Sustainable agriculture and protection of the environment

Ewa Siemianowska[1], *Andrzej* Wesołowski[1], *Krystyna A*. Skibniewska[1*], *Józef* Tyburski[2] and *Marcin* Gurzyński[1]

[1]UWM in Olsztyn, Faculty of Technical Sciences, 10-724 Olsztyn, Poland
[2]UWM in Olsztyn, Faculty of Environmental Sciences and Agriculture, 10-724 Olsztyn, Poland

Abstract. The economic, environmental and social development should not degrade the environment but it should leave it for the next generations in the state that it is presently or even better. The principle of sustainable agriculture is to cover the human needs for food without damage to the environment. The aim of the article was to research the farmers' awareness of the principle of sustainable agriculture and balanced fertilization and their influence on the environment. Among 100 farmers of the Tczew district (Poland) there was done questionnaire research on the determination rates of nitrogen fertilizers and on the regulation of fertilizers usage in Poland. Most of farmers declared a good knowledge of good agricultural practices and of balanced fertilization and the awareness of threats issuing from their activities. At the same time in Poland since the announcement of the Nitrate Directive of the former European Common Market (1992) up till now (2013) the application of nitrogen fertilizers doubled and the yield of wheat increased only by 15%, which means the increase of environmental burden with this chemical element.

1 Introduction

The aim of sustainable growth is to ensure the present and the future generations the access to the environment and the keeping it in non-degraded state. The issue of sustainable development is very important from the point of view of society, but also from the economic point of view. Though the policy of sustainable growth the EU tries to bring the environment to a state which prevents it from more damage [1, 2]. No implementation of the policy of sustainable growth, which serves the recognition and solving of the present environmental, social and economic problems, would mean that achieving these goals is impossible. Thanks to the policy of sustainable growth we obtain more and more energy from renewable sources, we reduce the emission unwholesome ashes and gases to the atmosphere. Progress in environmental protection can be made through responsible economic, environmental and social policy, which is accepted by society and enterprises [3 – 5]. People are very much aware today of threats produced by irresponsible usage of environment [6–9].

In the case of surface and ground (drinking) waters, their contamination with nitrogen compounds (nitrates) has mainly an agricultural origin. In Poland (similarly to other EU countries) over 50% of nitrogen as well as phosphorus contaminating water come from agriculture [10]. One of the measures taken by the EU was an introduction of so-called Nitrate Directive and the principles of so-called sustainable agriculture.

1.1Sustainable agricultural development

A definition of sustainable agriculture is based on the concept of sustainable growth, according to which the sustainable agriculture development is such a use of environment which combines the use and maintenance of earths' resources for the present and future generations in the present or better state, but not worse [11,12]. It will be possible to maintain the present state of soil fertility and the genetic diversity of animals and crops, keeping at the same time the environment in a good condition, by implementation of rules of sustainable development in agriculture, forestry and fishery.

In today's agriculture, fertile soils are cultivated in most cases, and cultivation of low quality soils requires covering high expenditures on means of production. The effectiveness of such an approach is not sufficient on low quality soils, which results among others from the higher expenditures on fertilization and its harmful influence on the environment [2, 13]. Królczyk et al. [14] demonstrated that yields of wheat and rapeseed can even be doubled in Poland due to broad implementation of rules of sustainable agriculture.

1.2 Balanced fertilization versus water quality

Fertilization of crops is the basic yield producing factor, whereas it is the most threatening to the water environment. Especially important is a risk of penetration of biogenes coming from nitrogen and phosphorus fertilizers to ground waters and water reservoirs, which are used in large doses, because of a very high demand of crops for above mentioned macro elements [15, 16]. Excessive/unbalanced fertilization results in disturbing the macro elements equilibrium in

* Corresponding author: kas@uwm.edu.pl

waters, which in turn leads to degradation of biodiversity in surface waters and contamination of surface and ground waters. Aware of these processes, the EU issued so–called Nitrate Directive – Council Directive 91/676 of the European Common Market as early as a quarter of century from Dec. 12. 1991 in order to prevent water pollution with nitrates of agricultural origin. The Nitrate Directive of the EU is to protect the environment from penetration of biogenes from fertilizers to waters, among this to prevent using too high doses of nitrogenous fertilizers in accordance with the principles of sustainable growth [17, 18].

