THE IMPACT OF THE "GREENING" OF THE COMMON AGRICULTURAL POLICY ON THE FINANCIAL SITUATION OF POLISH FARMS

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Abstract: This paper presents an assessment of the impacts of introducing the greening scenario of the CAP, proposed by the European Commission as an alternative for the reformed CAP after 2013.
In the past, the CAP has undergone numerous transformations in response to the changing macroeconomic environment and in reaction to developments in the farming sectors in EU countries. On the 12th of October 2011, the Commission presented a set of legal proposals designed to make the CAP a more effective policy to encourage more competitive and sustainable agriculture and vibrant rural areas. The proposal brings various new elements under consideration, some of them raising strong controversies such as introducing "greening" as a component of direct payments. Changes in the direct payments scheme in line with the EC proposition include forcing adjustments in the cropping pattern and creating ecological focus areas (EFA) on 7% of the farm land ; the consequences of such a proposal on the size and structure of agricultural production, and thus on the economic performance of farms and the whole agricultural sector are uncertain.
The authors analyse historical changes to the CAP with a focus on a growing importance of the environmental component of the CAP, discuss different scenarios of shaping the direct payments system and present the results of modelling the impacts of greening the CAP on the Polish farming sector with the use of the LP optimisation model. The study was based on Polish FADN data.
Results show that the majority of farmers in Poland comply with the crop diversification constraint of greening. However, establishing the required EFAs and necessary diversification on farms with simplified cropping structures will have a negative impact on the volume of agricultural production as well as on farm incomes.

Key words: CAP, greening, ecological focus area, crop diversification, farm income

Introduction

Proposals for the reform of the European Union's Common Agricultural Policy (CAP) for the budgeting period of 2014-2020 are still being discussed and analysed regarding the potential effects of these reforms. The basic document defining the shape of the future CAP is the proposal of the European Commission (COM 2011/625), although a significant voice in the discussion was represented by the European Parliament, as well as by the individual Member States. One of the essential elements of the reform is the concept of *greening* the CAP. This raises numerous controversies arising from the ambiguously defined objectives of *greening* as well as because of the difficulty in estimating its effects.

The implementation of the requirements of a CAP which has been greened will above all enforce the adjustment of crop structure in agricultural holdings, as well as the designation of a suitable ecological focus area. This will affect the area and structure of agricultural production, with changes in agricultural income thus arising.

The potential impact of the 2013 CAP reforms on various environmental and economic aspects, taking into account the European Commission's proposals of November 2010, has been discussed in a number of publications (Helming and Terluin, 2011; Van Zeijts *et al,* 2011). In addition to examining the impact of changes in the CAP on biodiversity and reducing greenhouse gas emissions, these authors also attempted to estimate the cost of greening and the impact on the development of agricultural income in the EU using the CAPRI model. The analysis shows that the inclusion of the requirements on greening to the direct payments system will improve income in regions with extensive agricultural production, such as those with the grazing system, but will worsen the results in regions with intensive agricultural production. The authors conclude that the reform's impact will be to improve agricultural income in the new Member States, while it will remain unchanged in the EU-15. However, one should refer to that conclusion with some caution, because due to its nature, the sectoral CAPRI model does not directly reflect the processes carried out on individual farms. This doubt is confirmed in analyses done by DG AGRI (EC, 2011), cited by A. Matthews

who states that "implementation of the instruments related to green payment will affect the increase in management costs in the EU or in the short-term the decrease in agricultural income". It is estimated that the cost of greening can reach 33 EUR/ha in 2020. One consequence of the exclusion of the use of arable land intended as an ecological focus area will be a reduction in supply and therefore an increase in the market prices of crops. The European Commission estimates that the increase in prices would apply to wheat and sugar beet (both seeing an increase of 3%), barley (12%) and beef. It is estimated, however, that the increase in prices and the expected increase in yields will not fully compensate for higher production costs, which will result in an average drop in agricultural income by 2% (Matthews, 2011).

The authors of another publication (Westhoek *et al,* 2012) analysed the impact of the greening of the CAP on the environment and concluded that introducing the obligation to diversify crop structure will not have a significant impact on improving the quality of the natural environment, since according to the estimates, the need to comply with this requirement applies only to 2% of the agricultural area in the EU.

