

GMO IN THE OPINION OF FARMERS

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Abstract

The cultivation of genetically modified plants is controversial. In the Polish society, the opponents of GMOs are strongly lobbying against it, claiming that it is harmful, unnecessary and unethical. Experts in the field of biotechnology, however, state that there is no reason for concern and that genetic modifications provide undisputable benefits. The paper presents the opinions of 128 farmers from the Świętokrzyskie and Opolskie Provinces on GMO crops and food, which were compared with the assessments of experts in the field of biotechnology. On average, the research results showed a negative attitude of the respondents and a low level of knowledge about GMOs. Convinced of its harmfulness, the farmers expressed little interest in the cultivation of genetically modified crops, although being aware of the advantages of the modification (including resistance to pathogens, lower costs, better quality features). The farmers younger in age, better educated, and running larger farms showed greater openness to GMO cultivation. Lack of adequate knowledge and even false perceptions about GMOs in the small sample indicate the need for more extensive surveying of the farming community in Poland, as well as the need for a substantive discussion of the benefits and potential risks.

Keywords: GMO, farmers' opinions, agriculture.

JEL codes: A14, Q13, Q19.

Introduction

The issue of genetic modification of crops has for many years been the subject of public debate and controversial opinions about the potential benefits and threats, especially in the context of food production. According to the definition of the Polish Chief Sanitary Inspectorate (GIS), a genetically modified organism (GMO) is “an organism other than a human being, in which the genetic material has been altered in a way that does not occur in natural conditions, in result of crossing or natural recombination”. Genetically modified food means “food consisting of, containing or produced from GMOs” (GIS, 2018).

In 2017, the area of genetically modified plants cultivated worldwide was almost 190 million ha. For comparison, 10 years earlier it was 114 million ha. The leader in GMO cultivation was the United States, where the cultivation area in 2017 was almost 75 million ha. Brazil was in the second place with a cultivation area of 50.2 million ha, and in the third place was Argentina (23.6 million ha) (ISAAA, 2018). The most commonly grown GM crop is soybeans, which makes up 50% of the GM crop. Almost 1/3 of the crop is maize; cotton and rapeseed are also popular (Niemirówicz-Szczytt, 2012).

The most popular genetic modification used in the world is the implantation of the gene responsible for the resistance of a crop to herbicides. Simplified weed control reduces the use of deep plowing, which contributes to soil erosion. The genetically modified plant is therefore not only resistant to herbicides, but also contributes to the protection of the environment (Acker et al., 2017; Lisowska & Gudyka, 2012). Another example of genetic modification may be plant resistance to insects. The first plant to be modified in this way was a potato resistant to the Colorado potato beetle. The modification in this case is the implantation of genes responsible for the production of Cry proteins that are toxic to insects. Such a modification allows for reducing the consumption of insecticides, which translates into a reduction in production costs as well as environmental benefits (PIORiN, 2013).

Genetic modifications also enrich plants with nutrients. An example of such an application is “Golden Rice”. It is a genetically modified rice variety distinguished by its golden colour, which is a valuable source of provitamin A. This is especially important in Asian countries where rice is the basis of the diet (Dubock, 2019; Potrykus, 2012). Vitamin A deficiency can lead to blindness, stunted growth of children (Dębski, 2016), and even deaths¹ (West & Klemm, 2010). Introducing widespread cultivation in the Asian region would help to radically reduce the dramatic risks. However, although golden rice has been proven to be completely safe (International Rice Research Institute, 2019), it was only in 2019 that the Philippines, as the first Asian country, allowed this rice to be grown and marketed (Dubock et al., 2019).

¹ It is estimated that 23-34% of deaths in children under 5 worldwide can be prevented thanks to universal access to vitamin A (West & Klemm, 2010).

The cultivation of GMO crops is currently only allowed in the European Union in a limited number of cases, following a careful risk assessment by the European Food Safety Authority (EFSA). However, members of the European Union can completely ban the cultivation of GMOs on their territory. This possibility was used by: Austria, Bulgaria, Greece, Germany, Hungary, Italy, Luxembourg and Poland. The only plant that is cultivated in the EU, in countries that allow it, is currently Monsanto MON 810 corn resistant to insects (European Parliament, 2014). In 2016, it was cultivated only in 4 EU countries (Spain, Portugal, Slovakia, the Czech Republic), with 95% of the crops (129,000 ha) being in Spain. Thanks to the modification, the plants are not damaged by the European corn borer, which causes very high losses in the yield and quality of grain in maize crops. (IHAR, 2017). This insect leads a hidden way of life inside plant tissues, disturbing all the aboveground parts, leading to the stalk breakage, as a result of which the plant falls over (Bereś, 2015). The chemical control of the European corn borer is very difficult, ineffective and expensive, while genetic modification in this case essentially eliminates the threat.