The Nitrate Directive obliges member states of the EU to take a number of measures, among them to delimitate areas of member states that are especially susceptible from which:

- run-offs / washing out take place to the surface and/or ground waters, which contain or may contain 50 mg/l of nitrates, if measures described in the Directive will not be taken
- run-offs take place to waters which results or may result in their eutrophication.

These areas are zones susceptible to contamination with nitrogen compounds and described according to the Council Directive 91/676 European Common Market as threatened zones (Nitrate Vulnerable Zones - NVZ), whereas according to the Polish parliamentary act from July 18, 2001 Water Law as nitrate vulnerable zones or NVZ.

Countries which join the EU are obligated to implement the provisions of the Nitrate Directive and the transposition the directive to the domestic law. The member states are obliged to monitor the concentration of nitrates in surface and ground waters and to assess the state of eutrophication of fresh surface waters and the estuary and seashore waters with the aim of reviewing and completion NVZ. They should also determine an agenda for NVZ survey as well as review agendas and additional measures at least every 4 years. The duty of member states is to inform the European Council within 6 months about all changes or completion of NVZ zones and of agenda, and to make reports for the European Council containing information on each 4-year period of implementation of the Nitrate Directive, within 6 months since the termination of the period to with it pertains [19, 20].

All these measures and abiding the legal regulations are to conduct a rational management of fertilizers on farms. An important aspect of applying a balanced fertilization is a recognition of the abundance of the soil with micro– and macro elements, as well as of other chemicals properties of the soil. Thanks to analyses of the soil, the appropriate rates of nutrients for each crop can be counted [21 – 23]. It allows to limit the biogenes contamination of surface and ground waters. Moreover, a balanced fertilization leads to a financial savings.

1.3 Transposition of the Nitrate Directive to the domestic law in Poland

In Poland the transposition of the Nitrate Directive to the national law began before the access to the EU in 2004 and introduces a number of parliamentary acts and decrees starting from 2000, among others the parliamentary act from July 26, 2000 *On fertilizers and fertilization*, the parliamentary act from July 18, 2001 *Water Law*, the decree of the Minister of Environment from Dec. 2002 (Journal of Laws No 241, position of 2093) and (Journal of Laws No 4, from 2003, position of 44), the decree of the Minister of Agriculture and Rural Areas Development from June 1, 2001 *On the detailed applications of fertilizers and on conducting trainings of their use* (Journal od Laws No 60, position of 616), 32 decrees of the directors of Regional Boards of Water Management on the *determination of waters which are susceptible to the contamination with nitrogen compounds of agricultural origin* and of *areas especially susceptible* as well as *On introduction of the agenda aiming to limit of running off of nitrogen of agricultural origin for the especially susceptible areas* (National Board of Water Management - RBofWM). Moreover Poland as a member state undertook the realization of the Council Directive 91/676/ECM from Dec. 12, 1991 on protection of waters against the contamination with nitrates of agricultural origin, on the date of the EU accession that is since May 1, 2004.

In the framework of the implementation of the Nitrate Directive areas especially susceptible to nitrate of agricultural origin, from which the outflow of nitrogen of agricultural origin to waters should be limited were delimitated. These areas composed barely 2% of the national territory and they were legally defined by the means of 11 decrees of the directors of respective regional boards of water management, issued mostly at the end of 2003 and in the 1st quarter of 2004.

