INSTITUTE OF AGRICULTURAL AND FOOD ECONOMICS
NATIONAL RESEARCH INSTITUTE

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no 82.1
Warsaw 2013

MULTI-ANNUAL PROGRAMME 2011 - 2014

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This publication was prepared as a contribution to the research on the following subject: **Budget grounds for implementation of the competitiveness of the Polish agriculture,** within the framework of the research task: *Direct Payments and budget subsidies versus finance and functioning of holdings and agricultural enterprises.*

The main objective of this book is to present relationship between subsidies and performance of Polish farms. Authors analysed the CAP reform proposal and using programming and regression models explored the probable impact of its implementation on the Polish agricultural holdings.

Reviewer
prof. dr hab. Henryk Runowski

Proofreader
Joanna Gozdera

Technical editor
Joanna Gozdera

Translated by
Contact Language Services

Cover Project
AKME Projekty Sp. z o.o.

ISBN 978-83-7658-444-7

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Preface

Reform of the Common Agricultural Policy for the period 2014-2020 was a subject of a long public debate. The debate on the future shape of the CAP was opened in 2010 by the European Commission. On 12 October 2011 the European Commission published a proposal package aimed at reforming the CAP in such a way as to better foster the creation of a more competitive and sustainable agriculture, while at the same time strengthening the viability of rural areas. After almost two years of negotiations between the European Commission, the European Parliament and the Council, in June 2013 partial political agreement on the reform of the CAP was reached.

Stronger environmental focus is one of the key issues of the new CAP. The agreed shape of the reform brings under consideration new elements, some of them raising strong controversies, such as national allocations of subsidies or introducing greening as a component of direct payments.

Authors of this publication analyse potential scenarios of future direct payments distribution in Poland and attempt to assess impacts of the greening components of the CAP. New reform introduced to the greater extent national coupled payments and support for young farmers within 1st pillar. Subsidies for small farms have rather negligible effect on the sector performance.

Changes in direct payments scheme towards "greening" of the CAP are forcing regulations regarding cropping pattern and creating Ecological Focus Areas at the farm level. This might create an uncertainty about consequences on size and structure of agricultural production and thus changes of the economic performance of farms and the whole agricultural sector. Results show that a majority of farmers in Poland comply with the crop diversification constraint of the greening. However, differentiation of requirements regarding size of arable land within farm causes that the reform has stronger impact on production structure and financial results of the large scale farming.

On the other side new reform eased "capping" regulations for large farms. When labour costs are recognized as expenditure lowering the basis for calculation of reduction of aid, there will be almost no farms with reduction in payments. Results also shown that it is difficult to estimate the level of capitalisation of this support, as the lease rates have remained unchanged in last years even if the payment rates have increased.

It might be concluded that further studies are still desired to consider a potential for long-term adjustments of farming systems to CAP reform, their environmental and economic effects.

1. Scenarios for implementation of direct payments in the new financial perspective 2014-2020

1.1. Current and planned shape of the direct payments system in the EU

The current reforms of direct payments system in the EU, planned for 2014-2020, result from the so-far, over two decades of experiences in implementing this mechanism. They were introduced as a part of the 1992 Mac Sharry reform, and initially acted as a compensation for the decrease in income from the market support reduction – reduction of institutional prices (Poczta 2011, Purgał 2011). Then and now, they transferred financial resources (redistribution of national income) directly from the budget to the farms, excluding the market. According to the adopted principles for covering the selected groups of crops and animals with the support, the national or regional financial envelope was dependent on the production levels (base areas, reference yields, number of livestock units receiving a bonus) secured in the reference periods. Such an approach stemmed directly from the compensatory nature of the payments, where the constraint of the market policy instruments (mainly intervention prices) concerned respective farmers in proportion to the scale of production. Determining the size of the direct support on the basis of payments from the reference period (as opposed to the market support, which was referred to the production levels in the given farm and it was supposed to stimulate an increase in production intensity), was aimed, at least partially, at making the current decisions of farmers independent of the support. This goal was initially not achieved, mainly because of the fact that the direct payments were not dependent on the current production level on a particular farm (yields obtained or the productivity of the animals), but only on the structure of crops and type of raised animals. Moreover, because of the multitude of the forms of support, the initial payment system was complicated. It generated significant administrative costs and despite the incentives, did not lead to extensification of production. Consequently, it became necessary to reform the system, which happened in 2003 as a part of the Luxembourg reform (Fischler reform). It essentially consisted in substituting the elaborate instrument of direct support by one (single) payment per farm. The amount of the support per farm was dependent on the amount of the support received in the reference period, which was established as 2000-2002. From the economic point of view decoupling of payments (full independence of the production decisions from the market policy instruments and reduction of the transaction costs of the payment system) introduced a much stronger impact of the market elements, at the same

time, fulfilling the role of agriculture income support. However, from the social point of view, it was necessary to find a justification for continuation of this approach. Coupling the payment system with environmental issues, improving food quality and concern for animal welfare proved to be the right solution. Because, in order to receive payments, the beneficiaries had to fulfil pro-environmental and pro-health requirements contained in the cross-compliance standards. So far, direct payments have had a redistributing function, supplementing the agricultural income, whereas since the Luxembourg reform concern for the health quality of the manufactured products and the status of the environment have provided their social justification. Although the assumptions of the Fischler reform pertained, basically, to the EU-15 countries, the cross-compliance principles were successfully introduced also in the new Member States.

The proposed reforms of the payment system for 2014-2020 are largely a continuation of the current coupling of the economic and environmental goals, but with the use of more developed instruments. Aside from the continuation of the cross-compliance principles, the environmental justification of the system was strengthened by the greening of the CAP, which consists of three essential elements:

- crop diversification: farms between 10 and 30 ha of arable lands are required to cultivate on the arable lands at least two crops, none of which can take up more than 75% of the arable land. The farms over 30 ha of arable lands are required to cultivate at least three crops none of which can take up more than 75% of the arable lands and two main crops no more than 95%,
- maintaining the permanent grasslands on the farm,
- designating the Ecological Focus Areas (EFA).

This obligation refers to the farms with over 15 ha of arable land, excluding those where permanent grassland constitutes 75% of agricultural land or where meadows and pastures constitute at least 75% of arable land and the remaining part of the arable lands is not larger than 30 ha. Ecological Focus Areas should constitute at least 5% of arable lands (it is planned that by 2017 this figure will increase to 7%). The Ecological Focus Areas include: land set aside, terraces, landscape features, buffer strips, forest areas, catch crops, nitrogen-fixing crops.

"Greening" is an obligatory component of the payment system, and a Member State is obliged to allocate at least 30% of the national envelope for the purpose. It must be noted, that the current (November 2013) shape of the "greening" instrument results from both the proposal of the European Commission, and the amendments submitted by the European Parliament (Czekaj et al.

2012, Czubak, Sadowski, Poczta 2013) and, as such, it differs from the initial assumptions of the Commission (Czubak, Poczta, Sadowski 2011, Czubak, Sadowski, Poczta 2011) as regards the subjective (farms covered by the instrument) and objective (e.g. elements meeting the EFA definition) aspects. First of all, it includes the specific character of agriculture and agricultural structures to a greater extent, and what is especially important in this context, it limits the obligation to designate EFA only to larger entities (over 15 ha of arable lands) and incorporates the nitrogen-fixing crops to such areas.

Aside from the economic goal and the environmental justification (which needs to be understood as the continuation of the trend, at least from the moment of the Luxembourg reform), the designed shape of the payment system sets out subsequent aims, not considered so far in the first pillar. These mainly cover:

- specific support for the selected lines of production,
- support for "small" farms,
- support for "young" farmers.

Support for "small" farms and for "young" farmers does not constitute a new aspect in the EU CAP; but up to now it was implemented exclusively with the instruments of the 2nd pillar. In Poland, the actions for farmers below 40 were implemented under the national policy through a line of preferential credits (Sadowski and Poczta 2007).

The support for the selected lines of productions was also applied, but to a limited extent, in the 2007-2013 programming period, in accordance with the provisions of Article 68 of the Council Regulation (EC) No 73/2009 (Council Regulation...2009). In the 2014-2020 perspective, it is planned that a Member State can allocate (on a voluntary basis) up to 15% of the national envelope (13%+2% for legumes) for this purpose. The scope of the support is relatively broad and covers the following lines of production: cereals, oilseeds, protein-bearing plants, legumes, flax and hemp, rice, nuts, starch potatoes, milk and dairy products, seeds (seed orchards), lamb and mutton, goat meat, beef and veal, olive oil, silkworms, dried fodder, hop, sugar beets, sugar cane and chicory, fruit and vegetables, and short rotation coppice. The decision on the accession to the mechanism and the selection of the supported lines of production belongs to the Member State.

The support for "small" farms is an optional mechanism (for the Member State and for the farmer), for which the Member State can allocate up to 10% of the national envelope. This form of support is essentially based on the use of lump-sum payments for eligible entities, no bigger than EUR 1,250 per farm. The beneficiaries-farmers are not required to control adherence to the principles of cross-compliance or to pursue "greening" practices. The proposed

provisions allow for the possibility of choosing one of the following forms of support for "small" farms:

- sum not exceeding 25% of the average payment per farm,
- sum corresponding to the average payment per ha, multiplied by the number of hectares at most amounting to 5,
- sum corresponding to the total amount of all payments, which will be granted to the farmer in a given year, but not more than EUR 1,250 per farm.

The legitimacy of the implementation of the support mechanism for "small" farms under the 1st pillar of the CAP can be examined from two points of view. Firstly, the problem which needs to be examined is the effectiveness of the support for small entities – in terms of area, and consequently – entities which have insignificant links with the market and which are struggling with numerous social issues[1]. In this respect, the amount of the offered support (up to EUR 1,250 per farm) is definitely too low to be used for restructuring of the farm, or at least noticeably improve the financial situation of the family (EUR 1,250 ≈ PLN 5,000 per year ≈ PLN 400 monthly). Thus the support for "small" entities will probably have the nature of social assistance. Secondly, from the administrative perspective, this form of support is connected with reduction of transaction costs, mostly by resigning from the control of the adherence to the cross-compliance and "greening" principles. Assuming that the entities from 1 to 3 ha will benefit from this form of support, and the lower administrative charges will concern over 400 thousand farms (nearly 32% which currently receive payments), the implementation of this mechanism in Poland can clearly contribute to reduction of transaction costs.

An alternative form of optional support for the "small" entities is **the redistributive payment (to first hectares)**. Up to 30% of the national envelope can be allocated to its implementation. This payment consists in raising the payment to first hectares in all of the farms eligible for direct payments, whose upper limit was specified for 30 ha, or for the average area of the farm, if in the given country it is larger than 30 ha. Simultaneously, the increase in the support against the basic payment cannot exceed 65%. Although the redistributive payment is addressed to all entities, it must be noted that the "first hectares" constitute a larger share in the "small" farms, and hence "small" farms (if this form of support is selected) will be its actual beneficiaries. For the remaining entities it

[1] Albeit the term "small" should not be understood as a synonym for "poverty of the countryside", or "social exclusion", because a significant number of the small farms has off-farm sources of income, and they do not face economic and social difficulties. Some of them are even "recreational" in nature (hobby-like farms) (Majewski 2005).

is an economically unfavourable mechanism, because it involves a considerable reduction of the basic rate.

The support for "young" farmers granted under the 1st pillar of the CAP is, according to the rules of the reform, an obligatory instrument for which the Member State can allocate up to 2% of the national envelope. Farmers entitled to this form of support, are the farmers eligible for direct payments, which are below 40 and manage a farm for not longer than 5 years. The support for "young" farmers consists in rising the payments by 25%, against the basic rate, for each hectare within the 25-90 ha range of agricultural land[2]. The selection of the area eligible for the support is the obligation of the Member State.

Some important aspects should be highlighted in the discussion of the proposed shape of the payment system. First of all, it must be noted that the presented proposals give relatively greater freedom to the Member States as regards selection of the final solutions. Since the support for the "small" farms is optional (along with the choice of one of the support options), just like the coupled support (and the designation of the preferred lines of production). The adoption of the optimal solution should include, at the very least, a few criteria that are vital from the point of view of the beneficiaries, agricultural sector and the economy and society as a whole.

First of all, the multitude of implemented goals should be noted. As it was previously emphasised, the suggested proposals are to continue the current goals (income support with the environmental and health justification), but they simultaneously designate new ones, often varied. Hence the support under the direct payments system may cover both the weakest entities in terms of the market ("small" farms), as well as the entities considered as the most resilient ("young" farmers). Thus it is important to consider, can many varied tasks be tackled by one mechanism. This is an especially valid question in such countries as Poland, where the national envelope is relatively small, while the scale of needs is significant.

The second aspect, which should be considered while shaping the system, is the level of its complexity that can be reflected in future possibilities of its effective operationalisation. The increase in the number of adopted solutions can result in the need to expand the administrative apparatus, thereby making the whole system unclear for both the farmers and the whole society. Moreover be-

[2] For example: when selecting the option of supporting 90 ha and allocating for the "young" farmers 1.24% of the national envelope (as the amount specified in this study as needed to fund the measure in Poland,) the basic rate will amount to EUR 216.34 per ha, and the preferential rate - EUR 270.42 per ha. Then the 80 ha farm will receive 80*270.42=EUR 21,634; while an entity owning 100 ha - 90*270.42+10*216.34=EUR 26,501.

cause of the level of expansion the political solutions may start to affect the current production decisions of farmers (and the Luxembourg reform primarily aimed to avoid this). The above-described phenomenon does not basically concern the support for "small" farms, which is expected to reduce the transaction costs and administrative burdens.

Thirdly, it should be noted that the inclusion of the remaining payments ("small" farms, "young" farmer, coupled support) consists in designating "sub-envelopes" thus reducing the resources available for the basic payment. Respective solutions will be financially beneficial for the entities eligible for the given form of additional support, but at the expense of the remaining farms.

The above presented discussion does not imply a clear-cut disapproval of the choice of additional support (which concerns mainly the optional components, as the implementation of the obligatory instruments is not the decision of the Member State). Because the inclusion of both the payments for "small" farms (the reduction of transaction costs mentioned before), as well as the specific support (the promotion of the nitrogen-fixing crops and the use of permanent grasslands via payments for cattle and sheep) can be rationally justified.

Currently (November 2013), the European Parliament approved the financial framework of the Common Agricultural Policy for 2014-2020, but the scope and form of its implementation in respective Member States, including Poland is still open. The wide range of options to be selected under the direct payments, forces to ask various questions about the economic, social and environmental effects of each of them. In this scope, the impact of the specific shape of the direct support system on the economic situation of various groups of farms, and consequently – on their development possibilities and competitive position remains one of the more important issues.

Thus research aimed at determining the impact of the specified direct support scenario, *ceteris paribus,* on the level of payment rates and, finally, on the economic situation of the respective groups of farms.

1.2. Methodological assumptions

The research was based on the following data sources: draft legislation of the European Union concerning the system of direct payments (Draft regulation) and unpublished data of the Agency for Restructuring and Modernisation of Agriculture.

The analysis consisted in determining the results of implementation of the mandatory and optional forms of additional support and the amount of financial resources needed for their implementation. To this end, this work uses previous

research of the Authors conducted as part of the studies[3] carried out for the Ministry of Agriculture and Rural Development and concerning support for: "young" farmers, "small" farms, selected lines of production.

General financial framework for the support system was defined, which first and foremost includes the national envelope referred to the supported area and number of farms participating in the system (Table 1.1.). In 2019, the payments per 1 ha of agricultural land would amount to EUR 219.05. Based on the data of the Agency for Restructuring and Modernisation of Agriculture (ARMA), the average farm size which in 2012 received support under the direct payments was 10.35 ha. Therefore, the average farm would receive around EUR 2,270 of the support.

Table 1.1. Basic assumptions for direct payments after 2013

Specification	Value
National envelope in 2015 (EUR)	2,987,267,000
National envelope in 2019 (EUR)	3,061,518,000
Area covered by support (ha)	13,976,263
Average size of a farm benefiting from payments (ha)	10.35
Average payment per hectare in 2019 (EUR)	**219.05**
Number of supported farms	1, 350,592
Average payment per farm (EUR)	2,267

Source: Own calculations based on unpublished data of the Agency for Restructuring and Modernisation of Agriculture, and Draft regulation.

