015

Source: own studies based on FADN data 2015.

Table 1. Land use in not obliged and obliged farms to greening (in ha)

No.	Specification	2014 2015		Δ	2014 2015		Δ	2014 2015		Δ
		< 10 ha			10-15 ha			\geq 15 ha		
1	Arable land	14 168	13 870	-299	19 491	19 286	-205	205 904	208 570	2 667
2	Fallow land	229	274	46	145	170	25	985	1 472	487
3	Orchards	1 565	1 597	33	308	322	14	705	701	-3
4	Permanent grassland	7 667	7 786	120	5 192	5 186	-6	20 131	19 457	-674
5	Agricultural Land	23 400	23 253	-146	24 990	24 794	-196	226 739	228 729	1 990

Source: own studies based on FADN data 2014-2015.

The greening requirements basically refer to the manner of arable land use but also involve monitoring related to the maintenance of permanent grassland. Therefore, this study has focused on both the classification of land in the identified groups of farms and on the changes in this regard (Tab. 1).

The arable land area in **farms under greening obligation** was comparable in the analysed years. In the case of smaller farms (10-15 ha), the fallow land area and change to it was small in physical terms and resulted in a small reduction in crop area. The larger farms (15 ha or more), however, increased their arable land area, including the fallow land (by nearly 50%)⁸. In the latter group, the additional land was put to use in 2015. The increase in this area was related to the

⁸In physical terms, however, this area was small and amounted to mere 0.7% of arable land area.

adjustment of the larger farms in order to comply with the EFA maintenance. Driven by the aim of increasing the ecological focus area, the farmers increased the farm area by including additional fallow land and at the same time kept the area used for crop production. The farmers purchased or leased the land that had not previously been used for agricultural purposes.

In the case of farms **exempted from greening** (ones with less than 10 ha), the area of arable land in use and permanent grassland was comparable in the analysed years. The fallow land area was a minor portion of their area. Their area increased to an extent that is definitely smaller than in the case of farms obliged to maintain EFAs.

What needs to be emphasised is the fact that the farms exempted from greening strongly differed from the larger ones in terms of land use. In the former group, permanent grassland took as much as a third of the agricultural land area, which determines their significance in terms of the carbon sequestration capacity, soil production potential and biodiversity. On the other hand, among farms under greening obligation, the percentage of permanent grasslands was significantly lower (21% for farms with 10–15 ha, and 9% for farms with 15 ha or more). These figures show that it is reasonable to vary the greening requirements depending on the farm's area and structure of agricultural land because on the smaller farms, the percentage of grassland is higher (on average) – it is a particularly important natural habitat for both the preservation of species and the continuity of natural processes. From this perspective, larger farms, where larger area is used for crop production through arable land use, should ensure its organization so that it is favorable for generating environmental benefits resulting from the agricultural practice. However, the substitution scale of permanent grassland maintenance and proper management of arable land is an open question.

Arable land use

The fulfilment of the crop diversification and the EFA requirements is related to a specific cropping pattern. Therefore, the analysis of the cropping patterns on arable land pays attention to the varieties and groups of main crops and catch crops.

In accordance with the greening requirements, farms under the crop diversification obligation should grow at least two crop species. According to the legal rules, spring and winter crops are treated as separate species. As shown in Tab. 2, inclusion of spring and winter varieties to a large extent allowed the crop diversification requirement to be satisfied, particularly in the case of farms with 10–15 ha. The high value of winter cover ratio makes it possible to state that the organization of crop production to a large extent had complied with the crop diversification requirement a year before it was introduced. The observed cropping pattern in regard to winter cover on arable land was more favourable on large farms than on smaller farms (in 2015, the percentage of area under winter crops in these two groups was 57% and 40% respectively). Farmers had numerous options allowing them to ensure the required number of cultivated crop species, which shows the great flexibility of the greening instruments. The farmers' selection in this regard was determined primarily by the organization of crop production in 2014, i.e. just before the imposition of greening. The maintenance of cropping patterns that take account of the relevant proportion of spring and winter crop varieties in 2015 resulted in the exemption of farmers from the obligation to introduce significant organizational changes to crop production. It can be stated that greening contributed to the continuation of the favourable status quo regarding the winter vegetation cover. In this aspect, greening can be considered effective.