For all NVZ 21 programs were introduced by the directors of RBofWM. The decrees were published in the Journal of Laws of Provinces and thus they became local law. The introduction of the schedules began on May 1, 2004 and lasted for 4 years till April 30, 2008. The tasks were addressed especially to farmers and partially also to institutions professionally related to agriculture and environment and to the circles cooperating with farmers. To the most important tasks were following the principles of GAP (Good Agriculture Practice) by farmers and realization of investments of building tanks and platforms for collection and storage natural fertilizers (originated from animal husbandry). Farmers were provided with organizational and technical help in the realization of the water protection investments on the farms (i.e. in the building of tanks and platforms for collection and storage natural fertilizers and of devices for treating of household sewage) and agricultural advising in preparing fertilization plans on the farms. The whole activities were controlled according to the schedules and the monitoring of the quality of surface and ground waters was done in the areas of special susceptibility, with the aim of assessment of the result of the action plans. Also, the training of the farmers on abiding law and the principles of GAP was carried out. An improved Code of

GAP was prepared which was adjusted to the recommendations of the Nitrate Directive [23, 24].

Realization of the article10th of the Council Directive 91/676 ECH obliged Poland to submit to the European Commission a report containing information on the 4–year period of introduction of this Directive, within 6 months since the termination of the period to which it pertains (in the case of Poland to the end of October 2008). The Report of the Minister of Environment on the realization of the regulation of the Council Directive from December 12, 1991 on the protection of waters from the contamination with nitrates of agricultural origin (91/676/ECM) deals with verification of the areas in Poland which are especially susceptible to the nitrates of agricultural origin and introduction of the plans of action aiming at the limitation running off of nitrates. Also, assessment of the contamination of waters with nitrates of agricultural origin and of the state of agriculture the borders of areas of special susceptibility lying within the administration of each RBofWM were verified by reducing by 26.2% in comparison to the state from 2004, therefore, in the period between May 2008 and April 2012 there were 19 NVZ (earlier 21 zones). The total NVZ area amounted to 4 623.14 sq km, which makes ca. 1.48 % of the national area, 0.5% less than in 2004 (earlier 2%). The reason for shrinking of the territory of the areas of special susceptibility in 2008 was, among others, their delimitation in the river drain basins according to geodetic units and not to commune borders, which was the case in 2004 [23-26].

New plans of action were prepared for the verified and newly-delimitated NVZ areas. At the end of 2012 Poland submitted to the European Commission a successive report entitled *A report of the realization of the provisions of the Council Directive from Dec. 12, 1991 on the protection of waters against the contamination with nitrates of agricultural origin (91/676/ECH) in the period of May 1, 2008 – April 30, 2012*, which was a contribution to the Report of the European Commission for the 27 EU. The European Commission was not satisfied with the acreage of the areas of special susceptibility, which functioned in the period of May 1, 2008 and April 30, 2012 and made barely 1.48% of the national area. So, in the period of January – June 2012 each RBofWM made a new verification of the special susceptibility areas on the basis of the expert appraisement submitted by the Ministry of Agriculture and Development of Rural Areas entitled: *An assessment of the agricultural pressure on the state of surface and ground waters and the indication of the areas of special susceptibility of the contamination of the state of surface agricultural origin* made in 2011 by the Institute of Soil Science and Plant Cultivation in Puławy, Poland, containing scientific evidences and analyses on the state of agriculture in Poland with the assessment of agricultural pressure on the state of surface waters (rivers, lakes, transmission waters and seashore waters) and ground waters, with the additional aid of the work of the Warsaw University entitled *Delimitation of areas under real pressure of agricultural activities considering the water contamination with nitrogen compounds* instructed by the National Board of Water Management. As a result of this verification the special susceptibilities areas expanded from 4 603.47 sq km (1.48% of the national area) to 13 935.06 sq km (4.48 % of national area), which makes a 3-fold (ca. 200%) increment compared to the state of 2008 [24].