More in-depth analysis of the effects that greening the CAP would have on production and agricultural income in Poland was carried out as one of the tasks of the research programme "Direct payments and budget subsidies versus finance and functioning of holdings and agricultural enterprises", realised by the Institute of Agricultural and Food Economics. The methodology of the analysis was developed and preliminary estimates of the effects of greening were made for selected types of cereal farms in the first stage of the implementation of the tasks. One finding was that in the population of farms in the Polish FADN which were the subject of the analysis, the degree of adaptation to the requirements of greening is diverse, and the effects are therefore unevenly spread between different groups of farms. In cereal farms adjusted to diversification of crops, in which it is necessary to isolate an ecological focus area, the reduction in agricultural income does not exceed 4%. However, in farms with a highly simplified structure of crops (mainly monocultures) and the lack of an ecological focus area consistent with the requirement of greening, the reduction in income can be as high as 20% in case of monocultures on good soils. Increased adjustment in crop diversification causes a decrease in the impact of the CAP reform on the development of the income of particular groups of farms. The preliminary analysis of only one type of FADN farm shows that in Poland, the required separation of ecological focus area will have a greater impact by far on agricultural income than will the obligation of diversification (Czekaj *et al,* 2011).

This paper presents an estimation of the effects of greening the CAP on different types of farms, up-scaled further to the entire population of FADN farms. The results of the analysis pertain to the first year (2014) of the new EU budget perspective. In this research we used a linear static farm optimisation model FARM-OPTY using MS Excel and SOLVER. Farm models were developed for specific types of farms using FADN typology with the use of three agricultural policy scenarios.

Methodology

Analyses of the effects of greening the CAP were made for a specific variant referred to in the European Commission's proposal as "**integration scenario**", which includes the concept of "greening"[1]. The basic requirements for greening included in the optimisation model are:

a) minimum of 3 crops in rotation, with maximum proportion of one of them at the level of 70% and a minimum proportion in the crop structure at the level of 5%;

b) maintaining the existing areas of permanent grassland, with the right to reduce the area by no more than 5% compared to the base year;

c) allocation of 7% of arable land as an ecological focus area, including ecological land such as land left fallow, terraces, landscape features, buffer strips and afforested areas.

According to the initial assumption and guided by the European Commission's proposal for the purpose of modelling, five agricultural policy scenarios were constructed:

Base Scenario [Base_2009] and Baseline_2014 scenario

These scenarios assume a continuation of the current CAP. The base scenario is used only to calibrate models constructed on the basis of FADN data as of 2009. The baseline scenario provides a benchmark for other scenarios of the reformed CAP. The baseline scenario assumes no change to the existing mechanisms of the CAP, assuming that the model will apply direct payment at the level which applied to Poland in 2013.

B. Integration Scenarios, including the concept of greening the CAP as proposed by the European Commission. This scenario highlights three options:

B1. basic variant of greening [**GREEN_2014**], in which, in the absence of a clear definition of the term "crop" in the European Commission's proposal, it was assumed that the crop is a single plant (species) – e.g. wheat, rye, rape, corn, etc.

B2. simplified variant of greening **[GREEN_ZB 2014]**, in which the term "crop" is understood as cereals in general, forming a group of crops.

B3. variant of the resignation from 30% of payment for greening **[GREEN (–30%) _2014]**, which allows for the possibility of not meeting the conditions of greening and reducing direct payments by 30%.

The main data sources were Polish FADN resources. Data from 2009 were used to develop a concept of typology and parameters for farm models. The data comes from 12,258 research facilities (individual farms). The entire population was divided into production types, adopting the criteria consist-

[1]Preliminary methodological assumptions presented in the study [Czekaj, Majewski, Wąs 2011] have been reviewed and modified for the purposes of this study.

ent with the Community typology for agricultural holdings of 2009 (Goraj *et al,* 2011). According to the adopted methodology, the standard output (SO) was used to determine the economic size and type of production, which is defined as "the average value of production of five years in specified plant and animal production obtained from 1 ha or 1 animal within 1 year in average production conditions for the region".