In the case of the **smallest farms exempted from the greening obligation** (below 10 ha), the winter crop area was definitely lower compared to the farms under the obligation because these crops took as little as a third of the crop area on arable land. Also, when comparing 2015 to

2014, there is no favourable change in this regard. Farmers utilising a small arable land area are not legally bound to diversify their crops, and they are also not motivated to increase the winter crop area.

Table 2. Crops in not obliged and obliged farms to greening (in ha, change in %)

No.	Specification	2014 < 10 ha	2015 < 10 ha	Δ in %	2014 10-15 ha	2015 10-15 ha	Δ in %	2014 ≥ 15 ha	2015 ≥ 15 ha	Δ in %
1	Winter crops (for the next year)	4 525	4 654	103	7 791	7 739	99	113 782	117 858	104
2	Catch crops	266	198	75	386	318	82	5 318	11 343	213
3	Cereal	9 133	8 753	96	13 581	13 177	97	136 619	134 087	98
4	Pulses for grain	350	542	155	396	683	173	6 305	11 456	182
5	- edible	32	46	145	40	112	281	436	1 333	306
6	- fodder	199	372	187	197	413	209	2 975	7 488	252
7	-- field pea	22	28	129	47	71	153	383	1 154	301
8	-- horse bean	10	30	290	22	49	217	234	801	343
9	-- sweet lupine	105	204	194	87	229	264	2 058	4 931	240
10	- pulse mixes with others	119	124	104	158	158	100	2 893	2 635	91
11	Industrial crops	542	522	96	1 202	1 150	96	37 825	36 800	97
12	Potatoes	447	411	92	620	548	88	3 387	3 434	101
13	Fodder crops	2 614	2 669	102	3 069	3 206	104	17 260	18 931	110
14	- grasses	611	663	108	508	612	121	2 380	2 834	119
15	- pulses	11	31	278	27	20	75	99	200	201
16	- papilionaceous	99	119	121	144	196	136	839	1 383	165
17	- papilionaceous mixes with grasses	746	662	89	451	344	76	2 757	2 311	84

Source: own studies based on FADN data 2014-2015.

The **cropping patterns of farms under greening obligation** were dominated by cereals (as of 2015, in the case of the 10–15 ha farms, the percentage of cereals was 69%, while in the case of farms with 15 ha or more it was 65%). The percentage of cereals slightly dropped, when comparing 2015 to 2014 (about 2 percentage points). When assessing the cropping patterns of an average farm under greening obligation, it can be stated that the proportion of other crops, including soil-improving crops, i.e. pulses and papilionaceous crops is negligible – in total, they amount to just a few percent. However, pulses and papilionaceous crops, both edible species grown for grain and fodder crops, are an important element of the cropping pattern, which has favourable impact on the soil organic matter, and in turn on the soil productivity. This is a reason for considering the papilionaceous crops as an ecological focus area. When comparing 2015 to 2014, there is a need to observe that the area of soil-improving crops significantly increased, which was particularly observable on larger farms. These changes occurred both on smaller farms, which selected pulses for the sake of crop diversification, and the larger ones, which were in addition obliged to ensure EFA. In the case of larger farms – 15 ha or more – the area of edible and fodder pulses for grain grew 3 and 2.5 times respectively.

Another important element of the cropping pattern were fodder crops, particularly papilionaceous crops and pulses for green fodder and grasses on arable land. In the case of the farms under greening obligation, their area on average increased over 1.5 times. Operators of larger farms, i.e. farms with 15 ha of arable land or more, were more active in this regard. These results show the impact of legal regulations related to greening, including ones concerning the

maintenance of EFAs, on decisions made by farmers in regard to the area of soil-improving crops.

The cropping patterns of **farms exempted from greening** were also dominated by cereals (65% in 2015). In the case of these farms, a relatively larger crop area was under fodder crops (particularly fodder maize, field grass and papilionaceous mixes and multi-species mixes). The smaller farms tend to combine crop and livestock production, which also determines the manner of arable land use. The dynamic of changes in pulses area, however, did not equal the ones observed in the case of farms under greening obligation.

