INSTITUTE OF AGRICULTURAL
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Environmental protection instruments in Polish agriculture in the context of its sustainable development

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The study reviews and assesses functioning of subsidized crop and livestock insurance as regards the level of their use and determination of factors motivating and demotivating to conclude insurance contracts by farmers.

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Introduction

The society is not indifferent to the economic changes taking place on the market and the development of civilization. This includes, among others, climate and epidemiological risks, the impact of market forces, economic policy as well as environmental pollution. These factors adversely affect the sustainable development of agriculture, in particular social security of the population, financial stability and environmental safety. In a market economy, when one of the market failures occurs, these are usually state interventions that are called for to correct the market mechanism by means of various financial instruments.

The budgetary and fiscal policies are the basic tool for achieving the goals of sustainable development, i.e. a model of economic development that will ensure future generations access to natural resources and appropriate quality of the natural environment. Market imperfections that lead to excessive use of natural resources, environmental pollution, adverse socio-demographic changes, as well as subsidies for certain activities should be reduced through appropriately selected financial instruments. The spectrum of these instruments is very wide, and among them are tools of a fiscal nature. These instruments encourage producers and consumers to use the environmental resources more efficiently and reduce its pollution. Only such activities can in the future provide appropriate conditions for maintaining balance in the economy and multiplying the well--being of subsequent generations.

The evolution of ecological/environmental policy in the world leads to searching for solutions that at the earliest possible stage would result in a reduction in the use of natural resources and would enable reducing the amount of pollutants discharged or causing disturbances in the natural environment. The use of financial instruments in environmental protection under the current environmental and technological conditions seems to be a necessity. The "Fifth Program" of the European Union has recommended their implementation since 1992, but to this day no such homogeneous instrument has been created at the EU level. However, such actions took place in individual member states, which taxed selected activities and products that have a negative impact on the environment.

Ecological fiscal reform is primarily about inclusion of system ecological aspects and fees and environmental taxes, as well as expenses for pro-ecological, pro-innovation and pro-employment purposes in the reform of the public finance [Stodulski, 2004]. As part of this reform, a variety of activities can be carried out. They can cover a broad or narrow range of instruments.

Broad-based activities consist in the implementation of environmental tax instruments, while the measures in the narrow range include internalization of costs in selected areas or elimination of subsidies harmful to the environment.

For many years, the CAP has been considering environmental issues as a strategic element of agricultural development. Among the goals to be achieved in this sector within the framework of policy integration are:

- reducing the negative impact of agriculture on human health and the environment by reducing the consumption of chemical products,
- effective protection of nature, landscape and biodiversity through promotion of organic farming,
- reduction of greenhouse gas emissions,
- effective use of natural resources, water resources in particular.

The elimination of anti-ecological subsidies may be of particular importance in the implementation of ecological financial policy in the agricultural sector. As OECD data show, the annual value of state aid for agricultural producers is approx. PLN 15 billion. It is worth noting that this support extends beyond traditional direct payments, debt relief, or preferential loans, but also includes reduced tax rates, price regulation, administrative barriers and hidden subsidies. The range of economic instruments that can be used is, therefore, very wide, but the possibility and the effectiveness of their use in agriculture are a separate issue.

The aim of this study is to review ecological financial instruments in terms of the ways and places of their application and to assess the need to implement this type of tools in the agricultural sector.

Past experiences with the introduction of ecological fiscal solutions indicate that few countries have decided to implement this mechanism in agriculture. These include Germany, Denmark and Sweden. The liquidation or reduction of environmentally harmful subsidies has not yet occurred in any European country. The reasons for this situation should be seen primarily in the policy supporting some forms of activity, especially agriculture, which is not always rational.

Regardless of the scale of the spread of new, green fiscal solutions, there is an urgent need to introduce them in agriculture, in order to increase savings and rational use of resources or undertake pro-ecological initiatives. These activities may consist in the creation of the ecological market, development of new technologies and innovations in agriculture. However, ecological fiscal instruments will be indispensable in this respect.

Bearing this in mind, it should be remembered that sustainable development is today an inseparable element of not only ecological but also socio-economic policy. The concept of sustainable development boils down to preserving the environment and natural resources for future generations and at the same time stimulating economic growth and social development, however, adopting the superiority of the environment in relation to economic development. The practical dimension of sustainable development shows, however, that not only ecology and the environment are important. The interests of the economy and modern society are also vital. Sustainable development is, therefore, a concept that assumes a balance in at least three areas – economic, environmental and social. A key element of this balance is the agricultural sector, because its functioning depends on natural resources, and in the model of family farming (so typical for Poland) also on social resources. Sustainable agriculture, therefore, covers all activities in the areas of nature and agriculture aimed at improving the condition of the natural environment, its quality and the quality of life of rural residents.

1. Key concepts related to sustainable development

1.1. Genesis of the concept of sustainable development

One of the elements of environmental protection is the preservation of the principles of sustainable development. The concept of sustainable development was created in response to the contemporary, unsustainable process of shaping economic growth, at the expense of the degradation of natural and social capital, both on a global and local scale. It was the answer to the critical assessment of the intensive use of the environment related to high specialization and concentration of production, excessive mechanization and overproduction. In the second half of the twentieth century, this concept played a significant role in shaping the way of thinking about mutual relations between the society and the economy and the resources of the natural environment. Its implementation is not only a matter of time, but above all it is an expression of concern for the state of the environment and the situation of future generations. In the concept of sustainable development, great emphasis is put on improving economies in terms of rational, more effective use of resources, which, in consequence, is to create more favourable environmental conditions and increase the competitiveness of economies.

The problem of environmental protection, as well as the interest in the influence of human activity on its condition began to appear at the turn of the 1960s and 1970s. During this time, a number of reports and studies were drawn up that highlighted the problem of limited natural resources, progressive environmental degradation, and thus limited opportunities for economic development.

For the first time in discussions, the concept of sustainable development appeared in 1968 during the session at the International Conference of Scientific Experts of UNESCO, devoted to the interconnectedness of the environment and man. As the beginning of the idea of sustainable development, however, the publication of two reports is regarded. These were: the report by UN secretary U. Thant of 1969 entitled "Man and his environment"[1] and a report for the Club of Rome from 1972 entitled "Limits of growth". These reports played a significant role in the discourse on the threats posed by inadequate management of natural resources. For the first time, the concept of eco-development, which today is the original definition for sustainable development, was used at the First UN Conference on "Environment and development" in 1972 in Stockholm. Eco-development was identified with the recognition of the superiority of environ-

[1] U. Thant, *Man and his environment*, Report of the UN Secretary General on 26.05.1969.

mental issues at the expense of solving social and economic problems. The conference resulted in the publication of the Declaration of the United Nations Conference on the Natural Environment of Man and the establishment of environmental protection as a state obligation. It should be clearly emphasized that this declaration does not directly refer to the term *sustainable development*, it is only included in the Rio Declaration[2].

In 1975, at the Third Session of the Governing Board of the Environmental Protection Program, the notion of sustainable development was formulated, which should be understood as "... the course of inevitable and desirable economic development that does not violate the human life environment in a significant and irreversible way, does not degrade the biosphere and harm the laws of nature, economics and culture"[3]. This definition was clarified by the World Commission on Environment and Development, established in 1983, in a report published in 1987 entitled "Our common future"[4] called the Brundtland Report[5]. The report referred to the problem of satisfying the needs of people at the expense of nature, rich at the expense of the poor or today's generation at the expense of future generations; situation in third world countries, as well as the definition of sustainable development. The sustainable development was defined as "... economic and social development that will meet the needs of the modern generation without the risk that future generations will not be able to meet their needs, violate the ability to meet the needs of future generations, allowing the choice of lifestyle".

The report also states that sustainable development should be recognized as the objective of the policy of governments of all countries, which many countries have adopted as a basis for their environmental policy. The definition contained in the Brundtland Report explains the essence of the concept of sustainable development as a process aimed at satisfying the developmental aspirations of the young generation in a way that allows the same aspirations to be pursued by future generations. Such a goal refers both to the protection of natural resources and collectively presents all the challenges and problems of the modern

[2]https://repozytorium.amu.edu.pl/bitstream/10593/739/1/Mi%C4%99dzynarodowe%20i%20europejskie%20koncepcje%20zr%C3%B3wnowa%C5%BConego%20rozwoju.pdf

[3] S. Kozłowski, *Czy transformacja polskiej gospodarki zmierza w kierunku rozwoju zrównoważonego* [in:] Mechanizmy i uwarunkowania ekorozwoju, vol. 1, Wydawnictwo KEiZOŚ Politechniki Białostockiej, Białystok, 1996.

[4] G.H. Brundtland, *Nasza wspólna przyszłość. Raport Światowej Komisji do spraw Środowiska i Rozwoju*, PWE, Warszawa, 1991.

[5] G.H. Brundtland, *Our Common Future*, The World Commission on Environmental and Development, Oxford University Press, Oxford, 1987.

world, including violations of human rights, gender equality and cultures. To sum up, Brundtland's report emphasizes the idea of balance on three levels: stable and integrated growth of economies; protection of the natural environment and its resources, and development of society.

During the 2nd UN Environment Conference organized in Rio de Janeiro in 1992, two documents were adopted, namely the "Declaration in Rio on Environment and Development" and "Global Agenda 21". The declaration focuses on the problem of sustainable development, which should be achieved through: sustainable production and consumption, creation of economic systems that take into account the value of the natural environment and the construction of new development models for developing and transforming countries. The declaration contained principles covering both the rights and obligations of states, guaranteeing the sustainable development of humanity while ensuring decent living conditions, and long-term economic growth is possible thanks to the protection of the environment and natural resources.

The most comprehensive and detailed interpretation of sustainable development was included in the Agenda 21 document[6]. It is on its basis and the criticism of the traditional economy that equates the rationality of consumer behaviour with the standard perceived consumption of goods and services that shaped the theory of sustainable development, which is based on three basic pillars: society, economy and environment. However, it should be clearly emphasized that the declarations adopted in Agenda 21 were practically not implemented[7], despite the fact that countries have not departed from the concept of sustainable development. This is evidenced by the fact that in the years 1992-2000 new ideas for implementing the principles of eco-development were created: multiplier of four, an ecological space, and national programs. For example, the concept of "multiplier of four"[8] proposed in the report for the Club of Rome in 1999 is a response to the intergenerational justice postulate and means a fourfold increase in resource productivity as a result of doubling the prosperity and twice reducing the consumption of natural resources. The implementation of such a solution would allow the use of non-renewable resources by future generations.

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[6] M. Sebaldt, *Von den Zinsen leben, nicht von der Substanz: Problemhintergrund und Entwicklung der Idee der Nachhaltigkeit*, [in:] *Sustainable Development – Utopie oder realistische Vision*?, M. Sebaldt (Hg.), Verlag Kovac, Hamburg, 2002.

[7] Ch. Görg, U. Brand (Hrsg.), *Mythen globalen Umweltmanagements Rio 10 und die Sackgassen nachhaltiger Entwicklung*, Verlag Westfälisches Dampfboot, Münster, 2002.

[8] E.U. Weizsäcker, A.B. Lovins, L.H. Lovins, Mnożnik Cztery. *Podwojony dobrobyt – dwukrotnie mniejsze zużycie zasobów naturalnych. Raport dla Klubu Rzymskiego*. Toruń: Polskie Towarzystwo Współpracy z Klubem Rzymskim, Wydawnictwo Rolewski, 1999.

In 2000, the World Millennium Summit of the United Nations was held, which defined the Millennium Development Goals. These were to be implemented by 2015. Among them were: eliminating extreme poverty and hunger, ensuring universal primary education, promoting gender equality and social advancement of women, reducing child mortality, improving maternal health, applying sustainable methods of natural resources management (including the principle of sustainable development in national strategies, using methods that inhibit the depletion of natural resources, halving the number of people deprived of access to drinking water).

In 2002, the World Summit on Sustainable Development was held in Johannesburg, where the program documents were adopted: Action Plan and Political Declaration, which were to help create real programs and projects enabling sustainable development. The Summit was committed to integrating three elements of sustainable development: social, economic and environmental development, which were to remain independent but mutually reinforcing pillars.

The United Nations Conference on Sustainable Development, known under the name "Rio+20", which took place in 2012 in Rio de Janeiro, was of crucial importance for the implementation of the concept of sustainable development. The conference was devoted mainly to two issues: 1) green economy contributing to solving social problems in a sustainable way, in particular to eliminating poverty, and 2) institutionalizing global cooperation for sustainable development, which is to lead to greater harmonization and effectiveness of these activities. It is worth noting that the importance of responsible business was recognized as an active partner in building sustainable development. Unfortunately, no effective mechanisms and no transparent framework for public-private cooperation were developed. The "Rio+20" summit ended with the adoption of the "*Future We Want*" document by the states, which highlighted the problems: reducing the scale of poverty, promoting social justice and ensuring environmental protection. The states also committed themselves to setting sustainable development goals after 2015, which would be modeled on the Millennium Development Goals. The evolution of the concept of sustainable development is presented in Figure 1.

Figure 1

Milestones in creating the concept of sustainable development

Source: own elaboration.

1.2. Essence of sustainable development

Despite many years of discussions, the concept of sustainable development has not been precisely defined so far. From the beginning of the 1990s, it has undergone a change under the influence of new ideas, which include, among other things, consideration of economic, ecological and social goals, ways of observing phenomena and wide possibilities of harmonizing these dimensions. The essence of this concept has been analyzed many times and modified, hence, both in national and world literature, there are many concepts and definitions relating to the essence of this issue.

A reliable review of concepts relating to sustainable development was made, among others B. Piontek, which counted 44 different definitions[9]. She noticed that all of them are dominated by natural, economic and civilization accents. According to H. Spehl[10], there are 50 to 163 definitions of sustainable de-

[9] K. Piontek, *Koncepcja rozwoju zrównoważonego ekologicznie w procesie transformacji w Polsce,* Akademia Ekonomiczna, Kraków 2000 (doctoral thesis).

[10] H. Spehl, *Soziale Innovationen – Schlüssel zur Nachhaltigkeit in Regiovision. Neue Strategien für alte Industrieregionen*. Vortrage und Diskussionen auf dem Jahreskongress des Wis-

velopment, also known as eco-development. The issue of defining sustainable development was also considered in other works, including F. Piontek and B. Piontek[11], who on the basis of the analysis of many concepts state that sustainable development consists in a permanent improvement of the quality of life of present and future generations by shaping the right proportions between the three types of capital: economic, human and natural[12]. The simplest definition of sustainable development is provided by W. Bojarski, who defines it as a socio--economic development harmonized with the natural environment[13].

The above indicates that the subject literature includes a number of definitions of the concept of sustainable development[14]. In Poland, there is a formal and legally formulated definition defining it as: socio-economic development, in which the process of integrating political, economic and social activities takes place, preserving the natural balance and sustainability of basic natural processes, in order to guarantee the ability to meet the basic needs of individual communities or citizens of both the modern generation and future generations. A.O. Brundtland similarly defines sustainable development an believes that it is a development in which *the sustainability of growth means that present needs are not met at the expense of reducing the ability of future generations to meet their needs*[15].

A very precise and adequate definition of sustainable development is included in the Environmental Protection Law Act, which explains sustainable development defining socio-economic development in which the process of integrating political, economic and social activities takes place, preserving the natural balance and sustainability of basic natural processes, in order to guaran-

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senschaftszentrums Nordrhein - Westfalen am 27ß 28 Oktober 1994. (Hrsg.) von F. Lehner, München, 1995.

[11] F. Piontek, *Człowiek i jego środowisko w strategii wzrostu gospodarczego i w zrównoważonym (trwałym) rozwoju*. Problemy Ekologii nr 5, 2000.

[12] F. Piontek, B. Piontek, *Najlepsze dostępne techniki (BAT) i Mnożnik Cztery dla zapewnienia ochrony środowiska*, Rocznik Ochrona Środowiska, t. 4, 2002.

[13] W. Bojarski, Koncepcja badań nad zharmonizowanym rozwojem społeczno-gospodarczym z poszanowaniem dóbr przyrody, Biuletyn Komitetu Ochrony Środowiska PAN, Wrocław-Warszawa, 1988.

[14] B. Piontek, *Koncepcja rozwoju zrównoważonego ekologicznie w procesie transformacji w Polsce, Akademia Ekonomiczna*, Kraków 2000 (doctoral thesis); A.O.Brundtland, Nasza wspólna przyszłość [in:] Our Common Future. Chapter 2: Towards Sustainable Development; Raport Światowej Komisji ds. Środowiska i Rozwoju, ONZ, 1987; Wilkin J., *Czy warto i dlaczego spojrzeć na zrównoważony rozwój przez pryzmat wykorzystania ziemi jako dobra wielofunkcyjnego?* [in:] Wilkin J, sc. ed., Ziemia ginącym i podlegającym degradacji zasobem środowiska i obszarów wiejskich, FDPA, KSOW, Warszawa 2018.

[15] A.O. Brundtland, *Nasza wspólna przyszłość* [in:] *Our Common Future*. Chapter 2: Towards Sustainable Development; Raport Światowej Komisji ds. Środowiska i Rozwoju, ONZ, 1987.

tee opportunities to satisfy the basic needs of individual communities or citizens of both the modern generation and future generations[16].

In the Sejm's Resolution of March 2, 1999, the notion of sustainable development was defined as a model of development in which satisfying current social needs and future needs of generations will be treated equally[17]. The resolution also expressed the Sejm,s expectation that the Sustainable Development Strategy, in a harmonious manner, would combine care for the preservation of the natural and cultural heritage of the nation with the civilizational and economic progress that is achieved by all social groups.

An interesting definition referring to socio-economic aspects was developed by D. Pearce, A. Markandya, and E. Barbier, and it describes sustainable development as realizing a specific set of socially desirable goals, i.e.:

- improvement of the general level of education;
- fair access to natural resources;
- improvement in the level of nutrition of the society;
- care for the health of the society;
- striving for real income per capita[18].

Looking through the prism of the above definitions, there is no doubt that the idea of sustainable development permeates virtually all areas of socio--economic life. The search for a compromise between satisfying the needs of the present generation without diminishing the development opportunities of subsequent generations successively becomes an imperative accompanying all kinds of activities undertaken by a wide range of participants and regulators of the contemporary economic system. The fundamental assumptions of the model of sustainable economic development focus on the permanent improvement of the quality of life of current and future generations by shaping the right proportions between the three types of capital – economic, social and natural. Summarizing the above, it can be stated that a set of the main goals of sustainable development includes:

- striking a balance between social, economic and natural resources,
- preserving intergenerational justice,
- increasing prosperity in social and economic terms,

[16] *Ustawa Prawo Ochrony Środowiska,* dated 21 of April 2001, art. 3, p. 50.
[17] *Rezolucja Sejmu Rzeczypospolitej Polskiej of 2 March 1999 w sprawie przedstawienia przez Radę Ministrów strategii zrównoważonego rozwoju Polski*. M.P. 1999 nr 8 poz. 96.
[18] D. Pearce, E. Barbier and A. Markandya, *Sustainable development: Economics and environment in the third world*. Edward Elgar Publishing Limited, 1990.

- maintaining the appropriate quality and quantity of natural resources for future generations,
- maintaining the proper level of social capital, understood as harmony between human and nature[19].

Scientific literature referring to the concept of sustainable development also does not omit agriculture and rural areas. J. Wilkin, however, rightly observes that this concept is not unequivocally and universally understood, and what is more, it raises many controversies and scientific disputes, especially with regard to the definition of this phenomenon[20]. A similar approach to the concept of sustainability (sustainable development) is presented by J.St. Zegar who thinks that they have to be treated like a blurred, metaphysical concept, forming a hard core around which analyzes are carried out and specific indicators demonstrating sustainability are established. The development of knowledge enables on the one hand the shift of cognition towards the center of the core, on the other hand, the budding of this core. This is understandable, because the process of cognition in relation to phenomena of this nature is infinite[21]. J.St. Zegar emphasizes that the following concepts should be distinguished: sustainable agriculture (or socially sustainable agriculture) and sustainable development of agriculture. In the first case, it is about the fulfillment of certain requirements by agriculture with respect to spheres of balance – it is a certain state, and therefore a static approach. In the second case, it is about changes to the desired (more balanced) state – thus it is about a progress and its dynamics. He also notes that it is necessary to take into account emerging new restrictions, new challenges and new opportunities resulting from technical progress and accumulated knowledge.

Sustainable rural development is a broad concept that covers many issues related to economy, environment and society. The essence of sustainable development of rural areas was described by A. Woś, who believed that this is a modern concept of shaping the internal balance of agribusiness and its links with the surroundings[22]. He also stressed that "... every human activity must respect the biological rights of species and the environment". He noticed that man through his presence transforms the natural environment, degrades it and deforms it,

[19] K. Osiecka-Brzeska, *Zrównoważony rozwój w świetle wybranych teorii ekonomicznych*, Prace i Materiały Instytutu Handlu Zagranicznego Uniwersytetu Gdańskiego, nr 30, Gdańsk 2011.
[20] J. Wilkin, *Czy warto i dlaczego spojrzeć na zrównoważony rozwój przez pryzmat wykorzystania ziemi jako dobra wielofunkcyjnego?* [in:] Wilkin J sc. ed. Ziemia ginącym i podlegającym degradacji zasobem środowiska i obszarów wiejskich, FDPA, KSOW, Warszawa 2018.
[21] J.St. Zegar, *Zrównoważony rozwój rolnictwa w świetle paradygmatu konkurencyjności*, Materiały konferencyjne, Konferencja IERiGŻ-PIB pt. WPR a konkurencyjność polskiego i europejskiego sektora żywnościowego, Józefów 26-28 listopada 2014 r.
[22] A. Woś, *Rozwój zrównoważony* [in:] Encyklopedia agrobiznesu. Fundacja Innowacja, Warszawa 1998.

which must be constantly reproduced[23]. S. Turner is of a similar opinion and emphasizes that the demand for agricultural products is satisfied by agricultural activity, which, however, in accordance with the theory of sustainable development must be economically efficient, environmentally friendly and socially accepted[24]. These definitions place the main emphasis on sustainability issues in the context of natural resource management. To a lesser extent, social issues are stressed, which is characteristic of the idea of sustainable agriculture, in which the ecological trend plays a dominant role. It results from the fact that farming activity depends strictly on natural conditions, which translates into the need to take into account the priority importance of the natural environment when implementing strategic development objectives for agriculture and rural areas. Nevertheless, with regard to rural areas, the concept of sustainable development also assumes striving to improve the living conditions of the agricultural population in such a way that, without disturbing natural resources, income and quality of life of farmers and other rural residents would be comparable between current and future generations. This approach seeks to reconcile the laws of nature and economics[25].

The above indicates that also in the literature on the agricultural issues there are many definitions and interpretations of sustainable development, mainly focused on environmental and ecological problems, but also emphasizing the socio-economic development. The main premises for sustainable development of agriculture include: increasing awareness of the limitation of the global ecosystem of the Earth; recognition that both marketable goods and non-marketable goods (non-commercial) are important in the development of agriculture; questioning the current formula of progress and awareness of the impact of food quality on health and quality of life in general.

Looking through the prism of the above definitions (regardless of the sector they concern), it can be concluded that sustainable development does not have a fixed, defined boundary and it is a continuous process, evolutionary, adapting to the changing environment and foreseen for an indefinite period.