Next, the scale of additional support was determined based on the EU rules and own assessment. The scope of support for **"young" farmers** (Table 1.2.) was determined based on:

- amount of funds available for the purpose (up to 2% of the national envelope),
- unit size of support (increase in rate by 25% against the basic rate),
- number of beneficiaries (farmers under the age of 40 running a farm work for less than 5 years).

[3] Czubak W., Poczta W., Sadowski A., Mrówczyńska-Kamińska A., *Sposób wdrożenia płatności dla młodych rolników, 2013;*
Sadowski A., Poczta W., Czubak W., Mrówczyńska-Kamińska A., *Preferencyjne warunki udziału „małych" gospodarstw w systemie płatności bezpośrednich, 2013;*
Poczta W., Sadowski A., Czubak W., Siemiński P., *Płatności związane z produkcją i ewentualny sposób ich zastosowania, 2013.*

Table 1.2. Results of analysis of preferential support for young farmers in option I – 90 ha[a] area limit

Specification	Value	
	2015	2019
National envelope of direct payments (EUR)	2,987,267,000	3,061,518,000
Area covered by direct payments (ha)	13,976,263	
Number of farms covered by support for "young farmers" (units)	89,060	
Agricultural land covered by support for the "young farmers" (ha)	701,920	
Amount of payment for implementation of the Young Farmer programme -**1.24%** according to the assumptions: - 2,987,267,000 (EUR) for 2015, - 3,061,518,000 (EUR) for 2019.	37,041,782	37,962,487
Remaining amount to calculate the Single Area Payment Scheme: - 2,987,267,000 - 37,041,782 (EUR) for 2015, - 3,061,518,000 - 37,962,487 (EUR) for 2019.	2,950,225,218	3,023,555,513
Single Area Payment Scheme: - 2,950,225,218 / 13,976,263 (EUR /ha) for 2015, - 3,023,555,513 / 13,976,263 (EUR /ha) for 2019.	211.09	216.34
An increase in the Single Area Payment Scheme: - 211.09 * 0.25 (EUR /ha) for 2015, - 216.34 * 0.25 (EUR /ha) for 2019.	52.77	54.08
Increased payment for beneficiaries of the "Young Farmer" action: - 211.09 + 52.77 (EUR /ha) for 2015, - 216.34 + 54.08 (EUR /ha) for 2019.	263.86	270.42

Source: Own calculations based on unpublished data of the Agency for Restructuring and Modernisation of Agriculture, and Draft regulation.

Support may be granted to any young farmer, regardless of the size of the farm. But it cannot be granted to a larger number of hectares than the limit specified by the Member State contained in the range between 25 and 90 ha. Assuming (Table 1.2.) the maximum area to which the payment may be paid, i.e. 90 ha[4], at EUR 211.09 per 1 ha of the basic rate in 2015 and EUR 216.34 per 1 ha in 2019, the maximum possible increases in the rates for young farmers would

[4] Adoption of the maximum possible area covered with support for "young farmer" resulted from a belief that the support should benefit the greatest possible number of entities eligible under the age criterion, including also large farms which are, by design, the most competitive ones.

amount, respectively, to: EUR 52.77 and 54.08 per 1 ha. This means 1.24% of the national envelope will have to be allocated for implementation of this programme.

Reducing the financial envelope by the amount necessary to cover the expenses for the "young farmers" support programme reduces the appropriations for the Single Area Payment Scheme. In such cases, the quite clear effect of shifting the support to the benefit of young farmers becomes apparent. In 2019, the additional payment for a medium-sized farm (10.35 ha – Table 1.1.) would amount to ca. PLN 2,350, i.e. PLN 11,750 – assuming the maximum possible period of 5 years. This is an amount partly facilitating the start-up and growth of agricultural activity, but it should be expected that it will play only a complementary (together with the Single Area Payment Scheme) part to funding the farm development from the own resources generated on the farm and the additional support under the 2nd pillar.

Table 1.3. Assumptions concerning support for small farms in the option assuming 25% of average payments per farm

Specification	Value	Remarks
Amount of payments for farms eligible for this form of support (EUR/farm)	566.7	2,266.8*25% = 566.7
Farms eligible for this form of support	1-3 ha	Farms of more than 3 ha in the basic option will receive payments per farm amounting to more than EUR 566.7, and thus more than 25% of the average payments per farm and, therefore, do not meet the requirements for "small" farms.
Number of farms eligible for this form of support	429,382	31.79% of the total
Area eligible for this form of support (ha)	811,897	5.81% of the total
Total amount of support (EUR)	**243,330,779**	does not exceed the limit of 10%
Amount of payments for farms ineligible for this form of support (EUR/ha)	214.08	(EUR 3,061,518,000 - 243,330,779)/ (13,976,263 ha - 811,897 ha) = 214.08

Source: Own calculations based on unpublished data of the Agency for Restructuring and Modernisation of Agriculture, and Draft regulation.

The size and form of the support for **"small" farms** was determined taking into account, first of all, the existing EU rules in this area, including mainly

the possible options of support and the size of the financial envelope. Besides, given the relatively small micro-economic impact of this mechanism (as mentioned earlier), it was considered that the main function of the introduction of this mechanism boils down to reducing transaction costs by simplifying the procedure of application and calculation of payments, and ceasing control of adherence to the principles of cross-compliance. Starting from this premise, it was considered that, from the social perspective, the best form of support for "small" farms is covering entities receiving 25% of the average payment per farm (Table 1.3.). It includes a rather large group of ca. 430 thousand entities (almost 32% of all beneficiaries of aid) measuring from 1 to 3 ha, which use a relatively small area of 812 thousand ha of agricultural land (less than 6%). Such a large number of entities is of great significance as regards reduction of transaction costs, and the small area also limits the possible negative environmental and production effects related to abandoning cross-compliance controls.

When targeting the support for selected sectors of agricultural production, it is necessary to follow the situation of Polish agriculture, the criteria set out in the EU legislation, as well as previous experience in the field of **coupled payments**. With this in mind, it can be recommended extending the coupled support to the following production sectors:

1. **Beef cattle** – this support aims at development of agricultural production with potentially large growth opportunities, at the same time, putting grasslands to use after the likely reduction of the number of dairy cows resulting from the reform of this market. It was assumed that the support will be awarded as per the scale of animal production, i.e. only on farms having between 10 and 100 animals[5]. On the grounds of provisions of the Specific support programme, implemented in Poland since 2011 under Article 68 of the Council Regulation (EC) No 73/2009, entitled *Support for farmers rearing cows in the voivodeships of South-Eastern Poland* the payment rate for cattle was established at EUR 142.5 per animal, granted twice for each animal depending on its age:
   - the rate for young beef cattle under the age of 1 year will total EUR 100 per animal,
   - the rate for young beef cattle at the age of 1-2 year(s) will total EUR 42.5 per animal,

   Adoption of two payment rates for cattle was dictated by technological considerations on the assumption that the payments are applied to the actual producer-farmer directly involved in the production of cattle. As some farms produce only calves, while others only rear cattle for fattening. The double

[5] The reason behind this assumption was the need to support commercial farms (hence the lower limit), but unable to produce without support (upper limit).

payment in this case will allow channelling the support for both groups of producers. The number of animals for each age group was estimated on the basis of the number of animals given by Central Statistical Office (*Livestock* ... 2011) at 1,400,000 animals aged up to 1 year and 1,300,000 animals aged 1-2 year(s).

2. **Sheep (ewes)** – the support for sheep production aims at providing an incentive for farmers to maintain the current (already low as compared to the previous years) number of animals and, as in the case of cattle, putting permanent grassland to use. It is assumed that the support should be directed at larger producers and, thus the support will be awarded to farms as per the scale of rearing, i.e. exclusively for females in herds of more than 10 animals. The suggested support rate of EUR 30 per animal was determined in accordance with the Specific support programme, implemented in Poland since 2011 under Article 68 of the Council Regulation (EC) No 73/2009, entitled *Support for farmers rearing sheep in the voivodeships of South Poland*. The number of ewes eligible for support will be 160 thousand animals.
3. **Legumes** – additional support for this production is primarily dictated by factors related to cultivation – fixing free nitrogen, and also results from a growing interest of farmers in the ongoing support programme. The suggested support rate at EUR 164 per hectare was determined in accordance with the Specific support programme, implemented in Poland since 2011 under Article 68 of the Council Regulation (EC) No 73/2009, entitled *Support for farmers growing legumes and herbage legumes*. On the basis of the currently supported acreage, it was estimated that the area of plants covered by support will amount to 204.6 thousand ha.
4. **Hops** – this labour-intensive production is of great economic significance in the hop-growing regions. The rate of EUR 311 per ha was determined in accordance with the applicable rates of direct payments in 2012. Support area of 1,500 ha was determined on the basis of the data of the Chief Agricultural and Food Quality Inspection (*Report on the implementation* ...).

The proposed approach to the specific support resulted from the need to provide effective support to the sectors, which are very important for agriculture and the environment, and, at the same time, are disadvantaged by the market mechanism (they cannot develop without the support under political mechanisms). The additional payments for the production of beef cattle are supposed to use the production potential of the market and, when considered along with support to sheep, put permanent grasslands to use. Legumes were selected on account of their role in absorbing atmospheric nitrogen and their positive impact on the soil structure. Hop production should be supported due to its location in

the areas of fragmented agriculture (mostly the Lubelskie Voivodeship), which require special efforts to create or maintain jobs in agriculture.

In 2019, the total amount of expenditure under the option of coupled support for the recommended sectors will amount to EUR 249,717,000, i.e. 8.2% of the national envelope (with the maximum possible support of ca. EUR 460 million – 15% of the national envelope).

Table 1.4. Assumptions for coupled support for the recommended sectors (explanation below)

Specification	Value
National envelope for direct payments (EUR thousand)	3,061,518
15% of the national envelope (maximum level of co-financing coupled support) (EUR thousand)	459,228
The amount of expenditure under the option of coupled support for the recommended sectors (EUR thousand)	**249,717**
Share in the national envelope in the option for the recommended sectors (%)	**8.2**

Source: Own calculations based on unpublished data of the Agency for Restructuring and Modernisation of Agriculture, and Draft regulation.

The proposals for the scope of assistance under additional payments included in this work were in each case designed to minimise the effect of redistribution (reduce the basic rate), while meeting important economic, social and environmental objectives. On the basis of the proposed scope of the additional payments (Tables 1.2.-1.4.), in particular using the amount of funds earmarked for each objective, the value of rates was calculated through successive subtracting (depending on the scenario) of each "sub-envelope" from the national envelope (amounts of expenditure needed to cover the payments for "young" farmers and "small" farms and coupled support) (Table 1.5.).

Support for "small farms" is linked to a flat-rate payment for specific entities (according to the proposals contained in this work – farms from 1 to 3 ha) and for a specific area, hence in the scenarios including this form of support, the area used by "small farms" was deducted (811,897 ha, Table 1.3.), from the total area of support (13,976,263 ha, Table 1.1) .

Table 1.5. Estimated rates of direct payments as per the scenarios adopted (EUR/ha) (2019)

Scenario	a) for farms which are not run by "young farmers"	b) for "young farmers"
1 Rate excluding all additional forms of support[a]		219.05
2 Rate including only the mandatory support for "young farmers"	216.34	270.42
3 Rate including the mandatory support for "young farmers" and support for "small farms"	211.19	265.27
4 Rate including the mandatory support for "young farmers" and coupled support	198.47	252.55
5 Rate including the mandatory support for "young farmers", support for "small farms" and coupled support	192.22	246.30

Source: Own calculations based on unpublished data of the Agency for Restructuring and Modernisation of Agriculture, and Draft regulation.

[a] Theoretical assumption for the purpose of comparison – support for "young farmers" is mandatory. In the remainder of this work two options were adopted: a) and b) depending on whether the farm will be run by a person who is eligible to receive additional support for young farmers, or whether the farmer does not meet with the conditions and will not receive the additional payments.

The average rate per hectare (excluding additional payments) was taken as the basis for further research, but for purely comparative and analytical purposes, as the support for "young farmers" is mandatory and, as such, regardless of political decisions at the national level, it will be implemented, which will ultimately affect the rates. Thus, the respective scenarios consider subsequent combinations of additional support were included, but each time (except for the baseline option – excluding additional support) including only the measures for "young farmers". Table 1.6. presents the ratios of hypothetical basic rate, excluding all additional support (EUR 219.05 per ha), in relation to the rates of payments arising from the reduction of the financial envelope resulting from the implementation of the new payments for: "young farmers", "small farms" and coupled support.

Table 1.6. Ratio of payment rates against the rate excluding additional support

Scenario		a) for farms which are not run by "young farmers"	b) for "young farmers"
1	The rate excluding additional support*		100.00
2	Rate including only the mandatory support for "young farmers"	98.76	123.45
3	Rate including the mandatory support for "young farmers" and support for "small farms"	96.41	121.10
4	Rate including the mandatory support for "young farmers" and coupled support	90.60	115.29
5	Rate including the mandatory support for "young farmers", support for "small farms" and coupled support	87.75	112.44

Source: as in Table 1.5.

**Theoretical assumption for the purpose of comparison. Support for "young farmers" is mandatory*

1.3. Summary

The European Union legislation on direct payments in 2014-2020 includes a considerable number of objectives and tasks, which constitutes an important novelty in relation to the existing solutions. Because of such an approach the planned shape of the support system will be characterised by a high level of complexity, which can not only result in the need for expansion of the administrative apparatus, but also hinder its public understanding. In addition, the EU provisions give quite a lot of freedom to the Member States as regards the choice of the final forms of support, which can have multiple economic and social repercussions. First and foremost, this requires that individual governments determine the most optimal solutions, but as a result this will contribute to a large diversification in terms of participation of different groups of farms from individual countries. Depending on the choice of specific forms of support, similar farms from respective Member States may receive different forms of support, and bearing in mind the number of possible options (inclusion or exclusion of "small" farms, covering with support specific lines of production or abandoning this form, etc.) the actual differences can be quite significant, especially taking into account the varied relative (referred to the arable land) amount of the na-

tional envelope. Of course, all this will consequently affect the competitive capacity of individual entities at the national and pan-European market.

The individual proposed support scenarios differently affect the rates of direct payments. The assumption should be to strive at the greatest possible social effect, in the form of improved competitive position of the Polish agriculture, with the use of a specific amount of funds. To the greatest extent, this assumption is met by support for the **"young famers"**, because it requires relatively low level of funds (1.24% of the national envelope). Support for the **"small" farms** also has a relatively small impact on the redistributive effect, which essentially consists in the fact that this support determines (separates) eligible farms and applies lump-sum payments with respect to them. The **coupled support** may have a slightly greater redistributive effect due to the fact that quite a lot of funds can be allocated for the purpose (8.2% of the national envelope, according to the Authors of the proposal, at 15% of the maximum share).

2. "New Greening" of the Common Agricultural Policy and its importance for economic performance of the Polish farms

2.1. Introduction

For more than twenty years, the CAP has been the subject of successive reforms aimed to increase the market orientation of agriculture, while providing income support for agricultural producers, increasing the requirements for the protection of the environment and making efforts to accelerate the development of rural areas throughout the EU.

One of the most important CAP changes, which was introduced by previous reforms, was a shift from product support to producer support with assignment of the existing direct payments to the area of the agricultural land owned by the farmer. This fundamental change in the philosophy of financial support for farmers in the EU was induced by external pressure, mainly exercised by the WTO, following from the desire to eliminate distortions in international trade in agricultural commodities and food.

Contemporary challenges facing the agricultural sector and the Common Agricultural Policy, largely result from the presence of external factors defined[6] as:

- economic (including food security and globalisation, decline in the growth rate of productivity, price volatility, pressure on production costs given the high prices of production inputs, deteriorating position of farmers in the food supply chain),
- environmental (regarding resource efficiency, quality of soil and water, and threats to habitats and biodiversity),
- territorial (rural areas in certain regions face demographic, economic and social changes such as depopulation or relocation of enterprises).

The shape of the current reform of the Common Agricultural Policy, for the first ever in the history of the EU, was negotiated jointly by the Council of the European Union and the European Parliament, whose role to date was limited only to consultations.

