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IMPACT OF THE CAP "NEW GREENING" ON ECONOMIC RESULTS OF THE POLISH FARMS

Abstract

After a long debate between political bodies of the EU, the final decision about the shape of the CAP in the next programming period has been made. The initial proposal of the European Commission was very ambitious yet, after the announcement of its final version, there is a common belief that green requirements have been watered down. This paper presents the results of impact analysis based on the most recent proposition of the CAP reform with a special focus on "greening" of direct payments. It evaluates changes in economic results of the Polish farms in the perspective of the year 2019. For the analyses, the authors proposed an original farm typology using data taken from 10,890 farms from the FADN sample in 2011. Farm optimisation model with PMP technique was applied to estimate potential effects of the reform for 218 types of the Polish farms. Farm model results were up-scaled to the country level. Results show that the majority of the Polish farms already complies with the new requirements. Adjustment of remaining farms to the new requirements will have a negligible impact on income generated by the Polish farm sector.

Introduction

The current reform of the Common Agricultural Policy is the most difficult in the history of the EU, because for the first time the decision about its shape was jointly made by the Council of the European Union and the European Parliament, whose role was, so far, confined to consultation.

Public debate on the future shape of the CAP has been opened already in 2010, when the Commission published a Communication "The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future" (Komunikat Komisji... 2010), which presented the first ideas for the functioning of the EU agricultural policy in the new budgeting period.

On 12 October 2011, the European Commission published a package of legal proposals (Rozporządzenie Parlamentu... 2011) aimed at reforming the CAP to effectively promote the creation of a more competitive and sustainable agriculture while strengthening the viability of rural areas. After almost two years of negotiations between the European Commission, the European Parliament and the Council, a partial political agreement on the reform of the CAP was reached in June 2013.

On 16 December 2013, the Council of Agriculture Ministers formally adopted four basic regulations governing the operation of the reformed CAP approved in November by the European Parliament, as well as the transitional provisions in force in 2014. Four days later they were published in the Official Journal of the European Union (Rozporządzenie Parlamentu... 2013a-e).

Provisions included in these regulations indicate the objectives on which the greatest emphasis will be put. The CAP after 2013 is to be more focused on the care for the environment, ensure a fairer distribution of the EU funds and it is also to help farmers in meeting the challenges of the market.

The main objectives of the CAP do not change and they are:
– profitable food production,
– sustainable management of natural resources and climate change mitigation activities,
– balanced territorial development.

Generally speaking, the EU agriculture is to achieve a higher level of production of safe and high quality food, while fostering the natural resources on which agricultural productivity largely depends.

"Greening" of the CAP

One of the important elements of the reform is the concept of "greening" of the CAP. There has been much controversy due to, e.g. ambiguously defined objectives, and also because of the difficulty in estimating its effects. "Greening" of the CAP forces an obligation to diversify the structure of crops and delimitate ecological focus areas (EFA) within farms. This can affect the size and structure of plant production and thus it can lead to changes in the level of agricultural income.

Changes in the system of direct payments are related to the "greening" of the CAP. In the new budget perspective it will consist of a few components in the form of separate payments, payments targeted at specific beneficiaries or specific actions. They will vary in terms of the support's nature, including voluntary support, while the decision to use a particular payment is left to a Member State, and obligatory support which must be implemented throughout the European Union. Part of direct payments (up to 30% of the national envelope) is dependent on the implementation of "greening" obligations, i.e. agricultural practices beneficial for the climate and the environment. According to the European Commission's announcement new rules are to take effect as of 2015.

"Greening" of the CAP is to rely on mandatory implementation of three measures consisting of:

- **crop diversification** – farms with up to 10 hectares of arable land will be excluded from the requirement of crop diversification. In the case of farms with more than 10 hectares and no more than 30 hectares of arable land there will be a requirement to maintain the structure of sown area with at least two different crops. The main crop should not occupy more than 75% of arable land. However, farms with over 30 hectares of arable land will be required to have a minimum of 3 crops on arable land (main crop with a maximum share of 75%, and the two main crops not exceeding a total share of 95% of arable land). These ceilings will not apply when the main crop is grass or other green fodder. The term "crop" refers to any kind of botanical classification, and land lying fallow. Winter and spring crops are treated as separate crops, even if they belong to the same genus. Thus, a farmer with 15 ha of arable land and having in its sown area 75% of winter wheat and 25% of spring wheat, according to this rule, is treated as satisfying the requirement of crop diversification;
- **maintaining at least 95% of the existing area of permanent grassland.** There are two accepted ways of enforcing this requirement – the first, assumes control at the level of individual farms, the second, at the level of a country or a region. The obligation to maintain permanent grassland at a farm level is limited to the Member States' permanent grassland under Natura 2000 sites, including peat soils and wetlands. If in a given country or region the share of permanent grassland in the total area of arable land did not decrease by more than 5% compared to the base year, then it is allowed to control permanent grassland at the level of a country or a region;
- **maintaining the ecological focus area** or implementing equivalent practices, which are assumed, according to the definition, to have the same as, or a higher than, compulsory practices level of benefits for the environment and climate. In 2015-2017, farmers will be obliged to exclude from agricultural production 5% of their arable land for environmental purposes. As of 2018, according to the European Commission's decision, this percentage can be increased to 7%. Farms with less than 15 hectares of arable land will be exempt from the need to comply with this requirement. Each Member State will itself choose a list of practices that will be considered equivalent to the practices of "greening". The practices on the lists of equivalent include: nitrogen-fixing crops (legumes), with the restriction that they will be grown without mineral fertilisers and plant protection products; catch crops; land lying fallow; landscape features; buffer zones; systems of agro-forestry; green cover; areas with short rotation coppice with no use of mineral fertilisers and/or pesticides; or strips of plots along the edge of a forest. Equivalent practices may also include elements of agri-environment-climate programme or national or regional systems of environmental certification. For determination of the EFAs the countries will be able to apply the appropriate weighting coefficients taking into account the importance of each category of land for the environment. These coefficients are to be fixed by each Member State by 1 August 2014.

  Exempt from "greening" will be farms conducting organic production.

Derogations from the need for "greening" will also be provided to farms when more than:
– 75% of eligible agricultural land is grassland,
– 75% of arable land are grass, green forage, fallow land and legumes,
– 75% of agricultural land is covered by agri-environmental programmes.

Failure to comply with the requirements of "greening" will result in a reduction in the payment. Penalties in the first two years will amount to 100% of the "green payment", and in subsequent years, respectively, up to 120% and 125% of the "green payment". Given the fact that the greening component amounts to 30% of direct payments, a farm not fulfilling at least one of these three criteria will receive a premium per hectare decreased by 30% in the first and second year, and, accordingly, by up to 36% and 37.5% in subsequent years.

Potential impact of the CAP reform on various aspects, including environmental and economic ones, taking into account individual proposals of the Commission was analysed in several publications. Matthews (2012) describes in his works all the components of "greening" of direct payments based on the European Commission's proposal of October 2011. He assesses potential consequences of introducing elements of "greening" and presents a number of options for consideration by Member States, the introduction of which would improve the environmental impact of "greening" and would reduce the administrative complexity of the new system and thus improve its cost-effectiveness by reducing implementation costs. Other authors (Allen B. et al. 2012) focus only on one of the "greening" components, such as maintaining EFA, which they consider to have the greatest potential to solve environmental problems. In another publication (Westhoek H. et al. 2012) analysing the impact of "greening" of the CAP on the environment, the authors emphasize that the introduction of the obligation to diversify cropping patterns will have no significant impact on improving the quality of the natural environment due to the fact that, according to the estimates, the need to adapt to this requirement applies only to 2% of the land area in the EU. In her work Cantore studied the impact of the CAP reform on developing countries (Cantore N. 2013). The author points out that "greening" of the CAP will reduce production in the European Union in the short term, which may lead to an increase in prices of agricultural products. This, in turn, will stimulate exports from developing countries (by up to 3% in respect to certain countries and commodities), but it will negatively affect food importing countries. In the medium and long term it will reduce CO_2 emissions which will mitigate the damaging effects of climate change in developing countries. The effects of the CAP reform were also analysed by the authors of this article who, in their previous work, presented the impact of introducing the earlier proposals published by the European Commission on the economic situation of the Polish farms specialising in the cultivation of cereals (Czekaj S., Majewski E., Wąs A. 2012) and the farms in the field of the Polish FADN's observation (Gohin A., Chantreuil F. 1999).