Types of model farms

The process of selecting the types of farms for modelling consisted of four basic steps and proceeded according to the following scheme:

- Step 1 – Division of farms by type of production, according to the Community typology for agricultural holdings of 2009;
- Step 2 – Further division of farm groups based on the degree of adaptation to the "greening" requirements:
  - **"green"**, here, means that farms meet one or both of the two requirements of greening – diversification of crops and ecological area (7% of arable land);
  - **"non-green"** means farms that do not meet the criteria for greening, neither in terms of diversification of crops nor minimum fallow land on the farm.

Among the **"green"** farms, the following were distinguished:

- farms that meet the requirement of diversification and ecological area in all of the greening scenarios [designated as D < 70%+E],
- farms that meet the requirement of diversification and ecological area except for the GREEN_ZB scenario. This group will include farms with more than 70% of cereals in the crop (D > 70%+E),
- farms that meet the requirement of diversification in accordance with all the greening scenarios analysed [D < 70%],
- farms that meet the requirement of diversification except for the GREEN_ZB scenario, i.e. the group includes farms with more than 70% of cereals in the crop [D > 70%].

"Non-green" farms were divided into three subgroups:

- farms with cultivation of plants in monoculture,
- farms with two equivalent crops (proportion of approximately 50% each),
- farms with a dominant crop (marked as MAIN+).

The result obtained after completion of the second phase is to determine the structure of farms with regard to the degree of fulfilment of the "greening" conditions in the various production types according to nT14 in the FADN sample (Table 1). 90% of the farms in FADN meet the conditions for recognising them as "green" based on the criterion of crop diversification. However, only 11% of farms are fully adjusted and meet the two essential criteria. From the above, it follows that the introduction of the requirement to diversify crops will not require significant adjustments to the structure of crop production (apart from the relatively small percentage of farms with strongly simplified crop structures). Stronger changes in the production and financial situation may be brought about by the increase in ecological area to the level of 7%.

Table 1. Structure of farms according to production types in the FADN sample with regard to fulfilment of the greening criteria. Source: Own study.

Description	Cereal	Arable	Cattle	Pig	Mixed	Other	Total
D+E	5%	9%	6%	3%	5%	60%	11%
D	71%	82%	86%	84%	89%	28%	79%
MAIN+	9%	5%	4%	4%	3%	6%	4%
TWO CROPS 50/50	12%	2%	3%	8%	3%	3%	4%
MONO-CULTURES	3%	2%	1%	1%	0%	4%	2%

- Step 3 – Division of farms by economic size. For ranges of economic size expressed in standard output (SO) there are four classes of farms, of which three: small (4,000 € ≥ SO ≤ 15,000 €), medium (15,000 € ≥ SO ≤ 50,000 €) and large (SO ≥ 50,000 €) will be the subject of modelling.
- Step 4 – Selection of farms with similar crop structure. This step applied only to farms which were not adjusted for diversification of crops. As a result of the analysis of the crop structure, we defined 448 types of farms selected on the basis of the criteria of belonging to the production type, adjustment to the proposed requirements of the new CAP, economic size and the dominant crop in the crop structure.

The farms were also assigned a word describing the soil quality determined by the average index of soil quality[1].

In all types of farms, an average value of parameters was specified and included in the optimisation model, covering the area of permanent grassland and ecological focus area, one of the two basic requirements of greening. The estimated size of the ecological focus area includes land left fallow.

In the development of parameters for models based on FADN data, it outliers (abnormally high or low) were found, especially in relation to variables such as marginal productivity, product prices, or some financial data from farms. The values of the characteristic appearing out of permissible range were replaced respectively by the maximum allowable value of the characteristic for values above the permissible maximum or by the minimum acceptable value for values less than the acceptable minimum. The above procedure was applied to crops, prices, productivity of animals, production values of residual crops (not subject to optimisation) per 1 ha, and the values of animal production not subject to optimisation per 1 LU (Czekaj *et al* 2012).

[1]The soil quality indicator is calculated by dividing the conversion area by the agricultural land area, expressed as physical hectares of the analysed farm.

FARM-OPTY agricultural farm model[1]

For each farm type, the optimisation model was solved with the use of the analysed agricultural policy scenarios, and the average change in income resulting from the introduction of appropriate greening scenarios was calculated.