[6] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2010) 672, Brussels, 18.11.2010.

Public debate on the future shape of the CAP was opened already in 2010, when the Commission presented a communication: *The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future*[7], which presented the first assumptions and possible scenarios of the CAP reform in the new EU budgetary period.

On 12 October 2011, the European Commission published a package of legislative proposals[8] aimed at reforming the CAP in such a way as to better foster the creation of a more competitive and sustainable agriculture, while at the same time strengthening the viability of rural areas. In June 2014, a partial political agreement on the CAP reform was reached after almost two years of negotiations between the European Commission, the European Parliament and the Council.

On 16 December 2013, the EU Council of the Agriculture Ministers formally adopted four basic regulations governing the functioning of the reformed CAP, which were approved in November by the European Parliament, and the transitional provisions applicable as of 2014. Four days later they were published in the Official Journal of the European Union[9,10,11,12,13].

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[7] Ibidem

[8] Regulation of the European Parliament and the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy, COM (2011) 625 final, Brussels, 12.10.2011.

[9] Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005, Official Journal of the European Union L347, Luxembourg, 20.12.2013.

[10] Regulation (EU) No 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the common agricultural policy and repealing Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008, Official Journal of the European Union L347, Luxembourg, 20.12.2013.

[11] Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009, Official Journal of the European Union L347, Luxembourg, 20.12.2013.

[12] Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007, the Official Journal of the European Union L347, Luxembourg, 20.12.2013.

[13] Regulation (EU) No 1310/2013 of the European Parliament and of the Council of 17 December 2013 laying down certain transitional provisions on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), amending Regulation (EU) No 1305/2013 of the European Parliament and of the Council as regards resources and their

The provisions included therein point to the priority objectives of the reformed agricultural policy. After 2013, the CAP is to ensure greater concern for the natural environment and a more equitable distribution of the EU funds. It is also to help the farmers meet the market challenges. In general, the EU agriculture should achieve a higher level of production of safe and high quality food while caring for the natural resources, on which largely depends the future performance of agricultural production.

The role of the CAP is to provide policy framework that promote and encourage producers to address these issues while maintaining cohesion with other EU policies. This translates into three long-term objectives of the CAP:

- viable food production,
- sustainable management of natural resources and climate action,
- balanced territorial development.

In order to achieve these long-term objectives it was necessary to accordingly adjust the existing instruments of the CAP. Therefore, the reform of the CAP focuses primarily on operational objectives by providing more effective policy measures aiming to improve the competitiveness of the agricultural sector and its stability in the long run.

Assigning greater significance to the environmental objectives in the reformed CAP is reflected in the variety of mechanisms, which when implemented should guarantee cumulative environmental benefits.

In the reformed "green" CAP the system of direct payments applicable in the new budgetary perspective will consist of several components, targeting specific beneficiaries or specific actions. Award of a part of direct payments (up to 30% of the national envelope) depended on the implementation of the "greening" requirements, i.e. the use of agricultural practices beneficial for the climate and the environment. In accordance with the European Commission announcements, the new provisions are to take effect from 2015.

Payments will also differ in terms of the nature of support. They cover both the optional support, in case of which the decision to introduce the given payment lies within the scope of responsibility of a Member State, and mandatory support which is an obligatory form of assistance throughout the European Union. Cross-compliance requirements, constituting the basic and, at the same time, compulsory requirement whose meeting is a prerequisite for obtaining full funding from the CAP, will be simplified and better targeted.

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distribution in respect of the year 2014 and amending Council Regulation (EC) No 73/2009 and Regulations (EU) No 1307/2013, (EU) No 1306/2013 and (EU) No 1308/2013of the European Parliament and of the Council as regards their application in the year 2014, the Official Journal of the European Union L347, Luxembourg, 20.12.2013.

The solutions negotiated for a system of direct payments ensure the possibility of continuing the simplified system of direct SAPS payments by 2020. In addition, as from 2015, the CAP will introduce new policy instruments in the 1st pillar, including:[14]

- payment for agricultural practices beneficial for the climate and the environment, i.e. the so-called "greening", whose implementation will precondition the award of a part of area payments (up to 30% of the national envelope),
- simplified scheme for small farms (3 ha of arable land),
- payment for young farmers,
- coupled support,
- payments for areas with natural constraints.

Direct payments will be paid only to active farmers, which means farmers not carrying out activity excluded from support, such as: airports, railway companies, water treatment plants, real estate agencies and sports and leisure areas.

The Commission proposed that, in nominal terms, the amounts for both CAP pillars for 2014-2020 will be maintained at the level from 2013. In real terms, the CAP funding will be reduced compared to the current period. Compared to the Commission's proposal, the amount allocated to the 1st pillar has been reduced by 1.8% and by 7.6% to the 2nd pillar (prices of 2011). This gives the total amount of EUR 362,787 billion for 2014-2020, of which EUR 277,851 billion was earmarked for direct payments and market-related expenditure (1st pillar) and EUR 84,936 billion for rural development (2nd pillar). Given the current economic and financial situation, these amounts are still a strong support for the agricultural policy, which constitutes 37.8% of the total EU budget for 2014-2020.

2.2. Practical aspects of CAP "greening"

One of the important elements of the reform is the already mentioned concept of CAP "greening". It raises a number of controversies not only because of vaguely defined objectives, but also given the difficulty in assessing its effects. CAP "greening" mainly enforces the obligation to adjustment the crop structure and to mark out a relevant Ecological Focus Area (EFA) on farms. This may influence the size and structure of crop production, and thus the change in the levels of farm incomes.

[14] Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009, Official Journal of the European Union L347, Luxembourg, 20.12.2013.

2.2.1. Initial "greening" concept

The issue of "greening" has been the subject of public discussion for a few years. Since the announcement of the first "greening" concept its versions changed. Subsequent draft reforms were analysed by a number of research teams in the EU Member States, including those made for the European Commission. Since the beginning of the debate "greening" was discussed by Authors [15,16] of this study.

The original document determining the shape of the future of the Common Agricultural Policy was the proposal of the European Commission of November 2011[17] which assumed:

- covering with the "greening" requirement all farms with an arable area of more than 3 hectares, which would be required to have a minimum of 3 crops in rotation, with a maximum share of one of them at the level of 70%, and a minimal share in the crop structure of 5%;
- maintaining the existing area of permanent grassland with the right to reduce the area by no more than 5% in relation to the reference year;
- assigning 7% of arable land to the Ecological Focus Area (EFA).

Considering those criteria, it was found that 88% of farms in the 2009 FADN population were eligible to be recognised as "green" because of the criterion of crop diversification (Table 2.1.). Fully adapted farms fulfilling two essential criteria (crop diversification and Ecological Focus Area) accounted for only 14% of the FADN population.

[15] Czekaj S., Majewski E., Wąs A., *Oszacowanie skutków „zazielenienia" Wspólnej Polityki Rolnej UE w Polsce w perspektywie 2014 roku na przykładzie zbiorowości gospodarstw FADN [in:] Dopłaty bezpośrednie i dotacje budżetowe a finanse oraz funkcjonowanie gospodarstw i przedsiębiorstw rolniczych*, ed. J. Kulawik, IERiGŻ-PIB, Warsaw 2012.

[16] Czekaj S., Majewski E., Wąs A., *Wpływ zazielenienia Wspólnej Polityki Rolnej na wyniki ekonomiczne gospodarstw roślinnych, Zagadnienia Ekonomiki Rolnej*, 2/2012, IERiGŻ-PIB, Warsaw 2012.

[17] Regulation of the European Parliament and the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy, COM (2011) 625 final, Brussels, 12.10.2011.

Table 2.1. The structure of farms by production type in the FADN sample on account of meeting the "greening" criteria

According to the number of farms represented (FADN 2009)							
	CEREALS	CROPS	CATTLE	PIGS	MIXED	OTHER	TOTAL
"Green"	4%	13%	13%	5%	9%	48%	14%
Lack of EFA	65%	75%	77%	75%	82%	37%	74%
Lack of diversification	31%	12%	10%	20%	9%	15%	12%

Source: Own compilation based on the Report No. 46, IERiGŻ 2012.

The majority of surveyed entities (as many as 74%) were farms having appropriately diversified structure of crops, but lacking the required ecological area. Only 12% of farms would not meet the requirement to diversify crops. From this it follows that the introduction of the rotation requirement would not mean significant adjustments to the structure of crop production (except for the relatively small percentage of farms with a strongly simplified crop structure). But the increase in the ecological areas, over that already in place on farms, to the level of 7% of arable land could have stronger production and financial effects.

2.2.2. "New greening"

The new Regulation of the European Parliament and of the Council of 17 December 2013 considerably alleviated the aforementioned requirements. In its final form "greening" assumes mandatory implementation of three activities consisting in the following:

- **crop diversification** with the exception of farms up to 10 ha of arable land. For farms with more than 10 hectares, but with no more than 30 hectares of arable land the requirement was introduced to maintain at least 2 different crops in the crop structure; but the main crop should not occupy more than 75% of the arable land. In the case of the farms with an area of over 30 hectares of arable land it will be required to have a minimum of 3 crops on arable land (main crops with the maximum share of 75%, and the sum of two main crops should not exceed the 95% share of arable land). The upper thresholds will not be applied when the main crop is grass or other forages. The term "crop" means

any genus in botanical classification, as well as fallow land. Winter and spring forms are treated as separate crops, even if they belong to the same species. For example, a farm covering an area of 15 ha of arable land, with a crop structure comprising 75% of winter wheat and 25% of spring wheat, is treated as complying with the requirement to diversify crops;

- **maintaining at least 95% of the existing area of permanent grassland.** This requirement may be enforced by two ways – one assumes control at the level of individual farms, the other at the level of the country or the region. The obligation to maintain permanent grassland at the level of the farm was limited to those designated by the Member States and recognised as naturally valuable Natura 2000 sites, covering peat soils and wetlands. If in a given country or region the share of permanent grassland in total area has not decreased by more than 5% against the reference year, then it is allowed to control maintaining permanent grassland at the level of the country or the region, allowing for greater changes in individual farms;
- **maintaining EFA (Ecological Focus Area).** In 2015-2017 there will be a mandatory exemption of 5% of arable land for environmental purposes, and then depending on the decision of the European Commission, which is expected to be taken by 31 March 2017, this percentage may be increased to the level of 7%. Farms with up to 15 ha of arable land will be exempt from this requirement.

Exemption from EFA may be replaced with equivalent practices, which (as is clear from the definition) will bring the same or a higher level of benefits for the environment and climate change as mandatory practices. Each Member State will individually draw up a list of activities, which will be considered as equivalent to "greening" practices. Equivalent practices usually include the use of nitrogen-fixing crops (legumes) with the proviso that they are grown without the use of mineral fertilisers and plant protection products, catch crops, fallow land, terraces, landscape protection elements, buffer zones, agro-forestry systems, green cover, short rotation coppice for which mineral fertilisers and/or plant protection products are not used, or plot areas adjacent to the edge of the forest. Equivalent practices may also include elements of agri-environment-climate programme, national or regional environmental certification systems. To convert individual equivalent practices to the EFA area appropriate weighting coefficients will be used taking account of the importance of certain categories of land for the environment. A proposal for the values of the coefficients was presented in June 2013 in the working version of the regulation of the European Commission[18]. The final values of the coefficients for the various elements of

[18] Working document of the Council 10991/2013 *Proposal for a Regulation of the European Parliament and of the Council establishing rules for direct payments to farmers under sup-*

the landscape should be determined by the Member States until 1 August 2014. As an illustration of the general principle an example of a isolated mid-field tree can be given, which according to the working version of the regulation is to be the equivalent of 200 m^2 of the EFA.

Farms pursuing organic production will be exempt from the greening obligation.

Exceptions in terms of having to use the selected "greening" elements on farms are also expected for units, where:

a) more than 75% of arable land is used for production of grasses or other herbaceous forage, is fallowed, used for cultivation of legumes, or it is a combination of these practices, provided that arable land not covered by these practices does not exceed 30 hectares;

b) more than 75% of eligible agricultural area is permanent grassland, or is used for production of grasses or other herbaceous forage, or crop growing under water for a significant part of the year or during a significant proportion of the crop cycle, or a combination of these practices, provided that arable land not covered by these practices does not exceed 30 hectares;

c) more than 50% of the area declared as arable land has not been included by the farmer in his support application for the previous year and, on the basis of a comparison of geospatial support applications, all arable land is grown using a different crop compared with the crop in the previous calendar year;

d) that are located in the area north of the 62nd parallel or some adjacent areas.

Non-compliance with the requirements of "greening" is to result in a reduction in payments. The penalties in the first two years will amount to 100% of the value of "green payment" and in the next year 120%, eventually from 2018 onwards reaching 125% of the amount of "green payment". Given that the green component is to be 30% of direct payments, a farm that does not fulfil at least one of these three criteria will receive (in the first and second year) support per hectare reduced by 30% and, accordingly, by a maximum of 36% and 37.5% in the subsequent years.

The potential impact of the CAP reform on various aspects both environmental and economic, was discussed in several publications taking into account the various proposals of the European Commission. Matthews[19] describes "green" components of the direct payment component based on the proposals of the Commission from October 2011. He examines the potential consequences of

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port schemes within the framework of the common agricultural policy (CAP Reform) dated 14.07.2013.

[19] Matthews A., *Environmental Public Goods in the New CAP: Impact of Greening Proposals and Possible Alternatives*, European Parliament, Brussels 2012.

introduction of "greening" components and presents a range of options for consideration by the Member States, whose introduction is designed to improve the impact of "greening" on the environment and to reduce the administrative complexity of the new system, and thus improve the cost-efficiency by reducing the costs of implementation. Other authors[20] focus only on one of the "greening" components, i.e. the maintenance of the EFA, which is believed to have the greatest potential to solve the environmental issues. In another publication[21], when analysing the impact of CAP "greening" on the environment the authors emphasize that the introduction of the obligation to diversify the structure of crops will not have a significant impact on improving the quality of the natural environment due to the fact that, according to estimates, the need to adapt to this requirement applies to only 2% of arable land in the EU. The impact of CAP reform on developing countries was examined by Cantore[22]. The author points out that CAP "greening" will reduce production in the European Union (EU) in the short-term, which could lead to an increase in the prices of agricultural products. This in turn will stimulate exports from developing countries (by a maximum of 3% with regard to certain countries and goods), but will be unfavourable to the countries importing food. In the medium and long-term the CO_2 emissions will be reduced thereby diminishing the damage resulting from climate change in developing countries.

The effects of the CAP reform were also analysed by the Authors of this chapter. In their previous work they presented the impact of the introduction of an initial version of CAP "greening" on the economic situation of the Polish farms[23,24].

However, it should be noted that the above analyses referred to the outdated proposal by the Commission of 2011, while the recently adopted new regulations and requirements imposed on farmers have been eased.

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[20] Allen B., Buckwell A., Baldock, D. and Menadue, H., *Maximising environmental benefit through ecological focus areas*, London, Institute for European Environmental Policy, 2012.

[21] Westhoek H., Van Zeijts H., Witmer M., van den Berg M., Overmars K., van der Esch S., van der Bilt W., *Greening the CAP - An analysis of the effects of the European Commission's proposals for the Common Agricultural Policy 2014-2020*. PBL Netherlands Environmental Assessment Agency, Haga 2012.

[22] Cantore N., *The potential impact of a greener CAP on developing countries*, London, Overseas Development Institute, 2013.

[23] Czekaj S., Majewski E., Wąs A., *Wpływ zazielenienia Wspólnej Polityki Rolnej na wyniki ekonomiczne gospodarstw roślinnych, Zagadnienia Ekonomiki Rolnej*, 2/2012, IERiGŻ-PIB, Warsaw 2012.

[24] Czekaj S., Majewski E., Wąs A., *Oszacowanie skutków „zazielenienia" Wspólnej Polityki Rolnej UE w Polsce w perspektywie 2014 roku na przykładzie zbiorowości gospodarstw FADN* [in:] *Dopłaty bezpośrednie i dotacje budżetowe a finanse oraz funkcjonowanie gospodarstw i przedsiębiorstw rolniczych*, ed. J. Kulawik, IERiGŻ-PIB, Warsaw 2012.