Yet, it should be noted that the above analyses were based on the already outdated 2011 proposal of the Commission, while requirements imposed on farmers in the recently adopted regulation eased.

The aim of this study is to determine the impact of the finally adopted CAP reform on the economic performance of the Polish farms taking into account their diversity in terms of type of production, FADN region and the degree of adaptation to the "greening" requirements.

Methodology

The main source of data for this analysis were the resources of the Polish FADN. Data for 2011 was used to develop a typology and to prepare parameters for model farms. The data set consists of 10,890 research units (individual farms). The entire population of farms was divided into types of production according to the size of their arable land and then according to types of production by adopting criteria consistent with the Community typology for agricultural holdings of 2009.

In accordance with the adopted methodology standard output (SO) was applied to determine the type of production. SO is defined as "a five-year average value of production of certain plants or animals obtained from one hectare or from one animal within one year under average conditions for the production region". According to Central Statistical Office data, in 2011 there were 1,651,700 individual farms with an area of >1 ha of UAA operating in Poland. The FADN population is 735,500 farms, representing 45% of their total number. Farms covered by the FADN produce about 90% of the total output value of the sector, and their share in the total area of agricultural land in Poland is 79%.

Farm typology

The process of extracting types of farms for modelling purposes was carried out based on three criteria:

- Criterion 1 – Distribution of farms based on the size of their arable land
  – Group I – farms up to 10 ha,
  – Group II – farms of 10-15 ha,
  – Group III – farms of 15-30 ha,
  – Group IV – farms larger than 30 ha.

Establishing such ranges was dictated by crop diversification requirements and delimitation of ecological focus areas as presented before. The first group consists of farms exempt from compliance with the requirements of "greening". In the second group are those entities that need to have at least 2 crops, but are not required to have ecological focus area. The third group included farms, which are obliged to meet the same requirements as the previous group, in terms of diversity of crops, but also had to allocate at least 5% of arable land to the EFA. The fourth group includes farms, which are expected to maintain at least 3 crops in their crop structure and have 5% of the EFA.

- Criterion 2 – Distribution of farms according to the type of production (by nTF 14)
  – plant,
  – cattle,

– pig,
– mixed,
– others.

- Criterion 3 – Distribution of farms according to the degree of adaptation to "greening":
  – exempt – with an area of up to 10 ha of arable land and organic farms,
  – "green" – meeting all the requirements of "greening",
  – lack of diversification – do not meet the requirement of crop diversification,
  – lack of EFA – do not have sufficient share of EFA in their farm area,
  – lack of EFA and diversification – at the same time, do not meet both of the above requirements.

The structure of the farms belonging to the FADN population according to the typology is presented in Table 1 (based on the degree of compliance of the Polish farms in different FADN regions) and Table 2 (broken down by type of production).

Table 1

Structure of farms represented in the FADN population by region according to the degree of compliance with the CAP "greening"

Specification	Exempt	Green	Lack of EFA	Lack of diversification	Lack of EFA and diversification
Poland	57%	20%	21%	1%	1%
According to FADN regions					
"Pomorze i Mazury" (785)	41%	24%	30%	2%	3%
"Wielkopolska i Śląsk" (790)	43%	21%	34%	1%	1%
"Mazowsze i Podlasie" (795)	61%	21%	16%	1%	1%
"Małopolska i Pogórze" (800)	72%	15%	11%	1%	1%

Source: Own calculations based on FADN data.

Lack of compliance with the "greening" requirements concerning one or two criteria applies to 23% of farms from the population represented by FADN, the fundamental problem is the lack of sufficient area of ecological compensation. However, it can be said that Polish farms generally have crop structure diversified to the extent consistent with the proposal of the European Commission. There is regional diversity in the share of farms that do not comply with the "greening" requirements. The largest share of unadjusted farms, respectively, 35% and 36%, is noted in regions of "Pomorze i Mazury" as well as "Wielkopolska i Śląsk". Voivodeships, which are part of these regions have the highest average size of farms, which means that in their structure there is also the largest number of farms in relation to which "greening" will be applicable. In areas where the farms are relatively small there is the largest share of farms exempt from the "greening" requirements. In the region of "Małopolska i Pogórze" (800) the total share of farms exempt or fully adapted to the "greening" requirements reaches 87% of the population represented by FADN.