For the purpose of this work, the sustainable development has been defined as the tendency of the present generation to improve economic and social well-being and rational management of natural environment resources, so as not to limit the ability to meet the needs of future generations. Therefore, it is a ver-

[23] A. Woś, *Rozwój zrównoważony* op. cit.
[24] S. Turner, *Koncepcja zrównoważonego rozwoju rolnictwa*. ADAS Consulting, Warszawa 2000.
[25] S. Urban, *Rola ziemi w rolnictwie zrównoważonym a aktualne jej zasoby w Polsce*, Acta Agraria et Silvestria, Series Agraria, Sekcja Ekonomiczna, Vol. XL, Warszawa 2003.

satile and harmonious solution to the current environmental, economic and social problems in various sectors of the economy, among others, and perhaps above all in agriculture. The implementation of environmental protection instruments in agriculture, the direct objective of which is to ensure broadly understood security both at economic and social level, may be of key importance.

Regardless of the adopted definition, the concept and idea of sustainable development is characterized by complexity and strong axiological foundations. As previously mentioned, it refers to the most important legal acts of the European Union, constituting the institutional framework of Community policy, as well as the most important documents, including the Constitution of 1997, which sets the framework for economic, regional and environmental policy in Poland. As in other sectors of the economy, also in sustainable agriculture, three types of equilibrium are pursued, treating them as complementary, i.e.:

- economic balance, which assumes an optimal allocation of production factors through a market mechanism and the balance of various markets,
- environmental sustainability, allowing self-renewal of natural resources consumed by the public. In this model, environmental resources are treated as public, mixed or social goods, i.e. those that cannot be subject only to market regulation,
- social balance ensuring social peace, ownership and investment security as well as the balance of interests of various social groups[26].

These three elements create a specific mechanism of the "balance of equilibria", which requires that the mechanism of payment regulation be supplemented by the market mechanism. Nevertheless, the current development of agriculture based on the intensification of agricultural production supported by the intervention tools of the CAP has proved insufficient to ensure lasting and sustainable development of agriculture and rural areas. Moreover, this policy has led to an increase in environmental and economic risks. M. Soliwoda develops this idea, noticing that state interventionism has negative consequences, mainly related to the distortion of the production structure, and demotivating managers to undertake preventive operations[27]. P. Jeżowski adds that the current path of socio-economic development and the duplication of the current trends of economic growth without looking at the broadly understood ecological, social and

[26] J. Wilkin, *Czy warto* ... op. cit.
[27] M. Soliwoda, *Dylematy wokół wymiaru finansowego zrównoważenia gospodarstw rolniczych*, Zagadnienia Ekonomiki Rolnej nr 3(344), Warszawa, 2015.

economic effects are unsustainable in the nearest future[28]. In view of these challenges, the European Union undertook actions aimed at developing instruments conducive to further growth of production and at the same time not affecting the environmental and economic balance.

Therefore, there is a new approach to non-commercial functions of agriculture and rural areas constituting the basis for sustainable development, and thus the legitimacy of public support for agriculture. The rationale for this approach is to treat goods and services provided by farmers as important to society. Therefore, as Wilkin[29] rightly observes, the phenomenon of inseparability (linking the positive externalities of agriculture with the production of market goods) makes it impossible to exclude elements of protectionism from agricultural policy. Lack of protection and support for agricultural activity may lead to the disappearance of agriculture, and thus deprive society of market and public goods that are important to them. The phenomenon of the inseparability of market and non-market functions of agriculture is a contribution to changing the philosophy of supporting agriculture: from protectionism and sectoral policy to the idea of rewarding farmers for public and social goods and services that they provide to the public. The principle of economization, also recognized as the application of economic instruments in environmental protection, is of great importance for the implementation of the concept of sustainable development and natural resources.

1.3. Sustainable development strategy in the European Union policy and in Poland

Sustainable and lasting development is the main goal of all European Union policies. At the beginning of the creation of this concept it was included in the Environmental Action Programs, which were described in the Community normative acts. These programs were the starting point for developing future sustainable development strategies of the European Union. The description of the Programs along with the objectives is presented in Table 1.

[28] P. Jeżowski, *Rozwój zrównoważony i jego nowe wyzwania*, Kwartalnik Kolegium Ekonomiczno-Społecznego, Studia i Prace, 10(2), Warszawa, 2012.
[29] J. Wilkin*, Czy warto* ... op. cit.

Table 1

Programs of European Union activities in 1973-2000

Program number	Period of validity	Goals
1	1973-1975	**Goals**: preservation and improvement of the natural environment for the sake of human health, rational use of resources **Actions undertaken**: pollution control. Application of preventive measures, neutralization of pollution sources, liquidation of damage to the environment
2	1976-1981	**Goals**: objectives from Program 1 and reduction of pollution. **Activities undertaken**: as in Program 1
3	1982-1986	**Objectives**: protection of natural resources recognized as the basis for economic development **Actions undertaken**: adherence to the principles of environmental protection using natural resources, activities aimed at limiting the negative effects of human activity (the so-called pipe end philosophy)
4	1987-1992	**Objectives**: environmental protection **Actions undertaken**: prevention of environmental pollution
5	1993-2000	**Objective**: reconciling civilization development with environmental protection **Activities undertaken**: counteracting business activities adversely affecting the environment, introduction of environmental protection tools

Source: own elaboration based on J. Zamojski, Podstawy zarządzania ochroną środowiska dla studentów kierunków ekonomicznych, Wyd. Wydz. Zarządzania i Administracji Akademii Świętokrzyskiej w Kielcach, Kielce 2001.

Program V was the starting point for the development of contemporary sustainable development strategies in the European Union. It should be clearly emphasized that both in Poland and in the European Union, sustainable development has been recognized as the guiding principle of socio-economic development since the concept was established. This concept is also reflected in many strategic documents of the European Union, including in the Treaty of Amsterdam of 1997, the Lisbon Strategy of 2000 in the form of the Sustainable Development Strategy of the European Union, the 2001 EU Sustainable Development Strategy or the Europe 2020 Strategy, which since 2010 is the main pillar. In Poland, references to sustainable development can be found both in medium--term documents – National Development Strategy 2020, as well as long-term – National Development Strategy 2030.

Figure 2
European Union activities towards the implementation of the concept of sustainable development

Source: own eleboration.

The first step towards incorporating the concept of sustainable development into the European Union Strategy was made in 1997 by signing the Treaty of Amsterdam. The agreement had an important impact on the whole European policy, because it explicitly defined the values that unite the European Union, including those relating to sustainable development, such as: freedom, democracy, respect for human rights and fundamental freedoms. The definition of these common European values was the determination of the sustainable way of the Member States. This treaty is the foundation for today's understanding of the concept of sustainable development.

In 2002, the Lisbon Strategy was adopted. It was a plan concerning social and economic development of the European Union. The strategic goal of this plan was the achievement by the European Union of the title of the most competitive economy in the world by 2010 in relation to the increasingly visible development differences between the United States and Japan, and the European Union. The objectives of the strategy were to be achieved by introducing numerous ecological, social and economic reforms that were to be implemented in two dimensions: economic and social. The strategy provided for actions in four different areas[30]:

- knowledge economy,
- sustainable development,
- modernization of the European social model,
- proper and stable macroeconomic policy.

[30] P. Lenain, U. Butzow Mogensen, V. Royuela-Mora, *Strategia Lizbońska na półmetku: oczekiwania a rzeczywistość*, CASE Raport, Warszawa, 2005.

The general objectives of the Lisbon Strategy were interlinked with each other through three levels:

- economic one, whose assumptions included, inter alia, the creation of the European Research Area, the integration of financial markets. Development of modern communication and information technologies, completion of internal market construction. This part also concerned the development of enterprises;
- social, whose priority goals in this area were to achieve full employment as well as to fight against the social marginalization. In addition, it was considered that a very important element is to emphasize the importance of education, because it is the foundation of the knowledge-based economy;
- ecological, related to environmental protection, this was an element included during the European Council in Goetborg in 2001.

The Lisbon strategy corresponded to the social dimension of sustainable development in European politics.

The next step leading to the contemporary shape of the European concept of sustainable development was the adoption in 2001 at the Goeteborg Summit of the First Strategy for the Sustainable Development of the European Union. This strategy was divided into two parts. In the first one, various tools and objectives of EU policy were proposed to fight against trends that contradict the idea of sustainable development. Part two refers to the need to change European policies and strategies to strengthen economic, social and environmental policies. The objectives of the European Union's Sustainable Development Strategy included:

- counteracting climate change,
- counteracting the negative effects of transportation,
- sustainable management of natural resources,
- counteracting threats to public health,
- fight against poverty and social exclusion,
- fight against global poverty outside the European Union.

These goals were to be achieved through three groups of tools: the use of the Knowledge Society, economic and financial instruments, and better communication.

Following the review of the European Union's sustainable development strategy carried out by the European Commission in 2004, the European Council adopted a renewed, ambitious and comprehensive sustainable development strategy to be applied in the enlarged EU and which is based on the strategy adopted in 2001. This strategy became applicable in 2006 and focused on the most serious threats to Europe's development, the so-called unbalanced directions, which include problems related to, among others, climate change, protection of natural resources (including lands) and management thereof. It also in-

cluded problems related to aging populations, poverty and social exclusion, rational and sustainable consumption and production.

In 2010, the Europe 2020 Strategy was adopted, which replaced the Lisbon Agenda implemented since 2000. The leitmotif of this strategy was the consolidation of sustainable European development activities guaranteeing stability. Two main projects have been developed as part of the sustainable development priority:

1. Resource-using Europe – the main objective of this project is to formulate commitments for a low-carbon society that will use resources more rationally, so that economic growth is not dependent on the amount of resources or energy used, but first of all on an innovative approach to management. The implementation of this objective would be carried out in two ways – actions taken at the level of the European Union and actions to be implemented by the Member States;
2. Industrial policy in the era of globalization – the project is devoted to the negative effects of globalization in relation to small and medium-sized enterprises, which in a short time must adapt their production and the products themselves to the requirements of a low-emission economy. In addition, attention is paid to improving the business environment and supporting sectors in a difficult situation, and assistance addressed to them can improve their future profitability.

In 2015, the "Agenda for Sustainable Development 2030" was adopted, which is a global framework for sustainable development and defines its 17 goals. It is a kind of obligation for the EU Member States to eliminate poverty and achieve sustainable development throughout the world by 2030. The goals are to balance in all three dimensions: economic, social and environmental. These goals relate to areas such as human dignity, regional and global stability, healthy planet, fair and resilient societies and prosperous economies. These goals are to serve the purpose of deepening convergence at the level of the European Union, within societies and in the world.

The current position of the European Union in terms of implementing the principles of sustainable development is strong, and the goals of this development are reflected in all 10 priorities of the European Commission for the years 2015-2019. The main goals that the concept of sustainable development sets for the countries in the European context are[31]:

[31] http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/sustainable-growth/index_pl.htm

- environmental protection, including: reduction of greenhouse gas emissions, protection of endangered species and taking actions to prevent their extinction and loss of biodiversity,
- striving for competitive low-carbon economies by minimizing costs and increasing productivity in a rational and economical way,
- development of environmentally friendly technologies,
- supporting the development of entrepreneurship by improving the conditions for their establishment and running,
- modernization, introduction of new and more efficient energy networks,
- assistance for European enterprises in gaining market advantage through the use of European Union integration and networks,
- raising consumer awareness.

In Poland, there are also changes aimed at maintaining the principles of balanced and harmonious development of the economy, which maintains a balance in three dimensions: social, economic and environmental. The first mentions of sustainable development appeared in the Environmental Protection and Development Act of 1980[32], defining sustainable development as "socio--economic development, in which, in order to balance opportunities for access to particular societies or their citizens – both contemporary and future generations – there is a process of integrating political, economic and social activities with maintaining the natural balance and durability of basic natural processes".

The first practical measures taken in Poland in the area of sustainable development date back to 1989, when the National Ecological Policy was prepared and adopted by the government in 1990 during the "Round Table" meeting. This document contained the accepted commitment to practical implementation of sustainable development and defined the concept of eco-development as a subordination of the needs and aspirations of society and the state to the opportunities offered by the environment. Unfortunately, as correctly pointed out by C. Więckowski, this document omits the recommendation of Agenda 21 to combat poverty, create new jobs and increase the level of affluence of society[33].

References to the sustainable development policy are also included in the Constitution of the Republic of Poland, where it was stated that "the Republic of Poland (...) guards national heritage and ensures environmental protection guid-

[32] Ustawa z dn. 31 stycznia 1980 roku *o ochronie i kształtowaniu środowiska* (Dz.U. 94.49.196, z póź. zm., art. 3.3a).
[33] C. Więckowski, *Polityka ekologiczna państwa. Priorytety, instrumenty prawne, planowane działania*, Problemy Ekologii, nr 4, Wydawnictwo Górnośląska Wyższa Szkoła Pedagogiczna im. Kardynała Augusta Hlonda, Mysłowice, 1998.

ed by the principle of sustainable development"[34]. Sustainable development in this document is understood as:

- preservation of the possibility of restoring natural resources,
- rational use of non-renewable resources and substituting them with substitutes,
- limiting the nuisance to the environment and not exceeding the limits determined by its resistance,
- preservation of biodiversity,
- providing citizens with ecological security,
- creating conditions for economic entities to compete fairly in access to limited resources and the infrastructure to remove pollutants,
- ensuring protection of the environment constituting the national good,
- creating conditions conducive to the realization of the right of citizens to the equal use of the environment.

The above indicates that the Constitution in a wide range refers to the environmental area, its renewal and protection, while indirectly affects the social and economic aspects. An important role in fulfilling these goals can be played by agricultural activity, which is an integral part of the natural environment and, if properly conducted, with respect for environmental rules, can become a key element of its sustainability.

In the years 1999-2000, the Second Ecological Policy of the State was prepared, in which the principles of environmental protection were specified in detail[35]. In this document, it was assumed that the most important principle of the state's ecological policy is the principle of sustainable development, which equally treats social, economic and ecological reasons, meaning the need to integrate environmental protection issues into the policies of individual sectors of the economy. In the Second Ecological Policy of the State, the main and detailed objectives were set and estimates of the necessary outlays and sources of financing of tasks related to sustainable development were made in the years 2002-2010. The main objectives were:

- ensuring the ecological security of the country from the point of view of residents,
- availability of natural resources and security of the existing social infrastructure,
- implementation of a development model that allows effective management of natural resources, preserving their quality and durability,

[34] *Konstytucja Rzeczypospolitej Polskiej* z dn. 2 kwietnia 1997 (art. 5).
[35] *Program Wykonawczy dla II Polityki Ekologicznej Państwa na lata 2002-2010,* Ministerstwo Środowiska, listopad 2002.

- setting the basis for the country's sustainable development strategy.

In order to achieve the main objectives, specific objectives were set for three time horizons: short-term (2002-2003), medium-term (2010-2012) and long-term (until 2025)[36].

The next document binding in Poland and related to sustainable development is "Poland 2025 – Long-term Strategy of Permanent and Sustainable Development" developed in 2000. The document shows that the implementation of the sustainable development strategy will be implemented in two stages:
Stage I – the period of mutual balancing of the course and socio-economic environmental effects of the development processes of the country, while maintaining the economy for dynamic growth, enabling Poland to join the group of highly developed countries;
Stage II – the period of maintaining balance in the economic, social and environmental aspect, while maintaining the economy's capacity to meet the current and future needs of society, in accordance with the principles of equality and social justice[37].

Unfortunately, in 2007, the document "Poland 2025 ..." was considered to be out of date, due to the lack of quantification of objectives and insufficiently defined mechanisms for its implementation, which significantly complicated the implementation of the national concept of sustainable development. The remedy for the lack of implementation of the principles included in the document "Poland 2025 ..." was a document prepared in 2009 "Poland 2030 – Development Challenges", which was to formulate the official government's position on the results of consultations on this document.

A list of documents adopted in Poland for the implementation of sustainable development principles is presented in Figure 3.

[36] S. Kozłowski, *Kompleksowa ocena ochrony środowiska do roku 2020-2025 i ocena minimalnych potrzeb inwestycyjnych oraz działań* [in:] *Strategia rozwoju Polski do roku 2020*, vol. II, Komitet Prognoz „Polska 2000 Plus". Warszawa, 2001.
[37] *Strategia Zrównoważonego Rozwoju Polski do 2025 roku*, Wytyczne dla resortów, Ministerstwo Środowiska, Warszawa 1999.

Figure 3

Poland's activities towards the implementation of the concept of sustainable development

Source: own elaboration.

Looking from the perspective of the rural areas and agriculture in April 2012, the Council of Ministers adopted the Strategy for the sustainable development of rural areas, agriculture and fisheries for the years 2012-2020 (SZRWRiR). It was developed in order to set out the key directions of rural development, agriculture and fisheries until 2020, and thus appropriate addressing the scope of public intervention financed from national and Community funds. The long-term main objective of measures serving the development of rural areas, agriculture and fisheries is defined in the strategy as follows: *improving the quality of life in rural areas and effective use of their resources and potentials, including agriculture and fisheries, for sustainable development of the country*. This strategy meets new challenges in civilization, including such as: aging of the population, climate change, generational change, information technology development, occupational and territorial mobility, and the impact of the demographic situation in the world on food security[38].

In February 2017, the Strategy for Responsible Development (SRD) until 2020 (from the perspective until 2030) was adopted. This strategy defines the basic conditions, goals and directions of the country's development in the social, economic, regional and spatial dimensions in the perspective of 2020 and 2030. The SRD presents a model of responsible development and socially and territorially balanced. It assumes a departure from the current support of all sectors / industries to support strategic sectors that may become the engines of the Polish economy. Its fundamental challenge is to rebuild the economic model so that it

[38] https://www.gov.pl/web/rolnictwo/strategia-zrownowazonego-rozwoju-wsi-rolnictwa-i-rybactwa-na-lata-2012-2020.

can serve the whole society. The main objective of the SRD is "Creating conditions for the growth of incomes of Polish residents, while increasing the cohesion in the social, economic, environmental and territorial dimension". The most important assumed result will be an increase in the average household income to 76-80% of the EU average by 2020, and by 2030 close to the level of the EU average, while striving to reduce the disproportion in incomes between individual regions[39].

In 2019, the draft Strategy for sustainable development of rural areas, fisheries and agriculture 2030 was submitted, which details the provisions of the medium-term national development strategy (SOR 2030) in the scope of development of the food and rural areas sector. The basic goal of the Strategy is to ensure an increase in income of the inhabitants of rural areas, while at the same time increasing the cohesion in the social, economic, environmental and territorial dimensions of the Polish village. The document stresses that the Area of Strategic State Intervention (SSI), which is all rural areas, is strongly diversified economically, socially and territorially (mainly due to differences in sources of financing the development, territorial accessibility, pace and directions of demographic and social changes and spatial order). It consists of dynamically developing rural areas, rural areas developing slowly and rural areas of the so-called closed development. The strategy assumes equalization of these differences and is a response to **mega trends** (such as globalization, demographic changes, digitization, climate changes and greater concern for the environment)[40]. The rural development strategies are presented in more detail in Chapter 1.4.

1.4. Objectives of Polish agricultural policy in the context of sustainable development of agriculture and rural areas

Changes taking place in the Polish rural areas as a result of the general civilization development accelerate the changes that take place in agriculture. The rural areas, similarly to agriculture, face the problem of choice of the path of further development, whose strategic direction should be sustainable development.

Agriculture is one of the areas that can be naturally included in the concept of sustainable development, especially when we look from the perspective of the protection of natural resources and cultural heritage. The essence of agriculture is based on natural resources necessary to implement the development goals of farms. Looking through the prism of the agriculture's function, it can be

[39] https://www.gov.pl/web/inwestycje-rozwoj/informacje-o-strategii-narzeczodpowiedzialnego-rozwoju

[40] *Strategia zrównoważonego Rozwoju wsi, rybactwa i rolnictwa 2030*, Projekt z dnia 29 maja 2019 roku.

the core of the activities on which the essence of sustainable development is based, i.e. the implementation of social, economic and environmental goals. The immanent functions of agriculture are social functions (jobs), economic (income creation) and natural (shaping the agricultural landscape). This means that in the case of agriculture and rural areas, the concept of sustainable development becomes essential, because the need to consider the priority importance of the natural environment in the implementation of strategic development objectives is particularly important in those forms of activity whose results depend on nature[41].

The concept of sustainable development of agriculture includes activities aimed at improving the conditions for running a business, living conditions in rural areas without any harm to the specific resources of the rural areas, including the natural environment, landscape, traditions and cultural heritage. This approach reconciles the laws of nature and economics.

A. Woś, and J.S. Zegar in the concept of sustainable development of rural areas distinguish four main directions of development:

- protection of rural areas, including protection of the rural landscape,
- biodiversity and counteracting soil erosion,
- stable and sustainable development of agriculture,
- protection of water, soil and air against pollution from agricultural sources,
- cautious approach to developing biotechnology of genetic engineering[42].

The sustainable agriculture, as one of the directions of sustainable development of rural areas and an alternative to industrial agriculture, should rationally manage the land resources in a way that will be able to use it in the future and meet the needs of subsequent generations of producers and consumers. Its essence is striving to achieve a stable and at the same time economically profitable and accepted socially production in a way that does not threaten the environment.

The sustainable and lasting development is the main goal of all European Union policies, including agricultural policy. It is included in the Environmental Action Programs, which are described in the Community normative acts.

In Poland, the Strategy for sustainable development of rural areas, agriculture and fisheries for the years 2012-2020 was the place of defining the objectives and development measures of the rural areas, agriculture and fisheries in recent years. It was adopted by the Council of Ministers on April 25, 2012 and was part of the system of strategic documents created based on the Guidelines

[41] M. Adamowicz, *Rola polityki agrarnej w zrównoważonym rozwoju obszarów wiejskich*, Roczniki Naukowe SERiA, t. 2, z. 1, Warszawa, 2000.
[42] A. Woś, J.S. Zegar, *Rolnictwo społecznie zrównoważone*, IERiGŻ, Warszawa, 2002.

for creating a development strategy and a plan for ordering development strategy – scope and structure and provisions of the Act of 6 December 2006 on the principles of conducting development policy (Journal of Laws No. 227, item 1658, as amended). This strategy was the key document setting the direction of public actions for the development of rural areas, agriculture and fisheries in 2014-2020. Its provisions have been reflected in the Partnership Agreement – a document planning the way Poland uses EU funds for the years 2014-2020.

The following years brought public institutions closer to verification of the country's development model and work on programming the new European Union financial perspective for 2021-2027. On 16 February 2016, the "Strategy for Responsible Development" was created. Its development is the new medium-term national development strategy "Strategy for Responsible Development until 2020 (with a perspective up to 2030)" adopted by the Council of Ministers on February 14, 2017. It is the starting point for the development strategy defining the basic conditions, goals and directions of development related to sectors, areas, regions or spatial development in the perspective up to 2030, including "Strategy for the sustainable development of rural areas, agriculture and fisheries 2030" (SZRWRiR 2030).

The very process of developing SZRWRiR 2030 was very open and participatory. Ministry of Agriculture and Rural Development carried out a number of activities, including:

- organization of thematic workshops during which the opportunities and threats as well as potential directions of rural areas development were analyzed, the analysis of the existing layout of strategic documents was made and planning at the level of regions as well as the manner of including in such documents the issues concerning rural development,
- conducting expert work of institutes subordinate to or supervised by the Ministers responsible for developing the strategy (including the Central Statistical Office, the Institute of Inland Fisheries in Olsztyn, Institute of Technology and Life Sciences in Falenty, Marine Fisheries Institute in Gdynia, Institute of Agricultural and Food Economics – National Research Institute in Warsaw and Institute of Soil Science and Plant Cultivation – National Research Institute in Puławy),
- supporting the work of voivodship teams by providing detailed data on socio-economic issues of rural areas of individual regions of the country and preparing contributions to specific parts of the strategy and diagnostic document,
- preparation of independent expert opinions, where the project approach for the strategic project Strategy of Responsible Development was used

for preparing "Pact for rural areas 2017-2020 (2030)", which identified the current role of other public entities in the process of rural and agriculture development,

- collecting information and opinions of employees of public institutions and independent experts (including during meetings of the interministerial team and as part of the review of the document by the Advisory and Consultative Team),
- running expert panels in each of the regions,
- preparation of ex-ante evaluation SZRWRiR 2030.