As shown by the presented figures, the farms not legally obliged to diversify their crops and maintain EFAs also follow the same course in the reorganization of crop production, but they differ in its dynamic. The increase in the area of pulses and papilionaceous crops can surely be attributed to greening, but it is not the sole determinant. In this context, there is a need to stress the importance of other instruments, such as the agri-environmental programmes, or direct support for soil-improving crop production, which have been encouraging farmers to cultivate crops in a symbiosis with natural environment. The additional incentive in the form of the greening payment surely incited farmers to make the desired and more dynamic change to their farms.

Apart from the change to the area of main crops, there was also a change to the area of **catch crops**. Catch crops are one of the most important elements forming the agricultural EFA. Their importance results from the soil-improving and protective properties, but they can also be used as fodder. As shown by the data, catch crops supplemented the cropping patterns in **farms under greening obligation**, but their area significantly grew in 2015 in the case of the larger farms (obliged to ensure EFAs). In the case of those farms, the percentage of catch crops increased from 2.6% to 5.5%, when comparing 2014 and 2015. On the smaller farms, however, this area dropped, which indicates the significance of greening mechanism. In the case of **farms exempted from greening**, catch crops were grown on an even smaller area, which significantly dropped in 2015 compared to 2014 – by 25%. Thus, the percentage of catch crops in the cropping patterns dropped from 1.9% in 2014 to 1.5% in 2015. Presented changes in the cropping patterns and the catch crop area (growth on the larger farms and drop on the smaller farms) indicated that the greening effectively encourages farmers to maintain EFAs through agricultural practices. Farmers not legally obliged to grow catch crops didn't introduce organizational changes aimed at increasing this crop area.

EFA specification⁹

The applicable legislation specified many different elements of EFA, that are related to agriculture, forests and landscape¹⁰. In accordance with the specification, most of these elements concern landscape, while some of them are related to the organization of plant production, i.e. the use of catch crops and companion crops, as well as the cultivation of nitrogen-fixing plants. The farmer can decide which elements are to be used to comply with the EFA requirement. In 2015, total EFA in farms keeping agricultural accounting was 15,000 ha¹¹, which accounted for 6.5% of arable land (tab. 3). This number shows that the analysed farms fully complied with the requirement to maintain EFA (taking into account the result for the entire analysed farms' group).

⁹ See (Wrzaszcz, 2017).

¹⁰ See footnote No. 5.

¹¹ This area refers to the weighted area. Due to different environmental significance of the various EFA elements (agricultural and landscape ones), an EFA weighted area is given (MRiRW, 2016).

As indicated in Tab.3, farmers concentrated on suitable plant production, adjusted to environmental requirements, and only few of them selected landscape and forest elements (these accounted for just a few percent of the total EFA). A total of 87% of the weighted ecological area was used for stubble catch crops and the cultivation of nitrogen-fixing crops. Farmers did not diversify EFA – one or two EFA types were selected most often on the farm level (which was done by 94% of farms). Farmers' choices related to meeting the EFA requirement by plants cultivation in the main crop and secondary crop translated into a change in the cropping pattern in their farms, thus improving water and soil conditions.

These results demonstrate the importance of the agricultural elements of EFA in the context of compliance with this requirement of the EU law. The farmers' selection of specific EFA elements could have been imposed to a large extent by the administrative requirements related to specific elements of ecological focus area. Particular difficulties that a farmer faced were related with keeping the registration of specific landscape elements. Pursuant to the administrative requirements, there is an obligation to measure and illustrate the size of each EFA element, which also involves its presentation on the maps. An important issue is the preparation of an up-to-date valuable natural resources' records in Poland, including their location on farms under the EFA obligation. The results can indirectly indicate a small proportion of valuable landscape and forest features compared to the utilized area on larger farms.

Table 3. The main EFA elements (in 2015)

Elements	Farms		Surface EFA			
	Number	%	Converted (ha)	Weighed (ha)	Converted (%)	Weighted (%)
EFA14a: stubble catch crops	2707	57.1	16 749	5 025	54.2	34.2
EFA15: nitrogen-fixing crops	2229	47.0	11 173	7 821	36.1	53.2
EFA14b: winter catch crops	275	5.8	1 610	483	5.2	3.3
EFA1: fallow land	228	4.8	804	804	2.6	5.5
EFA in total	4744	x	30 910	14 699	100	100

Source: own studies based on 2015 FADN data.