Table 2

Structure of farms represented in the FADN population broken down by types of production according to the degree of compliance with the CAP "greening"

Specification	Plant	Cattle	Pig	Mixed	Other
Exempt	35%	58%	34%	59%	93%
Green	23%	20%	18%	21%	3%
Lack of EFA	37%	20%	45%	18%	2%
Lack of diversification	1%	1%	0%	1%	1%
Lack of EFA and diversification	4%	1%	3%	1%	1%

Source: Own calculations based on FADN data.

Analysis of the degree of compliance in each type of production raises the hypothesis that the CAP "greening" will have the greatest impact on plant and pig farms. These are the production types with the lowest share of farms exempt from compliance with the requirements, or meeting all the criteria. There is also the largest number of farms with insufficient EFA surface and, at the same time, low degree of crop diversification.

Much lower share of farms that require adjustments to the "greening" can be seen in the group of farms specialising in cattle breeding, simply because of the specific nature of their activities as they very often maintain permanent grasslands and grass on arable land. A small area of arable land and a large share of grassland exempts them from the need to implement adjustments or automatically classifies these farms as "green". A similar phenomenon can be observed in mixed farms. In the group of other horticultural holdings due to the significant share of permanent crops and small surface (often less than 10 hectares of arable land) farms are exempt from "greening".

After dividing the sample according to the described criteria, 59 types of model farms were obtained. These types were further differentiated by location in the FADN region.

Finally, there were 218 separate types of farms modelled, taking into account the geographical location, the criterion of production scale and type of production and compliance with "greening" (e.g. 795_II_CATTLE_LACK EFA, 800_IV _PIG_LACK EFA+DIVERSIFICATION).

Considered scenarios

Following the adopted regulations on the introduction into the CAP of a new mechanisms, three scenarios of agricultural policy were constructed for the purpose of determining the effects of the new CAP:

A. Base scenario [Base_2011] and Baseline_2019 scenario

They assumed a continuation of the current CAP. The base scenario is only used to calibrate the models constructed on the basis of FADN 2011 data. While the Baseline_2019 scenario will be a reference point for the other scenarios of the reformed CAP. The Baseline_2019 assumes maintenance of the existing

CAP mechanisms unchanged with direct payments rate at the level achieved in Poland in 2013.

B. Green_2019 scenario

A variant with direct payments rate amounting to EUR 219.05 per ha, including 30% of "green payments" assuming the implementation of the requirements under the CAP "greening".

C. No_Green_2019

A variant of the resignation from 30% of the "greening" payment, assuming the possibility of not meeting the conditions of "greening" by farms not complying with the new requirements and the reduction in the direct payments by 125% of "green payments", i.e. EUR 82.31 per ha, as well as the same rate of direct payments at EUR 136.74 per ha for not complying farms. It was also assumed that the farms exempt from "greening" and those meeting all requirements will receive payment as in the Green_2019 scenario.

Optional payments (related to production and LFA) are supposed to be at the current level. In the Green_2019 scenario, it is assumed that due to the inclusion of the "greening" component and the likely reduction in funding of pro-environmental measures in Pillar II, agri-environmental payments will be reduced by 50% for a farm, which will be the subject of modelling.

Model of an agricultural farm

To determine the potential effects of changes a farm optimisation model, Farm-Opty, was applied. It was extended by a non-linear cost function using Positive Mathematical Programming (Howitt R.E. 1995a). The basic assumption on which the model is based, is economically rational behaviour of farmers seeking to maximise profits. The objective function is to maximise farm income and its general form is shown in the following equation:

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

Provided that $Ax \leq B$

where:

DR – farm income (value of the objective function),
p – vector of product prices ($n \times 1$),
y – vector of yields and productivity ($n \times 1$),
x – non-negative vector of optimal levels of production activities ($n \times 1$),
$x \bullet y$ – Hanamard's product,
s – vector of payments to production activities ($n \times 1$),
fc – value of relatively fixed costs,
fs – value of subsidies to operating activity relatively independent of the level of production,
A – matrix of coefficients of resources use ($m \times n$),
B – vector of available resources ($m \times 1$),
$d^T x - x^T Q x$ – non-linear element of the objective function determined during calibration of the model (Howitt R.E. 1995a).