Since the moment of the access of Poland to the EU our farmers have been given so-called direct supplements to each hectare of agricultural lands. From the very beginning it was clear that there is a well-founded apprehensions that at least a significant part of this money will be used to intensify production, among which to increase fertilization [27]. The degree to which this apprehension came true is shown in Table 1.

Table 1. The changes of rates of mineral fertilizers in Poland in the period of 1992-2013 and of the average yields of wheat.

Years	Rates of mineral fertilizers, kg ha^{-1}				Wheat yields, tha^{-1}
	N	P	K	Ca	
1991	39.9	22.3	32.9	117.2	3.80
2004	56.3	20.4	25.7	91.5	4.28
2013	80.7	25.6	26.7	40.3	4.44

Source: The Statistical Yearbook of Poland, GUS 1992, 2005, 2014

Contrary to the intention of the EU legislation, and particularly to the Nitrate Directive, the use of nitrogen fertilizers increased significantly in Poland from ca. 40 kg per 1 ha in the year of passing the Directive in the then countries of the EU (1991), through 56.3 kg in the year of Polish accession to the EU (2004), up to 80.7 kg N per 1 ha in 2013. However the doses of phosphorus fertilizers increased beyond the balance needs, but potassium fertilization decreased. It should be emphasized that the reduplication of the doses of nitrogen fertilizers was not accompanied with the proportional increase of crop yielding. In Poland wheat is the most often cultivated cereal and also of the highest nitrogen demand.

This species has heightened its yield by ca. 15%. It indicates the increasing disproportion between the growing fertilization and growing yields. In other words the decreasing effectiveness must be accompanied with the larger losses of N to the environment, among these to the ground and surface waters. What is worse, the growing doses of nitrogen fertilizers was accompanied with the decreasing calcium fertilization – in the period at issue it diminished almost 3-fold. Meanwhile nitrogen is one of more important factors that acidify soil, (it is assumed that each kg of mineral nitrogen causes soil acidity, which should be compensated by usage of 2 kg of CaO). In the period under discussion the 2-fold increased doses of N and 3-fold diminished of Ca had to influence negatively the state of soils and waters (decreasing productivity of fertilizers, increase of washing out of nutrients). It is doubtful whether Polish farmers are really aware of such goings-on of the situation and are mature to a reflection and among this the modification of way fertilization. To the deteriorating

state of the water habitat in Poland in the period under discussion testifies among others the result of research, documenting the increasing surplus of N (lack of balance) and the growing contamination of ground waters with nitrates and pesticides [27]. The balance surplus of nitrogen in Poland amounts to ca. 60 kg of N per 1 ha a year, whereas the recommended quantity stands at 25-35 kg of N [28]. In this context, it should be noted that such mobile nutrient as nitrogen can be utilized in 100% in creating a yield. And the higher its doses the greater damage to the environments on very intensive farms the yield – producing effectiveness of N drops even below 50% [27].

In some regions of Poland the content of nitrates in ground waters has approach the top admirable norm – 50 mg per 1 litre. The realistic method of water protection against the contamination with nitrates (and at the same time with pesticides) more and more often used in practice in Germany, is a conversion of farms in the water protection zones to the organic system [29]. In this context it is worth mentioning that on the neighboring Germany in the period of 1992-2013, the average rates of nitrogen fertilizers were subject to small changes, amounting at the level of ca. 100 kg ha^{-1} (Table 2). In the same time the rates of phosphorous fertilizers were halved, what considerable diminished the risk of eutrophication of waters with this element (reduction of surplus of P to zero). The rates of potassium fertilizers were also diminishing by more than 40%, and at the same time the yield of wheat increased from 6.31 to 8.00 tha^{-1}. Thus undoubtedly the effectiveness of utilization of fertilizers was improved and their surplus was diminished, which testifies to the better balance of fertilization in that country than before the passing of the Nitrate Directive. Hence it is justifiable to claim that in Germany the progress was made in the protection of waters in the period of functioning of the Directive, whereas in Poland the situation worsened considerably.