The objective of this work was to determine the impact of the finally adopted CAP reforms on economic performance of Polish agricultural farms, taking into account their diversity in terms of production lines, location in a FADN region and the degree of adaptation to the requirements of "greening".

2.3. Methodology

To implement the key aim of the study the baseline scenario and three scenarios for agricultural policy were constructed. Each of them was considered assuming appropriate alignment of market parameters, as well as maintaining current parameters at an unchanged level. To determine the economic impact of their potential implementation nonlinear optimization model was used based on the Positive Mathematical Programming. The model was solved for each separate type of farms. The typology of farms and their characteristics were developed on the basis of the Polish FADN data. Projections of changes in prices and yields resulting from proposed changes to the CAP were determined based on the results of CAPRI partial equilibrium sectoral model. The results obtained from model farms were aggregated in order to determine the impact of agricultural policy scenarios on economic results obtained in the different types of farms and FADN regions.

2.3.1. Scenarios considered

Guided by regulations adopted in respect of the implementation of the new CAP mechanisms, the four scenarios for agricultural policy were constructed for determining their impact.

A. Baseline scenario [Base_2011] and Baseline_2019

It assumes a continuation of the current CAP. The baseline scenario is used only to calibrate the models, designed on the basis of FADN data as from 2011. The Baseline_2019 will provide a point of reference for other scenarios of the reformed CAP. In the Baseline_2019 scenario, it is assumed that changes to the existing mechanisms of the CAP will be maintained, given that the model will use a direct payment rate at a level which was reached in Poland in 2013.

B. Green_2019 Scenario

It is the option using the rate of direct payments in the amount of EUR 219.05 per ha, including 30% of "green payments" assuming implementation of requirements arising from the "greening" of the CAP.

The Green_2019 scenario assumes that in connection with the inclusion of the "greening" and the likely decrease in funding of pro-environmental 2nd pillar activities the existing agri-environmental payments will be reduced by 50% per average farm which will be the subject of modelling.

C. No_Green_2019

The scenario implies giving up 30% of direct payments, as a result of the rejection of the proposal for "greening" of the CAP. Farms non-adapted to the new requirements would be "punished" by a reduction in direct payments by 125% of the green payment, i.e. EUR 82.31 per ha, thus receiving direct payments at the level of EUR 136.74 per ha. It was assumed that farms exempt from "greening" and fulfilling all the requirements will receive direct payments, equal to those assumed in Green_2019. At the same time, it is assumed that payments under the agri-environmental programmes in this scenario will not be reduced.

In practice, it needs to be considered improbable that all farmers from non-adapted farms will give up their greening payments. Therefore, the solution for No_Green_2019 scenario may only be treated as a point of reference for comparison, showing the maximum income drop caused by the planned CAP reforms.

In fact, probably only a small percentage of farmers will not attempt to adapt their farms agreeing to severe financial penalties. Optional payments were adopted in all the scenarios under consideration at the level used to date (coupled payments and the LFA).

The effects of changes in individual scenarios were calculated for two options differing in prices and yields in models for 2019. In the first option changes in prices and yields forecasted in the CAPRI model (adequately to individual scenarios) were taken into account. In the second option yields and prices from the base 2011 scenario were used. It should be assumed that options thus designated determine the probable variability boundaries of exogenous parameters used in farm models.

2.3.2. Research samples

The main sources of data for analysis were Polish FADN resources. The data from 2011 were used to develop typologies and prepare parameters for farm models. The data set consists of 10,890 research objects (individual farms). The entire population of farms was divided into production types according to the area of arable land, and then according to the production type by adopting the criteria in accordance with the Community typology for agricultural holdings of 2009.

In accordance with the methodology used, standard output (SO) was used to determine the production type. The SO is defined as "the average value of output of a specified type of crop or livestock production activity over the period

of 5 years, generated over one year per 1 hectare or 1 animal in average production conditions in particular regions."[25].

In 2011, according to the data of the Central Statistical Office there were 1651.7 thousand individual farms with an area of more than 1 ha of agricultural land. Population of the FADN (farms represented by FADN) includes 735.5 thousand farms, which accounts for 45% of all farms in Poland. The farms covered by the FADN system produce about 90% of the total value of output in the agricultural sector, and their share in the total agricultural area in Poland amounts to 79%.

2.3.3. Typology of farms

The process of identifying types of farms for modelling took place in accordance with the three criteria: area of farms in ha of agricultural land, production type of farm (according to nTF 14), degree of adaptation to the "greening" requirements.

The results obtained after application of these criteria are shown both as a whole (for the entire FADN population), and taking into account the individual FADN regions (Figure 2.1.).

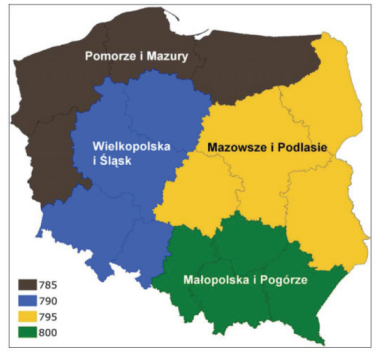

Figure 2.1. FADN regions

Pomorze i Mazury – Pomerania and Mazury Region, Wielkopolska i Śląsk – Wielkopolska and Silesia Region, Mazowsze i Podlasie – Mazovia and Podlasie Region, Małopolska i Pogórze – Małopolska i Pogórze Region

Source: Commission Regulation (EU) No 1291/2009 of 18 December 2009 concerning the selection of returning holdings for the purpose of determining incomes of agricultural holdings.

Below detailed assumptions for grouping of farms from the FADN population were presented.

[25] Goraj L. et al., *Analiza skutków zmian we Wspólnotowej Typologii Gospodarstw Rolnych*, Warsaw 2010, p.11.

- Criterion 1 – classification of farms by the area of arable land:
  - Group I → farms up to 10 ha,
  - Group II → farms above 10 hectares, but no more than 15 ha,
  - Group III → farms above 15 hectares, but no more than 30 ha,
  - Group IV → farms above 30 ha.

Such ranges were determined due to previously outlined requirements for diversification of crops and marking out of EFA. The first group comprised farms exempted from the "greening" requirements. The second group included entities that must grow at least 2 crops, but are not required to have a separate EFA. The third group includes farms which are required to meet the same requirements as the previous group in terms of diversification of crops, but they must also intend at least 5% of arable land to EFA. The last fourth group covers farms which are expected to maintain at least 3 crops in the crop structure and to mark out of 5% of EFA.

Table 2.2. Structure of farms by area classes based on FADN data

According to the number of farms represented				
Poland	I ≤ 10 ha	10 ha < II ≤ 15 ha	15 ha < III ≤ 30 ha	IV > 30 ha
	55%	21%	17%	7%
According to FADN regions				
785	37%	22%	23%	18%
790	41%	21%	25%	13%
795	59%	22%	15%	4%
800	70%	17%	10%	3%
In FADN sample				
Poland	26%	16%	28%	30%

Source: Own compilation.

The structure of farms based on area of arable land in the FADN population is significantly different in relation to the structure of farms in FADN sample. The study takes into account the number of farms represented by individual farms from the FADN sample calculated on the basis of the SYS02 variable[26]. The most numerous representation in the group of farms is that of farms with up to 10 ha of arable land, which means that they are not covered by the greening requirement. The requirement to separate EFA relates to 24% of farms in the

[26] Goraj L. et al., *Wyniki Standardowe 2011 uzyskane przez gospodarstwa rolne uczestniczące w Polskim FADN*, Warsaw 2012.

field of FADN observation. In regional terms, most exempted farms can be found in South-Eastern Poland, i.e. the region of Małopolska and Pogórze, which is characterised by highly fragmented agriculture.

- Criterion 2 – classification of farms by the types of production (according to nTF 14): *Field crops, Cattle, Pigs, Mixed ,Other*.

Details of the division are presented in Table 2.3.

Table 2.3. Production types of farms divided on the basis of the Community typology of agricultural holdings

nTF14		**PRODUCTION TYPE**
15	Specialist cereals, oilseed and protein crops	**FIELD CROPS**
16	General field cropping	
61	Mixed cropping	
45	Specialist dairy	**CATTLE**
46	Specialist cattle-rearing and fattening	
51	Specialist pigs	**PIGS**
73 and 74	Mixed livestock	**MIXED**
83 and 84	Mixed crops and livestock	
20	Specialist horticulture	**OTHER**
35	Specialist vineyards	
36	Specialist fruit and citrus fruit	
37	Specialist olives	
38	Various permanent crops combined	
48	Sheep, goats and other grazing livestock	
52	Specialist poultry	
53	Various granivores combined	

Source: Own compilation based on "Analiza skutków…" Goraj L. et al. 2011 and FADN data.

The "mixed" production type is the most numerous one in the FADN sample (Table 2.4.). They represent 37% of the sample, but this percentage is clearly lower than the share of "mixed" production in the structure of the farms represented by FADN population (63% on average in the country, similarly to

the other regions, ranging from 55% to 64%). Most pig farms operate in Wielkopolska and crop farms in Pomerania and in the north-western part of Poland.

Table 2.4. Structure of farms by the type of production on the basis of FADN data

According to the number of farms represented					
POLAND	FIELD CROPS	CATTLE	PIGS	MIXED	OTHER
	16%	12%	3%	63%	6%
According to FADN regions					
785	20%	17%	3%	55%	5%
790	21%	6%	5%	63%	5%
795	14%	12%	2%	64%	8%
800	12%	17%	1%	64%	6%
In FADN sample					
POLAND	25%	23%	7%	37%	8%

Source: Own compilation.

Crop farms, cattle and pig farms are slightly over-represented in the FADN sample, although differences in the sample structure and in the population of the farms represented are much smaller. The structure of farm types represented by FADN shows small regional variation.

- Criterion 3 – classification of farms due to the degree of adaptation to the requirements of "greening":
    - Exempted – with an area of up to 10 hectares of arable land and organic farms,
    - "Green" – fulfilling all the requirements of "greening",
    - Lack of diversification – not meeting the requirement to diversify crops,
    - Lack of EFA – not having sufficient Ecological Focus Area,
    - Lack of diversification and EFA – failing to meet both of the above-mentioned requirements at the same time.

The structure of farms belonging to the FADN population according to the adopted typology is shown in Table 2.5. (based on the degree of adaptation of the Polish farms in the various regions of FADN) and in Table 2.6. (broken down by type of production).

Table 2.5. Structure of farms represented in the FADN population divided into regions according to the degree of adaptation to the requirements of the CAP "greening"

	Exempted	Green	Lack of EFA	Lack of diversification	Lack of EFA and diversification
Poland	57%	20%	21%	1%	1%
Broken down into FADN regions					
Pomerania and Mazury Region (785)	41%	24%	30%	2%	3%
Wielkopolska and Silesia Region (790)	43%	21%	34%	1%	1%
Mazowsze and Podlasie Region (795)	61%	21%	16%	1%	1%
Małopolska and Pogórze Region (800)	72%	15%	11%	1%	1%

Source: Own compilation based on FADN data.

Non-compliance with the requirements of "greening" in terms of one or two criteria applies to 23% of the farms of the population represented by the FADN, with the major reason for being insufficient EFA. It can be stated that the Polish farms are mostly diversified in accordance with the proposal of the European Commission. The percentage of non-adapted farms is regionally much diversified. The greatest numbers of non-adapted farms, respectively 35% and 36%, are in the regions of Pomerania and Mazury as well as in Wielkopolska and Silesia. The voivodeships, which make up these regions, have the largest average area of farms, which means that their structure also comprises most farms, in respect of which the requirements of "greening" will apply at all. In areas where farms are relatively small, there is the largest share of farms exempt from the requirements of "greening". In the region of Małopolska and Pogórze, the total share of farms which are exempted and fully adapted to the requirements of "greening" is 87% of the population represented by the FADN.

An analysis of the degree of adaptation by production types gives rise to the hypothesis that CAP "greening" will have the greatest impact on crop farms

and pig farms (Table 2.6.). In these production types the number of farms exempt from compliance with the requirements or ones that meet all the criteria is the lowest. At the same time, they are characterised by a large share of farms with insufficient surface of EFA and too low level of diversification of crops.

Table 2.6. Structure of farms represented in FADN population by production types according to the degree of adaptation to the requirements of the CAP "greening"

Specification	Crops	Cattle	Pigs	Mixed	Other
Exempted	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 diversification and EFA	4%	1%	3%	1%	1%

Source: Own compilation based on FADN data.

Farms specialising in cattle have a much lower share of farms that require adaptation to "greening", because due to the specificity of their activities they very often maintain permanent grassland and grass on arable land. A small area of arable land and large share of grassland results in their exemption from having to implement adjustments or automatically classifies these farms to the "green" group. A similar phenomenon can be observed in the case of mixed farms. The group of other farms covers horticultural farms that due to the significant share of permanent crops and their small area often do not have 10 hectares of arable land, and thus are exempt from "greening".

After dividing the researched sample in accordance with the criteria described, 59 types of model farms were obtained. These types were also divided by their location in the FADN region.

Finally, 218 types of farms were modelled taking into account their geographical location, criterion of production scale and the production type as well as adaptation to the requirements of "greening".

2.3.4. Farm model

The Farm-Opty optimisation model of a farm upgraded with non-linear cost function using the Positive Mathematical Programming[27] method was used to determine the potential effects of changes. The basic premise on which the model is based, is the behaviour of farmers seeking to maximize profit, which is rational from the economic point of view. Thus this function assumes maximisation of the agricultural income and its overall form is showed by the following equation:

Provided that $Ax \leq B$

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

where:

DR – agricultural income (numeric value of the objective function),
p – products price vector (n x 1)
y – yield and productivity vector (n x 1),
x – non-negative vector of optimum levels of production activities (n x 1)
x • y – Hanamard's product,
s – vector of payments for production activities (n x 1)
fc – relatively fixed costs value,
fs – value of the payments for operating activities which are relatively independent of the level of production,
A – resource utilization coefficients matrix (m x n),
B – vector of available resources (m x 1),
d'x-x'Qx – non-linear element of the objective function determined in the course of model calibration[28].

This model provides a solution of the classical linear optimisation problem used in farm models[29,30]. Linear optimisation models usually require a lot of data, and often, in effect, give results which are different from reality, because of the tendency to over-simplify the production structure. This is due to the fact that substantially justified number of restrictive conditions is far less than the number of the observed activities.

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[27] Howitt R.E., *Positive Mathematical Programming, American Journal of Agricultural Economics*, 77(2), 1995a, pp. 329-342.
[28] Ibidem.
[29] Wąs A., *Model optymalizacyjny rolnictwa (na przykładzie gminy Kobylnica)*, Wydawnictwo SGGW, Warsaw 2005, pp. 1-144.
[30] Ziętara W., *Plan roczny i koncepcja systemu kontroli jego realizacji w państwowym przedsiębiorstwie rolniczym*, Szkoła Główna Gospodarstwa Wiejskiego, Warsaw, 1989.

Significant differences between the results of linear models and observed values hinder the transfer of results to potential recipients, even if the models properly react to the stimuli assumed in the scenarios. This results in a need for their calibration by adding various restrictions. The most common are crop rotation constraints, specifying the maximum or minimum shares of crops in the crop structure. Even apart from the weak theoretical or empirical justification for such restrictions, in the case of structures of models for farm aggregates (for example, for types according to the FADN), they often over-restrict the scope of permissible solutions for simulated scenarios.

The Positive Mathematical Programming (PMP), with regard to the classic models of linear programming, has some important advantages:

- the applied calibration procedure allows for easy and accurate representation of the actual observed values for modelled features[31];
- complementing the linear model with non-linear elements leads to overcoming the problems with excessive simplification of solutions (over-specialisation); solutions contain a greater number of activities without having to make additional "artificial" limitations;
- PMP allows to avoid sudden changes in the solutions which are disproportionate to the scale of changes in external conditions introduced in the scenarios analysed;
- modifications to the model applied at calibration stage, affect the model behaviour during simulation to a much lesser extent than calibration constraints used in linear programming models;
- nonlinear (quadratic) function of the objective captures an increase in unit cost of production as a result of the increase in the level of activity. They can result from inadequate equipment resources, insufficient organisational capacity and reduced yields due to the need to use lower-quality land[32].

