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Environmental Awareness of Farmers vs. Agricultural Sustainability

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Abstract:

Purpose: *Modern agriculture aims at sustainable management, i.e., stable and, simultaneously, economically viable and socially acceptable production, without endangering the environment. The aim of this paper was to evaluate the ecological awareness and pro-environmental attitudes among farmers managing agricultural holdings located in Wielkopolskie Voivodship.*
Methodology: *The source of empirical material comprised of a pilot survey conducted in 383 agricultural holdings in Wielkopolska. The measuring method consisted in a direct interview, using a standardized questionnaire. The questions were provided using the rank scale method, as well as the Likert scale. The collected information was analysed and subsequently characterised using descriptive statistics methods. The study was conducted from November 2018 to April 2019, both electronically and through direct contact with farmers.*
Findings: *The study concludes that a large number of the surveyed farmers declared knowledge of Good Agricultural Practices (73%) and Principle of Cross-compliance (67%). The majority of agricultural producers in Wielkopolska (56%) were convinced of the negative impact of conventional agriculture and their activities on the environment. The surveyed farmers indicated their willingness to undertake pro-ecological measures in their agricultural holdings.*
Practical Implications: *The farmers' environmental awareness is a key factor in reducing the negative impact of agricultural production on the natural environment.*
Originality/Value: *Understanding farmers' attitudes and behavior in terms of environmental protection is essential to identify and implement effective protection measures.*

Keywords: *Sustainable agriculture, pro-environmental activities, environmental protection, environmental awareness.*

JEL code: *Q01, Q13, D83.*

Paper type: *Study research.*

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1. Introduction

Agriculture has a very significant impact on the natural environment, as it directly uses environmental resources in production processes. Numerous ecological threats existing in the agricultural areas result from the excessive intensification of agricultural production, the main purpose of which is to obtain the highest possible yields, at the expense of the natural environment exploitation. Much of the damage caused to nature results from farmers' lack of professional knowledge regarding proper farming methods, improper use and storage of fertilizers and chemical plant protection products, or unsuitable management of waste and sewage generated on the agricultural holding. Insufficient awareness of environmental threats among many farmers, their lack of interest in environmental issues, as well as poorly developed infrastructure in rural areas (absence of sewage system and landfill sites), constitute a significant barrier to the achievement of sustainable development objectives in rural areas. It becomes necessary to undertake actions aimed at limiting negative practices used in agriculture, which is done by the promotion of ecological farming methods (Kazimierczak, Skąpska, and Rembiałkowska, 2010; Belka, 2008).

Currently, the priority is to promote environmentally friendly production methods. In the shaping and management of natural and agricultural areas, methods of pro-environmental activities are of particular importance. Organic and sustainable agriculture is therefore no longer perceived as inefficient and extensive. On the contrary, there is an increasing understanding that it creates both the opportunity to produce high-quality food, as well as improve the natural environment (Kuczuk, 2005). Agriculture should be one of those sectors that most visibly shapes and emphasizes the importance of sustainable development since it is a sector which all mankind directly, and, at the same time, the environment indirectly depend on. Agriculture is the most fundamental economic sector which ensures food security, alleviates the effects of poverty and preserves basic natural resources (Ghimire, 2002).

2. Literature Review

According to the proposals of the EU Common Agricultural Policy of 2005, agriculture should be sustainable and form an integral part of the economy. The concept of sustainable agriculture is not precise. In 1987, the Food and Agriculture Organisation of the United Nations (FAO) adopted a definition of agricultural sustainability which states as follows: "Sustainable development consists in the use and conservation of natural resources and the orientation of technologies and institutions in such a way as to achieve and maintain the satisfaction of human needs of present and future generations. This type of development (in agriculture, forestry and fishery), by preserving soil, water resources, plants and animal genetic resources does not degrade the environment, implements appropriate technologies, as well as is ecologically viable and socially acceptable" (World Commission, 1987). The idea of permanent and sustainable development was also reflected in Polish legislation. The following definition applies in Poland: "Sustainable development is a kind of social

and economic development which involves a process of integrating political, economic and social activities, while maintaining the natural balance and sustainability of basic natural processes, in order to guarantee the possibility of satisfying the basic needs of individual communities or citizens of both the present and future generations" (Environmental Protection Law, 2001).