Farms' outcomes¹²

Analyzing the impact of greening on the farms' organization, there is a need to mention their production and economic outcomes. The results of the analyzed farms have been illustrated both through the factor productivity and profitability indicators and the subsidies absorption (Tab. 4)¹³.

On **farms under greening obligation**, the productivity of production factors slightly dropped, while their profitability was comparable in the analyzed years, both in the case of the smaller (10–15 ha) and the larger ones (15 ha or more). The amount of the granted subsidies has to be seen otherwise – this value grew significantly in 2015 compared to 2014 – by 18%. The increase in the subsidy transfer should be attributed primarily to the administration decision (scope of and criteria of subsidy granting, and advance payments introduction related to direct payments) and then to the farmer (their greater activity). It has to be remembered that in 2015, the first year when greening was implemented, only a small percentage of the beneficiaries actually received the related payment. There is a need to notice the role of the administrative decision that granted advances of direct payments to farmers in late 2015 (MRiRW, 2015), i.e. much earlier

¹² According to FADN data, the average exchange rate in 2015 was EUR 1 = PLN 4.18.

¹³ Categories and definitions of standard results of farms were presented in: (Floriańczyk, Osuch, Płonka, 2017).

than in the previous years. Subsidy transfers for the preceding years were basically made in the following year¹⁴.

When comparing 2015 to 2014, it can be stated that the role of subsidies contributing to the economic situation of farms under greening obligation increased, which is shown e.g. by the higher ratio of payments to farm production value. In 2015, nearly half of the farm income came from that source, while in 2014, this was 38%¹⁵. The presented figures indicate that the funds in the form of subsidies exert an increasing impact on the economic condition of farms, particularly in the case of larger farms. In addition, this phenomenon has recently become more visible.

Productivity of production factors **on the farms exempted from greening** was comparable in the analyzed years, and the profitability ratios grew significantly (from a dozen or so percent for added value to 20% in the case of income when comparing 2015 to 2014), which has not been observed in the case of farms under the greening obligation. The subsidy to production ratio indicated that the economic situation of the farms exempted from greening was less dependent on the cash flows from subsidies compared to the farms under greening obligation. The studied years also saw a decline in the importance of such subsidies for the economic performance of farms below 10 ha.

Table 4. Outcomes, subsidies and their relation*

No.	Specification	2014	2015	Δ in %	2014	2015	Δ in %	2014	2015	Δ in %
		< 10 ha			10-15 ha			≥ 15 ha		
1	Total output (thous. EUR/ha)	1.93	1.99	103	1.73	1.65	95	1.57	1.47	93
2	Total output (thous. EUR/AWU)	14.69	15.30	104	18.48	17.62	95	39.16	37.14	95
3	Gross Farm Income (thous. EUR/ha)	1.00	1.14	113	0.85	0.87	102	0.78	0.76	98
4	Gross Farm Income (thous. EUR/AWU)	7.66	8.72	114	9.08	9.27	102	19.38	19.31	100
5	Income (thous. EUR/ha)	0.67	0.79	119	0.59	0.6	102	0.56	0.54	96
6	Income (thous. EUR/FWU)	5.08	6.08	120	6.29	6.4	102	14.08	13.74	98
7	Direct payments/Subsidies (%)	65	70	5 p.p.	69	75	6 p.p.	63	71	9 p.p.
8	Single area payments/Subsidies (%)	52	57	5 p.p.	57	61	4 p.p.	56	61	5 p.p.
9	Subsidies/Output (%)	16	17	1 p.p.	15	19	3 p.p.	17	21	4 p.p.
10	Subsidies/Income (%)	54	49	-5 p.p.	50	57	7 p.p.	53	65	12 p.p.
11	Balance subsidies and taxes/ Income (%)	38	37	-1 p.p.	38	46	8 p.p.	38	49	11 p.p.

* 1 AWU/FWU is the equivalent of the full-time labour of all workers/only farming family members. All production and economic categories in current prices; p.p. – in percentage points.

Source: own studies based on 2015 FADN data.