The main objective of the Strategy for the sustainable development of rural areas, agriculture and fisheries 2030 is to increase the income of the inhabitants of rural areas, while at the same time increasing the cohesion in the social, economic, environmental and territorial dimension of the Polish rural areas. Achieving the assumed goal will be possible thanks to the implementation of activities designed in the form of three specific objectives and three areas that have a cross-sectional impact on each of these objectives:

- Specific objective I. Increasing the profitability of agricultural and fisheries production.
- Specific objective II. Improvement of the quality of life, infrastructure and the state of the environment.
- Specific objective III. Development of entrepreneurship, non-agricultural jobs and active society.

The following three areas were identified that affect the implementation of the strategy's goals:

1. efficient development management,
2. stable financing for development,
3. lasting ability to create and learn.

While designing the goals and activities of the strategy, demographic processes were taken into consideration, which were a reference point for planning and implementing development activities. The following rules were adopted:

- principle of a selective approach (concentration, searching for niches, sectors);
- integrated and territorially differentiated approaches (management organized around strategic objectives, coordination of sectors and institutions operating at different levels of management);
- cooperation, partnership and joint responsibility of public entities, business and citizens in the implementation of public policies; mobilization of domestic capital.

SZRWRiR 2030 is a partial response to mega trends (such as globalization, demographic changes, digitization, climate change and greater care for the environment), reflects the new country development model adopted in the SRD (implementation of the responsible development model in place of the polarization and diffusion model) and are part of the initiatives designed in the Plan for Rural Development (based on three pillars: protection, support and development). The strategy introduces changes in the management system by establishing a broader agricultural dialogue, implementing a new CAP management model, describing institutional changes (Krajowy Ośrodek Wsparcia Rolnictwa – National Agricultural Support Center and agricultural extension centers) and assuming greater use of a design approach in managing agricultural and rural development. The strategic choices in SZRWRiR 2030 are also a response to the way of using EU funds for 2021-2027 (mainly the Common Agricultural Policy, Cohesion Policy and the Common Fisheries Policy) for rural development, agriculture and fisheries.

The practical implementation of the principles of sustainable development is conditioned by numerous factors among which listed are:

- ecological awareness of the society and its readiness to participate in the process of sustainable development,
- balance between the economy – environment – society and
- making decisions about the development of the organization, society, its education, etc.

An important challenge may, therefore, be the development of such instruments that could contribute to keeping balance in the environmental, social and cultural areas. These instruments may include ones of an economic nature, in the form of penalties, fees or taxes. The use of these tools in the policy of sustainable development can significantly contribute to changing the behaviour of entities. Attention should also be paid to natural soil cultivation techniques that can also contribute to the reversal of adverse environmental degradation processes.

This approach to the problem results from the depletion of natural resources, determining the strength and potential of agriculture, which will be a serious challenge for the coming years.

One of the factors determining the production potential of Polish agriculture is water, and actually the dependence of plant production on rainwater. In the conditions of changing climate, large fluctuations are observed in the availability of water and the resulting extreme phenomena, i.e. floods and droughts. This field requires immediate innovative solutions that reduce water consumption, accumulate it when it occurs in excess (small retention facilities), and de-

veloping cost-effective irrigation systems and technologies. An important element in water management is also water retention in the soil, the growth of which can be achieved by increasing the content of organic matter in it and / or using simplified cultivation techniques.

In addition, the observed in Poland in recent decades depletion of the soil organic matter is a serious problem that requires rapid intervention and innovative solutions, including the use of waste raw materials from agriculture for the production of biochar and its use in both crop and animal production. This is a problem of strategic importance for the country, as it also involves the reduction of greenhouse gas emissions from field crops and animal production and is part of the broadly understood green economy (the so-called bioeconomy).

The increase in the content of organic matter in the soil is also connected with the problem of significant acidification of soils in Poland and its adverse effect on the use of nutrients by crops. We belong to the countries in Europe with one of the lower coefficients of the effectiveness of using nitrogen, one of the most yielding macroelements. At relatively low, average doses of nitrogen (62 kg/ha), with low level of organic matter in the soil, its environmental impact is significant. On the one hand, it requires improvement of soil properties as well as innovations in the use of nitrogen fertilizers, their rational dosage and smart technologies of fertilization through changes in the methods of application, methods of slowing its release, as well as precisely matched dates of its application. These issues are an element of precision agriculture, based on the latest technologies for monitoring soil fertility (spectrometers for measuring electrical conductivity, organic matter content and soil pH mounted on agricultural machinery) allowing to create soil fertility maps. Modern solutions in the field of crop imaging (NDVI imaging readers, aerial photographs, drones, satellite images) allow to intelligently monitor the state of supply of crops with nutrients, as well as their phytosanitary status and apply appropriate treatment depending on the needs of plants.

Biological progress also determines the potential of agriculture. Creating new varieties better adapted to habitat conditions, resistant to water deficiencies and pathogens, better utilizing nutrients, are tasks for modern molecular biology and a wide field for innovative solutions in agriculture.

2. Instruments of environmental protection in agriculture

2.1. Concept of sustainable development of agriculture as an imperative of pro-environmental reorientation of agriculture

Agricultural development in the twentieth century was based on an industrial model, concentrated on intensifying management aimed at increasing the size of agricultural production, of both animal and plant origin[43]. The maximization of economic benefits as the overriding goal of management was inevitably associated with the necessity of an increasingly expansive use of chemicals, industrial feeds, improved plant varieties and animal breeds, and the implementation of efficient manufacturing techniques supporting and replacing human and animal labour[44]. As a result of the above, the increase in the productivity of land and farm animals was naturally translated into production progress in agriculture, being at the same time associated with high social and environmental costs constituting the basis for the criticism of the current (industrial) model of agricultural development[45]. Although the industrialization and modernization of agriculture have been considered a progressive and modern process for years[46], nevertheless these phenomena have disturbed the ecological balance, among others, leading to:

- loss of soil fertility,
- decay of natural habitats and reduction of biodiversity,
- contamination of agricultural land, water, air and food with residues of pesticides and heavy metals originating from mineral fertilizers,
- monotony or (and) impoverishment of the landscape as a result of the introduction of monocultures,
- addiction to non-renewable resources and an increase in the mass of consumer waste[47].

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[43] A. Kołodziejczak, *Modele rolnictwa a zróżnicowanie przestrzenne sposobów gospodarowania w rolnictwie polskim*, Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza w Poznaniu, Poznań 2010.

[44] M. Adamowicz, *Zrównoważony i wielofunkcyjny rozwój rolnictwa a agronomia*, Annales Universitatis Marie Curie-Skłodowska. Sectio E., Vol. LX, Lublin 2005.

[45] J.S. Zegar, *Współczesne wyzwania rolnictwa*, PWN, Warszawa 2012.

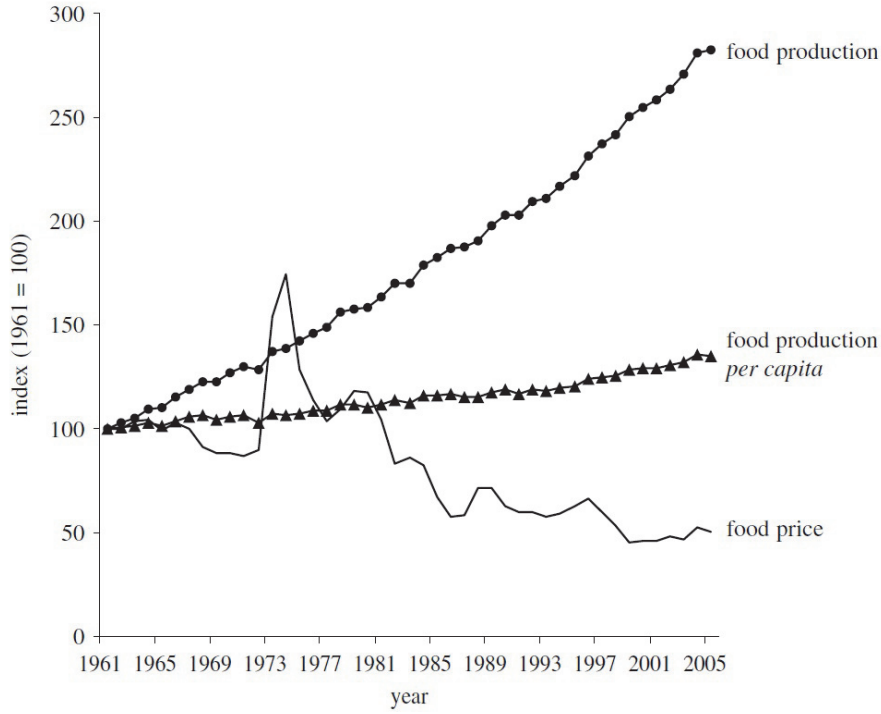
[46] K. Rykaczewska, *Rola agronomii w rozwoju rolnictwa wielofunkcyjnego – w świetle X Kongresu Europejskiego Towarzystwa Agronomicznego*, Biuletyn Instytutu Hodowli i Aklimatyzacji Roślin Nr 255, Radzików 2010.

[47] M. Głodowska, A. Gałązka, *Intensyfikacja rolnictwa a środowisko naturalne*, Zeszyty Problemowe Postępów Nauk Rolniczych, Nr 592, Warszawa 2018; J.S. Zegar, *Współczesne wyzwania rolnictwa*, Wydawnictwo Naukowe PWN, Warszawa 2012; Ministerstwo Rolnictwa i Rozwoju Wsi, *Prognoza oddziaływania na środowisko strategia zrównoważonego rozwoju wsi, rolnictwa i rybactwa* (maszynopis), Warszawa 2011.

Justified by the need to ensure food security, the dynamic development of agricultural production (Figure 4) intensified the scale of the negative impact of agriculture on the natural environment.

Figure 4

Trends in world food production in 1961-2005



Source: P. Hazell, S. Wood, Drivers of change in global agriculture, Philosophical Transactions of the Royal Society B: Biological Sciences, 363 (1491), 2008.

The negative effects of agriculture mentioned above and related with it external effects essentially formed the ground for conviction about the need for a new approach (model) to agriculture and its future development. Following Woś and Zegar[48], it can be assumed that harmonious development of agriculture is possible only if two principles are respected: (1) renewable resources will be used to a degree not exceeding the level of their reproduction and (2) pollution

[48] A. Woś, J.S. Zegar, *Rolnictwo społecznie zrównoważone*, Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa 2002.

entering the natural environment cannot be greater than the ability of this environment to assimilate them.

This view is not isolated and it is reflected in the concept of sustainable development – a concept that clearly emphasizes the importance of environmental protection in all types of activities undertaken by contemporary society[49].

The idea of sustainable development permeates virtually all areas of socio-economic life. The search for a compromise between satisfying the needs of the present generation without diminishing the development opportunities of subsequent generations[50] successively becomes an imperative accompanying all kinds of activities undertaken by a wide range of participants and regulators of the contemporary economic system. The fundamental assumptions of the model of sustainable economic development focus on the permanent improvement of the quality of life of current and future generations by shaping the right proportions between the three types of capital – economic, social and environmental ones[51].

With regard to agriculture, the paradigm of sustainable development has received numerous interpretations[52]. The discourse on the terminology of this issue has been going on basically since the 90s of the twentieth century and so far no key decisions have been made. The dynamic character of the analyzed concept and the multitude of appearances make it possible to disregard the exact nature of the concept of "sustainable development of agriculture" from the point of view of the subject of interest in this part of the study. However, it should be pointed out the characteristics and features of this model and its strong links with the environmental protection issues. S. Kowalczyk[53] gives the following attributes to the concept of sustainable agriculture:

- strategy of sustainable agriculture is based on the primacy of long-term production and economic goals (over short-term goals);

[49] The issue of sustainable development is the subject of analysis presented in chapter 1.
[50] World Commission on Environment and Development (WCED) (1987), *Our Common Future*, Oxford University Press, Oxford.
[51] B. Piontek, *Koncepcja rozwoju zrównoważonego i trwałego Polski*, Wydawnictwo Naukowe PWN, Warszawa, 2002; Sadowska B., *Rachunkowość podmiotów gospodarki komunalnej z perspektywy ekonomii zrównoważonego rozwoju. Pomiar – ewidencja – raportowanie*, Cedewu, Warszawa, 2019.
[52] A thorough analysis of the concept of sustainable agriculture can be found in: Kowalczyk S., *Z badań nad rolnictwem społecznie zrównoważonym. (45). Rolnictwo zrównoważone w erze globalizacji. Zagrożenia i szanse*, Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej - Państwowy Instytut Badawczy, Warszawa, 2018.
[53] S. Kowalczyk, *Z badań nad rolnictwem społecznie zrównoważonym. (45). Rolnictwo zrównoważone w erze globalizacji. Zagrożenia i szanse*, Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej - Państwowy Instytut Badawczy, Warszawa, 2018.

- this concept is focused on rational management of the natural environment, with particular emphasis on such areas as: soil, water and air;
- implementation of the sustainable agriculture model aims at protecting environmental resources and eliminating degradation processes;
- bundle of objectives integrated into the concept of sustainable agriculture also includes measures to improve the quality of rural life and work in agriculture and elimination of threats to the health and safety of producers and consumers;
- model of sustainable agriculture is based on the assumption that it is necessary to respect the needs of future generations by valuing them equally with the needs of current generations.

The particular importance of the concept of sustainable development in relation to agriculture is obvious. The importance of implementing the assumptions of the sustainable concept in the functioning and future development of agriculture results directly from the specificity of this type of activity and its fundamental and multifaceted relationship with the natural environment. Agriculture is a dimension of the economic use of natural resources, so a farmer (agricultural holding) performs simultaneously the function of: an agricultural producer and an entity using the environment. The problem is to balance the mutual relations between the two functions in a manner consistent with the triad of goals postulated within the concept of sustainable development[54]. It should be emphasized that this issue is not only a theoretical problem. As previously highlighted, the priority importance of the natural environment in the implementation of broadly defined strategic development objectives was laid down in article 5 of the Constitution of the Republic of Poland[55], in which it was stated that "the Republic of Poland (...) ensures environmental protection, guided by the principle of sustainable development". The rank of the cited legal act – as the superior source of law – makes the issue of environmental protection clearly distinguished in the realities of functioning of both the socio-economic system and state policy as a regulator of processes taking place in the real sphere of the economy. This statement opens the way and at the same time justifies the need to identify instruments for environmental protection in agriculture.

[54] S. Prutis, *Ochrona środowiska za pomocą instrumentów prawno-finansowych Wspólnej Polityki Rolnej*, Studia Iuridica Agraria, Nr 13, 2015.
[55] Konstytucja Rzeczypospolitej Polskiej, op. cit.

2.2. Classification of environmental protection instruments in agriculture

The natural environment is treated as a global public good, which benefits all participants of the global society[56]. In this matter, therefore, the interests of nation states, supranational economic entities, international institutions and organizations are crossed[57], aimed at providing methods, mechanisms and instruments to protect natural resources. A derivative of the perception of natural resources as a public good is, on the one hand, the need to provide a specific legal framework regarding the environmental protection and conditions of its exploitation, while also identifying the location of the (broadly defined) public administration apparatus in the environmental protection system. On the other hand, the environment understood as a public good requires a specific system of financing its protection, created on the basis of funds coming from various sources, both public (domestic and foreign budget funds) and private.

The complex nature of the issues under consideration – and above all its global character – makes the division of environmental protection instruments ambiguous. At the root of the difficulties in the classification of environmental protection instruments lies (1) the dynamic character of the discussed issue (illustrated by the multiplicity of forms and protective instruments and their high variability over time, for example, the emergence of newer solutions in this area) as well (2) it is impossible to set a clear boundary between the types of instruments used for environmental protection existing in practice[58]. As a consequence, numerous classifications of analyzed instruments are met in the literature on the subject, but none of them bears the universally binding attributes, but serves only an arbitrary ordering of the discussed matter[59].

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[56] J. Stiglitz, *Wizje sprawiedliwej globalizacji. Propozycje usprawnień*, Wydawnictwo Naukowe PWN, Warszawa, 2010.

[57] I. Macek, *Dylematy ponowoczesnej rzeczywistości na przykładzie środowiska jako dobra publicznego*, Wrocławskie Studia Politologiczne, Nr 17, Wrocław, 2014.

[58] Anticipating the next part of the analysis devoted to the classification of environmental protection instruments, it is worth pointing out that the instruments of economic sphere can be perceived as instruments difficult to classify unequivocally. As an example, one can give a decision to impose an administrative fine, which on the one hand is an administrative instrument (and thus can be classified as an administrative and legal instrument), as well as an instrument to supply the financing system for environmental protection with financial resources (acting as an economic instrument). (R. Stec, D. Strus, J. Bucińska, M. Niedziółka, M. Górski, *Administracja publiczna – człowiek a ochrona środowiska. Zagadnienia społeczno-prawne*, Wolters Kluwer Polska sp. z o.o., Warszawa, 2011).

[59] Lack of unambiguity in the classification of instruments for environmental protection is the subject of consideration in: (Stec R., Strus D., Bucińska J., Niedziółka M., Górski M., *Administracja publiczna – człowiek a ochrona środowiska. Zagadnienia społeczno-prawne*, Wolters Kluwer Polska sp. z o.o., Warszawa, 2011).

There are many tools, methods and means to achieve environmental and sustainable development goals. In the literature of the subject is used, among others division into following categories of instruments:

- soft:
  - educational – raising the level of public knowledge in the field of human--environment relations,
  - organizational – defining the tasks, competences, powers and responsibilities of individual bodies of the environmental management process,
  - planning and localization – improvement of the spatial planning system,
  - legal – regulating the rules of conduct in relation to the environment;
- hard:
  - technical – consisting in designing, manufacturing and using devices and products, and to minimize their impact on the environment,
  - economic, of legal-administrative or economic-market character.

The starting point for the classification adopted in this publication is the aforementioned claim that comprehensive environmental protection requires the co-existence of a legal imperative and an appropriate system of financing activities undertaken in this field. This statement is the basis for distinguishing two basic groups of environmental protection instruments – (1) administrative and legal instruments and (2) economic instruments (Figure 5), between which there are strong interactions and interdependencies.

The former group of administrative and legal instruments is established on the basis of applicable law, which grants public authorities a number of competences regarding shaping social relations related to the use of natural resources. These competences have the character of administrative powers, consisting in the possibility of unilaterally resolving individual situations – resolving and permanently binding all entities[60]. In essence, administrative and legal instruments take the form of prohibitions and orders, permits, pro-ecological administrative procedures and standards (norms) addressed to entities whose activities have impact on the environment and concern or focus on shaping space. These instruments constitute an external imperative determining the manner and intensity of using natural resources[61].

[60] E. Zębek, *Instrumenty administracyjno-prawne i ekonomiczne w ochronie środowiska*, Kortowski Przegląd Prawniczy, Olsztyn, 2017.
[61] A. Graczyk, *Mechanizmy rynkowe w ochronie środowiska jako czynnik zrównoważonego rozwoju*, Problemy Ekorozwoju, Vol. 4, nr 1, Lublin, 2009.

The latter category of environmental protection instruments – economic instruments – have indirect impact, serving[62]:

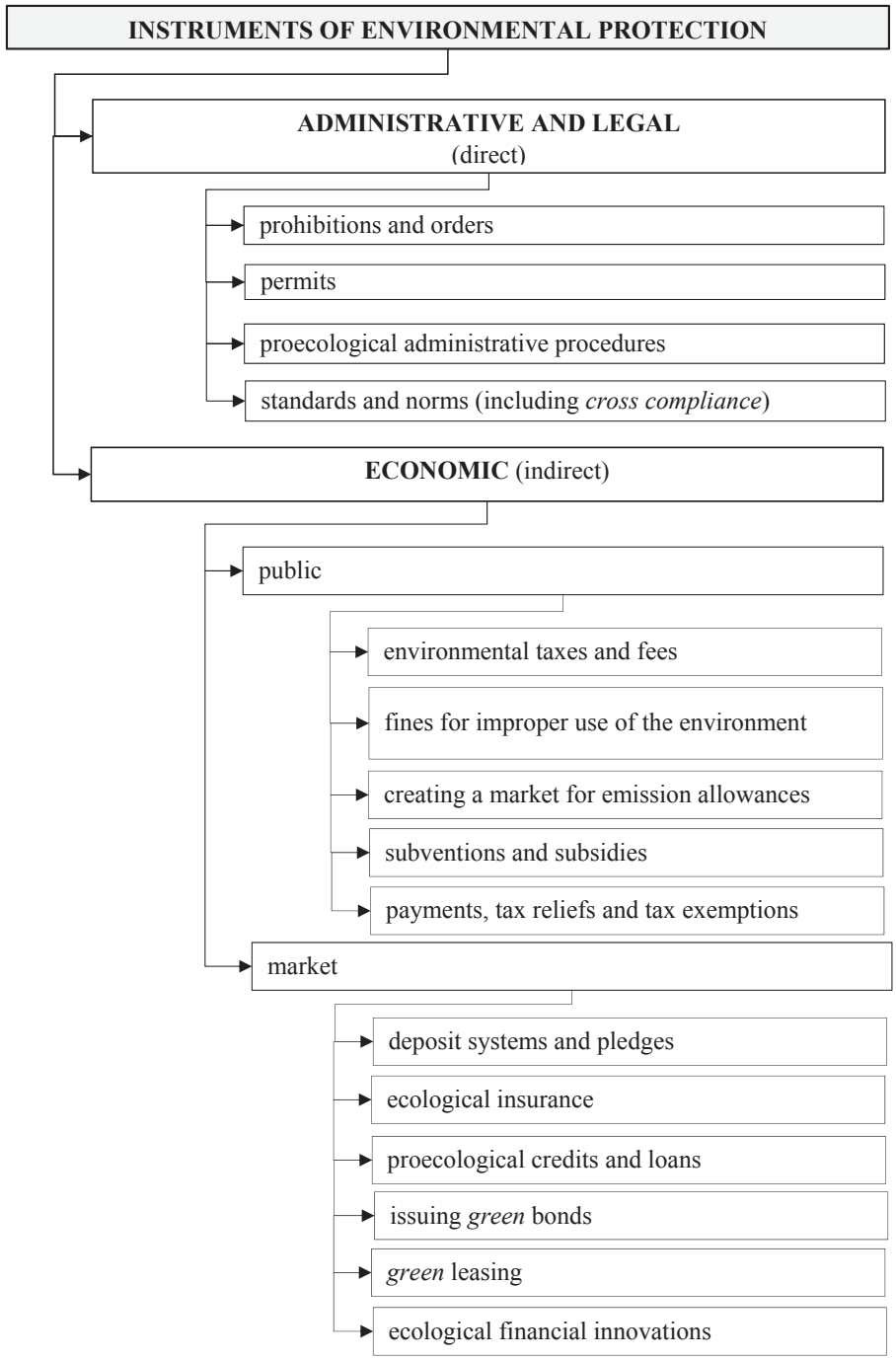
- creation of a system of incentives for economical use of natural resources and limiting the presence on the market of products whose production or use has a negative impact on the environment,
- internalization of environmental external costs of the production sphere related to pressure on the environment (based on the assignment of negative external effects of their perpetrator, and hence involving the transformation of external costs into internal costs),
- collection of financial resources that are a source of financing pro-ecological activities.