The principles of Sustainable Agriculture and Rural Development (SARD) were defined at the UN Conference on Environment and Economic Development in Rio de Janerio in 1992. The program document Agenda 21 adopted at the said conference, presents methods of developing and implementing sustainable development programs into agricultural practice (Śmiglak-Krajewska, 2018; Śmiglak-Krajewska, Wojciechowska-Solis and Viti, 2020). The essence, and simultaneously the condition for the success of this idea, consist in a comprehensive action of the whole society. In building environmental and legal awareness in the area of agriculture, it is to be facilitated by the Code of Good Agricultural Practice. The Code informs what is allowed or forbidden, prevents offences and is intended to aid in building ecological and legal awareness of the society, as well as instructs how to limit the negative impact of agriculture on the environment (MARD, 2004).

Sustainable agriculture, as one of the directions of sustainable development of rural areas, as well as an alternative to intensive, industrial agriculture, should manage its land resources in a rational way, so that in the future it can be used to satisfy the needs of successive generations of producers and consumers. Its essence is to strive for stable and, simultaneously, economically viable and socially acceptable production in a way which does not endanger the natural environment (Terluin, 2003; Harasim and Włodarczyk, 2007; Marsden and Sonnino, 2009; Łuczka and Smoluk-Sikorska, 2017). The primary principle of sustainability is to maintain a balance between social, economic and ecological systems, therefore, it is particularly important for agriculture as the activity which is directly linked to nature (Spiertz, 2010).

All functions must be perceived as complementary and not exclusive, therefore they should be performed in an atmosphere of mutual integration (Baum and Adamowicz, 2000). Sustainable agriculture should provide farmers with incomes comparable to those achieved by other social groups while maintaining the highest possible level of employment (Vereijken, 1997). Sustainable agriculture should meet the following requirements (Mizgajski, 1998; Fotyma and Kuś, 2000):

- produce good quality and proper quantity of food resources;
- use environmentally friendly production technologies (soil, water, air protection, maintenance of stability and diversity of ecosystems – the so-called biodiversity);
- ensure an adequate standard of living for the rural population (technical infrastructure, provision of jobs and an equitable income, covering not only the current living needs of the farmer's family but also enabling the development or at least restoration of production assets);

- maintain and develop the aesthetic and recreational qualities of rural areas (the role of landscape, opportunities for the development of alternative activities for the rural population, e.g. agrotourism);
- provide health and comfort for people and animals (health safety of farmers and consumers – the so-called healthy food, farm animal welfare).

Therefore, it should be stated that the principle of sustainable development should be implemented through multifunctionality of agriculture, i.e., through different dimensions: environmental, economic, social, as well as through different areas of agricultural and non-agricultural activities in rural areas (Lorek and Lorek, 2010).

Sustainable agriculture cannot exist without sustainable agricultural holdings, which are recognized as basic units in this section of the economy (Fotyma, 2000). With regard to the agricultural holding, the level of environmental sustainability is reflected in the applied crop rotation (characterized by the share of grain in the sowing structure, the number of groups of cultivated plants, the indicator of arable land covered with vegetation in winter), as well as the applied fertilizer management, which takes into consideration the stocking density and the fertilizing balance (Zegar, 2005).

The environmental consequences associated with the functioning of agricultural holdings may be positive or negative, although most often, both effects occur simultaneously (Clock, 2007).

3. Materials and Methods

The source of empirical materials comprised of pilot surveys conducted in 383 agricultural holdings in Wielkopolska (random sample, the number of entities accepted for the study was determined according to the minimum sample size for the population, i.e., for 121.4 thousand agricultural holdings in Wielkopolskie Voivodship). The study was conducted from November 2018 to April 2019, both electronically and through direct contact with farmers. The survey included questions regarding knowledge of the natural environment, methods of managing, awareness and understanding of the concept of 'sustainable agriculture', as well as Cross-compliance Principles. The collected information was analysed and subsequently characterised using descriptive statistics methods.

The aim of this paper was to evaluate the ecological awareness and pro-environmental attitudes among farmers managing agricultural holdings located in Wielkopolskie Voivodship.

4. Survey Results and Discussion

Agricultural holdings were divided according to their total surface area, consisting of the area of the farm and the area of the leased land (Table1).

Table 1: *Characteristics of the surveyed farms*

Surface area (in ha)	Number of agricultural holdings	Production		
		plant	animal	mixed
		(number of agricultural holdings)		
9-20	98	22	18	58
20-50	115	22	29	64
50-100	98	30	6	62
100 and above	72	26	15	31
Total	**383**	**100**	**68**	**215**

Source: *Own study based on surveys.*

In the individual groups of agricultural holdings, three directions of production were distinguished: plant, animal and mixed. Among agricultural holdings with a surface area of less than 100 ha, entities with mixed production direction dominated, while in the group of farms with an area of more than 100 ha, entities with mixed or plant production prevailed. Plant production was dominated by grain cultivation (in over 72% of agricultural holdings). Furthermore, pig farming dominated in animal production.