The above model constitutes a development of the classical linear optimisation models applied to farms (Wąs A. 2005; Ziętara W. 1989). Linear optimisation models usually require lots of data, and as a result they give results that deviate from reality because of the tendency to oversimplify the structure of production. This is due to the fact that a methodologically justified number of limiting conditions is far lower than the number of observed activities.

Significant differences between the results of linear models and the observed values hinder the transfer of results to their potential customers, even if the models actually react to the assumed scenarios' stimuli. This results in the need for calibration with the addition of various kinds of limitations. Most often these are crop rotation restrictions, specifying the maximum or minimum contribution of individual crops. In addition to the often weak theoretical or empirical justification for such restrictions in the case of construction of models for aggregates of farms (e.g. FADN types), they often unduly restrict the range of acceptable solutions for the simulated scenarios.

Positive Mathematical Programming (PMP) has several important advantages with respect to the classical models of linear programming:

– applied calibration procedure allows for easy and accurate representation of the actually observed values of the modelled features (Hazell P.B., Norton R.D. 1986);
– complementing the linear model with non-linear elements will overcome the problems of oversimplification solutions, the solutions contain a higher number of activities without the need for additional "artificial" restrictions;
– PMP avoids abrupt changes in the solutions that are not proportional to the scale of changes in external conditions introduced in the analysed scenarios;
– modifications to the model applied during the calibration phase to a much lesser extent influence the behaviour of the model during simulation than those applied in the calibration of linear programming models;
– non-linear (quadratic) function includes increases in unit production costs by extending the level of business conducted. They can result from insufficient hardware resources, insufficient organisational capacity and reduced yields due to the need for cultivating lower quality land (Howitt R.E. 1995b).

For the first time PMP approach was formalised and described in a paper written by Howitt (Howitt R.E. 1995a). However, already in earlier expert works supporting political decisions, similar techniques were applied successfully (e.g. Howitt R.E. 1986; Kasnakoglu H., Bauer S. 1988; Schmitz H.J. 1994). In most of such applications a new technique was introduced to the existing linear models as a substitute for many limitations of calibration.

Method published by Howitt immediately gained popularity as evidenced by numerous studies using this new approach (Arfini F. 2012; Arfini F., Paris Q. 1995; Barkaoui A., Butault J.P. 1999; Cypris Ch. 1996; Gohin A., Chantreuil F. 1999; Graindorge C., Henryde Frahan B., Howitt R.E. 2001; Helming J.F.M., Peeters L., Veendendaal P.J.J. 2001).

Sources of model data

Data on farm resources was taken from FADN database. In all types of farms average values of the parameters taken into account in the optimisation model were determined, including the area of permanent grassland and ecological area of compensation, which are the basic requirements of "greening", in addition to diversifying the crop structure. Fallow land was included in the estimated size of EFA.

In the process of preparing the parameters for the models derived from FADN data outlier values were found (abnormally high or low), especially in relation to variables such as unit productivity, prices of products, or some farm financial data. Due to the creation of models for farm types, which sometimes consisted of a small number of units, it was necessary to reduce the impact of such data on the analysis' results by eliminating outliers. For this purpose, non-parametric method was used based on the span between interquartiles (Czekaj S., Majewski E., Wąs A. 2012).

Market effects resulting from the implementation of the considered scenarios were estimated using CAPRI model (Britz W., Witze P. 2012). This model enables receiving a broad spectrum of indicators describing the effects of the tested changes. This article presents the results concerning the expected changes in price level ensuring market equilibrium (Table 3) and predicted yields (Table 4). Due to the fact that prices in CAPRI model are given as nominal values, they are presented in relative terms with respect to the Baseline_2019 scenario.