It should be added that there is no strict definition of economic instruments for environmental protection the literature on the subject nor in the economic practice. This category of instruments is a conceptual aggregate for all mechanisms that are separated based on the functions they perform. Economic instruments of environmental protection are assigned the role of a financial stimulus providing the users of the environment with incentives to take actions aimed at economical management of its resources (stimulus function). In addition, the analyzed group of instruments is essentially intended to collect funds and their further redistribution to finance projects in the field of environmental protection (income function, also referred to as transfer or redistribution). It is also indicated that the use of environmental protection instruments with indirect impact may influence the formation of public budgets (hence they perform a fiscal function), as well as – provides signals about significant environmental threats and the need to take appropriate measures (information function)[63].

[62] J. Jendrośka (ed.), *Leksykon prawa ochrony środowiska*, Wolters Kluwer Polska sp. z o.o., Warszawa. 2013.
[63] B. Poskrobko (ed.), *Zarządzanie środowiskiem*, Polskie Wydawnictwo Ekonomiczne, Warszawa, 2007.

Figure 5

Classification of environmental protection instruments in agriculture



Source: own elaboration.

Against the background of the above observations and taking into account the experience of economic practice, an internal division of economic environmental protection instruments into two main groups of instruments can be made: public and market (private). The proposed classification is of an ordinal character and is born on the basis of two criteria (adequate to the nature of the instrument):

- source of incentives encouraging to undertake activities focused on environmental protection,
- source of funds for financing expenditures on pro-ecological activities.

In the light of the above, economic instruments for environmental protection of a public nature aggregate all those mechanisms for which the basis of operation are the decisions of public authorities and institutions (both domestic and foreign), and the use of these instruments may be manifested in changes in the income or expenditure side budgets of these entities.

On the other hand, economic environmental protection instruments of a market nature are a group of mechanisms whose existence and operating conditions result from the activity undertaken by private sector entities. The market offer of these instruments and their diversity depend on the individual premises of the institutions creating economic instruments for environmental protection, and the impact of these mechanisms focuses primarily on financial support (incentive) for processes occurring in the sphere of pro-ecological solutions.

To sum up the considerations against the background of the general classification of instruments for environmental protection, it is worth making a comparative study of both groups of instruments, i.e. administrative and legal (with direct impact) and economic (indirect) instruments. First of all, the boundary between both categories of instruments is determined by the fact that instruments with a direct impact character indicate in a strict and unequivocal way the principles of actions taken by a given entity and / or the limits of the potential impact of its activity on the state of the natural environment. Breaking the rules defined by law always results in consequences defined by the content of direct regulation, i.e. incurring legal, civil, criminal or administrative liability[64]. On the other hand, economic instruments create a system of incentives (stimuli) encouraging to undertake activities focused on the economical management of natural resources. The implementation of these mechanisms in the practice of

[64] Therefore, it can be concluded that environmental protection instruments with a direct impact (administrative and legal) have a preventive function, essentially aimed at formulating an external imperative forcing specific behaviour in terms of the manner, scale and conditions of using environmental resources to minimize the negative impact of specific activity on his condition. A review of examples of solutions used within the administrative and legal instruments for environmental protection in agriculture is included in point 2.3.

socio-economic life manifests itself both in the form of specific penalties and fees for negative impact on the state of the natural environment, as well as – they take the form of a financial bonus rewarding pro-ecological attitudes of decision-makers[65].

The analyzed groups of instruments also delimit their degree of flexibility, understood as the possibility of a relatively quick modification of existing solutions in order to adapt them to changing economic conditions. Against the background of this criterion, instruments of a direct impact nature should be considered as not very flexible, and the premise for this claim is the issue of a long and complicated (multi-stage) legislative process on the basis of which changes are made to the current legal order. A similar situation also applies to the issue of introducing new pro-environmental regulations not yet present in the system of legal acts. In the face of the criterion under consideration, instruments with an indirect impact should be given a higher degree of flexibility. The introduction of new mechanisms focused on environmental protection and modification of existing solutions is the initiative of the entity implementing a specific instrument and indicating the conditions for its functioning (practical use).

It is also worth noting that economic instruments for environmental protection provide incentives for continuous reduction of pollutant emissions, even after reaching their normative limit. This feature significantly distinguishes economic instruments from administrative and legal ones, for which there are no incentives to continue pollution reduction after reaching the legally permissible level (scale) of their emission[66].

In summary, it should be pointed out that despite the indicated differences between the two classes of instruments, there is a strong interdependence. Mechanisms of an economic (indirect) nature should be seen in the context of legal and administrative regulation, setting acceptable limits and rules for the use of broadly understood natural resources. Thus, the economic instruments for environmental protection are an extremely important complement to administrative and legal instruments[67]. On the other hand, the interference of the public administration apparatus in the sphere which is the subject of this analysis is conditioned by the need to ensure such a quality of the

[65] This issue is discussed in more detail in section 2.4.

[66] A. Wasiuta, *Ekonomiczne instrumenty zarządzania środowiskiem w kontekście współczesnej polityki energetycznej Polski*, Studium Vilnense A, vol. 8, 2010.

[67] B. Fiedor, *Instrumenty ekonomiczne w ochronie środowiska. Istota, klasyfikacja, funkcje i pożądane kierunki zmian*, 2009, http://www.kee.ue.wroc.pl/informacje_dla_studentow/92, boguslaw_fiedor_prof_dr_hab.html?file_id=90 (access: 15.03.2019).

natural environment that would be consistent with the theory of sustainable development, which cannot be achieved due to the unreliability of the market mechanism (this is more broadly described by Ł. Popławski[68]).

2.3. The selected administrative and legal instruments for environmental protection in agriculture

The perception of protecting the resources of the natural environment, as one of the most important civilization challenges of modern society, finds its roots in the belief that it is necessary to provide future generations with ecological security and the availability of natural resources whose values will be no worse than those that accompany current generations. According to the findings so far, the supremacy of natural resources over the effects of any economic activity is an important element of the concept of sustainable development, which, in accordance with the spirit of the Constitution of the Republic of Poland, sets the direction of socio-economic development. Adequate to the content of the basic law, the conditions necessary for the gradual implementation of sustainable development assumptions – i.e. directly related to environmental protection issues – are created both at the level of government and self-government administration, by means of administrative and legal instruments embedded in relevant legal acts.

When assessing the legal system of environmental protection in agricultural activity in Poland, it should be stated that it is extremely extensive and at the same time decentralized, finding its sources in numerous acts and regulations. It is based on the abovementioned Constitution of the Republic of Poland and numerous legal acts covering, among others[69]:

- Act of 27 April 2001 *Environmental Protection Law*[70], which is a pillar for all regulations in the field of protection of broadly understood natural resources;
- Act of 3 February 1995 *on the protection of agricultural and forest land*[71], which specifies the provisions regarding the protection of agricultural and forest land;

[68] Ł. Popławski, *Ochrona środowiska jako zawodność rynku – wybrane problemy,* Folia Pomeranae Universitatis Technologiae Stetinensis, Oeconomica 301 (71), 2013.
[69] *Ochrona środowiska w gospodarstwie rolnym*, Centrum Doradztwa Rolniczego w Brwinowie. Oddział w Poznaniu, Poznań, 2010.
[70] Ustawa z dnia 27 kwietnia 2001 r. *Prawo ochrony środowiska*, Dz.U. 2001 nr 62 poz. 627.
[71] Ustawa z dnia 3 lutego 1995 r. o ochronie gruntów rolnych i leśnych, Dz.U. 1995 nr 16 poz. 78.

- Act of 28 September 1991 *on forests*[72], regulating the principles of conserving, protecting and increasing forest resources, as well as the principles of forest management, in relation to plants and forest stand as well as forest animals;
- Act of 16 April 2004 *on nature protection*[73], which specifies the provisions on the protection of areas and objects of natural value, as well as relates to the protection of landscape, animals and plants threatened with extinction;
- Act of 21 August 1997 *on the protection of animals*[74], which sets out provisions for the protection of farm and domestic animals;
- Act of 20 July 2017 *Water Law*[75], which sets out the rules for using water to ensure the appropriate quantity and quality of its resources;
- Act of June 9, 2011 *Geological and Mining Law*[76], whose regulations concern the management of mineral deposits and their exploitation, as well as the necessity of environmental protection following this activity.

The above catalogue of legal provisions regulating the issue of environmental protection within agricultural activities certainly does not exhaust all sources. Nevertheless, it provides a good basis for the exemplification of direct regulation instruments on the subject of ongoing considerations.

The group of prohibitions and orders – distinguished as the first under administrative and legal instruments for environmental protection in agriculture – includes mechanisms of legal control in the scope of limiting the possibility of implementing actions that have a negative (harmful) impact on the state of the natural environment. In essence, bans identify and strictly define the types of activities that are prohibited in the light of applicable legal regulations (under pain of legal liability). The most common bans relate to:

- use of selected agricultural production technologies (both plant and animal) that have a negative impact on the state of the environment,
- use of specific plant protection products containing active substances that strongly or permanently degrade the resources of the natural environment (air, soil, ground water and water reservoirs etc.) or are toxic to the flora and fauna surrounding crop fields,
- emissions of compounds that are dangerous to human life and health and the broadly understood natural environment.

[72] Ustawa z dnia 28 września 1991 r. *o lasach,* Dz.U. 1991 nr 101 poz. 444.
[73] Ustawa z dnia 16 kwietnia 2004 r. *o ochronie przyrody,* Dz.U. 2004 nr 92 poz. 880.
[74] Ustawa z dnia 21 sierpnia 1997 r. *o ochronie zwierząt,* Dz.U. 1997 nr 111 poz. 724.
[75] Ustawa z dnia 20 lipca 2017 r. Prawo wodne, Dz.U. 2017 poz. 1566.
[76] Ustawa z dnia 9 czerwca 2011 r. *Prawo geologiczne i górnicze* Dz.U. 2011 nr 163 poz. 981.

One of the examples from the group of instruments for environmental protection analyzed in agriculture is the ban on burning meadows, pastures and wasteland, constituted in art. 124 and art. 131 paragraph 12 of the Act of 16 April 2004 *on nature protection*. Despite the unambiguous content of the cited legal regulation, grass burning is firmly rooted in the practice of farm operations. In 2018 alone nearly 150,000 fires were recorded, of which 33% (48,767) were grass fires in meadows and wasteland[77].

The basic premise for burning grass shoots is the belief that burning the uncollected crop will improve soil fertility and burn weeds, and as a result will translate into increased yields in the future. In fact, burning the humus, the most fertile soil layer entails a decrease in its use value, because the decomposition processes of plant residue forming a fertile soil layer are inhibited. In addition to the degradation of vegetation and soil, burning grass is a significant threat to animals living in shrub areas and organisms living in the top soil layers. Fire consumes, among others: earthworms (which improve the structure and physical properties of soils ensuring their proper condition), ladybugs (significantly affecting the population of aphids), breeding nests of birds or shelter of reptiles, amphibians and small mammals (moles, shrews, hedgehogs, young hares etc.). It should also be borne in mind that fire is an element that is rapidly spreading and basically beyond human control. Therefore, burning grass is an activity that seriously threatens farmers themselves, who own farms, nearby forest areas or even the most accessible elements of economic infrastructure. The spread of fire in an uncontrolled manner (e.g. due to changes in wind direction) threatens the buildings that are part of the farm assets or agricultural machinery, equipment and animals[78].

The presented arguments clearly indicate the need to reduce – and ultimately eliminate – the infamous agricultural practice of burning grass. The multidirectional and extremely harmful impact of this activity on the state of natural resources leaves no doubt as to whether it is appropriate to include grass burning by a statutory ban, the violation of which gives rise to sanctions in the form of a fine or detention. In addition, in view of the low efficiency of legal regulations in shaping agricultural culture, violation of the ban on burning grass has its consequences in the form of financial penalties – the Agency for Restructuring and Modernisation of Agriculture reduces the amount of direct payments (from 5 to 25%), and in extreme cases even collect the full amount payments implemented within a given calendar year[79].

[77] http://www.stoppozaromtraw.pl/ (access: 10.03.2019).
[78] https://www.gdos.gov.pl/wypalanie-traw-szkodzi-i-jest-zabronione (access: 12.03.2019).
[79] https://www.gdos.gov.pl/wypalanie-traw-szkodzi-i-jest-zabronione (access: 12.03.2019).

There are extremely many categories of prohibitions operating in the area of agricultural activity, and their nature varies over time and depends on both the national and pan-European regulatory system. One of the most grateful grounds on which various categories of activities belonging to "forbidden" are born are the terms and conditions for providing financial assistance under the 2014-2020 Rural Development Program (RDP 2014-2010). The obligations set out for farmers wishing to take advantage of e.g. Package 4 in the RDP 2014-2020 are defined in an extremely detailed manner and include[80]:

- ban on plowing, rolling, using sewage sludge, applying under-cultivation and mechanical destruction of the soil structure,
- ban on yarping during properly defined periods,
- ban on the use of plant protection products, except for the selective and local destruction of troublesome invasive species with the use of appropriate equipment (e.g. herbicidal markers),
- ban on creating new, expansion and reconstruction of existing drainage systems, except for the construction of devices aimed at adjusting the water level using existing drainage systems to the requirements of the habitat species (habitats) that are the subject of protection in the package,
- ban on mowing from the outside to the inside of the mown area of permanent grassland,
- ban on storing biomass among clusters of trees and scrubs, in ditches and ravines and other depressions.

The exemplification of the bans used in the procedures for applying for financing agricultural production from European Union funds is only a good illustration of the conditions that stand in the way of realizing the idea of sustainable development of farms[81].

Environmental protection in agriculture – one of the main pillars of sustainability – is also implemented using a group of permits no less numerous in its diversity. In the light of the Act of 27 April 2001 *environmental protection law*, the use of the natural environment – beyond the scope of universal use – may be subject to the need to obtain a permit issued by a competent public administration body, specifying the scope and conditions for the use of natural resources (Article 4 of the Act of 27 April 2001 *environmental protection law*).

[80]https://www.arimr.gov.pl/fileadmin/pliki/PROW_2014_2020/Rolno_srodowiskowo_klimatyczny/a/prsk_pakiet4.pdf.

[81] A. Niewiadomski, *Rodzinne gospodarstwo rolne wobec ochrony środowiska w prawie polskim i europejskim* (in:) Prawne mechanizmy wspierania i ochrony rolnictwa rodzinnego w Polsce i innych państwach Unii Europejskiej, Litwiniuk P. (ed.), Fundacja Programów Pomocy dla Rolnictwa FAPA, Warszawa, 2015.

Regulating access to natural resources through administrative decisions taking the form of permits consists in entitling its addressee to conduct specific business activities, perform a certain activity or to use specific equipment, devices or installations. The basis for issuing the permit is a thorough analysis and assessment of the impact of the undertaken activities – which are the subject of the permit – on the state of the natural environment and human life and health, safety and public order as well as the issue of international obligations. At the same time, the requirement to obtain permits for individual types of economic activity is specified in the content of numerous and diverse legal acts, appropriate to the economic specifics to which they relate[82].

The general legal nature of permits is regulated in the *environmental protection law* (Article 181)[83], on the basis of which two basic types of permits are distinguished – integrated permits and sector permits.

An integrated permit is required for an installation that due to the type and scale of its operations, may cause significant pollution of individual natural elements or the environment as a whole. In relation to agricultural activities, integrated permits are issued primarily for the purposes of[84]:

1. rearing or breeding of poultry or pigs where these are installations:
- over 40,000 places for poultry,
- over 2,000 places for pigs weighing over 30 kg,
- over 750 places for sows;
2. slaughtering of animals with a capacity to process over 50 tonnes of slaughter mass per day;
3. production or processing of food products:
- from raw animal products (excluding milk production) with a production capacity of over 75 tonnes of finished goods per day,
- from raw plant products with a production capacity of over 300 tonnes of finished products per day[85],
- for the production of milk or dairy products with a capacity to process over 200 tonnes of milk per day[86],
- for the disposal or recovery of fallen or slaughtered animals and waste animal tissue with a capacity to process over 10 tonnes per day[87].

[82] E. Zębek, *Instrumenty administracyjno-prawne i ekonomiczne w ochronie środowiska*, Kortowski Przegląd Prawniczy, Olsztyn, 2017.
[83] Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska, Dz.U. 2001 nr 62 poz. 627.
[84] *Ochrona środowiska w gospodarstwie rolnym*, Centrum Doradztwa Rolniczego w Brwinowie. Oddział w Poznaniu, Poznań, 2010.
[85] Calculated as an average value in relation to quarterly production.
[86] Calculated as an average value in relation to the annual production.
[87] Calculated as an average value in relation to the annual production.

Depending on the type of activity undertaken and the related need to apply for an integrated permit, the relevant application is directed to the competent authority of the place of agricultural activity. The decisive body (issuing the administrative decision in the form of a permit) is[88]:

1. the marshal's office, when at least one of the installations on the farm qualifies as a project that can significantly affect the natural environment,
2. the poviat eldership or town hall with poviat rights in other cases.

The issuing of an integrated permit is connected with the necessity to pay a stamp duty (it amounts to PLN 506 – app. EUR 120 – to the account of the authority issuing the decision) and a registration fee paid to the account of the National Fund for Environmental Protection and Water Management. The registration fee[89] is a prerequisite for considering the application for an integrated permit, and its amount is calculated individually for each installation and its specificity, in accordance with the following formula proposed below[90]:

$$O = B \times \frac{WR}{WP}$$

where:
O – level of the registration fee
B – level of the base registration fee for a given type of installation
WR – maximum theoretical (achievable) value of the parameter characterizing the scale of operations carried out in a given installation
WP – threshold size of the parameter characterizing the scale of activity of a given type of installation.

In addition to integrated permits, there are sectoral permits that regulate the issue of emissions of certain types of substances or energy into the environment in such a way that these emissions are not harmful, and therefore not a source of pollution[91]. Environmental protection law distinguishes two basic (aggregated) groups of sectoral permits that may relate to (Article 181 of the Act of 27 April 2007 environmental protection law)[92]:

[88] https://www.biznes.gov.pl/pl/firma/obowiazki-przedsiebiorcy/chce-wypelniac-obowiazki-srodowiskowe/proc_1616-pozwolenie-zintegrowane (access: 15.04.2019).
[89] https://www.biznes.gov.pl/pl/firma/obowiazki-przedsiebiorcy/chce-wypelniac-obowiazki-srodowiskowe/proc_1616-pozwolenie-zintegrowane (access: 15.04.2019).
[90] The maximum level of the registration fee was set at PLN 12,000.
[91] E. Zębek, *Instrumenty administracyjno-prawne i ekonomiczne w ochronie środowiska*, Kortowski Przegląd Prawniczy, Olsztyn, 2017.
[92] Ustawa z dnia 27 kwietnia 2001 r. *Prawo ochrony środowiska*, Dz.U. 2001 nr 62 poz. 627.

1. permits for the introduction of gases or dust into the air, which is the case with farms in the case of animal husbandry installations which are equipped with mechanical ventilation or mixed ventilation;
2. permits for the production of waste, which is not applicable to agricultural holdings[93].

A separate type of permits arising under the Act of 20 July 2017 *Water law*[94] are water law permits for water intake and water law permits for the introduction of sewage into waters or land. The functioning of these permits in the Polish legal system is aimed at protecting the quality of surface and underground waters as well as maintaining water resources at a level that ensures the maintenance of biological balance.

The water law permit for water abstraction applies to a specific situation known in the law as a special use. It manifests itself when a farm[95]:

- draws water (surface or underground) in excess of 5 m^3 per day
- discharges sewage into water or soil not exceeding 5 m^3 per day
- makes agricultural use of wastewater, the total amount of which is more than 5 m^3 per day
- drains land and crops
- uses water found in ponds and ditches
- performs works or building facilities permanently related to land on real estate with an area over 3,500 m^2, and the implemented activity has an impact on reducing natural field retention by excluding more than 70% of the real estate surface from the biologically active area in areas not included in open or closed sewage systems.

Exhaustion of at least one of the above-mentioned premises raises the need to apply to the regional structures of the State Water Holding Polish Water for water law permit. It is granted for a specified period not exceeding 30 years from the day on which the decision on issuing the permit became final. Applying for a permit requires the payment of a fee amounting to PLN 88.74 for a water law application and payment of a fee amounting to PLN 221.34 for

[93] Although the development of agriculture increases the scale of generated waste, this activity is not regulated at the level of permits. Farmers producing hazardous waste up to 100 kg per year and non-hazardous waste (excluding municipal waste) up to 5 tonnes per year are required to keep simplified waste records based on the waste transfer card. However, if a farm exceeds the aforementioned quantitative criteria of generated waste, then it has a legal obligation to keep a full record of waste, including both a waste transfer card and a waste record card (Act of April 27, 2001 on waste).

[94] Ustawa z dnia 20 lipca 2017 r., Prawo wodne Dz.U. 2017 poz. 1566.

[95] https://www.biznes.gov.pl/pl/publikacje/3096-szczegolne-korzystanie-z-wod (of 5.06.2019)

a water permit. It is worth mentioning that one procedure may cover several water permits. In such a case, the PLN 221.34 fee shall be multiplied accordingly, with the maximum value of the fee for issuing a water permit not exceeding PLN 4,426.80.

Summing up the considerations devoted to the issue of permits as instruments of environmental protection of direct impact, one should point to the supreme importance of integrated permits. In the light of the applicable legal order, the integrated permit exempts the owner from the need to apply for emission (sector) permits, including:

- permits for the introduction of gases or dust into the air
- waste generation permits
- water permit for the discharge of sewage into water or soil
- water law permit for water intake.

2.4. The selected economic instruments for environmental protection in agriculture

2.4.1. Public instruments based on the example of fees and penalties

Environmental taxes constitute the most representative group of instruments within the analyzed criterion. The need for introducing taxes related to the environment is based on the belief that, apart from the fiscal function (manifested in budgetary tax revenues), they significantly fulfill the incentive function inclining taxpayers to abandoning activities harmful to the environment (provided that these activities constitute the basis of taxation, and therefore raises tax liability). Consequently, striving to reduce the amount of tax liabilities is to contribute to environmental protection by limiting the scale of pollutants emitted (or more broadly – the scale of negative impact on the state of the natural environment). In the OECD countries, as well as in the European Union countries, an active environmental protection policy is implemented, which includes in its instrumentation numerous and diverse categories of environmental taxes[96]. The third chapter of this study provides a broader context of considerations on environmental taxes.

Fees and penalties are another category of financial burden related to the use of the environment. Both categories are regulated by the *Environmental protection act* and constitute compulsory public-legal levies accompanying agricultural activities due to the use of natural resources. The premise for introducing a system of environmental fees and fines is the creation of an external impera-

[96] Śleszyński J., *Podatki środowiskowe i podział na grupy podatków według metodyki Eurostatu*, Optimum Studia Ekonomiczne, nr 3 (69), Warszawa, 2014.

tive focused on the economical management of natural resources (limiting the scale of negative impact on its condition), as well as the purpose of raising funds to finance environmental protection tasks undertaken by public authorities.

Both instruments – fees and penalties – were previously mentioned on the occasion of the characteristics of permits as instruments for environmental protection in agriculture. A strong connection between fees for the use of the environment and permits arises under applicable law, in the light of which obtaining an appropriate permit is subject to payment of a specific fee[97]. Moreover, farmers – treated as natural persons who are not entrepreneurs – pay fees for using the environment only to the extent that using the environment requires a permit. It is worth noting that in the absence of the required permit for the introduction of gases or dust into the air, as well as permits for the collection of water and the discharge of sewage into water or soil, the fee for such permits is increased by 500%.