Main conclusions

This publication discusses the new conditional mechanism of farmers subsidizing under the direct payment scheme, which has been named greening. The changes that occurred on farms after new requirements introduction were evaluated on the bases of 2014-2015 Polish FADN data. The first year of analysis presented the farms' state before the implementation of greening, while the next year showed the situation when the requirements came into force. This analysis has been supplemented by a parallel analysis of farms exempted from that obligation, which were used as a control group. Comparison of results for farms under greening obligation (at least 10 ha of arable land) and exempted from it (below 10 ha of arable land) enabled the identification of

¹⁴In 2015, the advances of direct payments were paid for the first time. These advance payments, at 50% of the total payment, were paid in advance of: the Single Area Payment, additional payment, protein crop payment, and the soft fruit payment. In total, about 80% of the direct payment beneficiaries received such advances (MRiRW, 2016).

¹⁵Also including tax liabilities.

organizational changes to farms that were introduced as a consequence of the new administrative solutions.

The main conclusions from the study, which refer to the analyzed group of Polish FADN farms and legal regulations related to greening that have been binding on farmers since 2015:

1. The greening requirements related to land use had no adverse impact on the production potential of farms. Farmers who assumed the greening obligations have not reduced the area of land used for production but instead slightly increased the total farm area to ensure balance between the production and the environmental goals.
2. The different structure of agricultural land in use in the studied groups of farms (under greening obligation and exempted from it) has indicated that it is reasonable to diversify the environmental requirements imposed on smaller and larger farms. The greater the farm area, the smaller the area of permanent grassland, which is a valuable natural habitat. Therefore, it is reasonable to induce users of larger farms (where the majority of land is used for crop production on arable land) to diversify cropping patterns and preserve valuable natural features in order to ensure environmental benefits. The current form of greening takes these issues into account.
3. Farms with at least 15 ha of arable land took the most organizational measures to adjust to the new administrative requirements. This state of affairs corresponds to the assumed impact of the greening mechanism, which confirms its effectiveness.
4. Maintaining status quo on farms (as regards winter crop and permanent grassland area) or introduction of desired organizational changes to crop production (as regards ensuring ecological focus areas, including catch crops, nitrogen-fixing plants, or maintenance of fallow land) is the quintessence of the measures related to the satisfaction of the greening requirements. In this aspect, greening can be considered effective.
5. Greening contributed to the dynamic increase in area of pulse and papilionaceous crops, but it is not the only determinant. In this context, there is a need to stress the importance of other instruments, such as the agri-environmental programmes, or direct support for soil-improving crops (including production of protein crops), which have been encouraging farmers to cultivate crops in a “symbiosis” with the environment.
6. The environmentally friendly organization of Polish farms before the introduction of the greening requirement allowed them to adjust smoothly in 2015. Therefore, the scope of changes to the organization of crop production due to the implementation of greening was minor, and they affected mainly larger farms (at least 15 ha of arable land), which have to comply with the most requirements. These changes were primarily related to the increase in the area of pulse and papilionaceous crops.
7. The farms not legally obliged to diversify their crops and maintain EFAs also follow the same course in the reorganization of crop production, but they differ in its dynamic. The more favourable dynamic of such changes on farms under greening obligation demonstrates the effectiveness of the mechanism.
8. Maintenance of EFAs on farms requires basically an appropriate organization of crop production. Farmers under the obligation to maintain the ecological focus areas rarely indicated landscape and forest elements, which is a reason for identifying the ground for such a decision. An up-to-date catalogue of natural features on larger farms is necessary to determine the actual possible choices a farmer has. It is reasonable to simultaneously carry out administrative work aimed at simplifying the procedures related to the listing of such features in order to encourage farmers to preserve them and include in the EFAs.

9. Another issue that should be considered important is the determination of substitutability of different agricultural practices in terms of the environmental impact and maintenance of natural resources at the farmers' disposal.
10. The extent to which the "desired" agri-environmental practices are implemented should serve as a basis for assessing the environmental effectiveness of greening. As indicated in the discussion presented in the academic literature, the environmental effects of greening are deemed insufficient due to the adopted greening requirements. Greater environmental challenges under greening should entail the farmers' higher involvement in agri-environmental practices but the final environmental effectiveness will be determined by the level of difficulty of these requirements and the area under those obligations.
11. In the first year of the implementation of greening, these requirements did not adversely impact the production and economic performance because the area allocated to the ecological focus areas amounted to mere several percent of the area in use and the crop diversification criteria did not force any significant organizational change in crop production.

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