Table 3

Changes in prices of basic agricultural products and inputs for production in considered scenarios (nominal prices)

Products and inputs	No_Green_2019	Green_2019
	Baseline_2019=100	
Wheat	100.50	102.34
Rye and triticale	100.54	102.56
Barley	100.45	102.34
Oats	100.49	102.37
Maize (grain)	100.35	101.93
Other cereals	100.45	102.39
Rape	100.41	101.98
Legumes	100.33	101.72
Potatoes	100.08	100.41
Sugar beet	100.00	100.20
Beef	100.33	101.82
Pork	100.20	100.82
Poultry	100.09	100.52
Milk	100.10	100.49

Source: Own research based on the results of CAPRI model.

Table 4

Changes in yield and cow milk yield in considered scenarios

Production activities	No_Green_2019	Green_2019
	Baseline_2019=100	
Wheat	100.17	100.78
Rye and triticale	100.17	100.68
Barley	100.18	100.73
Oats	100.17	100.78
Maize (grain)	100.17	100.66
Other cereals	100.09	100.54
Rape	100.08	100.41
Legumes	100.00	98.77
Potatoes	100.00	100.09
Sugar beet	100.00	100.08
Maize for silage	100.19	100.75
Fodder beet	100.00	100.19
Cows – intensive breeding	100.00	100.00
Cows – extensive breeding	100.00	100.00

Source: Own research based on the results of CAPRI model.

In the analysed scenarios it can be observed that imposing additional obligations in a form of "greening" or reduction in the level of support leads to increases in market prices for basic agricultural products. Farmers react to changing prices by adjusting the intensity of their production. For this reason, it can be assumed that an increase in the price level leads to an increase in production intensity, observable as an increase in unit efficiency (Table 4).

In addition to an increase in intensity resulting from the price increase, the exclusion of part of land associated with the set-aside requirement may lead to a slight improvement in the average quality of used soils, due to a probable exclusion of the weakest soils from cultivation. In the case of No_Green_2019 scenario, it can also provide a small increase in yields, as it seems due to the necessity of intensification of production on farms without support.

Diversification of cropping patterns

Shannon-Weiner index was used in order to verify the requirement of crop diversification for different farm types. This index was developed in 1948 and it is one of the most commonly used indices of biodiversity. Its most common values are in the range of 1.5-3.5, sometimes exceeding the value of 4.5. It is calculated according to the formula:

$$H = -\sum \frac{n_i}{N} \ln \frac{n_i}{N}$$

where in the assessment of crop structure's biodiversity:
n_i – area of the i^{th} crop
N – the total area of arable land.

The above ratio was calculated for all farms in the FADN sample under the baseline scenario. Then, for each of the farms, if it was required, necessary modifications in the structure of production were made in order to adapt it to the criterion of crop diversification.

The resulting values were then averaged for each farm type. Thus, for each group of farms a starting (observed) Shannon index level was obtained. The modified index values (target level) were averaged in the same way. Additional restrictions were introduced into the optimisation models for Green_2019 scenario, for types not meeting the diversification requirement, thus forcing them to obtain the value of the indicator at a level not lower than the target.

Results

The presented results refer to the average values for selected groups of farms. It should be noted that the results obtained were averaged for different types of farms in the process of aggregating. At a higher level of detail, it can be observed that there are more significant differences between the various model types, but because of the multitude of types and restrictions imposed by FADN on publishing data for samples with less than 15 objects, they could not be shown.

Table 5 shows the relative change in terms of agricultural income for farms divided by region, type of production and the degree of compliance with the CAP "greening".

The results indicate a slight impact of introducing the "greening" mechanism into the system of direct payments. Model results show, however, some differences across groups of farms. Farms losing on introduction of "greening" obligations include farms in "Mazowsze i Podlasie" region, farms representing other types of production, and also – to a limited extent – cattle and mixed farms as well as farms exempt from the "greening" and not meeting the diversification requirements. Other groups of farms could gain slightly on the CAP "greening".