While fees are a common component of the payment for using the environment, financial penalties should be seen as having a repressive nature. Fines are imposed in the situation of exceeding or violating the conditions of using the environment, which were defined in the permit or decision issued to the applicant. The basis for imposing a penalty (by way of an administrative decision of the voivodship environmental protection inspector) is the result of an inspection showing (Article 298 of the Act of 27 April 2001 Environmental Protection Law):

- exceeding the quantities of gases or fumes emitted to the air or the content of air pollutants,
- exceeding the noise level,
- violation of the terms and conditions for operating a waste storage area or a place and manner of storing them.

If the amount or type of gases or fumes emitted is contrary to regulations, the financial penalty shall be imposed at 20 times the unit rate of charges for pollution released into the air. The table of relevant fees, adequate to the type of pollution emitted, is regulated by the announcement of the Minister of the Environment. On the other hand, the storage of waste in a manner inconsistent with the conditions set out in the permit (decision) is subject to a financial penalty corresponding to the amount of 0.1 unit rate of fee for placing waste in the waste storage area (for each day of storage) (Article 309 of the Act of 27 April 2001 *Environmental protection law*).

[97] The characteristics of fees related to permits are included in point 2.3.

It is worth mentioning that financial penalties in agriculture are not only applied under the *Environmental protection law*. In relation to the fees discussed above, penalties constitute a much more diverse group of instruments, both in terms of types (source of origin) and the level of their size[98]. One of the most modern categories of financial penalties related to the negative impact of agricultural activity on the state of the environment is born on the basis of the "Action Program to reduce water pollution by nitrates from agricultural sources and to prevent further pollution" (the so-called Nitrate Program) (OJ 2018 item 1339). The nitrate program, which has been in force since July 27, 2018, is aimed at protecting waters against excessive runoff of biogenic agents from agricultural land and obliges all farmers who conduct agricultural production to manage it obeying specific requirements. The requirements that the Nitrate Program imposes on agricultural holdings depend on the area, scale and intensity of agricultural production[99] and their common denominator is the limitation of the maximum nitrogen dose that can be used in plant production[100]. In addition, the Nitrate Program introduces restrictions on the agricultural use of fertilizers and their application dates. The content of the adopted program introduced a ban on the use of fertilizers on frozen, flooded, saturated with water or snow covered soils[101]. In addition, the use of fertilizers on agricultural land near surface water is prohibited (Table 2).

[98] It is worth referring to the above mentioned in point 2.3 financial penalty for burning grass by farmers, manifesting itself in a reduction in the amount of direct payments or a call for a farm holder to repay the amounts received.

[99] Including special sections of agricultural production, and activities in which animal manure is stored or nitrogen fertilizers used (www6).

[100] The nitrate program is a standard, and therefore an administrative and legal instrument for environmental protection. Due to the need to preserve a logical sequence of narratives, the basic assumptions of the Nitrate Program were made, and then the foundation and amount of the potential financial penalty were indicated.

[101] In the case of natural fertilizers, the existing fertilization limit has been kept – 170 kg N / ha. However, for most crops, maximum nitrogen fertilization limits have been established for all sources, including both natural and mineral fertilization. More: U. Kozaczuk (2018), *Water pollution. New Action Program signed. Nitrate program*, Your Advisor – Agricultural market, No. 8, 2018.

Table 2

Distance of agricultural land from reservoirs, intakes and watercourses vs. ban on the use of fertilizers

Type of fertilizer	**Distance of arable land from:**			
	shores of lakes and water reservoirs up to 50 ha	banks of natural watercourses	ditch banks, excluding ditches up to 5 m wide measured on the upper edge of the ditch banks	channels edges
Slurry	10 metres	10 metres	10 metres	10 metres
Fertilizers, excluding slurry	5 metres	5 metres	5 metres	5 metres
Type of fertilizer	**Distance of arable land from:**			
	shores of lakes and water reservoirs over 50 ha	water intakes, if no protection zone has been established on the basis of the provisions of the Act of 20 July 2017 - Water Law (Journal of Laws, item 1566 and 2180 and of 2018, items 650 and 710)		coastal marine belt
All types of fertilizers	20 metres	20 metres	20 metres	20 metres

Source: own elaboration based on Kozaczuk U. (2018), *Zanieczyszczenia wód. Nowy Program działań podpisany. Program azotanowy*, Twój Doradca – Rolniczy rynek, nr 8, 2018.

In addition to the issue of the distance at which agricultural land is located in relation to specific reservoirs, water intakes and watercourses, the analyzed regulation specifies the allowable dates for the use of fertilizers (Table 3) and the method of their storage, as well as imposes the obligation to create documentation for the Program implementation (including preparation of nitrogen fertilization plan).

Table 3

Dates of using fertilizers in Poland

Farmland	Solid natural fertilizers	Mineral nitrogen fertilizers and liquid natural fertilizers
Arable land	1 March – 31 October	1 March – 20 October
Arable land selected municipalities specified in Annex 2 to the *Program* (applies to specific communes in voivodships: dolnośląskie, małopolskie, podkarpackie, podlaskie, śląskie and warmińsko-mazurskie)	1 March – 31 October	1 March – 15 October[1,2]
Arable land selected municipalities specified in Annex 3 to the *Program* (applies to specific communes in all voivodships)	1 March – 31 October	1 March – 25 October[1,2]
Permanent crops Perennial crops Permanent grassland	1 March – 30 November	1 March – 31 October
Set-aside soils	Fertilization is not applied all year round[3]	

[1] fertilizer can be used until November 30 due to adverse weather conditions.

[2] producers of sugar beet, maize and late vegetables who will plant in autumn are exempt from deadlines.

[3] fertilization is allowed in autumn before the end of set-aside.

Source: own elaboration based on: https://www.cdr.gov.pl/images/wydawnictwa/2018/2018-PROGRAM-AZOTANOWY-ULOTKA.pdf (access: 9.06.2019)

Natural fertilizers (both liquid and solid) should be stored in a manner safe for the natural environment, preventing its penetration into land and water. Farms are required to store liquid natural fertilizers in sealed and covered tanks, the capacity of which should ensure the possibility of storing these fertilizers for a period of 6 months. In turn, solid natural fertilizers (manure) should be stored in the livestock building (in the case of rearing on deep litter) or on manure heap. The nitrate program also provides for the possibility of storing manure directly on agricultural land (on sandy ground and not wetland), but for a period

not longer than 6 months (for each of the piles)[102]. In addition, manure storage must be located on flat terrain (except for depressions) with a slope of no more than 3%, and accurately specified on the map or plot sketch.

The nitrate program includes in its content a system of penalties, the gradation of which depends on the scope and degree of violation of the set standards. The matter of the administrative decision regarding the form and the possible amount of punishment is within the competence of the environmental protection inspector. The decision maker has the option of[103]:

(1) issuing a decision ordering the removal of the irregularities found (with a specified deadline for its implementation) or
(2) imposing a fine, the maximum amount of which may not exceed[104]:

- PLN 3,060 for storing animal faeces in a manner inconsistent with the standards adopted in the *Nitrate Program*,
- PLN 2,040 if fertilizers are not used in accordance with the standards adopted in the *Nitrate Program*,
- PLN 510 in the case of keeping documentation on the implementation of the *Nitrate Program* in a manner inconsistent with the project,
- PLN 510 in the absence of a nitrogen fertilization plan.

It is worth mentioning that the Agency for Restructuring and Modernization of Agriculture (ARMA) may also control the correct implementation of the *Nitrate Program*, having at its disposal another catalogue of penalties for violating commonly accepted fertilization standards. Sanctions imposed by ARMA are expressed in the reduction of the amount of direct payments or area payments. Depending on the type and scale of violation of the *Nitrate Program* rules, financial penalties imposed by ARMA may take the form of a reduction in the total amount of payments by:

- 3% or 5% if the non-compliance found is due to the negligence of the farmer;
- or 20% in the case of intentional operating (in extreme and blatant cases 100%).

[102] After this period, the creation of another pile in the same location is only possible after 3 years.
[103] https://www.gov.pl/web/gospodarkamorska/pytania-i-odpowiedzi-do-programu-azotanowego (access: 9.06.2019).
[104] The rates of financial penalties resulting from violation of the standards included in the Nitrate Program are updated annually. The values given in the text of the study illustrate the state of the maximum level of fees as at June 10, 2019.

2.4.2. Public instruments based on the example of taxes

The essence of environmental taxes is to reduce pollution, such as fertilizers, pesticides, municipal waste, etc. The use of environmental taxes and making their amount dependent on environmental pollution is intended to change the behaviour of producers and motivate them to effectively use environmental resources.

Dökmen explains[105] that the economic justification for environmental taxation was developed by the English economist Arthur C. Pigou in the first half of the 20th century. The basic premise for using taxes in environmental policy is the existence of environmental externalities: environmental effects, which are side effects of production and consumption processes, and which are not calculated in the cost of these processes. Where these effects are negative, externalities are costs. The external cost can be partially or completely internalized by imposing a tax on activities having such an effect[106].

There is no consensus in the literature about the impact of environmental taxes on economic activity. According to a large proportion of economists, environmental taxes negatively affect economic growth. In the analyzes of authors such as: Georgescu-Roegen, Meadows et al.[107], Gollop and Roberts[108], Daly[109], McDougall[110], Gradus and Smulders[111], Ploeg and Ligthart[112], Labandeira, Labeaga and Rodríguez[113] or Siriwardana, Meng and McNeill[114], environmental

[105] G. Dökmen, *Environmental Tax And Economic Growth: A Panel VAR Analysis*. Erciyes Ün-iversitesi İİBF Dergisi 40, 2012.
[106] P. Ekins, *European Environmental Taxes and Charges: Recent Experience*, Issues and Trends. Ecological Economics 31, 1999.
[107] D. H. Meadows, D. L. Meadows, J. Randers, W.W. Behrens, *The Limits to Growth*, New York: Universe Books, 1972.
[108] F. Gollop, M. Roberts, *Environmental Regulations and Productivity Growth: The Case of Fossil-fueled Electric Power Generation.* Journal of Political Economy 91 (4), 1983.
[109] H. Daly, *Steady State Economics*, Washington DC: Island Press, 1991.
[110] R. A. McDougall, *Short-Run Effects of A Carbon Tax. Centre of Policy Studies/IMPACT Centre Working Papers g-100*, Victoria University, Centre of Policy Studies/IMPACT Centre, 1993.
[111] R. Gradus, S. Smulders, *The Trade-Off Between Environmental Care and Long-Term Growth-Pollution in Three Proto-type Growth Models.* Journal of Economics 58 (1), 1993.
[112] F. van der, Ploeg, J.E. Lighthart, *Sustainable Growth and Renewable Resources in the Global Economy.* [in:] C. Carraro (red.). *Trade, Innovation, Environment*, Netherlands: Kluwer Academic,1994.
[113] X. Labandeira, J. Labeaga , M. Rodriguez, *Green Tax Reforms in Spain*. European Environment 14, 2004.
[114] M. Siriwardana, S. Meng, J. McNeill, *The Impact of a Carbon Tax on the Australian Economy: Results from a CGE Model.* Business, Economics and Public Policy Working Pa-

regulations are recognized as a source of slowing productivity growth. According to these authors, environmental taxes, in particular on CO_2 emissions, reduce the consumption of fossil fuels as a source of energy used in production, which reduces domestic production compared to a situation where there are no such restrictions.

On the other hand, environmentalists say that taxes of this type are a particularly attractive instrument for improving the quality of the natural environment without seriously damaging the economy. It is worth remembering that environmentalists do not treat economic results as a numerical value and focus on the qualitative nature of economic growth. This point of view sees environmental taxes not only as an instrument for environmental protection, but also as an important tool on the road to sustainable development. Studies by authors such as Pearce[115], Ewijk and Wijnbergen[116], Bovenberg and Smulders[117], Goulder[118] or Bovenberg and de Mooij[119] are trying to show that environmental taxes can even have a positive impact on economic growth. In particular, they point out that by raising taxes on carbon dioxide emissions and using revenues to reduce distorting income taxes, governments can reap the so-called "double dividend". According to this hypothesis, increasing taxes on polluting activities can provide two types of benefits. The first of them is to improve the state of the environment, and the second one is to improve economic efficiency by using revenues from environmental taxes to reduce other taxes, such as income taxes that distort labour supply and saving decisions. In this case, one would expect a positive and not a negative impact of taxes on environmental protection on economic results (see also Fullerton, Metcalf, and Markandya)[120].

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pers 2011-2, School of Business, Economics and Public Policy, Faculty of the Professions, University of New England, 2011.

[115] D. Pearce, *The Role of Carbon Taxes in Adjusting to Global Warming*. Economic Journal 101, 1991.

[116] C van Ewijk, S. van Wijnbergens, *Can Abatement Overcome The Conflict Between Environment and Economic Growth?*. De Economist 143, 1995.

[117] L. Bovenberg, S. Smulders, *Environmental Quality and Pollution-Augmenting Technological Change in a Two-Sector Endogenous Growth Model*. Journal of Public Economics 57, 1995.

[118] L. H. Goulder, *Environmental Taxation and the Double Dividend: A Reader's Guide*. International Tax and Public Finance 2 (2), 1995.

[119] L. Bovenberg L., R.A. de Mooij, *Environmental Tax Reform and Endogenous Growth.* Journal of Public Economics 63, 1997.

[120] D. Fullerton, G. E. Metcalf, [1997]. *Environmental Taxes and the Double-dividend Hypothesis: Did You Really Expect Something for Nothing?*. NBER Working Paper 6199, 1997; A. Markandya, *Environmental Implications of Non-Environmental Policies* [in:] K.-G. Maler,

Among the more recent empirical analyzes, the findings of Dökmen[121] are worth mentioning. He examined the impact of environmental taxes on economic performance based on data for 1996-2009 collected from 26 European countries. The impulse response functions and the results of the decomposition of variance obtained by this author show that the environmental tax has a great impact on the economies of European countries in the short term but has no long-term impact on gross national income. This does not mean that the environmental tax will not affect the economy in the long run. On the contrary, the environmental tax could change the structure of the economy. In his opinion, countries implementing environmental taxes are more involved in the development of industry based on advanced technologies with lower carbon dioxide emissions, which is conducive to increasing the rate of economic growth.

However, not only the impact of environmental taxes on growth is analyzed, but also on broadly understood economic development, including various socio-economic phenomena. For example, the purpose of the article by Ko et al.[122] was to examine the impact of environmental taxes on the so-called "return migration". In order to reduce poverty, many developing countries have tried to promote industrialization, which is most often accompanied by migrations from the countryside to the cities. Numerous empirical studies indicate, however, that after a long period of industrialization, there may be a return migration from cities to the agricultural sector. When companies in the urban sector generate pollution in the economy, the increase in employment in cities due to industrialization means more pollution. One of the instruments by which the government can try to control pollution is an environmental tax. Such a tax may reduce the demand for labour in the urban sector and thus lead to return migration from the

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J. Vincent (ed.), *The Handbook of Environmental Economics*, Amsterdam: North Holland/Elsevier Science, 2005.

Another interesting analysis using the concept of "double dividend" is presented by J. Chloupkova, G. Tinggaard Svendsen, T. Zdechovsky, A global meat tax: from big data to a double dividend. Agricultural Economics / Zemedelska Ekonomika 64 (6), 2018. These authors, taking the FAO Rome Declaration as a starting point, suggest that the first step in implementing the postulate of everyone's right to access safe, sufficient and nutritious food contained therein would be to introduce a global tax on meat in which the amount of negative externalities from meat production could be calculated using the foresight and big data methods. The application of a global meat tax would lead, according to these authors, to a "double dividend": a reduction in negative externalities, while at the same time large tax receipts that could be used to move further towards the goal set by the FAO in the Rome Declaration.

[121] G. Dökmen, *Environmental Tax And Economic Growth: A Panel VAR Analysis*. Erciyes Üniversitesi İİBF Dergisi 40, 2012.

[122] S.-H. Ko, K.-H. Kuo, C.-T. Lee, *Environmental Tax And Return Urban–Rural Migration*. The Singapore Economic Review 62 (2), 2017.

urban to the rural sector. These are also the conclusions of Ko et al.[123] model: when the government raises the environmental tax, migration returns and unemployment in cities decreases. These arrangements stand, however, in contradiction to other similar analyzes. For example, Daitoh[124] argues that if the pollution tax increases, return migration may or may not occur. In his opinion, it should be noted that due to the increase in the environmental tax, a reduction in production would lead to a decrease in employment in cities, i.e. an increase in unemployment there. Only when the impact on urban unemployment is large enough would the effect of return migration from urban to rural areas be achieved.

Some studies on environmental taxation address the problem of taxes on specific types of pollution or substances harmful to the environment. In this context, the health and nature threat caused by the use of pesticides in agriculture comes to the fore. As Skevas et al.[125] state, economic instruments such as taxes can be effective components of an optimal policy on the use of pesticides. However, they are rarely used (e.g. in Europe only in four countries: France, Sweden, Denmark and Norway).

Some interesting conclusions regarding pesticide taxation are drawn from the work of Finger et al.[126]. Firstly, according to these authors, differentiated tax systems have a great potential to reduce the risks arising from the use of pesticides, and the targeted distribution of tax revenues in the agricultural sector is crucial to achieving a leverage effect on the use of pesticides and increasing the acceptability of their taxation. Secondly, taxes on pesticides are not effective when used as stand-alone measures. They should be used in a coherent set of policies to reduce the risk of pesticide use. Thirdly, it should be remembered that pesticide policy, including the taxation of its use, has potentially high interactions with other policy objectives and instruments in relation to risk management that should be taken into account when developing such a policy. Fourthly, according to the study's authors, taxes on pesticides do not have a significant short-term impact on pesticide use, as demand elasticity is low in the short term

[123] S.-H. Ko, K.-H. Kuo, C.-T. Lee, *Environmental Tax ... op. cit.*
[124] I. Daitoh, *Environmental protection and urban unemployment: Environmental policy reform in a polluted dualistic economy*. Review of Development Economics 7, 2003.
[125] T. Skevas, S. E. Stefanou, A. Oude Lansink, *Pesticide use, environmental spillovers and efficiency: a DEA risk-adjusted efficiency approach applied to Dutch arable farming.* European Journal of Operational Research 237. 2014.
[126] R. Finger, N. Möhringa, T. Dalhaus, T. Böcker, *Revisiting Pesticide Taxation Schemes*. Ecological Economics 134, 2017.

and strong activities are triggered in relation with pesticide accumulation[127]. However, they are an incentive to reduce in the long term the risks to human health and nature associated with the use of pesticides. Finally, according to Finger et al.[128], revenues from taxes on the use of pesticides should be used to finance measures that have a leverage effect on reducing the risks associated with their use. These may include measures such as support for extensification, use of new spray material and new equipment related to the use of pesticides, support for biological plant protection strategies, etc.

Bonnet et al.[129] pay attention to agriculture as the sector with the largest environmental impact in terms of greenhouse gas emissions, especially in meat production. A measure counteracting this effect may be a change in household eating habits, aimed at reducing the consumption of animal products. Therefore, these authors analyzed the tax policy in France to determine whether the CO_2 tax could change household habits in relation to the purchase of animal products. By using two levels of the CO_2 tax (EUR 56 and EUR 200 per tonne of CO_2 equivalent) imposed on the consumption of all animal products, only ruminant meat or only beef, the authors showed that a high tax level only achieves a 6% reduction in the emissions of greenhouse gas in 2020. However, despite the weak effect of such a tax, the most effective scenario in the analysis turned out to be taxation of beef consumption only at a high level. Such a tax policy would achieve a 3.2% reduction in greenhouse gas emissions with social damage of 12%.

The above discussion is part of a wider discussion on agricultural taxation in general. In this respect, interesting material is provided by the analysis of tax systems carried out by Pawłowska-Tyszko and Soliwoda[130] in selected EU countries. It indicates that among the Member States, Austria, Belgium, France, Germany, Italy, Poland and Spain have tax systems applying all kinds of special solutions only for farms. The occurrence of such systems may result from a complex set of historical and socio-economic conditions. In most of these

[127] It should be noted that the increase in pesticide prices due to their taxation may, especially in the short term, result in lower farm incomes. However, some recent research, e.g. Pedersen et al. (2012) or Nielsen (2005) for Denmark, Skevas et al. (2014) for the Netherlands or Jacquet et al. (2011) for France suggest that income reduction due to limited pesticide use should be minor.

[128] R. Finger, N. Möhringa, T. Dalhaus, T. Böcker, *Revisiting Pesticide ... op. cit.*

[129] C. Bonnet, Z. Bouamra-Mechemache, T. Corre, *An Environmental Tax Towards More Sustainable Food: Empirical Evidence of the Consumption of Animal Products in France*. Ecological Economics 147, 2018.

[130] J. Pawłowska-Tyszko, M. Soliwoda, *Income taxation in agriculture vs. competitiveness. International perspective and evidence from Poland*. Journal of the Austrian Society of Agricultural Economics 25, 2015.

countries, tax preferences apply only to small-scale farmers. Importantly, according to the findings of these authors, an exception in this respect is Poland, where the system of fiscal burdens imposed on agricultural production operates on other principles than taxation of other business activities. Special taxation rules apply in Poland to almost all farmers, regardless of the scale of production and the size of a farm. Pawłowska-Tyszko and Soliwoda prove that preferential taxation of income can be treated as a kind of hidden, indirect support for agriculture, which may result in a significant reduction of budget revenues. For example, according to the estimates of the Polish Ministry of Finance, the budget revenues from personal income tax in 2012 decreased by almost 9% due to the exclusion of farmers' income from PIT. Then the authors present the results of a short survey involving a panel of 20 experts. The most important findings were 55% of experts saying that the importance of the tax rate as a factor determining the competitiveness of agriculture is high or very high.

2.4.3. Market-based instruments on the example of *green* bonds

Economic market environmental protection instruments are a very diverse and dynamically changing group of instruments, hence the protection instruments assigned to this group are only an exemplification of existing mechanisms and certainly do not exhaust the issues. Due to the specific nature of the market environment protection instruments distinguished, the issue of the use of *green* bonds in financing environmental protection in agricultural activities requires more discussion.

Green bonds are a classic debt securities meeting the bond standards[131], for which the distinguishing factor is the capital allocation direction declared by the issuer – funds raised as part of debt issuance must be used as part of activities conducive to the environmental protection. All other legal and market regulations related to the issue process are appropriate for the place of issue of bonds. As a consequence, there is no single, comprehensive and universally

[131] A bond is a security issued in the series, in the content of which the issuers state that they are the debtors of the buyer of the bond (the bondholder) and undertake to meet a specific benefit: (1) cash benefit – redemption of the bond as it becomes due and payment of interest on the denomination of the bond, on the declared dates and height; (2) non-monetary benefit – taking the form of any benefit decommitting a debt obligation, provided that it does not conflict with applicable law and has been accepted by a group of bondholders at the stage of the bond purchase offer (this benefit was described in the terms of issue on the basis of which the purchase of bonds was made).

binding framework regulating the issue of raising capital on the *green* bond market[132,133].

In view of the above, in order to present the essence of the issues discussed, the problem of using the analyzed instruments in environmental protection in agriculture will be limited to the conditions of the Polish economy.