Table 2. The changes of rates of mineral fertilizers (N, P, K) in Germany in the period of 1991-2013 and of the average yields of wheat [30].

Years	Rates of mineral fertilizers, kg ha^{-1}			Wheat yields, t ha^{-1}
	N	P	K	
1991	99,2	33,8	48,5	6,31
2004	105,3	19,3	28,3	8,17
2013	98,9	17,1	27,8	8,00

The introduction of the Nitrate Directive to the national law and to the Code of Good Agricultural Practice (GAP) did not stop the intensification of agricultural production or the increase of expenditures on chemical pesticides. We are witnessing the process of creation of large-area farms, on which the recommendations of appropriate crop protection and that of proper fertilization are not followed (among them the Nitrate Directive) and the balance between crops and animal production is unsettled. The non-observance of GAP causes that agriculture has still a negative impact on the natural environment of rural areas [31].

In 2007-2013 Poland attended Baltic Deal programme aiming to rise competence of farmers in sustainable agriculture [32]. Hundreds of farmers and agricultural advisers attended seminars, trainings, courses, workshops etc. learning how to reduce nutrients losses not to do harm to production effectiveness and farm competitiveness. The aim of the study was to research the farmers' awareness of the principle of sustainable agriculture and balanced fertilization and their influence on the environment.

2 Materials and methods

The research was done in 2016 by the means of pioneer study by the method of sounding measurement, applying a direct technique. The study group was made up to 100 farmers, running farms in Tczew district Pomeranian Province, Poland. It is a region of ones of the best soils in the country, where agriculture is one of the most intensive, and the wheat is a dominate crop. The study was conducted at a shop of pesticides, using a questionnaire of 22 questions. The selection of research objectives was made at random.

During the collection of research materials, the system analysis of information was applied which was oriented at the analysis of secondary sources [33], among them the works on the knowledge of counting of fertilizers' rates and the familiarity of the regulation of fertilizers' application in Poland. The research material was worked out with the aid of the horizontal and comparative economic analysis.

3 Results and discussion

In the researched group of farmers, the age was very various. The majority of the inquired were male. The most numerous group of the inquired people was composed of farmers, whose farms' area ranged from 10 to 20 hectares (36%), afterwards below 10 ha (30%), in the interval of 20-50 ha (20%) and 50-100 ha (14%).

Among the inquired only 38% had the knowledge on soil composition determined by a chemical analysis in a chemical-agricultural laboratory (Table 3). Such information allows to balance fertilization and to optimize the expenditures spent on fertilizers, resulting at the same time in decreasing environmental damage. Most farmers (62%) did not get their soil chemically analyzed, which may be the reason for applying inappropriate, unbalanced (often too high) rates of fertilizers and deficiency of nutrients in soil and in crops.

This fact is all the more alarming that only a part of the inquired was aware of the need of analysis of soil samples for the content of nutrients with recommended frequency, i.e. every 2 (12%) or 3 years (18%). Farmers which underwent examinations with the frequency of every 5 year (8%) should consider more frequent analyses because of rather fast changes of nutrients content in soil (Table 4).

Table 3. Declared by farmers sources and needs of knowledge on the macro- and micro- elements content in soil.

The entire group	0-10 ha	10-20 ha	20-50 ha	50-100 ha
Analysis of soil in a chemical-agricultural laboratory				
38%	4%	14%	14%	6%
Own practice of many years'				
44%	10%	22%	4%	8%
Unnecessary information				
18%	16%	0%	2%	0%

Table 4. Declared by farmers frequency of soil chemical composition analyzing.