In all the cases, the mechanism behind the deterioration of financial results appears to be similar. The assumed reduction in acreage due to increased ecological focus area in accordance with the results of CAPRI model translates into an increase in the prices of basic agricultural products. The projected increase in prices has a greater impact on the income of intensely organised large farms having the greatest contact with the market. This applies mainly to intensive plant farms, benefiting from increases in the price of cereals and pig farms, where the increase in feed prices is more than offset by the higher prices of their products. A slight increase in milk prices barely compensates for the costs of "greening" in the case of cattle and mixed farms. Farms of other types of production, even though the vast majority of them already shows compliance with "greening" obligations, will on average experience income loss due to the reduction in the surface of profitable horticultural crops.

Table 5

Changes in agricultural income in each scenario by regions, types of production and degree of compliance with "greening" (Baseline_2019 = 100)

Specification	Green_2019	No_Green_2019
By regions		
Poland	100.4	97.2
"Pomorze i Mazury" (785)	100.9	95.6
"Wielkopolska i Śląsk" (790)	101.0	96.8
"Mazowsze i Podlasie" (795)	99.7	97.8
"Małopolska i Pogórze" (800)	100.0	98.0
By types of production		
Plant	102.0	95.3
Cattle	99.9	97.2
Pig	100.6	97.2
Mixed	99.9	97.7
Others	99.2	100.7
By degree of compliance		
Exempt	97.8	100.6
Green	100.1	100.6
Lack of diversification	99.6	94.9
Lack of EFA	101.8	94.2
Lack of EFA and diversification	100.4	97.1

Source: Own elaboration.

Reducing the income level in the case of farms not meeting only the criterion of crop diversification is caused not so much by the severity of that requirement, but by characteristics of farms in this group. Because of the link between the "greening" obligations and arable land, this group consists mainly of farms with over 10 ha of arable land, but not exceeding 15 ha. The small scale of production does not enable profiting from price increases. Larger farms, required in addition to have ecological focus areas, were classified into two other groups.

A separate explanation is required in the case of a relatively large decrease in income for farms exempt from the "greening" obligations. These are often smaller farms and extensively organised (with a small size of arable land). In these farms a reduction in income is caused by 50% reduction in agri-environmental payments due to enlisting some of the previously implemented measures as equivalents of "greening" obligations. Losses resulting from reduced payments, of which many of the exempted farms benefit now, cannot be compensated by an increase in prices due to a relatively small volume of production.

In the case of No_Green_2019 scenario, assuming no change for farms not meeting the "greening" obligations, economic results of the farm sector deteriorate by less than 3%. Exempt and "green" farms can expect a small increase in agricultural income. It is based on the assumptions that agri-environmental

payments remain unchanged compared to the Baseline_2019 scenario, and there will be small increases in the prices of agricultural products. On the other hand, this scenario represents a relatively large drop in income of plant and pig farms, among which there is a large group of farms not meeting the "green" requirements. Due to a relatively high degree of specialisation and a larger than average farm size, it affects mainly farms in "Wielkopolska i Śląsk", and "Pomorze i Mazury" regions. In general, it can be concluded that, from an economic point of view, the scenario assuming lack of compliance with "greening" is not a favourable alternative for the Polish farms.

Conclusions

The study indicates little relevance of the CAP "greening" to the economic results obtained by the Polish farms. Limitations resulting from the implementation of the "greening" mechanism will focus on a small number of very large farms, mostly plant and pig ones, with an area of over 30 hectares located in northern and western Poland. However, despite the necessity of implementing the adjustments resulting from "greening", the level of income of these farms will not deteriorate due to the expected increase in prices.

Significantly less favourable option for these farms is rejection of the implementation of "greening", thus resigning from part of the subsidies. The adoption of such a scenario has a much larger impact on the level of farm income than limitations resulting from the need to implement "greening".

A relatively small reduction in agricultural income resulting from the CAP "greening" may occur in the case of small farms, extensively organised and benefiting so far from assistance under agri-environmental schemes. However, taking into account the scale of production and initial economic performance, a reduction in agricultural income by a few hundred zlotys per year per farm can be considered insignificant from the point of view of the agricultural sector.

On a global scale, one can risk a statement that the main effect of the CAP "greening", after easing the requirements in relation to the original proposal, is to provide a justification for further support of farms. In Poland, farms are either exempt from "greening" requirements or they already comply with "greening", or require only moderate adjustments of their activity, and any costs of compliance are practically irrelevant from the point of view of their economic performance.

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