In the system of national legal order, the issue of bonds is directly regulated in the Act of 15 January 2015 on bonds[134]. This Act, in addition to the detailed terms and conditions of the issuing process, gives specific market entities the ability to issue bonds effectively, and thus entitles the listed groups of entities to raise funds on the market of these instruments. In this respect, the legislator applied a twofold criterion. First, it defined a set of two obligatory features that should be simultaneously characterized by the entity applying for funding on the bond market. They are: (1) conducting business activity and (2) having legal personality or, alternatively, the legal form of a limited joint-stock partnership. In addition, the entities enumerated in art. 2 of the Act of 15 January 2015 on bonds. Despite the discourse observed as to whether or not a farmer should be considered an entrepreneur[135], the fact is that on the basis of the interpretation of the law – a farmer is not a business entity. In addition, the agricultural holding does not have legal personality, nor is it an entity mentioned in the catalogue of entities equipped with emission capacity on the bond market. Therefore, the issue of bonds, both green and classic, has no legal justification in the activity of farms. It should be stipulated that the above statement is valid only when we consider a farmer (farm) in terms of a bond issuer and not a beneficiary of funds from the market of these instruments. It turns out that directly (in his own name) a farmer (farm) is not entitled to raise funds by issuing bonds. This opportunity is gained only indirectly – using the formula of financial intermediation or the Treasury – i.e. in a situation where the issuer of the bond is an entity authorized to do so, and its issuing activity is focused on raising funds for their further redistribution to farms.

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[132] *Green* bonds are a conceptual aggregate for all debt securities issued to raise funds for activities aimed at environmental protection. Given the global nature of these instruments, the detailed characteristics of green bonds and the terms and conditions for their issuing is a difficult task that goes beyond the scope of this study. Depending on the geographical area (country of issue) and the person of the issuer, the conditions for using the bonds in financing environmental activities are different.

[133] M. Pawłowski, *Zielone obligacje rządowe*, Ekonomiczne Problemy Usług, nr 4, Szczecin, 2017.

[134] Ustawa z dnia 15 stycznia 2015 r. *o obligacjach*, Dz.U. 2015 poz. 238.

[135] More on this subject in: R. Musiałkiewicz, D. Walczak, *Rolnik indywidualny – (mikro)przedsiębiorca czy rolnik? Analiza ekonomiczno-prawna*, Ekonomiczne Problemy Usług, nr 799, Szczecin, 2014.

Returning to the purpose of issuing green bonds – as a premise for separating these instruments from the group of other debt securities – it should be noted that while the formal and legal conditions accompanying the issue of green bonds are diversified (in geographical terms), the procedure of giving the issued instruments a green rank is based on the defined and universal catalogue of directions for the allocation of acquired capital. In order to qualify the issue of debt as green, the following types of economic activity must be involved[136]:

- renewable and alternative energy – investments in solar, wind, water, bioenergy and geothermal energy projects, including expenditure on infrastructure construction, production, distribution and storage of energy from the above-mentioned sources.
- energy efficiency – construction and modernization of green residential and commercial buildings, development and implementation of energy-saving products, processes and technologies, waste heat recovery, reduction of greenhouse gas emissions.
- low-emission transport – spending on: construction of domestic and municipal rail and freight systems, production of electric vehicles and vehicles powered by alternative fuels, fast bus transit, bicycle transport, aviation biofuels.
- sustainable water management – investments in the field of rainwater adaptation systems, treatment and recycling of water resources, making the economy resistant to rainfall variability.
- waste management, recycling and pollution control – activities in the field of circular economy aimed at reducing energy consumption and greenhouse gas emissions.
- **sustainable agriculture and forestry**, which deal with problems of coal management, afforestation (primarily, but not only) of degraded areas, promotion and implementation of solutions in agriculture that: contribute to reducing carbon dioxide and greenhouse gas emissions, improve the economy's resistance to climate change, are targeted on limiting the use of chemical fertilizers in agricultural production.
- infrastructure resistant to climate change, mainly in the field of weather anomalies.

The above generic catalogue of *green* bonds is consistent with the classification used in statistics illustrating the state of development of the analyzed market. As an introduction, it is worth mentioning that, despite the relatively

[136]https://www.climatebonds.net/standard/taxonomy(access: 14.06.2019).

short history of functioning[137], the global green bond market is characterized by high growth in its value. Over the years 2012-2018, the total value of debt under the issue of green bonds increased their value almost 7-fold – from USD 174 billion (2012) to USD 1,199 billion (2018)[138] (Table 4).

A high growth rate of the value of debt arising from the issue of *green* bonds is observed in each of the segments of the analyzed market. At the same time, it can be seen that emission activity focuses primarily on bonds used to finance projects in the field of low-emission transport and renewable energy. The total debt arising from the issue of these bonds constitutes 67% of the value of the market in question.

The assessment of the global market of *green* bonds from the perspective of amounts of debt in its individual segments indicates little interest in using these instruments in financing environmental protection in agricultural activity (or more broadly – financing sustainable development of agriculture). Although the growth rate of this market segment value reflects the general trend of changes in the global *green* bond market (7-fold increase in the value of debt in 2012-2018), the share of green bonds financing sustainable agriculture in the total value of the global green bond market is small (not exceeding 1%).

[137] The first issues of these instruments date back to 2007. Climate Awaness Bonds are considered as the foundation of the green bond market – instruments issued by the European Investment Bank in 2007, whose purpose was to raise funds constituting the basis for loan financing of investment projects in the field of renewable energy sources and improvement of energy efficiency (Modak 2018, p. 162).

[138] P. Oliver, B. Boulle, S. Kidney, N. Silver, *Bonds and Climate Change. The State of the Market 2012*, http://www.climatebonds.net (access: 15.06.2019), 2012; Filkova M., Boulle B., Frandon-Martinez C., Giorgi A., Giuliani D., Meng A., Rado G., *Bonds and Climate Change. The State of the Market 2018*, http://www.climatebonds.net (access: 15.06.2019), 2018.

Table 4

Value of the global green bond market in 2012-2018 (in billion USD)

	2012	2013	2014	2015	2016	2017	2018
Low-emission transportation	119	263	358.4	418.8	464.98	545.95	532
Alternative and renewable energy	29	41	74.7	118.4	131.86	170.05	271
Sustainable water management	0	0	0.27	3.2	13.88	26.85	101
Energy efficiency	0	0	0.27	3.2	13.88	26.85	101
Waste management, recycling and pollution control	1	5	13.5	19.6	13.88	17.9	72
Sustainable agriculture and forestry	1	4	1.4	7.1	6.94	8.95	7
Other	22	32	50.1	28.2	55.52	116.35	179
TOTAL	**173**	**346.5**	**502.57**	**597.6**	**694**	**895**	**1199**

Source: own elaboration based on: P. Oliver, B. Boulle, S. Kidney, N. Silver, *Bonds and Climate Change. The State of the Market 2012*, http://www.climatebonds.net (access: 15.06.2019), 2012; P. Oliver, B. Boulle, S. Kidney, N. Robins, Z. Knight, *Bonds and Climate Change. The State of the Market 2013*, http://www.climatebonds.net (access: 15.06.2019), 2013; B. Boulle, S. Kidney, P. Oliver (2014), *Bonds and Climate Change. The State of the Market 2014*, http://www.climatebonds.net (access: 15.06.2019); B. Boulle, *Bonds and Climate Change. The State of the Market 2016*, http://www.climatebonds.net (access: 15.06.2019), 2016; B. Boulle, C. Frandon-Martinez, J. Pitt-Watson, *Bonds and Climate Change. The State of the Market 2017,* http://www.climatebonds.net (access: 15.06.2019), 2017; M. Filkova, B. Boulle, C. Frandon-Martinez, A. Giorgi, D. Giuliani, A. Meng, G. Rado, *Bonds and Climate Change. The State of the Market 2018*, http://www.climatebonds.net (access: 15.06.2019), 2018; T. Olsen-Rong, K. House, B. Sonerud, S. Kidney S., *Bonds and Climate Change. The State of the Market 2015*, http://www.climatebonds.net (access: 15.06.2019), 2015.

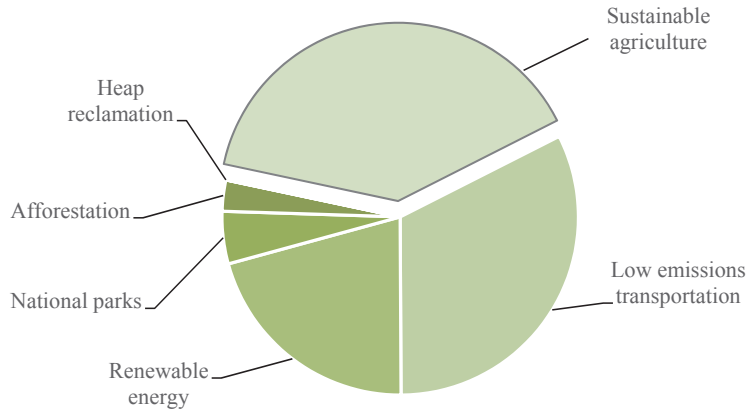
While in the global economy the use of *green* bonds in financing environmental protection in agriculture is low, in the conditions of domestic economic reality this mechanism has found wide application. In 2016, the Ministry of Finance issued 5-year *green* bonds in the amount of EUR 750 million, directing its purchase offer to foreign investors. This event is significant for at least several reasons, with the most important – and thus worth emphasizing – the fact that it was the world's first *green* bond issue carried out by a government issuer. The purpose of raising capital by the Polish government through the issue of *green* bonds is to finance or refinance investment projects to protect the environment, including[139]:

- modernization of the railway infrastructure in order to reduce the use of combustion cars in communication between cities;
- **afforestation and development of organic farming to reduce the use of pesticides;**
- development of renewable energy sources;
- tax breaks and subsidies for green energy companies and prosumers donating part of their energy to the system.

According to the announcement of the Ministry of Finance, 81% of the value of funds raised under the issue of *green* bonds was allocated to finance pro-ecological projects initiated in 2014-2016, while the remaining part of the funds was spent on financing activities started in the first quarter of 2017[140]. Figure 6 shows the allocation directions acquired under green bond issues.

[139] M. Pawłowski, *Zielone obligacje rządowe.* Ekonomiczne Problemy Usług, nr 4 (129), Szczecin, 2017.
[140] *Green Bond Report on the Use of Proceeds*. *Poland's Green Bond EUR 5-year maturing on 20 December 2021* (2017), Ministry of Finance, Republic of Poland (a leaflet).

Figure 6
Directions for the allocation of capital acquired by issuing *green* bonds of the Ministry of Finance



Source: own elaboration based on: Green Bond Report on the Use of Proceeds. Poland's Green Bond EUR 5-year maturing on 20 December 2021 (2017), Ministry of Finance, Republic of Poland (a leaflet).

The allocation of the accumulated capital was made in accordance with the assumptions of the issue, with the largest part of the funds focused on supporting sustainable agriculture (39% of the total value of green bond issues). The value of EUR 292.1 billion was allocated between the financing and refinancing of state budget expenditure under:

1. agri-environmental program implemented under the Rural Development Program for 2007-2013, which aimed to support the sustainable development of rural areas and the preservation of biodiversity. The allocation amount of EUR 106.1 billion was allocated to projects started in 2014 and 2015, and the directions of using these funds are presented in Table 4.
2. agri-environment-climate program implemented under the Rural Development Program for 2014-2020. This program is aimed at promoting sustainable soil use, controlled use of fertilizers, protection of endangered bird species and natural habitats, as well as protection of the diversity of ecosystems. The bunch of implemented objectives assigned to the agri--environment-climate program was supported by funds in the amount of EUR 150.4 billion.

3. organic farming[141] support program implemented under the Rural Development Program for 2014-2020. The goal of this program is to implement environmentally friendly solutions in agriculture, focused on exclusion from agricultural production of chemically synthesized plant protection products and chemical fertilizers. Under this program, capital allocation of EUR 35.6 billion was made, supporting:
    - agricultural holdings that have begun the change of agricultural production to organic farming (EUR 3.4 billion)
    - farms that continued organic farming (EUR 32.2 billion).

Table 5

Directions of capital use under the agri-environmental program implemented under the Rural Development Program for 2007-2013

Specification	**2014**			**2015**		
	Allocation (EUR bn)	Supported area (ha)	Number of farms	Allocation (EUR bn)	Supported area (ha)	Number of farms
Sustainable agriculture	16.4	50,162	1,831	6.6	6,848	1,094
Organic agriculture	15.2	26,770	1,174	12.0	12,121	1,403
protection of endangered bird species and natural habitats:						
Non-Natura 2000 areas	8.5	27,125	2,417	4.4	10,946	1,040
Natura 2000 areas	10.7	27,236	2,744	6.8	11,367	1,915
Soil and water protection	11.5	53,598	1,910	5.0	19,924	1,255
Other	6.0			3.2		
TOTAL	**68.3**	**184,891**	**10,076**	**38**	**61,206**	**6,707**

Source: Own elaboration based on Green Bond Report on the Use of Proceeds. Poland's Green Bond EUR 5-year maturing on 20 December 2021 (2017), Ministry of Finance, Republic of Poland (a leaflet).

[141] Support for organic farming was one of the activities under the agri-environmental program implemented under the RDP 2007-2013. In the new financial perspective (RDP 2014-2020) organic farming has been distinguished as a separate program.

3. Assessment of selected instruments for environmental protection in the context of its sustainable development

In the context of changing natural conditions, policy changes that put particular emphasis on environmental protection as a strategic element of agricultural development, a discussion on the development of environmental protection instruments seems to be inevitable. This is due to the fact that one of the most current problems is environmental pollution, which leads to inefficient use of resources. This causes the society to experience environmental external costs more and more clearly, prompting practitioners, politicians and scientists to look for more effective solutions recommended in economics. Moreover, current fiscal instruments are inefficient in terms of environmental protection and the economical use of natural resources.

On the other hand, there are concerns about the introduction of new pro-ecological fiscal solutions, because, as literature research shows, they:

- affect the costs incurred by enterprises, and thus lead to a decrease in their competitiveness on the domestic and international market,
- may contribute to an increase in inflation,
- may be regressive, exacerbating or creating distribution problems in society by increasing taxation for low income groups.

The scale of instruments for environmental protection covers a wide variety ranging from legal and administrative instruments through fees, the more forceful approach (penalties), deposit systems and market creation mechanisms, taxes to concessions, subsidies, loans and even insurance (Table 6).

Table 6

Instruments for environmental protection

Direct instruments	Indirect regulations
Legal instruments Administrative instruments	Economic instruments • eco-taxes and fees (fees for using the environment, product fees, administrative fees) • financial incentives supporting law (money fines due to improper use of environment) • deposit systems and pledges • creation of the emission allowance market (marketable permits, interventions in market mechanisms) • ecological insurance • subventions (subsidies and loans, exemptions, tax reliefs, preferential lending rules)

Source: own elaboration based on J. Śleszyński, Przegląd instrumentów ekonomicznych [in:] W. Stodulski (ed.) Ekologiczna reforma podatkowa. System podatkowy jako instrument zrównoważonego rozwoju w Polsce w pierwszej dekadzie XXI wieku, Raport 2/2001, Instytut na rzecz Ekorozwoju, Warszawa 2001.

At the practical level, the main difference between economic instruments and direct regulations is that economic instruments do not indicate the behaviour of the polluter. Polluters have some freedom of decision to modify their behaviour according to their own circumstances / preferences.

On the other hand, economic instruments occupy a special place among all environmental protection measures – they are an indirect tool for influencing economic entities, affecting their financial results. They cover all polluters, in accordance with the principle that every user of the environment (business entity) should bear the full, and therefore also external, costs of their activities. In further analysis, it is important to distinguish between taxes and fees.

According to W. Stodulski[142], taxes are an obligatory, not directly compensated financial liability, which ultimately constitutes a financial contribution to the central budget. On the other hand, the fees are accompanied by direct compensations, because the payer in a way acquires rights to certain benefits, which are connected with the emission of pollutants or the production of certain goods. The benefits available to the payer remain in a certain proportion to the fee paid. Revenues from fees may also be transfered to the budget, but most often they are directed to special purpose funds, primarily environmental protection funds.

[142] W. Stodulski (ed.) *Ekologiczna reforma podatkowa. System podatkowy jako instrument zrównoważonego rozwoju w Polsce w pierwszej dekadzie XXI wieku*, Raport 2/2001, Instytut na rzecz Ekorozwoju, Warszawa 2001.

From the point of view of sustainable development, the overall result of applying a given regulation is important.

Fiscal instruments can play a different role in relation to other instruments, above all they can play an autonomous role in shaping the financial base of the ecological policy of the state. Ecological fiscal systems are used to eliminate polluting activities / products on the one hand, and to promote alternative activities on the other. The use of indirect instruments does not impose a specific polluter's behaviour, but significantly affects its financial result, thus forcing pro-environmental behaviour.

The advantage of fiscal instruments over direct instruments results from:

- their high flexibility,
- wide group of addressees – "fuller" coverage of the economic instrument,
- continuity of incentives and stimuli to reduce pollution, even after reaching the normative pollution limit,
- greater incentives for innovation,
- possibility of shifting the burden of cost increase to final consumers.

Research conducted by W. Stodulski[143] suggests that thanks to fiscal instruments the so-called *green taxes* will be able to solve several important environmental problems, including:

- removal or limitation of instruments harmful to the environment, in particular subsidies leading to the proliferation of harmful pressure on the environment,
- imposing taxes on those types of economic activities which are inherently unfriendly to the environment (the excessive use of chemical fertilizers or the use of non-renewable natural resources),
- reducing taxes on capital and labour, which impede economic development.

Weaknesses and advantages of economic instruments used in environmental protection are presented in Table 7.

[143] W. Stodulski (ed.), *Ekologiczna reforma podatkowa. System podatkowy jako instrument zrównoważonego rozwoju w Polsce w pierwszej dekadzie XXI wieku*, Raport 2/2001, Instytut na rzecz Ekorozwoju, Warszawa 2001.

Table 7

Characteristics of selected main economic instruments

Type and definition	Advantages	Weaknesses/disadvantages	Application
Fees for pollutant emissions or waste water discharges *fees introduced on the quantity and quality of contaminants introduced*	Low costs from companies or individuals	• setting the fee at the right level, • need for monitoring	Derivation from point sources
Product fees *fees imposed on products that are harmful to the environment*	Reducing the consumption of environmentally harmful products	• Setting the fee at the right level, • need for monitoring	Wherever it is not possible to monitor pollution from individual sources
Compensation fee for cleaning *fee for obtaining funds for cleaning the environment*	Equalization funds are linked to environmental objectives	Identify the appropriate group to impose the fee	To cover cleaning costs caused by past (but not ongoing) activities
Subsidies *payment for those who undertake environmentally friendly actions*	Encourages actions to overcome environmental problems	• External effects are not internalized by the polluter, • they can reward poor environmental performance, • they can pay for those who take action even without subsidies	Where other economic instruments do not work or are too "expensive"
Performance links *financial security provided by the government against environmental damage*	• Minimizes the risk and potential costs of negligence of perpetrators, • encourages renewal and reorganization when needed	Determining the real level of security	Where necessary to minimize risk when damage is not remedied
Transferable emission allowances *returnable deposit that is paid on products that can cause pollution if rejected*	Reduces the amount of waste and / or the release of toxic waste into the environment	• Transaction costs can be high, • significance of the benefits (relative to cost changes) is not always clear	Most effective for products that have an existing distribution system, e.g. household milk containers

Table 7 (cont.)

Sales permits *right to dispose of a specific level of pollution or use a certain amount of resources*	• Allocation of resources for the most valuable use, • information needs for regulatory authorities, • greater certainty about the level of pollution or consumption of resources	• Establishing an effective market, • setting the initial level and allocation of permits, • transaction costs	Where the environmental impact is independent of the source of pollution, e.g. air pollution in a specific area
Responsibility for the environment *makes polluters legally responsible for damage caused to the environment*	Potential polluters are forced to adopt environmentally friendly practices or to pay for potential damages (through higher contributions)	• Choosing the level of premium increases that will cover liability and risk, • enforcement of responsibility	Where environmental performance is related to the availability of finance, insurance, etc.

Source: own elaboration based on W. Stodulski (ed.), *Ekologiczna reforma podatkowa. System podatkowy jako instrument zrównoważonego rozwoju w Polsce w pierwszej dekadzie XXI wieku*, Raport 2/2001, Instytut na rzecz Ekorozwoju, Warszawa 2001.

The introduction of fiscal reform goes beyond the issues of traditional economic instruments used in environmental policy. Economic instruments have a huge impact on the effective management of environmental resources, and fiscal reform is the process of implementing all legal and administrative projects, as well as financial and systemic solutions and tools leading to shifting fiscal burdens from work and capital to resources and qualities of natural environment consumed or destroyed in the production and consumption process.

The experiences of EU countries in using ecological fiscal reform as a tool of ecological policy are difficult to assess and compare due to different interpretations of the reform process by different countries. Most economic instruments operate outside of the mechanism of environmental fiscal reform. Only in some countries (Germany, Denmark, Sweden), it was possible to initiate the process of implementing ecological tax reform within the meaning of the definition of ecological fiscal reform described.

3.1. Domestic and foreign experiences in implementing economic instruments into environmental policy

The review of instruments used in environmental protection indicates that in most highly developed countries there are instruments of direct regulation, next to which there are also complementary diverse economic instruments that are tools for indirect impact on users of the environment. As the research shows, they play a limited role in stimulating changes in consumer and producer behaviours. These include: transferable emission allowances (Australia, Canada, Germany and the USA), tax differentiation for vehicles and gasoline (e.g. Great Britain, the USA, Sweden, Switzerland, Portugal, Belgium, Denmark and Finland), penalties and ecological pledges (Australia, Canada, Sweden and the USA). Economic instruments primarily fulfil a fiscal function, serving to accumulate funds usually used to finance projects related to environmental protection.

In some European countries, economic instruments have also been implemented, most often these are various types of tax incentives incorporated into existing tax systems, as shown in Table 8.

Table 8

Examples of applied tax solutions (tax incentives) in environmental protection in selected European countries

Type of solution used (Tax incentives)	Poland	Belgium	Finland	France	Greece	Spain	Norway	United Kingdom
Investments in environmental protection		X		X	X	X		
Investments in new technological lines	X				X			X
Investments in new products					X			
Recycling or recovery of packaging		X			X			
Investments in a green car fleet		X						X
Increasing the eco-efficiency of buildings	X	X			X			
For companies using renewable energy sources	X	X	X			X		
Other incentives							X	

Source: own elaboration based on: Przegląd zachęt podatkowych w kontekście CSR w wybranych krajach europejskich, Accereo Taxand, Warszawa 2011.

The information contained in Table 8 indicates that only a few countries have decided to apply tax incentives to environmental policy, i.e. Belgium, Finland, France, Greece, Spain, Norway and the United Kingdom. In Poland, the following have been implemented:

- relief for new technologies conducive to environmental protection (it is possible to deduct 50% of the expenditure incurred on new technologies),
- exemptions in PIT based on a thermomodernization relief. These reliefs are applied as a way of repayment of part of the loan taken out for thermomodernization,
- exemption from excise duty on electricity generated from alternative energy sources,
- exemptions from agricultural tax for the purchase and installation of equipment for the production of energy from renewable sources (the possibility of deducting 25% of expenditure from agricultural tax, the relief applied for no more than 15 years).

The analysis shows that there are no tax incentives in agriculture for investments aimed at environmental sustainability. In the fiscal policy there are neither solutions that support organic farming nor ones encouraging entrepreneurs to cooperate with organic farmers. The exception is France, where since 2010 ecological companies can deduct expenses for specific activities from tax. In comparison with the European Union, Poland is not an exception. However, it should be clearly emphasized that in Poland, investment activities undertaken by local farmers are supported, including introduction of reductions for farmers involved in small-scale processing and sales of products from their own farms. These activities are exempt from income tax under the so-called agricultural retail and direct sales. These two mechanisms make it easier for farmers to sell farm-produced products. Both allow a rise in profitability of the farm, but each of them has different rules.