For the first time the PMP approach was described and formalised in Howitt's work[33]. However, already earlier expertise-type of works supporting the political decision-making processes successfully used similar techniques[34,35,36]. In most applications of this type a new technique was introduced to

[31] Hazell P. B., Norton R.D., *Mathematical Programming for Economic Analysis in Agriculture*, MacMillan, New York, 1986.
[32] Howitt R.E., *A Calibration Method for Agricultural Economic Production Models*, [in:] *Journal of Agricultural Economics 46*, 1995b, pp. 147-159.
[33] Howitt R.E., *Positive Mathematical Programming*, American Journal of Agricultural Economics, 77(2), 1995a, pp. 329-342.
[34] Howitt R.E., Gardner B.D., *Cropping Production and Resource Interrelationships among California Crops in Response to the 1985 Food Security Act*, [in:] *Impacts of Farm Policy and Technical Change on US and Californian Agriculture*, Davis, 1986, pp. 271-290.

the already existing linear models as a substitute for numerous calibration constraints.

The method published by Howitt immediately gained popularity as evidenced by a lot of publications using the new approach [37,38,39,40,41,42,43].

2.3.5. Farm data

Data on farms were taken from FADN resources of the year 2011. What was determined for all types of farms was the average value of the parameters taken into account in the optimisation model, including the area of permanent grassland and EFA, which in addition to the diversification of crop structure form the basic requirements of "greening". The fallow land was qualified as the EFA area.

Outlier values (abnormally high or low) were found in the process of preparing parameters for FADN data models, in particular with regard to variables such as yields, prices of products or some financial data from farms. Given the

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[35] Kasnakoglu H., Bauer S., *Concept and Application of an Agricultural Sector Model for Policy Analysis in Turkey*, [in:] *Agricultural Sector Modelling*, S. Bauer und W. Henrichsmeyer (ed.), Vauk Verlag, Kiel, 1988.

[36] Schmitz H.J., *Entwicklungsperspektiven der Landwirtschaft in den neuen Bundesländern - Regionaldifferenzierte Simulationsanalysen Alternativer Agrarpolitischer Scenarien*, Studien zur Wirtschafts- und Agrarpolitik, Witterschlick/Bonn, M. Wehle, 1994.

[37] Arfini F., *The Effect of CAP Reform: A Positive Mathematical Programming Application, Paper presented at an International Conference on 'What Future for the CAP'*, Padova, 1996.

[38] Arfini F., Paris Q., *A positive mathematical programming model for regional analysis of agricultural policies*, [in:] Sotte E. (ed.): *The Regional Dimension in Agricultural Economics and Policies*, EAAE, Proceedings of the 40th Seminar, 26-28. Juni 1995, Ancona, pp. 17-35.

[39] Barkaoui A., Butault J.P.: *Positive Mathematical Programming and Cereals and Oilseeds Supply within EU under Agenda 2000*, Paper presented at the 9th European Congress of Agricultural Economists, Warsaw, August 1999.

[40] Cypris Ch., *Abbildung des regionalen Angebotsverhaltens bei der Prognose*, [in:] *Endbericht zum Kooperationsbericht 'Entwicklung des gesamtdeutschen Agrarsektormodells*, RAUMIS96, Bonn und Braunschweig Völkenrode, Dezember 1996.

[41] Gohin A., Chantreuil F., *La programmation mathématique positive dans les modèles d'exploitation agricole. Principes et importance du calibrage*, Cahiers d'Economie et de Sociologie Rurales, 52, 1999, pp.59-79.

[42] Graindorge C., Henryde Frahan B., Howitt R.E.: *Analysing the effects of Agenda 2000 Using a CES Calibrated Model of Belgian Agriculture*, [in:] Heckelei, T., H.P. Witzke, and W. Henrichsmeyer (ed.), *Agricultural Sector Modelling and Policy Information Systems*, Proceedings of the 65th EAAE Seminar, March 29-31, 2000 at Bonn University, Vauk Verlag Kiel, 2001, pp. 177-186.

[43] Helming J. F. M., Peeters L., Veendendaal P.J.J., *Assessing the Consequences of Environmental Policy Scenarios in Flemish Agriculture*, [in:]: Heckelei T., Witzke H.P., Henrichsmeyer W. (ed.), *Agricultural Sector Modelling and Policy Information Systems*. Proceedings of the 65th EAAE Seminar, March 29-31, 2000 at Bonn University, Vauk Verlag Kiel, 2001, pp. 237-245.

preparation of the models of farms for types sometimes comprising small numbers of farms it was necessary to limit the impact of such data on the results of the analysis, by eliminating outliers. To this end, non-parameter method was used based on interquartile interval value[44].

Market effects resulting from the implementation of those scenarios were assessed using the CAPRI[45] model. It is a partial equilibrium model for the agricultural sector. The basic assumption in the CAPRI model is to determine the economic equilibrium in the sector. Unlike other sectoral models, supply of agricultural products in the CAPRI model is determined in a similar way as in the optimisation models of farms (supply models), but at a higher level of aggregation (NUTS 2). Observed changes in the supply of agricultural products in individual EU regions are then matched with the forecasted demand in the market module, which takes into account agricultural market regulation instruments, including customs duties, tariff rate quotas (TRQ). Armington's model is used for international trade forecasting.

Anticipated prices (Table 2.7.) ensuring market equilibrium and yields predicted by the CAPRI model were used as parameters in farm optimisation models (Table 2.8.). In view of the fact that the prices in the CAPRI model are reported in nominal terms, in this paper they are presented in relative terms with respect to Baseline_2019 scenario.

CAPRI model results for the analysed scenarios show that the imposition of additional requirements in the form of CAP "greening", or a reduction in the level of support causes an increase in market prices for basic agricultural products. The strongest price increase in the CAPRI model concerns cereals (ca. 2%). This is due to the high share of cereals in crop structure, which on average accounts for 70% of arable land in Poland. However, their share can be up to 100% of arable land on many farms with a simplified structure of crop production. The requirement to diversify crop structure forces some farmers to reduce the area of cereals. It results in lower yields and, consequently, higher prices of cereals.

Changing prices generally force farmers to adjust the level of intensity of production. The CAPRI model results confirm that growing prices will result in an increase in the intensity of production observed as an increase in yields (Table 2.8.).

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[44] Czekaj S., Majewski E., Wąs A., *Oszacowanie skutków „zazielenienia" Wspólnej Polityki Rolnej UE w Polsce w perspektywie 2014 roku na przykładzie zbiorowości gospodarstw FADN* [in:] *Dopłaty bezpośrednie i dotacje budżetowe a finanse oraz funkcjonowanie gospodarstw i przedsiębiorstw rolniczych*, ed. J. Kulawik, IERiGŻ-PIB, Warsaw 2012.

[45] Britz W., Witzke P., CAPRI model documentation http://www.capri-model.org/docs/capri_documentation.pdf, 2012.

Table 2.7. Changes in the prices of basic agricultural products and inputs according to the CAPRI model under different "greening" scenarios [nominal prices]

Products	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
Oilseed 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 on the basis of the results of the CAPRI model.

Table 2.8. Yields changes according to the CAPRI model in CAP "greening" 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
Corn (grain)	100.17	100.66
Other cereals	100.09	100.54
Oilseed rape	100.08	100.41
Legumes	100.00	98.77
Potatoes	100.00	100.09
Sugar beet	100.00	100.08
Maize	100.19	100.75
Fodder beets	100.00	100.19
Intensive cow-rearing	100.00	100.00
Extensive cow-rearing	100.00	100.00

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

In addition to increased intensity resulting from the increased prices, exclusion of some land associated with the requirement to mark out EFA can lead to a small improvement in the average quality of soils used for commercial activities due to a likely exclusion from cultivation of the poorest-quality soils. In the case of No_Green_2019, a slight increase in yields can be also anticipated due to likely intensification of production on farms with a reduced support.

2.3.6. Diversification of the structure of crops

In order to verify the requirement of crop diversification in each type of farm Shannon-Weiner's index was used, which was developed in 1948[46] and is one of the most widely used indices of biodiversity. It usually achieves values in the range of 1.5-3.5, sometimes exceeding the value of 4.5. It is calculated according to the following formula:

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

where, if applied to evaluate biodiversity of crop structure:

N - total area of arable land

n_i *– area of i-th crop*

This index was calculated for each farm from FADN sample under the baseline scenario. Next, the obtained values of the index were averaged for selected types of farms. As a result, for each group initial (observed) level of Shannon index was obtained.

Then in each of the farms, where it was required, necessary modifications were introduced in the structure of crops in order to adapt it to the criterion of diversification. Modified index values (target level) were averaged in the same way as for the baseline situation. In optimisation models for the Green_2019 scenario, for the types which do not comply with the requirement of diversification, additional constraints were introduced that enforce achievement of the Shannon index value at a level not lower than the level of the target value.

2.4. Results

The results presented are average values for farm types modelled. It should be noted that in the process of aggregation, the results obtained for the various types of farms were averaged. At a higher level of detail more signifi-

[46] Shannon, C. E., *A mathematical theory of communication. The Bell System Technical Journal*, 27, 1948, pp. 379-423 and pp. 623-656.

cant differences between model types can be seen, but they may not be presented in detail due to the multiplicity of types and limitations imposed by the FADN in terms of publishing data for samples of less than 15 farms.

It should be also pointed out that the results presented in the tables were obtained on the basis of the FADN database and show changes in the agricultural income, which may take place in case of scenarios considered for farms of the FADN population. Because of the exclusion of farms with an area of less than 10 ha, it can be assumed that small non-commercial farms outside the field of FADN observation (< 2 ESU or EUR 4 thousand of SO) will be exempt from the obligation to conform to the new requirements of the CAP. This means that the average changes in economic performance as a result of the CAP reform in the sector of Polish agricultural farms will, in fact, be a somewhat lower than those presented. The precise scale of the phenomenon of changes would require determining the initial income level in small farms outside the field of FADN observation.

However, given that the farms in the field of FADN observation represent 90% of the production value and 87% of the cultivated land, it can be assumed that results reported below well reflect the direction and scale of changes in the most important, from the point of view of agricultural policy, group of farms.

Table 2.9. shows the results of the model solutions in the option assuming changes in price and productivity determined on the basis of the CAPRI model for 2019. It illustrates the relative changes of agricultural income on farms divided according to geographical criterion, production type and the degree of adaptation to the requirements of CAP "greening".

The results of model solutions point to small impact of incorporating the "greening" mechanism to the system of direct payments. Price increase forecast in the CAPRI model compensates for the costs incurred for CAP "greening". The results of the models show, however, some variation in each group of farms. The farms losing because of the introduction of the "greening" requirements are farms from Mazovia and Podlasie regions, farms covering "other" types of production, and to a small extent also cattle and mixed farms and farms exempt from the "greening" requirement and not meeting the requirements of diversification. Other farm groups benefit slightly.

Table 2.9. Changes of agricultural income in individual scenarios by regions, production types and degree of adaptation to the "greening" requirements assuming prices and productivity developed on the basis of the results of the model

Agricultural income Baseline_2019 = 100	**Prices in CAPRI 2019**	
	Green_2019	**No_Green_2019**
Broken down into FADN regions		
Poland	100.4	97.2
Pomerania and Mazury Region (785)	100.9	95.6
Wielkopolska and Silesia Region (790)	101.0	96.8
Mazovia and Podlasie Region (795)	99.7	97.8
Małopolska and Pogórze Region (800)	100.0	98.0
Broken down by types of farms		
Crops	102.0	95.3
Cattle	99.9	97.2
Pigs	100.6	97.2
Mixed	99.9	97.7
Other	99.2	100.7
Broken down by degree of adaptation		
Exempted	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 diversification and EFA	100.4	97.1

Source: Own compilation.

In all cases, the mechanism behind the deterioration of financial performance seems to be similar. Assumed reduction of areas under cultivation for EFA in accordance with the results of the CAPRI model translates into an increase in the prices of basic agricultural products. The projected increase in prices, to a greater extent, affects the income of large farms, intensively organised, having the greatest contact with the market. This mainly concerns intensive crop farms benefiting from an increase in cereals prices and pig farms on which feed price increases are more than offset by higher prices of pig meat. A small increase in milk prices hardly compensates for the costs of "greening" on cattle and mixed farms. In the case of farms of other types, although the vast majority

of them has been adapted, the need to limit the area of profitable horticultural crops causes an average fall in income.

Reducing the level of incomes on farms not meeting the criterion of diversification (only) is caused not so much by the severity of that requirement, but rather by the characteristics of the farms that were in this group. Due to linking the requirements of "greening" with the area of arable land, this group eventually includes farms with more than 10 ha of arable land, but not exceeding 15 ha. The small scale of production does not give such farms the possibility of benefiting from of situations created by increases in prices. Larger farms that additionally are obliged to mark out EFA were qualified to the other two groups of farms ("Lack of EFA", "Lack of diversification and EFA").

A separate explanation is required for a relatively large decline in incomes on farms exempted from the "greening" requirements. These are often smaller farms and extensively organised (with a small area of arable land). In this type of units, the cause of a reduction in income is the planned reduction in the level of payments in respect of agri-environmental programmes by 50% due to the inclusion of some of the previously conducted activities into "greening" practices. Losses arising from the reduction of payments, which were used by a significant part of farms exempted so far, cannot be compensated for by an increase in prices, due to the relatively small volume of production.

In the case of No_Green_2019 scenario assuming no changes on farms not adapted to meet the requirements of "greening", the economic result of the sector of agricultural farms decreases by less than 3%. A small increase in agricultural income can be expected on farms that are exempted and "green", which follows from the assumptions made. Those farms receive direct payments and agri-environment payments at the level of the Baseline scenario (no sanctions for non-compliance), and also benefit from higher prices for agricultural products. The results of models for No_Green 2019 indicate a relatively large decline in incomes in crop and pig farms. This is due to the relatively large share of units non-complying with the "greening" requirements. Due to the relatively high degree of specialisation and above average area, income drop mainly affects farms in the regions of Wielkopolska and Silesia, Pomerania and Mazury. In general, it can be concluded that the scenario assuming non-compliance with the "greening" requirements is not advantageous, from an economic point of view, for Polish farms.

In the second option of calculations based on keeping the price levels and yields from the base year (2011) in scenarios for 2019, the negative impact of the CAP reform on the income of farms in FADN population can be noticed (Table 2.10.).

Table 2.10. Changes of agricultural income in individual scenarios based on region, production type and degree of adaptation to the "greening" requirements assuming fixed prices and yields at the level of the year 2011

Agricultural income Baseline_2019 = 100	**Fixed prices 2011**	
	Green_2019	**No_Green_2019**
Poland	95.7	93.5
Pomerania and Mazury Region (785)	95.7	91.6
Wielkopolska and Silesia Region (790)	97.0	92.6
Mazovia and Podlasie Region (795)	94.8	94.8
Małopolska and Pogórze Region (800)	95.2	94.4
Broken down by types of farms		
Crops	96.0	87.9
Cattle	96.5	95.3
Pigs	98.5	94.5
Mixed	95.2	94.9
Other	91.6	97.5
Broken down by degree of adaptation		
Exempted	91.0	100.0
Green	95.5	100.0
Lack of diversification	95.9	88.8
Lack of EFA	97.8	88.1
Lack of diversification and EFA	98.0	93.6

Source: Own compilation.

As for all types of farms, regardless of the level of non-compliance, under the Green_2019 scenario a decrease in income can be observed. The maximum decrease in income for the farm groups concerned does not exceed 9% of agricultural income and concerns farms exempted from the implementation of the "greening" requirement. As in the previous option, the decrease in income on intensive farms is due to the introduced constraints, especially resulting from excluding parts of land, and on extensive farms due to assumed reduction of agri-environmental payments. Adoption of the unchanged level of prices and yields does not give a chance to compensate for obstacles by increasing the intensity of production.

In No_Green_2019 scenario, the projected decline of agricultural income is more significant and in extreme cases reaches 12%. However, it should be

pointed out that it concerns only a total of 23% of farms in the FADN population (see Table 2.4.).

The results of the modelling show that the No_Green_2019 scenario, from the point of view of economic performance, is neutral to the farms deemed to be adapted to or exempted from the implementation of the new requirements. As a result, assuming unchanged price levels and unit performance for 2019, the decrease in income due to CAP "greening" in the population of Polish farms included in the FADN was at the level of 4.3%.