The structure of the model used in the calculations allows for optimisation of the structure of crops and livestock production, reflecting the specific conditions of the different types of farms in order to maximise agricultural income. The objective function is:

$$\underset{x_i \geq 0}{DR} = \mathbf{p}^T(\mathbf{x} \bullet \mathbf{y}) + \mathbf{s}^T\mathbf{x} + fs - \mathbf{c}^T\mathbf{T}\mathbf{x} - fc$$

provided that Ax ≤ B, where:
DR – agricultural income (numerical value of objective function); p – vector of prices (n x 1); y – vector of yields and productivity (n x 1); x – non-negative vector of optimum levels of production activities (n x 1); x•y – Hanamard product; s – vector of payments for production activities (n x 1), c – vector of input prices (z x 1); T – matrix for input consumption for individual activities (z x n); fc – value of relatively fixed costs; fs – value of operational subsidies relatively independent of the level of production; A – resource utilisation coefficient matrix (m x n); B – vector of available resources (m x 1).

In the process of optimisation, the model enables us to determine the production structure based on the parameters entered for 23 crop production activities, complemented by non-productive activities (set aside, green manure in main crop, ecological infrastructure) dependent on a scenario and basic activities in animal production. When determining the boundary conditions of the model, we assumed that the set of crops found in the base models will not be expanded with potentially high-yield activities (such as potatoes, sugar beet, vegetables, fruit, etc.), considering that the increase in acreage of these crops in the whole sector is limited by existing demand, technological barriers and skills at the level of a farm. In the greening variant of GREEN (-30%)_2014, with a reduced area of cereals, we admitted the possibility of introducing or increasing the share of plants similar to cereals – rapeseed and legumes for grain.

Model solutions were prepared for 2014, the first year of the new budget perspective and the reformed CAP. This allowed us to disregard long-term trends in prices and marginal productivities in our considerations – we accepted the assumption that in the short term these parameters will not change significantly in relation to the current state.

Results of model solutions

Farms with an economic size over 3 SO, representing the most numerous production types of farms in Poland, were selected for modelling from a total of 448 separate types of farms. The following group of farms were treated as residual: farms from economic class 1-2 SO and orchard farms, which, due to their small area or specific activities, are exempt from the obligation of greening, as well as others, e.g. poultry farms and other using nutritive fodder, the number of which is small in both the FADN sample and the general population of farms in Poland.

From the types created for modelling, 338 were selected. Separate modelling types of farms were created on the basis of 10,966 farms from the FADN sample and represent 654,960 individual farms. The remaining 110 types of farms classified under the group of residual farms were created on the basis of data from 1292 FADN farms representing 95,586 real farms in Poland.

The results from the model, presented below (for 338 types of farms), are aggregated based on the weights constructed on the basis of the proportion of each model type represented by farms in the FADN sample. Whilst the effects of the implementation of assumed changes in the CAP can be considered as having been objectively estimated for farms from the FADN sample, the generalisation of the results to the level of farm population represented by analysed farms from the FADN sample using the variable SYS 02 is approximate.

Of the entire sample of model farms, approximately 5% meet the basic requirements of greening (the share of ecological focus area at 7% and diversification of cropping patterns). Nearly 85% of farms have sufficiently diversified structure (these farms must allocate a sufficient area of their arable land to create an ecological area) and other farms do not meet either of these conditions. The highest percentage of farms that fully or partially meet the requirements of greening is on cattle and mixed farms, which is due to some extent to their dominant share in the total population of farms (over 60% of the analysed population). However, the main factor contributing to the diversification of crops is the need for fodder crops on arable land, supplementing, in relation to permanent grassland, the demand for forage for cattle.

Nearly 10% of the model farms are characterised by a highly simplified structure of crops (including just over 1% of farms with crops in monoculture); these farms would have to introduce additional crops to achieve the greening conditions, while reducing the scale of the plants currently grown on these farms.

The density and structure of livestock corresponds to the types of cattle and pig farms. On mixed farms, the predominant livestock are pigs. A small population of livestock, with the majority of pigs, is also found on cereal and arable farms.