The hitherto experiences indicate that we have few tax solutions in agriculture that would contribute to maintaining environmental sustainability in this area. Only a few countries have decided to introduce such mechanisms. To the greatest extent, the tax reform covered mainly the Scandinavian countries, especially Denmark (Table 9).

Table 9

Review of economic instruments used in agriculture in the Scandinavian countries

Agriculture and natural sources	Denmark	Finland	Island	Norway	Sweden
Tax on the extraction of raw materials	X				
Tax on pesticides	X			X	X
Tax on fertilizer consumption	X				(X)
Traditional fishing quotas	X		X		

Legend: economic instruments indicated in brackets were removed in 2009.

Source: Hrafnhildur Bragadóttir, Carl von Utfall Danielsson, Roland Magnusson, Sampo Seppänen, Amanda Stefansdotter and David Sundén, *The Use of Economic Instruments In Nordic Environmental Policy 2010–2013*, TemaNord 2014:549, Nordic Council of Ministers, Denmark.

In the Scandinavian countries in agriculture and natural resources, few economic instruments have changed since 2009. The most visible changes include the change in the pesticide tax base in Denmark and the removal of the fertilizer tax in Sweden.

In Denmark, fertilizer use is mainly regulated by a quota system. However, for small users (e.g. households, small agricultural enterprises) a nitrogen tax applies. Danish farmers, whose annual turnover exceeds DKK 20,000 (EUR 2,685) from agricultural production, are obliged, in the case of large farms, to keep account of the use of fertilizers. For small farms, keeping these accounts is voluntary. Farmers who keep account of the use of fertilizers are exempt from paying nitrogen tax. In addition, they must report the amount used to the public authority. The invoice is the basis for agricultural quotas for fertilizers that cannot be exchanged. Farmers who exceed their quotas are subject to a fine. The penalty is proportionate to the breach of the quota limit.

In 1998, a tax on fertilizers based on nitrogen content was introduced in Denmark in response to the second water plan. The rate was set at DKK 5 (EUR 0.67) per kg and has remained constant since then. Farmers who are regulated by the amount of fertilizer and who are required to keep a fertilizer use account are not charged this tax. The tax on pesticides was changed in 2013. Earlier the tax was based on the value of pesticides. From July 1, 2013, the tax rate is charged per kilogram or litre of pesticide. The tax consists of four components, based on specific properties for health and the environment, as well as the concentration of the active substance in pesticides. The average tax rate also increased.

Since the tax now depends on the characteristics of the product, several products have a lower tax than before 2013, while others have a much higher tax.

It should also be noted that in Sweden, due to low efficiency, the fertilizer tax was removed in 2009.

Accumulation of funds is one of the effects of the introduction of fiscal tools. In Scandinavian countries, environmental taxes provide on average up to EUR 10 million per year, which represents from a few to over a dozen per cent of total tax revenues. It should be added that revenues from taxes imposed only in agriculture alone account for only 1% (Table 10).

Table 10

Income from various types of taxes, fees and charges with environmental protection

Category	Denmark	Finland	Island	Norway	Sweden
Energy and air pollution (%)	47.8	52.2	15.9	25.5	58.8
Water (%)	2.6	14.6	4.8	0.0	0.0
Waste (%)	2.3	4.0	5.6	2.3	0.3
Transport (%)	46.4	28.7	53.0	72.1	40.6
Agriculture and natural resources (%)	1.0	1.4	20.7	0.1	0.3
Total (million EUR)	9,638	6,154	296	8,156	9,665

Source: Hrafnhildur Bragadóttir, Carl von Utfall Danielsson, Roland Magnusson, Sampo Seppänen, Amanda Stefansdotter and David Sundén, The Use of Economic Instruments In Nordic Environmental Policy 2010–2013, TemaNord 2014:549, Nordic Council of Ministers, Denmark.

In Poland, there are also solutions that favour the protection of the environment, which are of a fiscal nature, as presented in Table 11. These are mainly penalties for the illegal use of fertilizers. A system for collecting data on the use of pesticides in individual crops is introduced, which greatly facilitates the enforcement of penalties. It should be added that in Poland there is also an integrated plant protection system that allows the use of alternative methods to chemical methods in the protection of natural resources (e.g. crop rotation, drought-resistant, hail-resistant plants, etc.). There are also fees for allocating land for non-agricultural and non-forest purposes, which significantly limits trade in agricultural land. In 2017, water intake fees were introduced to Polish agriculture, which have not been charged to farm users so far.

Table 11

Economic instruments used in Polish agriculture

Type of instrument	Legal basis	Fees	Exemptions	Range
Charges for water use	The Water Law Act of July 20, 2017 (Journal of Laws of 2017, item 1566)	- Soil and crop irrigation with pumps (0.15 PLN/m^3) - Water supply for people and animals for business purposes (0.10 PLN/m^3 – for groundwater and 0.05 PLN/m^3 – for surface water)	Farms with annual average consumption 5 m^3 / day	App. 8% of farms
Penalties for improper use of fertilizers	The Water Law Act of July 20, 2017 (Journal of Laws of 2017, item 1566)	- PLN 2,000 for use contrary to regulations - PLN 3,000 for storing faeces not in accordance with the regulations (min. up to 6 months) - PLN 500 for keeping documentation of the implementation of the program of activities contrary to the provisions or lack thereof - PLN 500 for no nitrogen fertilization plan		
Fees for allocating land for non-agricultural and non-forestry purposes	Act on the protection of agricultural and forestry land of February 3, 1995	- Reclassification fee results from the size and class of land and is reduced by the market value of the land determined according to market prices applied in a given dwelling in land trading on the day the land is actually excluded from production. For example, the fee for 1 ha of class I is PLN 437,175, II 378,885, II 320,592, IV 262,305. - Annual fee for 10 years representing 10% of the amount due		

Source: own elaboration based on Ustawa Prawo wodne z dn. 20 lipca 2017r. (Dz.U. 2017 poz. 1566 oraz Ustawy o ochronie gruntów rolnych i leśnych z dn. 3 lutego 1995 r.

3.2. Subsidies harmful to the environment and sustainable development of agriculture

Subsidies are a traditional form of financing. In their pure form, they are mainly accessed by budgetary units and a social ecological organization to finance the liquidation of the effects of extraordinary environmental threats, investments in nature protection, tasks in the field of ecological education, etc.

Environmentally harmful subsidies (EHS) are mainly subsidies or tax reliefs and tax exemptions that enable certain consumers, users or producers to supplement their income or reduce costs, but have a generally negative impact on the wider environment. The EU intends to eliminate them by 2020. Hence, they are widely studied by equal scientific and political centres.

Subsidies that can have a negative impact on the environment often occur in areas such as fossil fuels, transport and water; their global value is estimated at USD 1 trillion. Although they seem to be beneficial to industry and consumers, they actually waste natural resources, damage our biodiversity, sustain inefficient activities and discourage innovation.

The EU, like others, has long sought to remove or withdraw EHS (IEEP, 2012) because they burden fiscal budgets and contribute to global greenhouse gas emissions. However, the pace of progress at EU and national levels is slow. The EU has achieved some successes and recent proposals to reform the Common Agricultural Policy (CAP), the Common Fisheries Fund and Cohesion Policy funds make financing conditional on meeting environmental objectives. However, there is still a need to create effective national action plans setting clear goals and deadlines and a transparent reporting system. This also applies to environmentally harmful subsidies in the form of tax exemptions applicable in the Member States.

To a large extent, two aspects determine the political possibility of reforming the EHS, i.e. the fiscal and environmental effects of phasing out such subsidies. The analysis of both areas (environmental impact and fiscal budget) may allow to separate subsidies, thanks to which positive effects can be obtained in both areas.

The comprehensive list of effects of the EHS reform makes it possible to assess which subsidies should be considered for the purposes of the reform or further investigated and which should not be considered. Efforts should concentrate where EHS has the greatest impact. The table shows three case studies, namely:

- Lower energy tax on diesel used in transport compared to gasoline;

- EU direct payments to farmers;
- Transfer of allowances to the EU emissions trading system.

Table 12 shows the estimated environmental and financial impact of EHS. Direct payments have the lowest environmental and fiscal impact associated with the removal of subsidies with harmful effects on the environment followed by diesel tax, while the largest impact has the distribution of emission allowances. Although this indicates that the issue of the distribution of emissions should be subject to a thorough reform, the reform will be very extensive, which may limit its potential. Therefore, one of the aspects that should be considered in this context is the analysis of the size of fiscal impact in relation to environmental impact. Removal of subsidies with high fiscal impact may be undesirable due to the possibility of being guided by fiscal rather than environmental considerations. Direct payments have the greatest potential for development, which means that direct payments have the greatest environmental impact in fiscal terms.

Table 12

Fiscal and environmental impact of removing identified environmentally harmful subsidies (EHS)

EHS	Environmental impact	Fiscal impact	Environmental impact/fiscal impact
Lower tax on diesel used in transport compared to gasoline engines	EUR 89-223 mn	EUR 1.3 bn	0.07-0.22
EU direct payments to farmers	EUR 61-135 mn	EUR 218 mn	0.28-0.62
Division of permits in the EU ETS	EUR 240 mn	EUR 1 bn	0.24

Source: own elaboration.

In practice, environmental and fiscal attention is compared with other economic interests and potential other effects of the reform of environmentally harmful subsidies. For example, removing subsidies could reduce the competitiveness of the domestic industry, affect employment or reduce consumer welfare. In addition, there may be arguments for maintaining subsidies that are difficult to quantify in economic terms such as food security in combination with

agricultural subsidies. Such effects should be further analyzed before proposing reforms. In addition, the current study takes into account the static effects of subsidy removal, and in some cases, some dynamic effects. Other potential dynamic effects, such as the economic effects of price changes and subsequent effects on production and consumption decisions, are also probable.

The impact of subsidies on farmers' behaviour in the context of environmental protection is shown in Table 13. The data contained in the table indicate that a farmer with risk aversion uses less nitrogen than a risk-neutral farmer (assuming that nitrogen fertilizer is a risk increasing factor) and invests less in productive capital. Compared with the market solution, which is a benchmark, the nitrogen fertilizer tax has a strong negative impact on nitrogen use and investment for both risk-neutral and risk-averse farmers.

Investment subsidies for adaptive capital increase both optimal nitrogen consumption and investments, because subsurface drainage increases yield efficiency up to 9.5% compared to the situation without drainage investments.

Other policy instruments have less impact on the use of nitrogen. As economic theory indicates, due to the so-called wealth effect, the decoupled area payment has a small, increasing impact on the use of nitrogen in the case of farmer's risk, which shows the difference in the intensity of nitrogen use in the case of both the market solution and the decoupled area payment. For risk-neutral farmers, the decoupled area payment slightly increases nitrogen consumption and investment. The reason for this is that in a dynamic model with internal capital, the area payment decoupled from production increases the profitability of production and increases capital investment, which increases productivity and thus increases the optimal use of fertilizers.

The crop insurance subsidy slightly increases both optimal nitrogen use and productive investment for a farmer who avoids risk. Ecological set-aside subsidies reduce productive investments for both risk-neutral and risk-averse farmers.

Table 13

Impact of subsidies on farmers' environmental behaviour

The policy scenario	Nitrogen application (kg / ha)	Investment costs (EUR / ha)	Nitrogen application (kg / ha)	Investment costs (EUR / ha)
	Risk averse farmer		Risk neutral farmer	
Market instruments	88.4	44.8	88.3	44.5
Decoupled direct payments	89.1	48.2	88.7	47.7
Greening of direct payments	88.4	44.1	88.0	43.9
Crop insurance subsidies	-	-	88.4	45.4
Tax on nitrogen fertilizers	82.5	42.4	82.1	42.2
Carbon tax for emissions to soil	87.2	37.1	87.3	36.8
Subsidies for investment in adaptation capital	94.4	49.1	91.7	54.3

Source: own elaboration.

The environmental protection financing system is a collection of economic, legal and organizational institutions and solutions designed to provide effective ways of collecting and spending funds to protect the environment. The system is supported by many instruments stimulating pro-ecological behaviour of entities using natural resources. As mentioned earlier, these are primarily economic instruments, including subsidies in the form of exemptions and tax reliefs.

As provided by A. Majchrzycka-Guzowska[144], tax exemptions consist in total or partial omission of income obtained from certain sources when determining the tax base. Consequently, the reduction in the tax amount results from the fact that the tax base is lower than the actual income achieved. They are subjective (exemption from taxation of certain categories of entities, e.g. ecological special purpose funds) or objective (exemption from taxation of certain situations, provided they occur in the sphere of activity of a given taxpayer, e.g. income from the right of perpetual usufruct on the basis of environmental protection regulations).

[144] A. Majchrzycka-Guzowska, *Finanse i prawo finansowe,* Wydawnictwo Prawnicze PWN, Warszawa 1997.

Tax reliefs work slightly differently, which reduce the amount of tax after its assessment[145]. Among the tax reliefs, the most important are economic reliefs used to influence the directions of activity and its location.

The opposite of tax exemptions and reductions are tax increases, the application of which increases the burden.

An important goal of correcting the tax assessment through exemptions and concessions and tax increases is the need to adjust the amount of tax burden to the reduced or increased ability of taxpayers to pay, as well as to stimulate taxpayers to develop or take specific activities desired by the legislator.

The scope of impact of pro-ecological tax preferences is wide. They affect[146]:

- amount of taxpayer's income, e.g. VAT and excise duty exemptions, increases the entrepreneur's income,
- amount of operating costs borne by taxpayers, for example adding higher depreciation to the costs results in lower taxable income, while the exemption from cost taxes, e.g. from property tax on buildings, structures and land related to environmental protection reduces tax deductible costs,
- amount of taxable income – deductions from income before income tax, e.g. donations for ecological purposes reduce the tax base, and thus the value of the tax,
- tax assessment – due to income tax exemptions, among others due to the use of waste in business, the value of tax is reduced,
- differences in tax rates – lower VAT rates and differentiation of the excise tax rates through the lower tax input affects the amount of entrepreneur's income.

There are a number of tax solutions that are to encourage business entities to take pro-environmental initiatives that directly or indirectly affect the protection of natural resources. Among them are: tax incentives for innovations and investments in the field of environmental protection or tax incentives for innovations and investments in new technological lines in the field of environmental protection (Table 14).

[145] A. Majchrzycka-Guzowska, *Finanse i prawo ... op.cit.*

[146] M. Kożuch, *Preferencje podatkowe jako element systemu finansowania ochrony środowiska w Polsce,* Zeszyty Naukowe Akademii Ekonomicznej w Krakowie, nr 732, Kraków, 2007.

Table 14

Examples of tax solutions relevant in the field of environmental protection in selected EU countries

Member State	Type of solution used
Tax incentives for innovations and investments in the field of environmental protection	
Spain	tax relief of 8% of the value of investments in fixed assets intended for environmental protection. They concern, among others, devices for reducing noise, air pollution, pollution of surface waters, groundwater and sea waters, as well as for the reduction, recovery or disposal of industrial residues.
France	tax breaks for research and development activities related to investments or implementation of environmental innovations of 30% of expenses incurred by already existing enterprises and 35-40% for new companies. This relief consists of deducting the amounts spent from the income tax of a taxpayer investing in research and development in the consecutive 3 fiscal years.
Belgium	80% tax relief invested in the acquisition of a patent. This relief can be granted to companies regardless of the type of legal form or the sector in which they operate.
Greece	reducing the tax base by 50% of the value of expenses incurred by enterprises to reduce the environmental impact of their activities.
Tax incentives for innovations and investments in new technological lines in the field of environmental protection	
Poland	Deduction from the tax base up to 50% of the amount spent on the purchase of a new technology. Write-offs to the innovation fund created by Central Agricultural Library (write-off not exceeding 20% of CAL's revenues) and exemptions from property tax, agricultural and forestry tax.
United Kingdom	increased tax depreciation rates for investments in selected "green" technologies – energy-saving devices and installations (including water purifiers or air conditioners)
Greece	subsidies for new technologies with innovative applications that aim to protect the environment and energy efficiency, in an amount not exceeding 50% of eligible investment expenditure. The subsidy can be combined with tax reliefs that vary depending on the size of the investment and the region in which these technologies are to be used.
Tax incentives for investments in new products	
Greece	CIT exemption for investments in new products. This solution applies to profits from the sale of products that have an international patent registered for an enterprise applying for an exemption.

Table 14 cont.

Tax incentives for recycling or recovery of packaging	
Belgium	3% investment relief on reusable packaging
Greece	recycling costs can be tax costs.
Tax incentives for innovation and investment in a green car fleet	
United Kingdom	one-time tax depreciation is possible for electrically powered vehicles (taxpayers apply 100% depreciation rate in the first year of putting vehicles into use). Employees do not pay tax on electric cars provided by the employer and pay reduced tax on hybrid cars and vehicles with lower CO_2 emissions.
Belgium	tax incentive for the purchase of cars with an electric engine, expressed in a fixed amount specified in internal regulations. The relief is higher for cars with optimal CO_2 emissions specified in the regulations and amounts to 50--100%.
Poland	proposals for exemption from excise duty on electric cars and the increase to EUR 30,000 in the amount of the deduction of the purchase of electric vehicles as well as the exemption from property tax in a situation where an electric car would be used in a given position.
Tax incentives for innovations and investments in increasing the eco-efficiency of buildings	
Belgium	investment relief of 15.5% for all enterprises for energy saving investments, consisting of a tax deduction of 15.5% of the value of acquired assets (in the year of their purchase or in subsequent years).
Greece	costs of improving the ecological performance of buildings are tax deductible costs. This relief applies to, for example, expenses for the installation of a solar heating system, replacement of central heating with a gas system, or additional heating insulation. It can be used by both building owners and tenants who deduct costs incurred for the duration of the lease.
Poland	exemption from excise duty of electricity produced from renewable energy sources, based on a document confirming the energy origin certificate, as well as an investment relief for expenses incurred for the purchase and installation of equipment for producing energy from renewable sources for agricultural taxpayers.

Source: own elaboration based on: Przegląd zachęt podatkowych w kontekście CSR w wybranych krajach europejskich, Accereo Taxand, Warszawa 2011.

There are a number of tax incentives in support of mid-range activities in selected European countries. Nevertheless, there are still areas that could be of interest to both entrepreneurs and public institutions. Missing are among others tax incentives for companies sourcing from local suppliers. The analysis did not show any initiatives related to rewarding companies for activities related to this type of activities, although support solutions for local producers are known (e.g. in Poland). It can be assumed that the lack of public administration activities in this area creates a real barrier for enterprises to invest and develop local economies, which is not conducive to cohesion and strengthening of local economic growth, especially in the context of supporting less developed regions.

Another area of business worth exploring is the market segment associated with the production of healthy food. In the analyzed tax systems there are no tax incentives related to the bonus for enterprises producing healthy, organic food. In Poland, this product segment is only developing, while countries where the demand for organic food is high do not see the need to support this segment. Apart from France, where until 2010 agricultural companies involved in ecological activities could have deducted small amounts specified by law from the tax.

Polish companies as well as those operating in EU member states are required to recover and recycle certain amounts of packaging in which they market their products. To date, many of them have not seen the economic benefits of working on new forms of packaging. However, changes in this area will be necessary by 2021. The EU has introduced an obligation to withdraw all plastic packaging from the market. Hence, in recent years, many scientific centers, including the ones in Poland, have undertaken activities to develop new biodegradable packaging. It should be noted, however, that entrepreneurs do not receive economic support from public funds for activities related to the launch of products in more ecological packaging. Therefore, the costs associated with recovery and recycling, which are increasing every year, are being passed on to consumers.

3.3. Impact of pollution taxes on agricultural production in European Union countries in 1997-2016 – econometric analysis

Pollution taxes, in particular the issue of taxes on the use of pesticides, have been the subject of interest in agricultural economics for some time. For example, Skevas et al. (2013) argue that taxes, although they may be effective components of an optimal policy on the use of pesticides, are, however, relatively rarely used as such (e.g. in Europe only in four countries: France, Sweden, Denmark and Norway). However, according to Finger et al.[147], taxes on pesticides are not effective if used as stand-alone measures. According to these authors, they should be used in a coherent set of policies to reduce the risk of pesticide use.

However, it seems that no studies have been conducted yet using econometric cointegration and causality (in Granger's sense) tools to study pollution taxes. This is a more general problem of studies in the field of agricultural eco-

[147] Finger R., Möhringa N., Dalhaus T., Böcker T., *Revisiting Pesticide Taxation Schemes*. Ecological Economics 134, 2017.

nomics. Meanwhile, as Gruszczyński explains[148], the authors of far more popular studies based on regression methods often make the mistake of assigning an alleged cause-effect relationship to a relationship that only indicates the relationship of variables, without specifying its nature or direction. This study attempts to meet the problem indicated above, aiming to determine whether changes in the amount of pollution taxes collected by EU member states in 1997-2016 showed a long-term relationship with or had an impact on the agricultural production of these economies.

The next part of the chapter briefly discusses the econometric methods used in the analysis. Then the data used in the study were presented. The rest of the text presents the results obtained to conclude with a brief summary.

The study examines the occurrence of cointegration and Granger causality between two variables representing the volume of revenues from pollution taxes to the budgets of the European Union and agricultural production in these countries represented by cereal production. Due to the nature of the data used (time series), panel econometry methods were used in the analysis, adopting the following procedure:

1. checking the possibility of occurrence of cross-sectional dependence (CSD) in the data using the method proposed by Pesaran[149],
2. unit root tests, appropriately selected taking into account their usefulness in the analysis of small panels, in particular those with low T-values, from among these available 1st and 2nd generation tests, and taking into account possible correction of the CSD effect (1st generation tests: Im, Pesaran and Shin[150], Levin, Lin and Chu[151], Harris and Tzavalis[152] and Breitung[153] – all enabling subtraction of cross-sectional means to take into account the CSD effect – and the second generation test proposed by Pesaran[154],

[148] Gruszczyński M., *Badania ilościowe w finansach przedsiębiorstw i rachunkowości – wyzwania metodyczne*. *Finanse. Rynki Finansowe. Ubezpieczenia* 91, 2018.
[149] Pesaran M. H., *A Simple Panel Unit Root Test in the Presence of Cross Section Dependence.* Cambridge Working Papers in Economics 0346, 2003.
[150] Im K. S., Pesaran M., Shin, Y., *Testing for Unit Roots in Heterogeneous Panels.* Journal of Econometrics 115, 2003.
[151] Levin A., Lin F., Chu C. J., *Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties.* Journal of Econometrics 108, 2002.
[152] Harris R. D. F., Tzavalis E., *Inference for unit roots in dynamic panels where the time dimension is fixed.* Journal of Econometrics 91, 1999.
[153] Breitung J., *The local power of some unit root tests for panel data.* [in:] B. H. Baltagi (ed.), *Advances in Econometrics*, t. 15: *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, JAI Press, Amsterdam, 2000.
[154] Pesaran M. H., *A Simple Panel Unit Root … op. cit.*

3. cointegration test using the method proposed by Westerlund[155] and
4. Granger causality test using the approach presented in the work of Dumitrescu and Hurlin[156].