As in the option based on the results of the CAPRI model, failure to take action to adapt to the new requirements by the Polish farmers, is not an economically attractive alternative on a national scale.

At the same time, it should be pointed out that in relation to the entire farm sector in Poland, average fall in income will be somewhat lower than presented in this study, since the FADN sample does not represent the smallest farms, exempt from having to implement the requirements of the "new greening".

As in the case of assumptions based on the results of the CAPRI model in the option based on a fixed price level, No_Green_2019 scenario may be relatively favourable to farms exempt from "greening", adapted to the new requirements and farms of the "other" type.

In Green_2019 scenario farms adapted to and exempted from the obligation to adjust may lose some part of the support in respect of participation in agri-environmental programmes due to shifting the "greening" component to the set of compulsory practices. However, we can assume that at least part of the farmers from such farms will take more ambitious agri-environment activities in order to maintain the current level of payments. This will partly compensate the anticipated decline in income, which was not included in the presented results.

For "other" farms abandonment of adjustments to the requirements means that there is no need to set aside 5% of the land, resulting in a slightly smaller drop in income than in the case of the implementation of "greening". The presumption is that in the group of intensively organised farms some cases of abandonment of the "greening" component can be economically justified. At the same time, it can be assumed that it is possible for farmers to take up various forms of mutual cooperation with a view to formal adjustment of the farms by concluding, for example, properly formulated leases.

2.5. Conclusions

The initial proposal for the CAP reform submitted by the European Commission in 2011gave raise to numerous controversies. Doubts concerned espe-

cially the requirement to exclude 7% of arable land for Ecological Focus Areas, which could result in a real reduction in the EU production of agricultural raw materials, and thus interfere with one of the fundamental objectives of the CAP, which is to ensure food security. In some analyses it was underlined that the probable drop in farmers' incomes and the increase in costs associated with the more complicated payment scheme were also contrary to the priorities of the CAP.

In the course of the legislative process, although the justification for introducing CAP modifications has remained virtually unchanged, the requirements formulated in relation to farmers have been gradually mitigated.

As a result, as confirmed in the study, the current version of the CAP "greening" has a small impact on the economic results achieved by Polish farms. Restrictions arising from implementation of the mechanism of greening will be focused on a relatively small group of the largest farms, mostly pig and crop farms, with an area of over 30 hectares of arable land, located mainly in Northern and Western Poland. However, despite the need to implement the adjustments resulting from "greening", a significant reduction in agricultural income in the Polish sector of farms should not be expected.

In the optimistic scenario, the projected price increase when using the CAPRI model, due to the limited supply of agricultural products in Europe as a result of "greening", compensates for the costs arising from the additional requirements imposed on the Polish farms. In the worst-case scenario average income drop on the Polish farms should not be greater than 4%.

In both options a much less favourable solution for farms currently not satisfying the conditions posed by the reform of the CAP would be to give up the implementation of the "greening "component and thus resign from some payments. The adoption of such a scenario, to a much greater extent causes a reduction in the level of agricultural income, than restrictions requiring the introduction of relevant adaptations.

Regardless of the targeted price level extensive farms can be particularly vulnerable to deterioration in economic performance, as they are largely involved in the implementation of the existing agri-environmental programmes. Due to shifting of the "greening" component from the agri-environmental programmes to mandatory practices they may lose a part of the payments.

Reduction in agricultural income due to the CAP "greening" can also affect small farms, extensively organised and formerly benefiting from agri-environmental programmes. However, given their scale of production and initial economic results, reduction in agricultural income per farm by a few hundred

PLN a year can be considered to be insignificant from the point of view of the agricultural sector.

The initial assumptions of the European Commission in terms of the effects of the introduced CAP[47] reform were very ambitious. Now, after the announcement of its final shape, there is a widespread belief that CAP "greening" has a purely propaganda dimension and serves to legitimize financial support for farmers in the European Union. Economic impact of the introduction of the reform discussed in this study points to the small, almost negligible effect from the point of view of farms, with a likely increase in expenditure on the implementation and control of the new system. Environmental effects of CAP "greening" are also very controversial as indicated by the work of other authors [48,49].

In summary, it can be concluded that farms in Poland in their majority, meet the "greening" requirements or are exempt from them. Possible changes on the non-adapted farms should not be associated with large inputs. Hence, it can be assumed that the implementation of CAP "greening" will not result in a significant decline in economic performance on the Polish farms.

[47] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2010) 672, Brussels, 18.11.2010.
[48] Hart K., Little J., *Environmental approach of the CAP legislative proposal*, PAGRI 1/2012.
[49] Matthews A., *Greening CAP Payments, A Missed Opportunity?* The Institute of International and European Affairs, Dublin, Ireland 2013.

3. Projected effects of the new CAP legislative solutions for the large-scale commercial enterprises

3.1. Theoretical aspects

Adoption of the Regulations defining the shape of the Common Agricultural Policy for 2014-2020 on 20 November 2013 by the European Parliament[50,51] ends the formal legislative process at the EU level. Legal solutions designed determine, *inter alia*, the level of financial support to agriculture in the various Member States, the conditions for granting public aid and the manner of organisation of the outlet markets for selected agri-food products. Thus enacted legal provisions will create a formal and financial and legal framework for European agriculture in the coming years.

The aim of the study was to determine the potential effects of changes in the reformed CAP for 2014-2020 for the group of the largest farms in Poland. Entities that make up this group are referred to as large-scale commercial enterprises – large-scale farms.

From the point of view of maximizing the stream of support for Polish agriculture in the new financial perspective, an important issue was the amount of the national envelope determined for our agriculture for funding activities under the European Agricultural Guarantee Fund (EAGF) – 1st pillar of the CAP, and under the European Agricultural Fund for Rural Development (EAFRD) – 2nd pillar of the CAP. In 2014-2020, Poland is expected to receive the total amount of EUR 21,148 million, primarily to finance direct payments and expenses associated with the regulation of agricultural markets and for the rural development the amount of EUR 95,328 million is earmarked (in prices from 2011).

An important criterion in determining the level of support for particular groups of farms and the efficiency of the use of EU funds will however be the destination of the funds and their allocation.

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[50] European Parliament legislative resolution of 20 November 2013 *on the proposal for a regulation of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy* (COM(2011)0625 – C7-0336/2011 – COM(2012)0552 – C7-0311/2012 – 2011/0280(COD)), P7_TA-PROV(2013)0493, www.europarl.europa.eu (accessed: 02.12.2013).

[51] European Parliament legislative resolution of 20 November 2013 *on the proposal for a regulation of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)* (COM(2011)0627 – C7-0340/2011 – COM(2012)0553 – C7-0313/2012 – 2011/0282(COD)), P7_TA-PROV(2013)0491, www.europarl.europa.eu (accessed 02.12.2013).

In the new financial perspective, Member States have the flexibility to target the spending of the EU funds because of the possibility to shift amounts between the pillars of the CAP. The amounts allocated to Poland, under the national envelopes financed by the EAGF or the EAFRD, do not set the final levels of direct payments and the level of support for rural development. The flexibility provided for in Article 14 of the European Parliament legislative resolution on *Direct payments to farmers* allows each Member State to shift 15% of funds between the two pillars of the CAP, so depending on the decision of the country, support for structural actions can be increased at the expense of direct support and vice versa. In the case of Poland, it possible to shift up to 25% of the funds from the second pillar of the CAP to increase the amount for direct payments (1st pillar of the CAP). The final amount of the rates of direct payments that are a fundamental instrument in support of agriculture can be varied depending on the political decisions taken at the MS level.

In Poland, in the case of allocating all resources from the national envelope financed under the EAGF to direct payments, the rate of support will be EUR 207 in 2015 and will be increased to EUR 212 in 2019-2020 (Table 3.1.). Thus the rates would be lower throughout the programming period, compared to 2013, when the rate stood at EUR 215 per 1 hectare.

Table 3.1. Predicted rate of direct payments (EUR per ha agricultural land)[a] in 2015-2020 (current prices)

Source of funding	Years					
	2015	2016	2017	2018	2019	2020
CAP 1st pillar[b]	207	208	209	211	212	212
CAP 1st pillar after shifting 15% of funds to CAP 2nd pillar[c]	176	177	178	179	180	180
1st pillar of the CAP and shifting 25% of funds from 2nd pillar of the CAP[d]	235	236	237	238	240	240
A complementary payment from the national budget[e]	31	29	27	24	22	20

[a] The basis for determining rates was the area of land entitled to a single area payment in 2011, i.e. 14,151 thousand ha; [b] the rate calculated takes into account the allocation of 2% of the national envelope for additional direct support for young farmers; [c] option takes into account the effects of the decision to shift 15% of funds from 1st pillar of the CAP (direct payments) to the 2nd of the CAP (rural development); [d] option takes into account an acceptable shift of 25% funds from 2nd to 1st pillar of the CAP; [e] complementary payment for selected groups of plants continued under the principles from before 2013 with the maximum permitted support from the national budget (estimated eligible area 11,795 thousand ha - area from 2011).
Source: Own compilation.

The decision to increase the 2nd pillar of the CAP (rural development) by shifting funds (at the full acceptable limit) from the national envelope envisaged for the 1st pillar of the CAP to direct payments would result in a reduction in payment rates for 2015-2020. This would mean their reduction by ca. 18% in 2015 compared to 2013, to 16.5% in 2019 and 2020. A significant increase in the rates of direct payments in relation to 2013 should only be expected in the case of a decision to allocate 25% of the appropriations for Poland under EAFRD to increase CAP 1st pillar funds. Only in this option the rate of direct payments will be higher in the whole programming period, by an average of 10% compared to 2013.

In accordance with Article 28 of the European Parliament legislative resolution on *Direct payments to farmers* Member States applying SAPS will be also able to continue public aid until 2020 from the national budget for the sectors currently supported within the framework of the complementary payments (basic crops, i.e. such as cereals, oilseeds, protein-bearing crops, feed crops and livestock payment for permanent grassland, hops, tobacco, starch). If there is a decision to continue this form of assistance and the amount is equally divided according to the area criterion, additional support from the national resources will start from EUR 31 per 1 ha in 2015 and will gradually decrease to EUR 20 per 1 ha in 2020 (Table 3.1.).

In the new programming period the support for sugar beet growers will disappear in its form decoupled from production, i.e. existing sugar payments. This type of support will be possible to be applied only in 2014 on the basis of the transitional provisions. However, the new regulations allow the possibility of voluntary coupled support in certain sectors and fields of activity, including sugar beet. This type of support is possible only on condition that this is due to a difficult situation and is of particular importance for economic, social or environmental reasons. The amount committed for this purpose would be funded from the national envelope financed by the EAGF, and a consequence it would result in a reduction in the rate of direct payments for all other farms[52]. In the case of maintaining support for cultivation of sugar beet on the current level, for this purpose Poland would need to earmark EUR 159,392 million per year. As a result, the rates of direct payments would be reduced by ca. EUR 11.

The political declarations of the Minister of Agriculture and Rural Development give reason to expect a scenario assuming a shift of 25% of the funds from the rural development fund for financing CAP 1st pillar and, thus, an increase in the amount of direct payment rates[53]. There is, however, no declaration

[52] Article 38-41 of the European Parliament legislative resolution of 20 November 2013 *on the proposal for... establishing rules for direct payments to farmers.*

[53] A. Osiecki, *Będzie więcej pieniędzy na rozwój polskiej wsi*, interview with the Minister of Agriculture and Rural Development, *Rzeczpospolita* dated 5.12.2013.

as to the intention of allocating funds from national budget for direct payments and using complementary payments. In the context of a difficulty in keeping a tight rein on the national budget deficit and growing public sector debt, this will be difficult to implement.

From the point of view of maximising the level of the stream of budget support, the increase in direct payments, even at the expense of funds allocated for rural development, will be the preferred solution for large-scale farms. This is due to the direction of works carried out in Poland on the Rural Development Programme for 2014-2020, which assumes concentration of public aid for small and medium-sized farms and the practical exclusion of large-scale farms from the support[54].

An important decision for the functioning of the Polish system of support for farms is the possible application of the Single Area Payment Scheme (SAPS) until the end of 2020[55]. The decision in this case has serious implications because of the form of granting direct payments and the set of potential beneficiaries. An important aspect is the impact of the system of granting direct payments on the cost of the factors of production, especially land. The SAPS system is one of the growth drivers for agricultural land prices and affects the rate of lease in Poland. The continuation of this system will have an impact on the financial situation of large-scale farmers that are not owners of the land used (tenants) or plan to enlarge their production capacity through the acquisition of land[56].

The amount of direct support that would be available to the different groups of enterprises assuming different options of the amounts of public aid was estimated on the basis of the parameters from the identified group of large-scale farms from 2012. Next, these amounts were referred to aid actually received for individual enterprises in 2012 (Table 3.2.). The amount of the subsidy received includes the funds obtained in the form of a single direct payment, complementary direct payments and sugar payments. On the basis of the results obtained, it can be concluded that the differences in the estimated amount of direct payments between different groups of large-scale commercial enterprises are small within the given option.

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[54] Minister of Agriculture and Rural Development, *Draft Rural Development Programme for 2014 – 2020 (RDP 2014-2020)*, 26 July 2013, http://www.minrol.gov.pl/pol/Wsparcie-rolnictwa-i-rybolowstwa/PROW-2014-2020, (accessed 25.11.2013).

[55] Article 28(c) of the European Parliament legislative resolution of 20 November 2013 *on the proposal for ... establishing rules for direct payments to farmers*.

[56] A. Kagan, *Stan i perspektywy wielkotowarowych przedsiębiorstw rolnych w Polsce*, IERiGŻ-PIB, Warsaw 2013.

Table 3.2. Predicting of the amount of direct payments in 2015 in relation to 2012

Amount of support		Group of large-scale commercial enterprises			
		Agricultural Property Agency companies	Agricultural cooperatives	other[a]	total
obtained in 2012 (in thousand EUR)		574	123	214	234
Payments envisaged in 2015 without special payments to sugar beet (EUR thousand)	option I	475	106	188	200
	option II	404	90	159	170
	option III	539	120	213	228
	option IV	610	136	241	258
	option V	678	148	267	285
Projected in 2015 in relation to 2012 (%)	option I	82.8	85.9	87.6	85.5
	option II	70.4	73.1	74.5	72.7
	option III	94.0	97.6	99.5	97.1
	option IV	106.3	110.4	112.6	109.9
	option V	118.1	120.2	124.8	121.6
Payments envisaged in 2015 including special payments to sugar beet (EUR thousand) [a]	option I	557	117	210	223
	option II	486	102	182	194
	option III	621	132	236	250
	option IV	692	148	264	280
	option V	760	160	290	306
Projected in 2015 in relation to 2012 (%) after consideration of special payment to sugar beet	option I	97.1	95.2	98.2	95.3
	option II	84.7	82.3	85.1	82.7
	option III	108.3	106.8	110.0	106.7
	option IV	120.7	119.6	123.2	119.3
	option V	132.5	129.4	135.4	130.7

Option I - rate of payment when allocating all funds from CAP 1st pillar to direct payments (EUR 207 per 1 ha), Option II - payment rate when shifting 15% from the 1st pillar to 2nd pillar of the CAP (EUR 176 per 1 ha), Option III - payment rate when shifting 25% from CAP 2nd to 1st pillar (EUR 235 per 1 ha), Option IV - payment rates when allocating all funds from CAP 1st pillar for direct payments (EUR 207 per 1 ha) and with additional payments from the national budget (EUR 31 per 1 ha of selected crops), Option V - payment rate when shifting 25% of funds from CAP 2nd to 1st pillar (EUR 235 per 1 ha) and with additional complementary payment from the national budget (EUR 31 per 1 ha of selected crops).

[a] the amount of support includes support for cultivation of sugar beets at sugar payment levels achieved in 2012. Payment rates were accepted (with the exception of the complementary payment) which were lower by EUR 11 due to the reduction in the national envelope for the sugar payment.

Source: Own compilation on the basis of Kulawik et al. in 2013[57].

[57] J. Kulawik et al., *Ranking 300 najlepszych przedsiębiorstw rolnych w 2012 roku*, IERiGŻ-PIB, Warsaw 2013.