Table 2 shows the modelling results for the estimation of the impact of greening on farm's financial results . These results are presented for different greening scenarios and for number types of farms distinguished according to different criteria. The results refer to the average values for the specified farm types, so that the condition is met for presenting the results from the FADN system at the aggregation level not lower than 15 farms.

[1]FARM-OPTY model was developed in the Department of Economics and Organisation of Farms of the Warsaw University of Life Sciences.

All greening scenarios involve a decrease in agricultural income compared to the baseline reference model – the base Green_2014 scenario - by an average of 3.8 percentage points. In the case of scenarios Green_2014 and Green_ZB 2014, which differ in their interpretation of the term „crop", the drop in revenue is similar, reaching 3.8 and 4.0 percentage points respectively in the model farm population. The difference between the two variants of the model solutions is low mainly due to the high average degree of diversification of crops in Polish agriculture. Highly simplified structures of crops with a limited number of activities occur mainly in the relatively small group of cereal farms. Because of this, the variant that hypothetically is more strict, in which all the cereals are one „crop" of the allowable 70% share in the structure (Green_ZB 2014), is less favorable a for the most types of model farms than Green_2014 scenario. The exceptions are primarily cattle farms and mixed farms with a large proportion of cattle and farms with poor soils where agricultural incomes are rising slightly. This is due to the adoption of a seemingly reasonable assumption that at least in the first year of a greening policy, farmers will not be inclined to make more radical changes in the structure of production, if not necessary.

According to this assumption, in the model for the Green_2014 scenario, the model boundary conditions were specified in such a way that the possibility of introducing new crops to the crop structure was limited. In the models for these types in the Green_ZB 2014 scenario, due to the more restrictive boundary conditions for the proportion of cereals, it was necessary to loosen some restrictions on the model to allow for the introduction of new crops, especially rapeseed and legumes. Although it was assumed that the yield of new crops not previously existing on farms will be lower (by about 30%) compared to average values for a given type of soil, they were characterised by a higher gross margin compared to extensive cereals (rye, cereals mixes). As a result, agricultural income on these farms was slightly increased. On farms breeding cattle, the model optimised cattle breeding within the accepted limits, replacing part of the forage area on arable land (maize silage) with less expensive grass from permanent grassland.

The model results indicate that the highest costs of greening are in the types of arable and cereal farms, as well as on farms on good soils and on these types of farms, characterised by a low degree of adjustment to greening, especially on farms with crops in monoculture. The largest decline in agricultural income in the whole population under study concerns farms with crop monoculture on good soils on which the replacement in part of the most cost-intensive and profitable activities (wheat, rapeseed) lowers the income to about 77% compared to the Baseline reference solution.

On average, the Green (–30%)_2014 variant is far less favourable to farmers; it assumes the possibility of not complying with the requirements of greening and a 30% reduction in direct payments per farm. On the scale of the whole population, while leaving the structure of production and revenues as in the Baseline scenario, the decline of income is 9 percentage points. The differences in the size of agricultural incomes between scenarios result in changes in the share of direct payments in agricultural income (Table 1.8).

Due to the increase in prices of some agricultural products in the past few years (mainly cereals), agricultural income in the Baseline scenario and greening scenarios are on average higher than in the base scenario for 2009. Changes in prices are beneficial mainly to crop farms (increase in revenue by about 70%) and to a lesser extent to animal farms. Significantly higher incomes are also achieved on farms with good soil and on larger farms. This affects the proportion of direct payments – for all types of farms these are highest in the base scenario in comparable to the Baseline scenario and the greening scenarios. In the GREEN (–30%)_2014 scenario, the share of payments in income is

Table 2. Effect of greening on the level of agricultural income for the population of farms from the FADN sample. Source: own study