The entire group	0-10 ha	10-20 ha	20-50 ha	50-100 ha
Every 2 years				
12%	0%	6%	2%	4%
Every 3 years				
18%	4%	6%	8%	0%
Every 5 years				
8%	0%	2%	4%	2%
I do not examine				
62%	26%	22%	6%	8%

The farmers applied in most cases only mineral fertilizers (68%). It issues from the dominating trend in Poland of reducing animal husbandry, especially that of pig and cattle (Table 5).

Table 5. Declarative kind of applied fertilizers.

The entire group	0-10 ha	10-20 ha	20-50 ha	50-100 ha
Mineral				
68%	20%	28%	14%	6%
Organic				
0%	0%	0%	0%	0%
Mineral-organic				
32%	10%	8%	6%	8%
Natural				
0%	0%	0%	0%	0%

A half of the farmers under examination (50%) declared the knowledge of the regulations on application of organic/natural fertilizers. According to law these fertilizers can be applied from March 1 to November 30. The majority of inquired (58%) was aware of advantages of using organic fertilizers, though there was also a group of farmers (10%) convinced that this kind of fertilization did not supply nutrients to the soil (Table 6).

Table 6. Declared time-limits of application of organic natural fertilizers.

Time-limits of application of organic fertilizers				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
From March 1 to November 30				
50%	14%	22%	8%	6%
From February 1 to October 30				
24%	8%	4%	6%	6%
From April 1 to November 30				
26%	8%	10%	6%	2%
Entire year				
0%	0%	0%	0%	0%
Knowledge on impact of organic fertilization				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
It shapes the content of nutrients and organic matter in soil				
58%	16%	26%	8%	8%
It influences only the content of organic matter in soil				
30%	10%	6%	8%	6%
I inethink that organic fertilization is useless				
10%	4%	4%	2%	0%

Most farmers (88%) knew the principles of application of nitrogen fertilizers as provided by parliamentary acts. This knowledge allows their proper usage and the limitation of environmental damage. Unfortunately, the majority of the inquired (54%) made allowances for a nutrition demand of crops only by visual examination while determining the rates of nitrogen fertilizers. Solely a part of the farmers allowed the nutrients content in soil and the requirements of crops (18%). The most distressing phenomenon was the fact that there were farmers who did not even consider the crops' needs while fertilizing (Table 7).

Basing on the knowledge of determining the rates of nitrogen fertilizers by the farmers it should be concluded that a half of them (50%) considered only the nutrition requirements of crops to fit the planned yield. The residues of N from the previous growing season should be also taken into account, which was a case in 42% of the inquired.

An avoidance of the present content of N in a soil in determining the doses of nitrogen for the planned yield, may result in its excessive washing out to the ground and surface waters. The majority (70%) of inquired was conscious what a dose of nitrogen they may have supplied in natural fertilizers in a year (Table 7).

Table 7. Declared by the farmers knowledge on the principles of N fertilizers application and practice.

Knowledge on the principles of application of nitrogen fertilizers				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Possibility of application all year round				
0%	0%	0%	0%	0%
Application to soil in appropriate condition				
88%	24%	32%	20%	12%
In spring				
12%	6%	4%	0%	2%
Declared knowledge on the principles of determining of rates of nitrogen fertilizers				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Exclusively on the basis of the content of N in soil				
0%	0%	0%	0%	0%
On the basis of the content of N in soil and crops requirements				
22%	2%	14%	2%	4%
On the basis of the content of N in soil and crops requirements for the planned yield				
18%	4%	0%	12%	2%
Exclusively on the basis of crops requirement				
54%	18%	22%	6%	8%
I do not consider the above mentioned factors				
6%	6%	0%	0%	0%
Declared ways of determining the rates of nitrogen fertilizers				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
I allow the content of N in soil and crops requirements for the yield				
42%	6%	14%	14%	8%
I allow only crops requirements for the yield				
50%	8%	22%	6%	6%
I always apply 300-350 kg N per 1 ha				
8%	8%	0%	0%	0%
Observance of permissible rates of nitrogen in natural fertilizers in a year				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Yes				
30%	12%	8%	6%	4%
No				
70%	18%	28%	14%	10%

The farmers under examination demonstrated the knowledge on the influence of souring of soils on the assimilation of nutrients by the crops. The inquired were (96%) conscious of the importance of liming and the correlation between the pH of soil and the assimilation of macro- and microelements. The majority of the farmers (70%) cares of the appropriate level of the soil pH on their farms (Table 8).