The area of the farm, its legal form, production technology can to a small extent affect the amount of calculated amounts of direct budget support for agricultural enterprises. But the adopted payment option will have a much greater impact. This is a natural consequence of the different rates of support. It should be noted that in options I, II and III the calculated payments without the special payments to sugar beet would be lower than the payments received in 2012. The smallest differences occurred in option III, assuming the transfer of 25% of funds from financing rural development to increasing direct payments. However, only launching national budget funds for complementary payments will allow to achieve a support level which will be significantly higher than in 2012.

From the point of view of maximising of the amount of budget support in the case of the analysed group, it would be preferred to have special payment to the cultivation of sugar beet. The amounts envisaged for it more than compensate for the lower stream of funds caused by lower rate per 1 ha (by EUR 11) of basic direct payment. In such a situation, the predicted amounts would be nearly by 7% higher in the analysed population than in 2012 already under option III (shifting of 25% of funds from CAP 2nd to 1st pillar). Additional complementary support from the national budget would have resulted in a significant increase in the expected payment amounts compared to the reference period. The support to growers of sugar beet in the form of special payments may be of particular importance in view of the envisaged ending of the quotas for sugar from 1 October 2017, which so far have been the tool for ensuring stability for the area of cultivation of this plant in the country.

Regardless of the option, obtaining the above amounts of direct payments in the new financial perspective will depend on meeting the "greening" requirements, which in accordance with Article 29(1a) of the European Parliament legislative resolution on *Direct payments to farmers*" consist in:

- crop diversification – having a differentiated structure of crops;
- maintaining on the area of the agricultural land the Ecological Focus Area – facilities fulfilling a compensatory role for the environment;
- maintaining the existing area of permanent grassland[58].

In the framework of direct payments, 30% of the national amount from EAGF funds (EUR 896 million in 2015) is appropriated for payments as compensation for the above practices. In the simulations carried out, the funds allocated to finance "greening" per 1 ha amount to: EUR 63 in 2015, EUR 64 in 2016-2018, to EUR 65 in the 2019-2020 period. The survey conducted on the sample of large-scale

[58] Article 29 (1a) of the European Parliament legislative resolution of 20 November 2013 *on the proposal for ... establishing rules for direct payments to farmers.*

commercial enterprises demonstrates, however, that the farms are not willing to give up this amount of support and will strive to meet the new requirements[59].

In accordance with Article 30 of the European Parliament legislative resolution on *Direct payments to farmers* crop diversification means that all farms above 30 ha of arable land will have the obligation to keep a minimum of 3 different crops in rotation. The maximum cultivation area of any one of them should not exceed 75% of the area of arable land, and the two main crops should not occupy more than 95% of the area under cultivation.

The definition of the term "crop"[60] contained in the Article 30(1b) is very liberal as compared to the original proposal and the proposal for a Regulation. Under the "greening" concept it means growing any of the different genera that are defined in the botanical classification of crops as well as fallow land and grass and other green forage plants. Winter and spring varieties belonging to the same genus are treated as separate crops. This means in practice that all large-scale farms will not have a big problem with meeting this requirement.

The condition of keeping an EFA on arable land will be met if in accordance with Article 32 of the European Parliament legislative resolution on *Direct payments to farmers* at least 5% of the arable land is intended for compensating areas for the environment. However, the individual countries may decide that a long list of potential lines of land use such as single trees in the field, shelterbelts etc., may be considered as the Ecological Focus Area, which greatly eases the above obligation.

It should be noted that a substantial part of the farms surveyed have marginal land (cultivated only for area payments), whose exclusion from production will not have a significant impact on agricultural activity. If Poland adopts a complete list of areas that can be considered as EFA, this requirement will not constitute a serious constraint on the population analysed.

The case with the obligation to maintain permanent grassland will be similar due to declaratory nature of the definition of this crop.

Public aid granted to large-scale farms in the form of direct payments in the new financial perspective may be limited as a result of the operation of a mechanism known as "capping". Article 11(1) [61] provides for a reduction in di-

[59] A. Kagan, *Stan i perspektywy* ..., Warsaw 2013.

[60] J. Kulawik (ed.), *Dopłaty bezpośrednie i dotacje budżetowe a finanse oraz funkcjonowanie gospodarstw i przedsiębiorstw rolniczych*, IERiGŻ-PIB, Raport Programu Wieloletniego 2011-2014, Issue 20, Warsaw 2011.

[61] European Parliament legislative resolution of 20 November 2013 *on the proposal for... establishing rules for direct payments to farmers*.

rect payments to beneficiaries who receive direct support amounting to over EUR 150 thousand per year. Its implications were, however, much alleviated in relation to the draft Regulation presented by the European Commission, involving progressive reduction in support and its maximum limit at EUR 300 thousand for one entity. Ultimately, the reduction is to be 5% of the amount by which the limit of EUR 150,000 per year has been exceeded.

The introduction of a solution reducing the amount of direct payments made in the case of the group of the largest farms will have different consequences depending on the option and the amount of rates and the final shape of the mechanism for determining reductions. The payment reduction mechanism now excludes compensation based on "greening", i.e. this part of payment funded in 30% from the funds obtained under the national envelope of the EAGF allocated to Poland for 2015-2020 (Article $33(2^{12})$).

The effects of payment reduction mechanism for the largest beneficiaries may be substantially alleviated by subtracting from the calculation base (for reduction of direct payments) the wages of farm workers actually paid and declared in the year preceding payment of the subsidy. The remuneration will also include work-related taxes and social security contributions. According to the Article 11(2) of European Parliament legislative resolution on *Direct payments to farmers* decisions in this matter are at the discretion of each Member State.

3.2. Summary and conclusions

The EU budget planned for 2014-2020 has a follow-up character and provides for significant resources for implementation of objectives of the Common Agricultural Policy. Thus in the new financial perspective there will not be any essential cuts in spending for the European agriculture, which was requested, *inter alia*, by the United Kingdom. Poland may benefit from the large amounts reserved for the country to support the development of rural areas, but mainly the amounts from the European Agricultural Guarantee Fund – especially for direct payments. However, the final amount of public aid and the allocation of funds will largely dependent on political decisions taken in the country. This is the result of a large freedom in shaping the financing of individual pillars of the CAP, which the Member States have according to the new EU rules, and the possibility to supplement aid to agriculture from national funds.

An important criterion in determining the level of support for particular groups of agricultural farms and the efficiency of the EU funds will, however, be the ultimate destination of the funds and their allocation. From the point of view of maximising the budget support for large-scale commercial enterprises, the most favourable scenario would be to shift 25% of funds provided for the 2nd

pillar of the CAP to increase direct payments. In this scenario, the estimated rate of base payments would be higher than in 2013. However, only earmarking funds from the national budget to complementary payments will enable large-scale commercial enterprises to obtain a higher amount of aid in 2015 than direct support actually received in 2012. In fact, the EU support alone, even when increased by shifting funds from rural development to direct payments, will not allow the examined farms to get the direct support at a level higher than in 2012. This is due to the significant share of sugar aid in the structure of budgetary subsidies in the reference year.

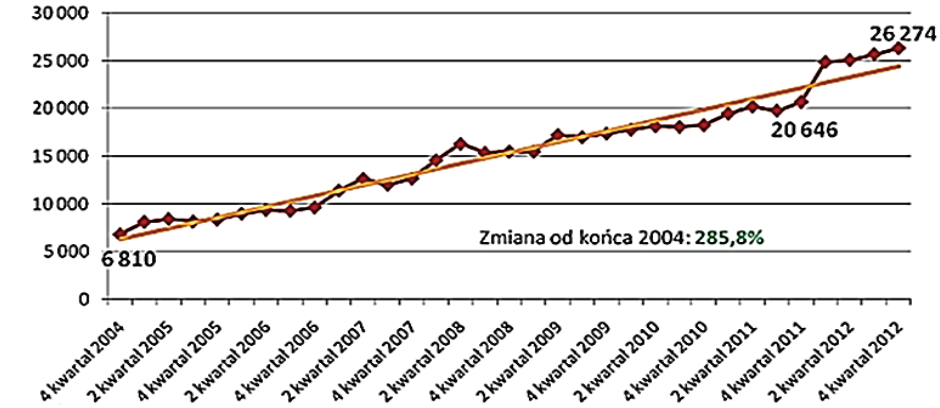
Increase in the EU funds in the analysed population would result in the introduction of payments to sugar beet as special coupled payments in certain sectors and fields of activity. Reallocation of resources and allocating under the national envelope of the EAGF a part of the amount for special payment to sugar beet would decrease the rate of support. Owing to the payments to sugar beet large-scale farms will, however, receive a higher level of support in 2015, already at the maximum acceptable financing of budgetary subsidies from EU funds. In this option the national support only increases the benefits for the analysed population, and is not subject to a higher support as compared to 2012. This requires not only political agreement in the country, but also the recognition by the European Commission of the Polish sugar beet sector as a sector in difficulty.

The final conditions that the farms will need to meet to get a part of direct payments under the so-called "greening", in relation to those originally presented in the proposal for EU regulation, have been greatly eased. In practice, it will be fairly easy for the large-scale commercial to fulfil both the requirement to diversify crops, as well as to maintain the permanent grassland. In the case of a request of Poland's government for the recognition of the majority of equivalents for EFA proposed by the EU, the requirement to maintain EFA will not be a burden for the sampled population of farms.

In the legislative solutions adopted, the instrument for restricting support for the largest beneficiaries of direct payments, i.e. "capping" was considerably eased. Poland now also has a significant impact on the severity of this mechanism as regards national beneficiaries. When labour costs are recognised as expenditure lowering the basis for calculation of support reduction, there will be virtually no farms with a reduction in payments. Only in some farms with a special organisation of production, i.e. performing basic activities in the form of ordered services, payments will be reduced. But, the scale of the decrease will be small and only apply to a situation in which the maximum level of EU funds is allocated for direct payments and there is an additional payment from national funds.

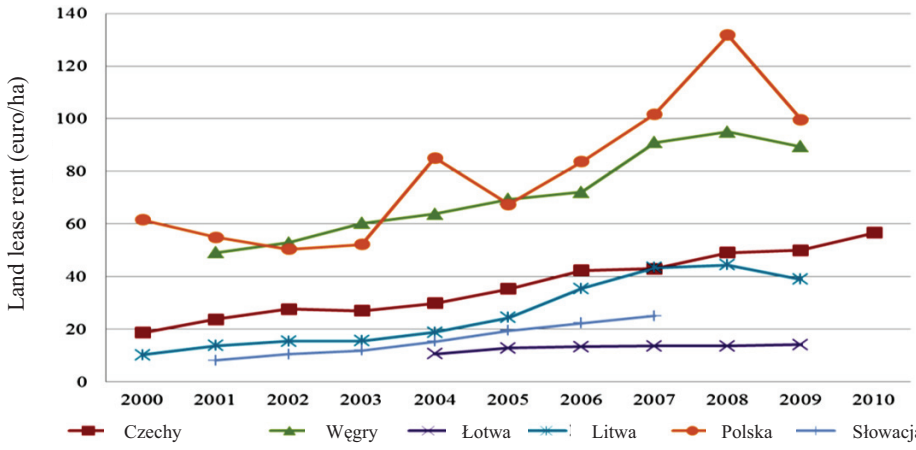
4. Capitalisation of financial support to agriculture

The work contains the concept of capitalisation of financial support understood as a process of impact of the instruments of the Common Agricultural Policy on the price level of agricultural land and the payments for the lease of land. The impact was manifested by a gradual increase in their size (Graphs 4.1.-4.2.). But there are many reasons to believe that, in the future, agricultural land prices and lease rates will continue to grow.



Graph 4.1. Prices of arable land in private trade PLN per ha
Changes until 2004: 285.8%, 4 kwartał – Quarter 4, 2 kwartał – Quarter 2

Source: B. Turek, Ceny gruntów rolnych rosną od 8 lat, eGospodarka.pl,15.02.2013.



Graph 4.2. Land lease rent changes in selected countries (EUR/ha)
Czechy (the Czech Republic), Węgry (Hungary), Łotwa (Latvia), Litwa (Lithuania), Polska (Poland), Słowacja (Slovakia)

Source: as above.

When analysing agricultural property market, the factors shaping the demand should be kept in mind. One of them is the economic environment of this market, which has significantly changed after Poland's accession to the European Union. Demand for agricultural land increased as well as interest in its lease. It can be assumed that with the increase in the prices of land and their reduced supply in Poland, the importance of lease will grow. Demand for the lease of agricultural land is further stimulated by the possibility of using subsidies by tenants. Apart from the EU support, Polish agriculture may also benefit from national aid schemes approved by the European Commission. In Polish conditions there is agricultural expenditure together with subsidies for Agricultural Social Insurance Fund (KRUS). Expenditure on KRUS means payments to Pension Fund Scheme and is associated with the expenditure on agriculture, but they are social in nature.

The line of thinking and analysis should not be restricted only to the impact of CAP instruments on Polish agriculture, because in the last 20 years the situation in the Polish agricultural sector was influenced first and foremost by three important factors: (1) the improvement of economic situation in agriculture, (2) the EU accession and subsidies under the Common Agricultural Policy (Table 4.1.), (3) the improved efficiency of production and operation of farms (as a result of the formal and legal requirements on the part of the Union and the social changes taking place at the same time in Polish villages).

The changes that have occurred during this period in Polish agriculture can be classified as follows: (a) change in the structure of farms, (b) specialisation, (c) modernisation, (d) deepening regional disparities.

Table 4.1. Financial resources from the EU budget for Poland under the direct payments and rural development for the 2007-2013 period (EUR million, current prices)

Type of support	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2007--2013**
Direct payments	1,264	1,579	1,877	2,192	2,477	2,788	3,045	15,222
Rural development	1,990	1,933	1,971	1,936	1,861	1,857	1,851	13,399
Total payments and RDP	3,253	3,512	3,849	4,128	4,338	4,623	4,896	28,621

Source: Council Regulation (EC) No 1782/2003 and Council Regulation (EC) No 73/2009, "Funds for rural development" – European Commission Decision from 27.04.2010.

Based on research by other authors and own research it would seem that subsidies had a differentiated impact on the functioning of farms, the decision-

making processes of farmers and external environment of agriculture. As can be seen from foreign research, these made it very difficult for new farmers (beginners) to enter the sector and develop activities because of the growing prices of agricultural land, lease rates and credit limits. At the same time, they deterred farmers from small and not very successful farms to leave the sector and they largely affected the further operation of these non-profitable entities. Also, they had a significant impact on the perception of risks by the farmers themselves, as well as their customers. As a result, special offers of loans and lease for agribusiness appeared on the market. In an ambiguous way, the payments have so far determined the efficiency and productivity of farms. The divergence of these results was due, e.g. to the location of the farms (in different regions there were different lines of impact), the period adopted for research, as well as type of support to be taken into account in analyses (different CAP instruments interacted differently with performance indicators and productivity). It was found that the subsidies improved technical infrastructure of work, but it was not a necessary and sufficient condition to increase the efficiency of activities. There is also research indicating the further impact of the subsidies on the structure of production, despite the fact that the introduction of decoupling was supposed to prevent it.

The most important instrument to support agriculture were and still are direct payments. Due to them, agricultural producers were involved in the mechanisms of the financial market system, and then its subsystems: deposit, credit, investment, insurance and transaction systems. Direct payments linked to the area of land affect the increase in the price of land and lease (capitalization of payments). In many EU countries, a large part of the land is cultivated by tenants, and not by its owners. According to OECD estimates, up to 90% of area payments received by tenants may be transferred to owners of agricultural land in the form of increasing land lease rents and land prices.