Types of farms	BASE-LINE_ 2014	GREEN_ 2014	GREEN_ ZB_2014	GREEN (–30%)_ 2014			
	Value in PLN	Baseline = 100	Value in PLN	Baseline = 100	Value in PLN	Baseline = 100	Value in PLN
According to types of production							
Cereal	168 817	100	157 848	93 ,5	157 254	93 ,2	148 189
Arable	97 162	100	90 480	93 ,1	92 758	95 ,5	87 119
Cattle	59 794	100	57 587	96 ,3	59 413	99 ,4	52 474
Pig	186 962	100	183 966	98 ,4	180 600	96 ,6	179 609
Mixed	63 308	100	61 374	96 ,9	61 392	97 ,0	57 278
According to economic size							
Small	22 660	100	21 710	95 ,8	21 657	95 ,6	19 854
Medium	67 983	100	65 115	95 ,8	65 711	96 ,7	60 546
Large	258 307	100	249 102	96 ,4	248 720	96 ,3	239 162
According to the degree of adaptation to greening							
D+E	59 980	100	59 582	99 ,3	59 262	98 ,8	59 932
D	96 038	100	92 500	96 ,3	93 071	96 ,9	87 022
50/50	112 614	100	106 877	94 ,9	104 060	92 ,4	103 335
MAIN+	91 661	100	87 507	95 ,5	85 153	92 ,9	82 956
MONO	115 830	100	99 976	86 ,3	96 964	83 ,7	105 738
According to soil quality							
Good	168 185	100	153 166	91 ,1	154 123	91 ,6	150 492
Medium	137 015	100	132 240	96 ,5	131 589	96 ,0	126 228
Poor	53 467	100	51 772	96 ,8	52 622	98 ,4	47 556
Population							
Total	95 035	100	91 383	96 ,2	91588	96 ,0	86461

significantly lower. This is due to the fact that with the same income from agricultural production as in the Baseline scenario, direct payments are reduced by 30% for failure to meet greening requirements.

Although the optimum solutions exclude the least profitable crops from production in a given type of farm, the aggregated production shows a decline for all crops. In the case of farms with good soil in which the intensive and most profitable crops grow, there is a relatively large decrease in the production of wheat, rapeseed and maize for grain. At the same time, due to the maximum allowed 70% share of the most important crop, less profitable plants are used in these farms to diversify cropping patterns. On farms with average and poor soil, plants such as cereals, rye, barley and oats, characterised by their relatively low profitability, are more often displaced by an ecological focus area than wheat and rapeseed. Despite their relatively low profitability, legumes are an attractive alternative to cereals on farms with poor soil, but in extreme cases, even on poor soil wheat and rapeseed enter the model solutions of crop structure.

An almost five-fold increase in the production of legumes in the Green_ZB 2014 scenario could give rise to doubts as to the feasibility of selling, even at low prices, such quantities of legumes. In light of the recent interpretation of the term „crop" in the greening proposals, this scenario should be treated as a benchmark, as the likelihood of its implementation in practice is negligible.

Summary

The reform of the EU's common agricultural policy (CAP) proposed for 2014–2020 covers many aspects, as evidenced by regulatory proposals for the new budget perspective.

Important elements of the reformed CAP will be the changes in the distribution of support measures for agriculture between Member States, the coverage of the increasing volatility of the market conditions with agricultural policy, and better targeting of measures aiming at addressing environmental challenges.

The current reform proposal assumes that the new CAP will address future challenges to the agricultural sector and will be compatible with the basic objectives of the CAP related primarily to:

- viable food production;
- sustainable management of natural resources and climate action;
- balanced territorial development (EC SEC 2011/1153).

The objectives of the reformed agricultural policy of the EU will be achieved through effective use of resources while maintaining agricultural support from the existing two pillars of the CAP. The documents of the European Commission conclude that „this reform accelerates the process of integration of environmental requirements. It introduces a strong greening component into the first pillar of the CAP for the first time thus ensuring that all EU farmers in receipt of support go beyond the requirements of *cross compliance* and deliver environmental and climate benefits as part of their everyday activities". Making 30% of direct payments dependant on greening is to ensure achieving these benefits through the retention of soil carbon, protection of species on permanent grassland (grassland habitats associated with permanent grassland), protection of waters and habitat protection through the establishment of ecological focus areas and the improvement of the resilience of the soil and ecosystems through diversification of crops.