Despite many advantages of GM crops, there is a widespread lack of public acceptance of GM crops and food, translating into political decisions restricting the cultivation of GM crops in many countries.

The European society, including Poland, has a negative attitude towards genetically modified food. Research shows that Poles have limited knowledge about GMOs, and their opinions about “modern food” are becoming more and more negative (Kosicki & Kosicka-Gębska, 2012). The reason for this may be the duplication of stereotypes and unverified information found in various types of media, even though the harmful effects of GMOs on human health have not been documented (Kalinowski, 2012; Małycka & Twardowski, 2009; Twardowski, 2018).

According to research conducted on a sample of 270 people by Krzysztofik (2018), Polish consumers are unable to define what GM food is. They consider it to be harmful and badly labelled, and they do not know what plants are being modified. The consumers, however, are aware that GM crops are more resistant to pests and diseases, and GM foods are more durable. The team of Kramkowska, Grzelak and Czyżewska (2012) conducted a similar study among students of two fields of study: biotechnology and dietetics. As can be expected, the knowledge of the students was more profound than that of an average consumer, as was the level of acceptance of genetic engineering. In both cited cases, the respondents indicated the media (press, the internet, television) as the main source of knowledge.

In 2012, as part of the cyclical Omnibus survey conducted by the TNS Pentor studio, a group of 1,005 people, representative of all Poles over 15 years of age, was examined. Research shows that about 66% of respondents did not know what the acronym GMO means. More than half of the respondents believed that:

- the introduction of GMOs into breeding serves only the business interests of companies producing these organisms,
- food produced on the basis of GMOs has an adverse effect on the health of consumers,

- the introduction of GMOs into the natural environment will cause artificially introduced genes to spread without any control,
- consuming food produced with the use of GMOs may uncontrollably modify human DNA (Kalinowski, 2012).

Szlachetko (2014) obtained similar results in the consumer survey. The respondents declared that they were not willing to buy food containing GMOs, and also reported the lack of readily available information on this subject. The author also pointed to the high effectiveness of the campaigns of GMO opponents with the simultaneous low effectiveness of information activities conducted by genetic engineering supporters.

There were very few studies in Poland to identify farmers' views on genetically modified crops and food (Kudęłka & Strzelecki, 2018; Polska Federacja Biotechnologii, 2004). They show that farmers are familiar with the concept of GMOs, but their general attitude to the introduction of genetically modified crops is negative, despite the awareness of the benefits (higher productivity, resistance to plant protection products) (Kudęłka & Strzelecki, 2018).

The aim of this article is to assess the awareness and level of interest of farmers in the cultivation of GM plants. The article is a contribution to expanding the knowledge on the understanding of GMO crops by Polish farmers.

Methodology

The study was carried out by the method of a diagnostic survey with the use of a questionnaire among 128 farmers from the Świętokrzyskie and Opolskie Provinces. The method of convenience sampling was applied. The surveyed farmers participated in training courses, however, dealing with issues completely different than GMOs.

The questionnaire consisted of seven closed questions and concerned farmers' awareness of GMOs and the level of acceptance of the cultivation of genetically modified crops. Farmers' assessments were compared with the assessments of experts, specialists in the field of biotechnology from several academic centres in Poland. The questionnaire, similar to that for farmers, was sent to the heads of Biotechnology Departments in agricultural universities. Experts' responses were averaged for comparisons.

Likert scale was used for most of the questions. For these questions, the Expert Opinion Compliance Index (EOCI) was calculated, denoting the unitless sum of differences between the assessments of farmers and experts. Then, based on the calculated index and metric data, the Spearman's rank correlation coefficient was calculated.

Findings

The sample of 96 men and 32 women had a wide age range from 20 to 70 years. The surveyed farmers declared mostly secondary education (46.7%). There was a large group of farmers with primary and vocational education (31.7%), and 21.7% of people had higher education.

In terms of age, the sample structure (Figure 1) was similar to the age structure of farmers in Poland (GUS, 2017).

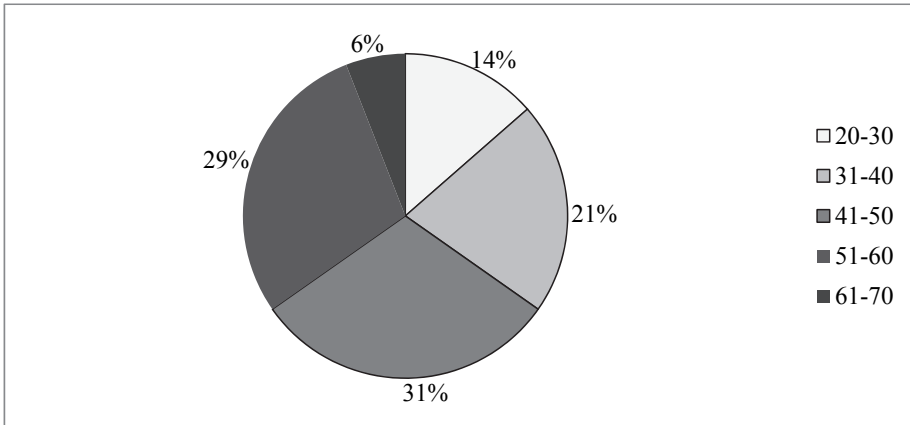


Fig. 1. The age structure of the respondents.