The impact of subsidies on agricultural production, funds allocation and distribution of income is extensively analysed in the literature of the subject.[62]

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[62] A. Ridier, F. Jacquet, *Decoupling direct payments and the dynamic of decisions under price risk in cattle farms*, „Journal of Agricultural Economics", vol. 53, no. 3, 2002; C. J. Lagerkvist, *Agricultural policy uncertainty and farm level adjustments: The case of direct payments and incentives for farmland investment*, „European Review of Agricultural Economics", vol. 32, no.1, 2005; B. K. Goodwin, A. K. Mishra, *Are 'Decoupled' Farm Payments Really Decoupled? An Empirical Evaluation*, „American Journal of Agricultural Economics", vol. 88, no. 1, 2006; T. Serra, D. Zilberman,
B.K. Goodwin, A. Featherstone, *Effects of decoupling on the mean and variability of output*, „European Review of Agricultural Economics", vol. 33, no. 3, 2006; P. Sckokai, D. Moro, *Modelling the impact of the cap single farm payment on farm investment and output*, „European Review of Agricultural Economics", vol. 36, no. 3, 2009; F. Femenia, A. Gohin, A. Carpentier, *The decoupling of farm programs: revisiting the wealth effect,* http://ajae.oxfordjournals.org, November 5, 2013; J.G.

Literature studies show both positive and negative impacts of the subsidies on the performance of agricultural farms.[63] However, the indisputable fact is that this interaction is omnidirectional (multichannel)[64]. By analysing the scientific work devoted to support capitalization, it should be noted that its effect depends mainly on: the structure of farms, the country and its economic situation, region within the Member State, the way to implement a given policy and line of production.

When it comes to analysis of the methods of assessing the impact of the payments on the functioning and results of agricultural farms, it should be noted that the studies to date are dominated by panel and dynamic models. Panel models may take the form of: FEM – *Fixed Effects Model* or REM – *Random Effects Model*, but the decomposition of random element may only take into account one factor (one-factor models), or two factors simultaneously (two-factor models). Models of FEM and REM can generally be written as follows:

$$y_{it} = m_i + bx_{it} + e_{it},$$

where:

m_i – intercept,

b – structural parameter expressing the impact of explanatory variable X,

x_{it} –- explanatory variable realisation for i-th object in the t-th period,

e_{it} – residual value meeting traditional assumptions: $E(e_{it}) = 0$ and $Var(e_{it}) = S_e^2$.

For the sake of simplicity, a model with one explanatory variable was used, but it can also have many explanatory variables (X). The choice between the FEM and REM is made using Hausman's test (for $p = 0.05$ the FEM model is considered more reliable than REM).

However, a universal method to be used in models, in which no assumptions are made about the normal distribution of the random component, is the Generalized Method of Moments – GMM. The most popular methods are, in practice, all methods based on GMM and, in particular, the so-called first-differenced GMM – FD GMM, introduced by Arellano and Bond and GMM by Blundell and Bond (GMM – SYS GMMS). One of the main advantages of this method is the possibility of its application to parameter estimation of nonlinear dynamic models.

Weber, N. Key, *How much do decoupled payments affect production? An instrumental variable approach with panel data*, „American Journal of Agricultural Economics", vol. 94, no. 1, 2012.

[63] D.A. Hennessy, *The Production Effects of Agricultural Income Support Polices under Uncertainty*, „American Journal of Agricultural Economics", no. 80, 1998; P. Ciaian, J.F.M Swinnen, *Credit Market Imperfections and the Distribution of Policy Rents*, „American Journal of Agricultural Economics", vol. 91, no. 4, 2009.

[64] *Dopłaty bezpośrednie i dotacje budżetowe a finanse oraz funkcjonowanie gospodarstw i przedsiębiorstw rolniczych,* (ed. J. Kulawik), PW nr 46, IERiGŻ-PIB, Warsaw, 2012.

Previously discussed studies on support capitalization were used as a reference to carry out own estimates of the impact of subsidies on selected (literature-based) indicators characterising large-scale commercial farms. The purpose of the study was to determine the relationships between the rates of lease (the first explanatory variable – **lease rate in PLN per ha**) and the level of net financial result (second explanatory variable – **net financial result in PLN** per **ha**) of Polish large-scale commercial farms[65] depending on the level of subsidies and other indicators of economic production and organisation based on panel data from the 2007-2010 period (the number of observations in the balanced panel amounted to 344). It should be noted that the analysis concerned most farms subject to capping.

When analysing the residual distributions of the model, statistical test results and the value of the coefficient of determination, it can be concluded that regression equations included in the following tables are sufficiently well estimated to be able to interpret their results. The total subsidies (model 1), area payments (model 2), area of agricultural land and the legal and organisational form (model 3 and 4) turned out to be the determinants of lease rates in FEM model (Table 4.2.). They had a statistically significant and unfavourable negatively impact on the dependent variable. Only payments included in absolute terms positively influenced the rates of lease for large-scale commercial farms and clearly revealed the same capitalization. Based on data from Table 4.2, it can be concluded that with the increase in subsides by PLN 1 thousand, land lease rent will increase by PLN 0.58 per ha and in the case of area payments – their increase by PLN 1 thousand results in an increase in the lease rent by PLN 0.79 per ha under *ceteris paribus* conditions. We need to keep in mind that those relationships concerned the group of large-scale commercial farms, where there were no updates of lease rates in the 2007-2010 period.

In the case of equations with random effects (Table 4.3.), the amounts of total payments and area payments were also stimulants of the dependent variable (model 3 and 4), while subsidies in the form of interest subsidies interacted in an adverse manner (model 1 and 2). In contrast to the literature cited earlier, independent variables (age and length of service of farm manager) had a different impact. In the case of these farms, the variables were found to be neutral, which is surprising, especially in the group of farms with a large share of leased land. The average age in the group investigated was 52.6 years with a standard deviation equal to 8.6.

[65] The data from the Department for Economics of Agricultural Farms at IERiGŻ-PIB and concern units farming on the area of more than 100 ha of agricultural hand.

Table 4.2. Panel models with fixed effects (FEM) estimated based on data from 2007-2010

Variables and parameters	**Dependent variable rate of land lease per ha** [1]			
	Model 1	Model 2	Model 3	Model 4
Constans	3082.68 (434.18)***	3162.96 (427.35)***	3155.39 (152.43)***	3153.80 (156.87)***
Total subsidies in total operating revenue (subsidy rate I)	-20.26 (11.81)*			
Total payments in total operating revenue (subsidy rate II)		-40.73 (14.90)***		
Total subsidies (PLN thousand)			0.58 (0.28)**	
Area payments (PLN thousand)				0.79 (0.32)**
Organisational and legal form (legal person, natural person)			-266.71 (150.60)*	-271.61 (150.38)*
Technical infrastructure for work (value of fixed assets to employment PLN per person)	0.35 (0.39)	0.45 (0.38)		
Rate of investment (gross capital expenditure to depreciation value)	-0.85 (0.67)	-1.01 (0.65)		
Arable land area in the year			-0.59 (0.30)*	-0.56 (0.26)**
Sample size	60	60	60	60
R^2	0.87	0.86	0.86	0.86

[1] models apply only to farms with leased agricultural land.

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.

Source: Own calculations.

Table 4.3. Panel models with random effects (REM) for 2007-2010

Variables and parameters	**Dependent variable rate of land lease PLN per ha** [1]			
	Model 1	Model 2	Model 3	Model 4
Constans	3070.26 (394.68)***	3135.96 (381.67)***	3063.92 (340.70)***	3387.17 (375.66)***
Total subsidies in total operating revenue	-20.71 (9.71)**			
Area payments in total operating revenue		-40.06 (16.40)**		
Total subsidies (PLN thousand)			0.57 (0.26)**	
Area payments (PLN thousand)				0.84 (0.42)**
Legal and organisational form				-501.40 (271.12)*
Financial stress index (the value of interest and lease to the proceeds of sales)		3.64 (3.40)		
Technical infrastructure for work	0.34 (0.21)*	0.45 (0.22)**		
Rate of investment		-1.40 (1.11)		
Arable land area in the year			-0.67 (0.33)**	-0.73 (0.35)**
Sample size	60	60	60	60
Breusch-Pagan test asymptotic test statistic: Chi-square (1)	240.57 p = 2.94323e-054	205.06 p = 1.64366e-046	235.70 p = 3.40195e-053	226.34 p = 3.74897e-051
Hausman's test: asymptotic test statistic Chi-square (2)	0.02 p = 0.988803	17.84 p = 0.001327	1.57 p = 0.454783	3.53 p = 0.316377

[1] models apply only to farms with leased agricultural land.

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.

Source: as above.

When analysing models 1-2 (Table 4.3.), it should be noted that technical infrastructure for work affected the dependent variable in a positive and statistically significant manner (see Table 2, a change in the strength of its impact is visible). Assuming *ceteris paribus*, the level of capitalisation for models 3-4 was similar: *the value of the lease will increase by PLN 0.57 per ha at total subsidies increased by PLN 1 thousand, the lease will increase by about PLN 0.84 per ha when area subsidies increase by PLN 1 thousand.*

For data from Table 4.4. and dependent variable (**net financial result** (PLN per ha)), the key role among determinants was played by the share of revenue from the sale of crop production in the revenue from total agricultural production sales (models 1-4). A statistically significant and adverse impact was seen in subsidy rates (models 1-2). In the case of model 3, the positive dependency of net financial result (PLN per ha) and the amount of the subsidies per farm (PLN thousand) discussed above for lease (tables 2-3) was confirmed. As a result, increased subsidy by 1 PLN thousand (under *ceteris paribus* conditions) resulted in an increase in the net profit/loss by PLN 0.33 per ha. However, the growing value of financial stress index was reduced by the level of explanatory variable in a way that is statistically significant.

Table 4.4. Panel models with fixed effects (FEM) estimated based on data from 2007-2010

Variables and parameters	**Dependent variable net profit/loss PLN per ha**			
	Model 1	Model 2	Model 3	Model 4
Constans	677.01 (350.04)*	747.22 (315.48)**	213.24 (367.64)	418.98 (390.38)
Total subsidies in total operating revenue (subsidy rate)	-47.37 (8.97)***			
Area payments in total operating revenue		-83.84 (16.57)***		
Total subsidies (PLN thousand)			0.33 (0.15)**	
Area payments (PLN thousand)				-0.38 (0.51)
Revenue from the sale of plant production in the revenue based on agricultural production sales	17.61 (4.97)***	19.77 (5.65)***	8.55 (5.12)*	8.85 (5.33)*
Financial stress index			-6.32 (3.30)*	-6.64 (3.48)*
Sugar payment PLN thousand				2.44 (1.21)**
Sample size	86	86	86	86
R^2	0.53	0.54	0.51	0.51

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.
Source: as above.

In the model with random effects (Table 4.5.) subsidy rate (model 1 and 2) interacted in a negative way. Subsidies expressed in absolute terms have lost

statistical significance (3-4). Technical infrastructure for work continued to play a crucial role.

Table 4.5. Panel models with random effects (REM) for 2007-2010

Variables and parameters	**Dependent variable net profit/loss PLN per ha**			
	Model 1	Model 2	Model 3	Model 4
Constans	1104.06 (274.33)***	1069.61 (272.19)***	672.54 (275.63)**	829.89 (189.03)***
Total subsidies in total operating revenue (subsidy rate)	-37.55 (8.10)***			
Area payments in total operating revenue		-64.36 (11.74)***		
Total subsidies (PLN thousand)			0.18 (0.12)	
Area payments (PLN thousand)				0.15 (0.16)
Revenue from the sale of crop production in the revenue based on agricultural production sales	7.89 (3.55)**	8.80 (3.37)***	3.81 (3.31)	4.01 (3.32)
Covering liabilities with financial surplus	41.79 (16.97)**			
Technical infrastructure for work		0.25 (0.14)*		0.13 (0.15)
Financial stress index		-5.08 (3.18)*	-8.38 (3.23)***	
Sample size	86	86	86	86
Breusch-Pagan test asymptotic test statistic: Chi-square (1)	56.92 p = 4.53874e-014	43.18 p = 4.99097e-011	48.03 p = 4.19476e-012	50.25 p = 1.35306e-012
Hausman's test: asymptotic test statistic Chi-square (2)	6.58 p = 0.08640	6.63 p = 0.15669	5.26 p = 0.1533	1.22 p = 0.54388

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.
Source: as above.

Application of the Generalized Method of Moments (Table 4.6. and 4.7.) did not give a clear result – the impact of the subsidy rate was unfavourable and very important both in the case of lease variable (PLN per ha), as well as the net

financial result variable (PLN per ha). A strong destimulant of the **net profit** turned out to be the index of financial stress (Table 4.6.-4.7.).

Table 4.6. Dynamic panel models (SYS GMM estimation) for 2007-2010

Variables and parameters	**Dependent variable rate of land lease PLN /ha** [1]			
	Model 1	Model 2	Model 3	Model 4
D_lease PLN per ha (-1)	0.05 (0.11)	0.04 (0.11)	0.06 (0.14)	0.10 (0.16)
Constans	3707.94 (761.48)***	3582.10 (740.18)***	2434.72 (557.56)***	3113.88 (701.23)***
Total payments in total operating revenue	-41.50 (12.41)***			
Area payments in total operating revenue		-50.16 (24.92)**		
Total subsidies (PLN thousand)			0.73 (0.38)*	
Area payments (PLN thousand)				-1.33 (0.49)***
Sugar payment (PLN thousand)				4.22 (1.51)***
Technical infrastructure for work	0.47 (0.28)*	0.47 (0.28)*		
Arable land area in the year	-0.54 (0.28)*	-0.50 (0.28)*	-1.09 (0.47)**	
Share of cereals in crop structure			10.34 (8.19)	
Financial stress index		8.61 (5.07)*	6.14 (5.54)	
Rate of investment	-2.40 (1.51)	-2.13 (1.47)		
Equity to external capital	10.84 (5.08)**			-8.12 (3.79)***
AR test (1) for error	-0.46 [0.6454]	-0.40 [0.6866]	-1.25 [0.2110]	-1.06 [0.2900]
Sargan test Chi-square (4)	1.55 [0.8184]	1.94 [0.7470]	4.15 [0.3854]	4.42 [0.3519]

[1] models apply only to farms with leased agricultural land.

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.

Source: as above.

Table 4.7. Dynamic panel models (SYS GMM estimation) for 2007-2010

Variables and parameters	**Dependent variable net profit/loss PLN per ha**			
	Model 1	Model 2	Model 3	Model 4
D_lease PLN per ha (-1)	0.24 (0.10)**	0.17 (0.09)*	0.25 (0.08)***	0.24 (0.09)
Constans	1003.19 (515.14)*	944.52 (571.78)*	763.90 (174.55)***	823.49 (164.16)***
Total subsidies in total operating revenue	-35.94 (9.04)***			
Area payments in total operating revenue		-64.87 (16.33)***		
Total subsidies (PLN thousand)			0.15 (0.08)*	
Area payments (PLN thousand)				-0.15 (0.13)
Sugar payment (PLN thousand)				1.61 (0.50)***
Revenue from the sale of crop production in the revenue based on agricultural production sales	8.48 (4.43)*	7.66 (5.07)*		
Technical infrastructure for work		0.29 (0.15)*		
Financial stress index	-22.56 (6.42)***		-24.59 (7.14)***	-24.19 (7.06)***
AR test (1) for error	-1.5051 [0.1323]	-1.3938 [0.1634]	-1.71619 [0.0861]	-1.6507 [0.0988]
Sargan test Chi-square (4)	85.7634 [0.0000]	89.3167 [0.0000]	75.603 [0.0000]	75.1091 [0.0000]

*** variable is important at the level of significance of 1%, ** variable is important at the level of significance of 5%,* variable is important at the level of significance of 10%.
Source: as above.

* * *

Panel data concerning large-scale commercial farms with an area of over 100 hectares of arable land in 2007-2010 that were analysed in the work did not confirm all the ways that the subsidies impact agriculture which were described in the literature. Inclusion of Polish farms to the group of CAP beneficiaries did not result in increased rates of lease in the case of largest units in terms of area.

Similar conclusions were made by Gocht, Britz, Ciaian and Gomez y Paloma.[66] They demonstrated that in various regions of the EU Member States the impact of area payments on the level of capitalisation in lease rents may look differently, both positively and negatively. In the "own" study, it was difficult to determine the level of capitalization of the support in the case of lease rates in view of the fact that they have not been updated for many years. This did not allow for an actual assessment of the level of capitalization.

[66] A. Gocht, W. Britz, P. Ciaian, S. Gomez y Paloma, *Farm Type Effects of an EU-wide Direct Payment Harmonization*, „Journal of Agricultural Economics", vol. 64, no. 1, 2013.

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