All data used in the study come from the EUROSTAT database and include observations for 23 EU Member States (excluding Bulgaria, Croatia, Portugal, Romania and Hungary, due to missing data that would affect the imbalance of the panel) for 1997-2016 (annual data). They include the following variables:

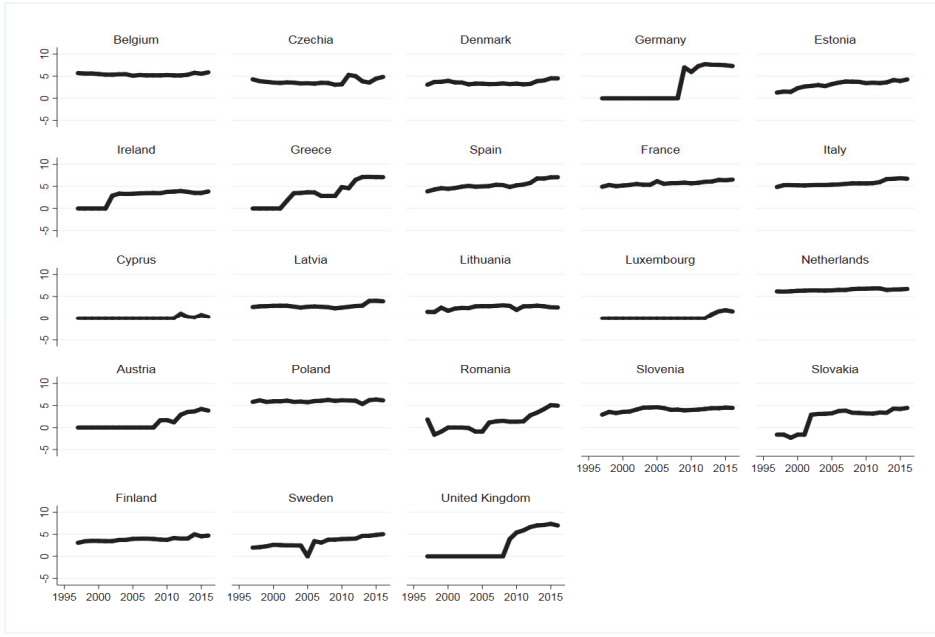
- TAXES: natural logarithm of the value of taxes on pollution[157] (in EUR million) that have been paid to the budgets of the public finance sector (general government) of member states and EU institutions,
- PRODUCTION: natural logarithm of cereal production volume (in 1000 t) in individual EU countries, when harvesting under standard EU humidity conditions.

The values of the variables are shown in Figures 7 and 8.

[155] Westerlund J., *Testing for error correction in panel data.* Oxford Bulletin of Economics and Statistics 69, 2007.
[156] Dumitrescu E.-I., Hurlin C., *Testing for Granger non-causality in heterogeneous panels.* Economic Modelling 29, 2012.
[157] In the European Union nomenclature, taxes on pollution relate to the air and climate protection sector and include taxes on emissions (measured or estimated) in air and water, solid waste management, as well as taxes imposed to reduce noise and vibration. Taxes on CO_2 emissions, already included in energy taxes, are excluded from this category. From the agricultural point of view, crutial in this category of taxation is the use of pesticides, SO_2 or NOx, as well as local taxes on environmental protection.

Figure 7

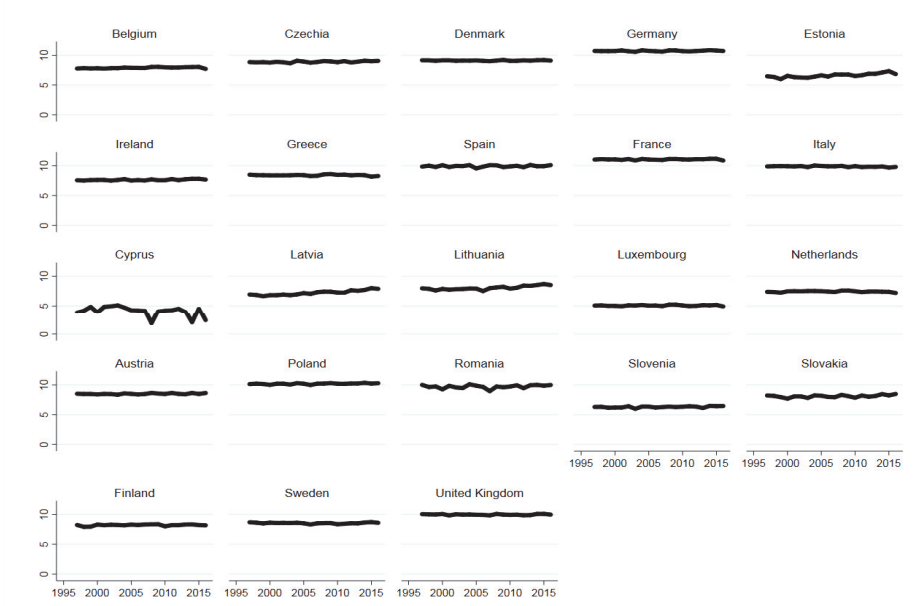
TAX variable values



Source: Own study based on conducted research.

Figure 8

PRODUCTION variable values



Source: Own study based on conducted research.

As a result of tests for the occurrence of cross-sectional dependence, it was found that this problem occurs in the case of both variables (Table 15). Therefore, the unit root tests were corrected for this fact.

Table 15

Test results for *cross-sectional dependence*

Specification	TAXES	PRODUCTION
z	37.137	15.135
p	0.0000	0.0000

Source: Own study based on conducted research.

As a start, first generation tests were performed with subtraction of cross--sectional averages to take into account the CSD effect. Due to the small number of observations in the series, the maximum rank of delays was assumed to be 2. The selection of optimal orders was made using the Bayesian information criterion (BIC). The results of four different tests (with different null hypotheses, although in each case it was a non-stationary test), carried out in variants with or without a deterministic component, for levels and then the first differences clearly indicate the stationary nature of the PRODUCTION variable and the possible trendostationality of the TAX variable (table 16). There is no doubt, however, that the second variable is a panel of series with an integration degree of at most *I*(1).

Table 16

Unit root test results (1st generation)

		TAXES	ΔTAXES	PRODUCTION	ΔPRODUCTION
Levin, Lin, Chu	no trend	0.3128	0.0000	0.0000	-
	trend	0.0000	0.0000	0.0000	-
Im, Pesaran, Shin	no trend	0.9832	0.0000	0.0000	-
	trend	0.0041	0.0000	0.0000	-
Harris, Tzavalis	no trend	0.5565	0.0000	0.0000	-
	trend	0.2281	0.0000	0.0000	-
Breitung	no trend	0.6641	0.0000	0.0000	-
	trend	0.0296	0.0000	0.0000	-

Note: The table shows *p*-values ($\alpha = 0.05$). The first differences are marked with Δ.
Source: Own study based on conducted research.

Due to the doubts about the TAX variable, an additional second generation test was conducted using Pesaran's approach (null hypothesis: all series are non-stationary), in variants for the order of delays 0 or 1, with constant or constant and trend. The results of this test (Table 17) essentially coincide with the results of the first generation tests. The variable PRODUCTION in all test variants showed stationarity in levels, while the variable TAXES – stationary in levels with the test delay rank equal to 0 and the stationarity of the first differences for the test delay rank of 1. Therefore, in further analysis it was decided to include the variable TAXES in two variants – as a panel of stationary series in levels or in the first differences.

Table 17

Unit root test results (second generation)

		TAXES	ΔTAXES	PRODUCTION	ΔPRODUCTION
lag = 0	constant	0.000	-	0.000	-
	constant and trend	0.011	-	0.000	-
lag = 1	constant	0.078	0.000	0.002	-
	constant and trend	0.673	0.000	0.040	-

Note: The table shows *p*-values ($\alpha = 0.05$). The first differences are marked with Δ.
Source: Own study based on conducted research.

The above unit root test results have major implications for the test procedure. The fact that the variable PRODUCTION turned out to be a panel of stationary series means that testing the long-term relationship between the analyzed variables becomes pointless. Thus, the rest of the analysis is limited to testing Granger causality (Table 18). Due to the occurrence of the CSD phenomenon, critical values were bootstrapped (1000 draws). The tests were carried out in two variants of the TAX variable (for levels and first differences), and the respective rank of delays were determined using the BIC criterion. As the results presented in Table 4 show, at $\alpha = 0.05$ no occurrence of the phenomenon of causality in the Granger sense was demonstrated for any of the pairs of variables. However, if we assume α at the level of 0.1, it should be considered that the TAX variable (in levels) precedes the variable PRODUCTION in the examined data panel.

Table 18

Granger causality test results

	Rank of delays	Z-bar	*p-value*	Z-bar tilde	*p-value*
TAXES (levels) → PRODUCTION	1	3.8964	0.0640	2.6703	0.0640
PRODUCTION→ TAXES (levels)	1	1.1182	0.4240	0.4959	0.6150
TAXES (first differences) → PRODUCTION	1	0.4356	0.7380	-0.0662	0.9390
PRODUCTION → TAXES (first differences)	1	2.1463	0.1140	1.2480	0.1930

Source: Own study based on conducted research.

In EU countries, economic instruments in environmental policy began to be used in the 1970s. At that time, certain solutions based on emission and usage fees were applied. Currently, their roles are taken over by taxes related to the use of goods and resources of the natural environment. The very essence of such taxes, which in the literature are commonly called environmental taxes, refers to the taxation of those forms of activity for which there is certainty or the general opinion as to their adverse impact on the environment. However, an important issue in the aspect of taxation of activities that may have a negative impact on the environment is the evaluation of their direct and clearly negative impact on the environment. This problem is crucial to resolve, especially in the context of developing new tax tools that could foster the concept of sustainable development in the environmental dimension. However, studies show that the high share of environmental taxes in the total structure of taxes shows their fiscal significance rather than the impact on shaping the pro-environmental behaviour of specific business entities[158]. If the direction of their impact led to a reduction of undesirable behaviour, then the income from these taxes would be reduced. It should be emphasized, however, that for such a situation to take place, environmental taxes would have to be "severely" high.

[158] M. Giergiczny, J. Śleszyński, *Ekologiczna reforma podatkowa w krajach UE* [in:] sc. ed. J. Śleszyński, *Ekologiczna reforma podatkowa. Wyzwanie do polskiej polityki ochrony środowiska*, Wyd. Ekonomia i Środowisko, Białystok 2004, p. 67.

Another solution conducive to environmental protection and aimed at supporting pro-environmental activities is to reduce tax burdens related to income taxes (CIT, PIT) or other common taxes, such as VAT, excise tax or agricultural tax applied in Polish agriculture. Such solutions could be used in agriculture, which plays an important, natural role in the field of environmental protection, including the protection and preservation of habitats and biodiversity.

Expert opinion surveys on the impact strength and direction of the pro-environmental impact of currently operating taxes in Polish agriculture indicate that it is possible to use some tax instruments to improve the state of environmental sustainability. This is confirmed by expert opinions presented in Tables 19 and 20.

Table 19

Direction of the impact of taxes in Polish agriculture on environmental sustainability in the opinion of external experts (% answers)

Type of tax	Nature of the impact of selected taxes						
	Negative high	Negative medium	Negative low	Neutral	Positive low	Positive medium	Positive high
Agricultural tax	0.0	1.8	0.0	56.4	29.1	9.1	3.6
Income tax	0.0	3.9	0.0	63.6	14.3	15.6	2.6
CIT	4.5	0.0	0.0	22.7	40.9	22.7	9.1
VAT	0.0	4.6	0.0	40.9	40.9	13.6	0.0
Exercise tax	9.1	0.0	4.5	50.0	18.2	13.6	4.5
Average answer	***1.5***	***3.0***	***0.5***	***55.1***	***19.7***	***16.7***	***3.5***

Source: Own study based on conducted research.

The analysis of the responses from external experts indicated that the taxes existing in Polish agriculture have a neutral impact on environmental sustainability (approx. 53% of responses). This situation may indicate that these tools in their current shape are not useful for shaping the desired activities in the field of environmental balancing in agriculture. Particularly according to experts, income tax (around 64% of responses), followed by excise duty (50%) and then VAT (around 41% of responses) are of little relevance. It should be added that 40% of respondents, however, see their positive impact, with a weak positive impact being indicated by approx. 19.7% of respondents, while a strong positive approx. 3.3%. Only 5.0% of the surveyed experts indicated that the current taxes

have a negative impact on the improvement and protection of the environment. Among the taxes that may have a negative impact on the environment, mainly CIT (approx. 4.5% of responses received) and excise duty (9.1% of responses) are indicated. On the other hand, many experts believe that tax tools incorporated into CIT and VAT may contribute to improving the natural environment. However, it should be emphasized that the most important tax burden in Polish agriculture is the agricultural tax, which, according to most experts (56.4%), does not play a significant role in shaping the balance in the environment. It should be added that about 42% of respondents note that agricultural tax instruments can have a positive impact on sustainability, which is confirmed by their detailed analysis.

In agricultural tax, a positive impact is attributed mainly to investment allowances (over 90% of responses), of which 45.5% of the experts surveyed rate the impact at medium level and 18.2% at high level.

Table 20

Direction of the impact of agricultural tax instruments on the sustainability of agriculture (% of responses)

Type of tax instrument	**Direction of the impact (% of answers)**						
	Negative high	Negative medium	Negative low	Neutral	Positive low	Positive medium	Positive high
Amount of tax	0.0	0.0	0.0	63.6	36.4	0.0	0.0
Privileged taxation rules	0.0	0.0	0.0	72.7	27.3	0.0	0.0
Tax exemption	0.0	0.0	0.0	63.6	36.4	0.0	0.0
Investment relief	0.0	0.0	0.0	9.1	27.3	45.5	18.2
Tax waiver	0.0	9.1	0.0	72.7	18.2	0.0	0.0

Source: Own study based on conducted research.

The analysis of the strength of the impact of individual tax instruments indicated their neutral impact on the sustainability of agriculture (Table 21). It should be added, however, that none of the examined instruments worked negatively. According to experts, investment relief and deductions for the purchase of new technologies have medium impact.

The above considerations indicated that in the Polish agricultural tax system there is a small group of tools currently used and having an impact on envi-

ronmental sustainability. However, it should be noted that the shape of this system does not adversely affect such activities. Moreover, the low nuisance of this system (simplified settlement rules, low burden, small number of reliefs applied) means that this system can be treated as a kind of remuneration of agriculture for its positive external effects. However, the problem is the lack of targeting of these activities at specific agricultural entities, because this system applies to the entire agricultural sector.

Review of expert opinions on new tax tools has shown that in this case there is no full agreement of experts on the direction of their impact. A significant part of these instruments is assessed negatively, which may indicate the experts' fears about the effects of introducing this type of taxes in agriculture. A review of the literature indicates that environmental taxes would have to be at a very high level to cover all budget expenditure, and reduce or abolish the burden of current taxes. Meanwhile, most EU countries maintain budgets above 40% of their GDP, which cannot be provided by environmental taxes. The reasonableness of tax introduction is determined by the economic argument of the cost-effectiveness of this type of solution. In the context of environmental protection, introducing new taxes in agriculture could mean achieving environmental goals at a much higher cost.

Expert assessments indicate that environmental taxes (over 72% of responses) and deposits (over 72% of responses) can have a negative impact on environmental protection in agriculture (Table 22). This opinion may result from the fact that taxes are assumed to be imposed in order to gain fiscal benefits and the tax itself does not give any right to the payer. Therefore, this would be an additional fiscal burden for Polish farms, which would not translate into a change in their behaviour in terms of environmental protection. Similarly, in the opinion of experts, the institution of a deposit may be treated because its application may cause an increase in the financial threshold of access to a given good, which may be poorly perceived by small farms and treated as an introduction of an additional fiscal burden. However, it should be noted that about 27% of respondents indicate a positive impact of these tools. Such a large divergence of these results may indicate either a poor recognition of the problem of the impact of new tax instruments on the sustainability of agriculture, or an ongoing dispute regarding the sense of introducing such solutions into Polish agriculture.

Table 21

Strength of the impact of current tax instruments on shaping environmental sustainability (most common answers)

Type of tax	Strengh of impact vs. type of tax instrument		
	Neutral (0)	Positive low (1)	Positive medium (2)
Agricultural tax	• Amount of tax • Privileged taxation rules • Tax exemptions		• Investment relief
Income tax	• Tax rate • Tax allowance • Deduction of insurance premiums • One-time depreciation • Interest cancellation • Possibility of deducting losses		• Investment relief
CIT		• Tax exemption on income from the lease of agricultural land	• Deductions for the purchase of new technologies
VAT	• Simplified tax rules for VAT in agriculture	• Preferential rates for agricultural products	
Exercise tax	• Partial refund of the tax included in the price of oil • Discounts for biofuel producers		

Source: Own study based on conducted research.

Table 22

Direction of the impact of "new" tax instruments on environmental sustainability in agriculture

Type of tax instrument	Type of impact of "new" tax instruments on environmental sustainability						
	Negative high	Negative medium	Negative low	Neutral	Positive low	Positive medium	Positive high
Tax differentiation depending on the scale of environmental pollution	0.0	9.1	0.0	27.3	36.4	18.2	9.1
Fee for introducing pollutants into the environment	0.0	27.3	36.4	0.0	27.3	0.0	9.1
Production fee	0.0	27.3	36.4	9.1	27.3	0.0	0.0
User fee	0.0	18.2	36.4	36.4	9.1	0.0	0.0
Administrative fee	9.1	9.1	27.3	27.3	18.2	9.1	0.0
Ecological tax	18.2	45.5	9.1	0.0	18.2	9.1	0.0
Deposits	9.1	36.4	27.3	18.2	0.0	9.1	0.0
Transferable permits for use of the environment	0.0	9.1	45.5	9.1	27.3	0.0	9.1

Source: Own study based on conducted research.

Noteworthy is the positive assessment of tax differentiation depending on the scale of environmental pollution (Table 22). It is believed that this opinion is the result of an assessment of the economic situation of Polish farms and the adjustment of the analyzed tools to various types of activities. It should be noted, however, that tax differentiation is most often a form of hidden subsidization of various branches of agriculture and is a substitute for existing tax tools used in the Polish agricultural tax system.

If we look at the strength of the impact of new instruments on environmental sustainability in agriculture (Table 23), tax differentiation may have a positive, though low impact. The vast majority of "new" instruments, according to experts, will have a negative impact, while the strength of this impact will be medium for environmental taxes and low for most other instruments, such as: fee for introducing pollution into the environment, product fee, user fee, deposits, transferable permits for using the environment.

Table 23

Strength of the impact of "new" tax instruments on shaping environmental sustainability (most common answers)

Strenght of the impact			
Negative medium (-2)	**Negative low (-1)**	**Neutral (0)**	**Positive low (1)**
• Ecological taxes	• Fee for introducing pollutants into the environment • Product fee • User fee • Deposits • Transferable permits for use of the environment	• Administrative fee	• Tax differentiation

Source: own studies.

Summary

Along with the development of civilization, the environmental impact of human economic activity was increasing, over time leading to a greater violation of the natural balance in nature and causing the need to change current practices. In the case of establishing and conducting ecological and pro-environmental policy, the dominant subject of these activities is the public sector, which is reflected, among others in prepared sustainable development strategies. Actions taken by the state are usually interventionist and are aimed at eliminating or decreasing the negative environmental impact of economic activities in the form of reducing losses and environmental costs. In this process, pro-environmental policy provides, in addition to legislative tools, a number of instruments to influence the administrative, economic, financial and socio-economic market.

The importance of implementing the assumptions of the sustainable concept in the functioning and future development of agriculture results directly from the specifics of this type of activity and its fundamental and multidirectional relationship with the natural environment. Agriculture is a dimension of the economic use of nature resources, therefore the farmer (farm) simultaneously performs the functions of: agricultural producer and entity using the environment. The issue of balancing the relationship between the two functions remains a problem. Mechanisms of an economic (indirect) nature should be seen in the context of legal and administrative regulations, setting acceptable limits and rules for the use of broadly understood natural resources. Thus, economic instruments for environmental protection are an extremely important complement to administrative and legal instruments. However, the interference of the public administration apparatus is conditioned by the need to ensure such a quality of the natural environment that would be consistent with the theory of sustainable development, which cannot be achieved due to the unreliability of the market mechanism.

The argument for introducing fiscal solutions to protect the environment is the perception of ecological taxes as effective tools for solving environmental problems and potentially higher economic growth. Research indicates, however, that it is rarely accompanied by real GDP growth, which is associated with reduced investment and lowering the competitiveness of countries that have introduced such taxes to tax systems against countries not applying these mechanisms. These arguments may discourage countries from the introduction of fiscal solu-

tions in agriculture. However, the assessment of environmental protection instruments for sustainable, smart and shock-resistant development in this respect should take into account mutual interactions (substitution/complementarity). It seems necessary to harmoniously develop fiscal and financial environmental protection instruments, as well as to establish administrative regulations, taking into account assessment criteria from the perspective of the state, the sector and its social surroundings.

Environmental taxes constitute the most representative group of environmental protection instruments. The need for functioning of taxes related to the environment is based on the belief that, apart from the fiscal function (manifested in budgetary tax revenues), they significantly fulfill the incentive function inclining to abandon activities harmful to the environment (provided that these activities constitute the basis of taxation, and therefore raise tax liability). Consequently, striving to reduce the amount of tax liabilities is to contribute to environmental protection by limiting the scale of pollutants emitted (or more broadly – the scale of negative impact on the state of the natural environment).

In the selected European countries there are a number of initiatives in the form of tax incentives supporting environmental protection. However, there are still areas that need to be supported. Among other things, there is a lack of initiatives related to rewarding companies purchasing raw materials from local organic farmers, as well as companies producing organic food. Lack of administrative activities in this area creates a real barrier to investment and development of local economies based on activities conducive to environmental protection. It is also not conducive to cohesion and strengthening of local economic growth. The analysis indicates that in Poland there are a small number of tax incentives in agriculture for investments aimed at environmental balance. Compared to the European Union, Poland is not an exception. However, it should be clearly emphasized that in Poland investment activities undertaken by local farmers are supported, including introduction of tax reliefs for farmers involved in small-scale processing and sales of products from their own farm. These activities are exempt from income tax under the so-called agricultural retail and direct sales. These two mechanisms make it easier for farmers to sell farm-produced products. Both allow a rise in the profitability of the farm, but each of them has different rules.

The hitherto experiences indicate that we have few tax solutions in agriculture that would contribute to maintaining environmental sustainability in this area. Only a few countries have decided to introduce such mechanisms. To the greatest extent, the tax reform covered mainly the Scandinavian countries, especially Denmark. Current tax instruments have a neutral or positive impact on environmental diversity. Investment rebates and deductions for the purchase of new environmentally friendly technologies have the greatest average positive impact. The assessment of the impact of new tax instruments on the natural environment is negative. Environmental taxes can have a particularly negative impact. Tax differentiation can bring positive, but insignificant impact. Favourable taxation rules in the form of tax differentiation constitute a kind of remuneration for introducing positive externalities to the environment. In Polish agriculture, the application of this instrument could complement or replace selected instruments in the current agricultural tax system.

The results of the conducted causality analysis in the Granger sense indicate that taxation of pollution, measured here by the value of taxes received into the budgets of the financial sector of the Member States and EU institutions, does not quite determine agricultural production, measured by the volume of cereal production, in individual EU countries. It is worth noting, however, that if we assume the stationary nature of the TAX variable in levels and the coefficient $\alpha = 0.1$, the econometric analysis carried out indicates that there is at least one of the EU countries examined (23), where changes in ecological taxes precede changes in agricultural production (cereals). However, the results obtained should be approached with great caution, primarily due to the short length of the time series studied (20 years).

Regardless of the scale of prevalence of pro-environmental fiscal instruments, there is a need for their introduction in agriculture in order to increase saving and rational use of resources. These activities may involve the creation of an ecological market, development of new technologies and innovations in agriculture. However, the harmonious development of these instruments both at the national and international level will be necessary in this respect.

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