Table 8. Declared knowledge and practice of liming.

Knowledge on the impact of liming on the assimilation of macronutrients				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Yes				
96%	26%	36%	20%	14%
No				
4%	4%	0%	0%	0%
Frequency of application of lime				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
On the basis of the needs issuing from an analysis of the pH of soil				
70%	14%	24%	18%	14%
Once in a 4 years				
24%	10%	12%	2%	0%
When I recall to mind				
6%	6%	0%	0%	0%

It has been proved that the farmers know the principles of fertilization in the proximity of water reservoirs and watercourses. Most farmers (84%) declared the necessity of observing a special caution during application of fertilizers in the neighborhood of water reservoirs (Table 9).

The greatest part of the inquired farmers (62%) had also the knowledge of the issues of sustainable agriculture and they had proper associations with sustainable farming. The majority (86%) gave a right answer, which proves the good awareness of the farmers of the issues of sustainable growth (Table 9). Moreover most of the farmers (66%) claims that they observed GAP. Fortunately enough, the most numerous group of farmers (22%) that do not observe these rules, are the owner of small farms up to 10 ha (Table 10).

Table 9. Observing caution during application of fertilizers by water reservoirs.

The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Yes				
84%	24%	28%	18%	14%
No				
16%	6%	8%	2%	0%

Table 10. Declared knowledge on the goals of sustainable farming knowledge on the goals of sustainable farming.

Knowledge on the goals of sustainable farming knowledge on the goals of sustainable farming				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Maximization of yield, does not make allowances for the environment needs				
4%	4%	0%	0%	0%
Optimization of yield, minimization of inputs, allowing the environmental needs				
34%	14%	12%	6%	2%
Optimization of yield and inputs, allowing the environmental needs				
62%	12%	24%	14%	12%
Associations with sustainable agriculture				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Social, economic and environmental responsibility				
86%	26%	30%	16%	14%
Social and environmental responsibility				
12%	2%	6%	4%	0%
No associations with sustainable agriculture				
4%	4%	0%	0%	0%
Applying the principles of GAP				
The entire group	**0-10 ha**	**10-20 ha**	**20-50 ha**	**50-100 ha**
Yes				
66%	8%	32%	14%	12%
No				
34%	22%	4%	4%	2%

4 Conclusions

In the questionnaire study most of the inquired declared the knowledge of the principles of GAP and need of applying a balanced fertilization. The farmers declared that they were aware of the influence of agricultural activities on the environment. Anyway the statistical data pertaining the application of mineral fertilizers in Poland prove that declared knowledge on the above–mentioned matter bears no relation to the fertilization practice. There is a need of greater and greater indoctrination of agricultural society of the necessity of putting into practice the principles of sustainable growth, and particularly of balanced fertilization [34-36].

The presented statistical data testify the duplication of the Nitrate Directive of the EU (1991) to 2013, with barely a 15% increase of wheat yields. It indicates the lack of a proper fertilizers' balance and the augmentation of environment threat – in other words the nitrate Directive was implemented in Poland in such a way that it has not worked so fair. In the same time in the neighboring Germany, a considerable increase of yields was obtained white keeping the same size of N rates. In that country the Nitrate Directive was properly implemented and yielded the assumed result, i.e. the improvement of the effectiveness of fertilization and the state of the environment.

In the above context it can be concluded that in Poland the common and at higher level agricultural advisory is indispensable in the field of preparing fertilization plans and of increasing of the pro-environmental awareness among farmers.

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