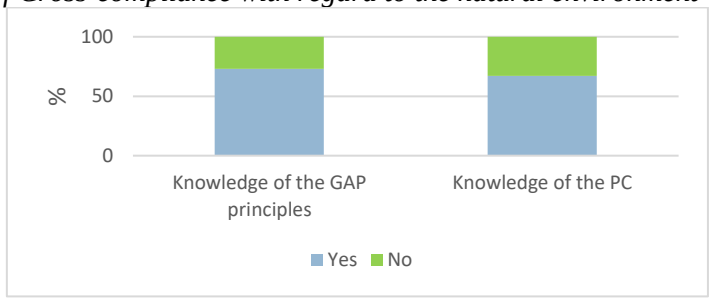
In the structure of population managing the surveyed entities, the most significant in all groups was the share of men (86% in the group of the largest agricultural holdings, 78-84% in other groups), as well as persons with higher education (65-70%). In the distinguished groups of agricultural holdings, the majority of managers (58-67%) were between 35 and 54 years old. 81% of the surveyed farmers indicated that the main source of income in the household budget comprises of income from work in the agricultural holding.

The multifaceted impact of agriculture on the environment requires farmers to understand the existing correlations, as, through their practices, production and decisions they make may significantly reduce or increase the negative influence of agricultural production on individual ecosystem elements. Therefore, it can be assumed that the issue of farmers' ecological awareness is fundamental for limiting the negative impact of agricultural production (Sulewski, 2017). Achievement of objectives of sustainable agriculture requires a high ecological awareness from farmers (Kałuża, 2009). For one cannot expect pro-ecological actions from farmers in a situation when they would not know which actions improve and which worsen the state of the natural environment (Gołębiewska and Pajewski, 2015).

Farmers were asked whether they were familiar with and understood the term "sustainability". The majority of the respondents, i.e. 76% who were mostly owners with higher agricultural education and larger agricultural holdings, declared knowledge of the term. Subsequently, the survey participants were asked about their knowledge of the principles of Good Agricultural Practices (including a set of environmentally friendly agricultural practices, the application of which would ensure

sustainable development in the area of agricultural production in plant cultivation and animal husbandry), as well as the Principles of Cross-compliance (the action plan obliges all farmers to comply with the requirements provided in the plan regarding, e.g.: conditions of manure storage, periods, doses and methods of fertilization, or keeping records of agrotechnical treatments related to fertilization (Figure 1).

Figure 1: *Knowledge of the principles of Good Agricultural Practice and the Principles of Cross-compliance with regard to the natural environment*



Source: *Own study based on surveys.*

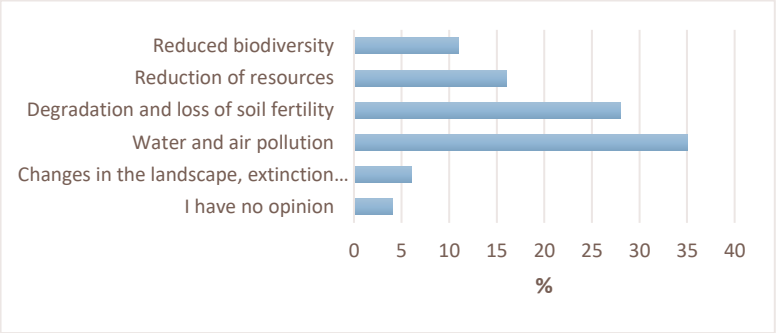
The majority of respondents (73%) indicated knowledge of the principles of management defined by GAP and PC (67%), which should be considered as a satisfactory result. Farmers increasingly often realize that while taking care of nature's resources, they also provide for their "workshop", thus they attempt to introduce these principles within their agricultural holdings. They are also obliged to implement and comply with the said rules if they wish to apply for payments regarding agricultural subsidies. According to S. Krasowicz (2005), obeying the principles included in both these documents contributes to the formation of ecological awareness and knowledge-based management, as well as a systemic (holistic) approach to the agricultural holding.

In the assessment of ecological awareness among farmers, the respondents were asked to express their views on the impact of conventional agriculture on environmental pollution. The majority of farmers (56%) are aware that their actions may affect the degradation of environmental resources. 22% of survey participants believe that agriculture has no impact on environmental pollution, 12% claim it has little impact, while 11% have no opinion on this issue. However, according to the conducted research, a large group of agricultural producers does not feel or do not wish to feel responsible for the state of the environment, as this would entail the reduction of their economic benefits.