Since the announcement of the European Commission's proposal, greening the CAP is the subject of intense and sometimes emotional debate. For many stakeholders involved in this discussion, the concept of greening seems controversial, either because it does not stress environmental objectives strongly enough, or because it imposes too restrictive limitations which interfere with the organisation of agricultural holdings. One of the important reasons for the existence of the controversy is the lack of reliable and comprehensive assessment of the effects of greening, in particular in relation to the expected environmental benefits. Although there are numerous positive effects of greening to the environment, including those mentioned in the Impact Assessment, they are merely of general regularity. At the same time, the expected effects have been assessed as doubtful due to the relatively stringent requirements of greening. For example, it is stressed that the diversification of crops in the sense of the European Commission's proposal is different from „crop rotation", which requires crop rotation in the sense of cultivating plants on a cycle of fields over the coming years. Thus, the benefits of the diversification of crops will not be of the kind that one would expect from agriculturally proper crop rotation.

Supporters of strong environmental protection are also critical of attempts to alleviate the greening requirements and of optional solutions that arise in the ongoing discussion, concluding that they would lead to the continuation of financial support for agriculture „without providing any environmental effects"[1].

As regards the issue of production and financial effects, the analyses made so far, including the estimates presented in this study for Polish agriculture, indicate that the agricultural sector of the European Union will bear the costs of greening, and will not be compensated in the short term by an increase in the productivity of production factors, nor by expected increases in prices of certain agricultural products. In the absence of any convincing arguments for the positive, long-term effects of greening, it seems rational to argue that this reform is in contradiction with one of the main objectives of the CAP, i.e. ensuring the viability of food producers. Moreover, it could mean a decrease in the share of EU agriculture in meeting the growing global demand for agricultural products.

The estimates of the effects of greening on Polish agriculture presented in this paper indicate that in the first year of

[1] "...keep pumping money into the pockets of farmers without any environmental delivery being assured". Ariel Brunner, BirdLife, "Leaked council paper suggests attempt to kill the greening of the CAP", Media Release, [Brussels, April 30, 2012].

implementing the reformed CAP, there would be a reduction in farm income by about 3–4 percentage points compared to the scenario without changes in the agricultural policy [Baseline_2014]. This would be primarily due to the exclusion of part of the arable land in order to create ecological focus areas, as well as due to the changes in crop structure which are necessary in order to meet the condition of crop diversification. The analysis, carried out on the basis of the European Commission's initial proposal, known as the „integration scenario", assumes several variants of greening scenarios. The results of calculations relate to 2014, adopted as the first year of the CAP reform. In determining the parameters for the model calculations, it was established that compared to the Baseline scenario (no greening), adjustments to greening requirements will have an impact on changes in the structure of production, but will not cause significant changes in the development of the agricultural product prices and costs.

The results of the analyses are presented for different types of farms selected from the FADN farm population after aggregation with the SYS02 parameter and, in the synthetic approach, in the scale of the general population of farms represented by the analysed part of the FADN population. In the process of aggregation, the results obtained for individual types of farms have been averaged. As a result, the differences in the crop structure between the scenarios for aggregated values are smaller than those observed at the level of the modelled individual types of farms.

A comparison of the results indicates that the most advantageous to the farmers, in terms of the level of agricultural income, would be a continuation of the current CAP [Baseline_2014]. Implementation of the requirements of greening the CAP results in a slight decrease in agricultural income for the population of farms analysed (3-4 percentage points). On average, it is not a rational choice not to comply with the terms of greening, thus losing 30% of direct payments (this would lead to a decline in agricultural income by an average of 9 percentage points). The exception to this rule are arable farms with good soil, where a reduction in the area used to grow highly profitable crops and the diversification of cropping patterns would lead to a decreased revenue, despite obtaining the full rate of payment.

In view of the relatively high degree of diversification of crops in Polish agriculture, except for some crop farms, the main determinant of changes in plant production is the need for delimitation of an ecological focus area. Assuming that the estimated size of the ecological focus area is now on average ca. 1%, this means that almost 6% of arable land would have to be excluded from agricultural use.

While diversification leads to shifts in crop structure, the requirement of 7% of the farm's total area to become an ecological focus area is the main driving force of the decline in agricultural income and reduced production in Polish agriculture. This condition is particularly controversial given the fact that in Poland there is a relatively small amount of good soil in the structure of arable land. Farms on good soil have a significantly lower percentage of areas recognised as ecological focus areas than farms with poor soil. With regard to the efficiency of using production factors, this is an irrational action which serves to weaken the competitiveness of agriculture in the EU.

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