Unfortunately, intensive agricultural exploitation of the environment increasingly often results in environmental degradation. The study analyzed how the surveyed farmers perceive the impact of agriculture on environmental elements such as water purity, air quality, biodiversity, landscape, climate change and soil condition.

Respondents were asked to indicate negative consequences of agricultural activity on the environment (Figure 2).

Figure 2. *Negative consequences of agricultural activity on the environment*

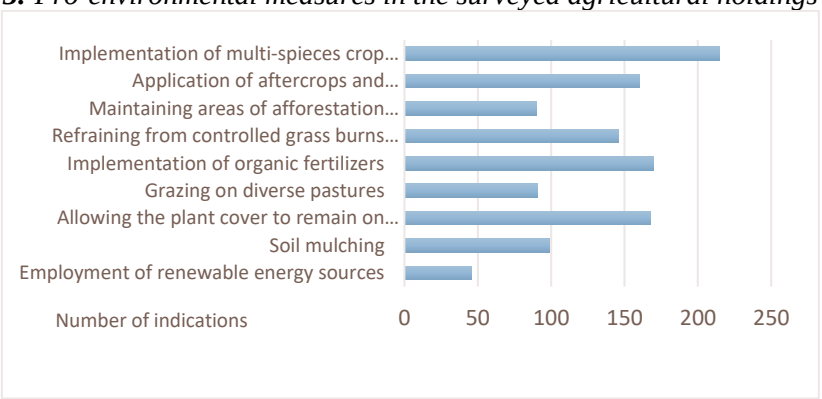


Source: *Own study based on surveys.*

Primarily, the farmers indicated danger resulting from the employment of chemical plant protection products and fertilizers. They emphasized the related threats to the purity of groundwater and open waters, the release of nitrogen compounds into the atmosphere, as well as the adverse impact of these agents on the life of animals, particularly insects (35%). According to the respondents, agriculture negatively influences soil degradation as well (28%). They accentuate that the main causes of degradation consist in: intensive agrotechnical treatments, excessive chemicalisation of agriculture, monocultural cultivation or improper melioration. 16% of the respondents indicated that some of the currently implemented agricultural methods and technologies have a negative impact on the environment, which in turn may limit the availability of these resources in the future.

The surveyed farmers indicated their willingness to undertake pro-ecological measures in their agricultural holdings (Figure 3).

Figure 3: *Pro-environmental measures in the surveyed agricultural holdings*



Note: **several answers could be given.*
Source: *Own study based on surveys.*

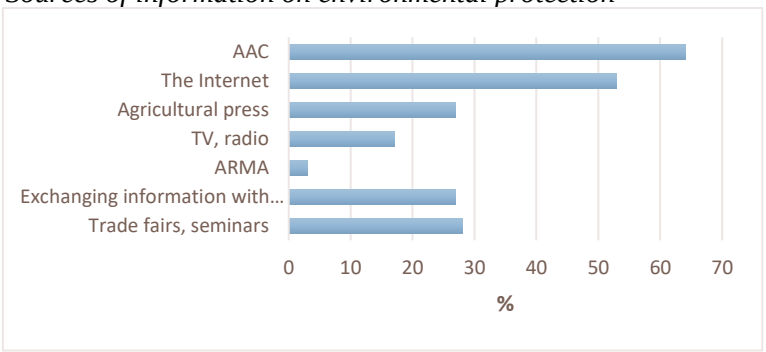
With regard to the environmental protection, the measures undertaken by the respondents consist primarily in multi-species crop rotation (56%), allowing the plant cover to remain on arable land in the autumn-winter period, application of organic fertilizers (44%), as well as the application of aftercrops (42%). Most of the surveyed farmers (67%) recognise the need to conserve electricity mainly for economic, not environmental reasons. 15% of the respondents indicated that they employ renewable energy sources, i.e., primarily solar energy (solar collectors – 11% of the respondents), wind energy (6%) and geothermal energy (heat pump – 5%). 14% of farmers reduce the use of water retrieved from the water supply system, either through a deep well or collected rainwater. Only 12% of farmers carry out an annual examination of the soil nutrient content prior to drawing up a fertilization plan for the agricultural holding. Fertilization plan facilitates rational management of fertilization in the agricultural holding. It enables proper planning of fertilization for the following years. The plan includes the distribution of fertilizers to individual plants and fields while taking into consideration the affluence and the pH level of the soil. Unfortunately, the majority of the surveyed farmers (78%) do not undertake such measures. In the event of overfertilization, their absence may cause soil degradation, as well as eutrophication of surface and underground waters. With regard to the animal production, the majority of the respondents declared the provision of good microclimatic conditions in livestock buildings (73% – appropriate temperature, humidity, ventilation), proper lighting (72%) and stocking density (71%), grazing on pastures (56%), as well as maintaining native animal breeds (22%).

The surveyed farmers were asked about the factors which would induce them to apply the principles of sustainability in their daily agricultural practice. The answers were given by ranking the factors according to their importance, i.e. assigning a weight of 1 to the most important one and 5 to the least important. The most relevant factor encouraging the respondents to undertake pro-environmental measures are financial incentives, e.g. tax breaks, subsidies (mean weight of 1.27), while legal regulations (mean weight of 2.19) placed second. Recognition of the environmental endangerment (2.57), as well as satisfaction and complacency (2.98), were most frequently mentioned in 3rd and 4th place. In the last place, the respondents indicated pressure from society, with a mean weight of 3.16. It should be emphasized, that the surveyed farmers expressed their agreement on the assessment of the most relevant factors inducing them to apply the sustainable development principles, while the standard deviation ranged from 0.72 to 2.23. In the research conducted by J. Kostecka and J. Mroczek (2007), the surveyed farmers also indicated financial incentives as the fundamental factor, while satisfaction as the least relevant.

One of the main elements which enable farm owners to make rational production decisions is access to information (Śmiglak and Zielińska, 2009). The level of personal knowledge is one of the endogenous factors determining the development and adaptation to the changes occurring in the agricultural holding environment, as well as increasing the personal predispositions and intellectual resources of the superiors. Moreover, information is a significant component influencing the quality

of human capital, which determines people's ability to work, adapt to changes in the environment and create new solutions (Prus, 2008). Farmers indicated the sources from which they derived information on farm management and legal requirements regarding environmental protection (several answers could be given) (Figure 4).

Figure 4: *Sources of information on environmental protection*



Note: **several answers could be given.*
Source: *Own study based on surveys.*

The advisory services provided by Agricultural Advisory Centres (64% of respondents indicated this answer) proved to be the most favoured form. A significant part of the respondents suggested the Internet (53%), agricultural press (27%), the mass media, i.e. television, radio (17%), as well as the administrative unit – Agency for Restructuring and Modernisation of Agriculture (3%). A large number of farmers participating in the survey stated that they obtain valuable information by exchanging experience with their neighbours (27%) or at trade fairs or training courses (28%).

5. Conclusions

Farmers perceive and respond to environmental issues in different ways, while their attitudes with regard to managing environmental problems vary. Therefore, understanding the attitudes and activities of farmers involving environmental protection is essential to identify and implement effective protection measures. The research conducted by Gliński (1996) reveals that farmers possess a low level of ecological awareness and display little interest in ecological problems – they perceive the financial benefits as the fundamental aspect of agriculture. According to some authors, the poor state of ecological awareness among farmers results from their insufficient personal knowledge (Runowski, 1996; Średnicka, 2006; Prus, 2008; Bo Hou, and Linhai Wu, 2010). As indicated by Wielogórska and co-authors (2011), the environmental awareness of large agricultural holdings' owners, who implement high mineral fertilizers and intensive protection of plantations with pesticides, is greater than the knowledge of farmers with small agricultural holdings who employ cost-efficient cultivation technologies.

Agricultural activity conducted in an improper way results in the destruction of the natural environment and, in the longer perspective, the limitation of development opportunities for both agriculture and the entire rural areas. Regardless of whether they were prompted by economic or environmental factors, any measures undertaken by farmers are desirable and should be perceived as part of a positive change in the agricultural sector. The study concludes that a large number of the surveyed farmers declared knowledge of Good Agricultural Practices (73%) and Principle of Cross-compliance (67%). The majority of agricultural producers in Wielkopolska (56%) were convinced of the negative impact of conventional agriculture and their activities on the environment. Primarily, the farmers indicated danger resulting from the employment of chemical plant protection products and fertilizers.

The environmental protection measures undertaken by farmers consist primarily in multi-species crop rotation, allowing the plant cover to remain on arable land in the autumn-winter period, application of organic fertilizers, as well as the application of aftercrops. As the most relevant factor which may induce them to undertake pro-environmental activities, farmers identified financial incentives The farmers' level of ecological awareness should be increased in order to reduce improper agricultural practices. This may be achieved through proper education in schools, courses or agricultural advisory centres which have a significant influence on the promotion of the ecological forms of agricultural activity.

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