Source: own study.

The average farm size (29.8 ha) was higher than the national average in the sample (Figure 2).

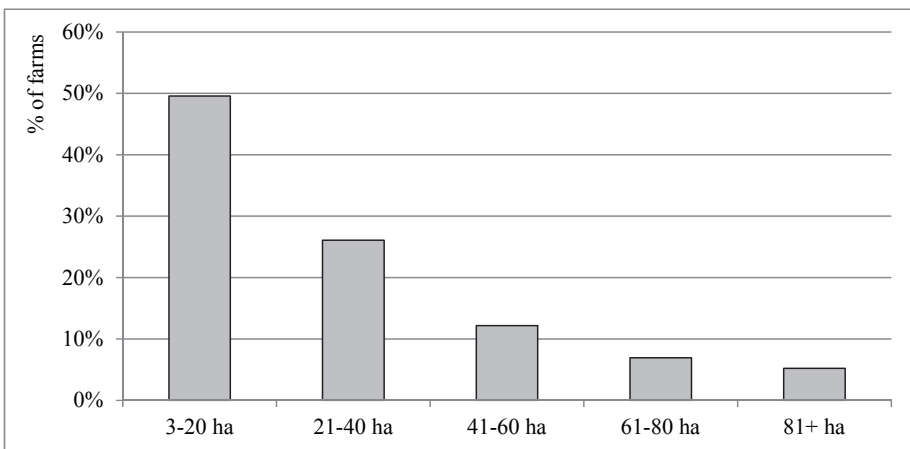


Fig. 2. The structure of the surveyed population by farm size.

Source: own study.

The share of the farmers from farms below 20 ha (50%) was the highest, but farms with larger areas were also numerous. The smallest farm had an area of 3 ha, and the largest – 154 ha.

Table 1 presents the farmers' views on the possible benefits of GMO crops, as well as average expert ratings.

Table 1

The level of compliance of farmers' opinions with the statements regarding the benefits of introducing GMO crops
(on a scale of 1-5, where: 1 – I strongly disagree, 5 – I strongly agree)

| Goals of the introduction of GMOs | Farmers' average rating | Standard deviation | Coefficient of variation | Average expert opinion | Average grade difference |
|--------------------------------------|-------------------------|--------------------|--------------------------|------------------------|--------------------------|
| increased plant resistance | 3.53 | 1.26 | 0.36 | 3.00 | 0.53 |
| increased yields | 3.58 | 1.28 | 0.36 | 3.00 | 0.58 |
| resistance to chemicals | 3.40 | 1.26 | 0.37 | 5.00 | -1.60 |
| production of cheaper food | 3.10 | 1.47 | 0.48 | 3.75 | -0.65 |
| resistance to plant disease/insects | 3.62 | 1.31 | 0.36 | 5.00 | -1.38 |
| better quality of food | 3.05 | 1.41 | 0.46 | 4.50 | -1.45 |
| reduced global hunger | 3.27 | 1.36 | 0.42 | 3.25 | 0.02 |
| increased production of cheaper feed | 3.31 | 1.38 | 0.42 | 4.25 | -0.94 |
| production of medicines and vaccines | 2.83 | 1.39 | 0.49 | 3.25 | -0.42 |

Source: own study.

Average ratings for the individual goals of introducing GMO crops oscillate around the rating of 3, ranging from 2.83 to 3.62. However, the relatively high deviation between 1.26 and 1.47 indicates a large divergence of opinions. The farmers seem to be failing to see the full potential of GM crops, especially with regard to some GM applications, as shown by comparison with expert average assessments (Table 1). The experts were not uniformly consistent in their assessments, however, in the vast majority of cases, the differences did not exceed the neighboring assessment classes from the adopted range of 1-5. There is a certain ambiguity in the experts' assessments, expressed in several cases as an average close to the average score of 3.0. This is due to the fact that the experts, while recognizing the technological possibilities of achieving the assessed effects from the implementation of various genetic modifications, also took into account the fact that not all of them have the same rational justification for large-scale use due to high costs (e.g. in the production of drugs and vaccines) or the occurrence of adverse effects, e.g. increased resistance to adverse environmental factors, but at the cost of specific characteristics of crops.

The largest differences in the opinions of farmers and experts are visible in terms of *plants resistance to chemicals and improving the quality of food*. The low appreciation of the potential of GMO technology to make plants resistant

to chemicals is surprising given how high profile it was in the public debate to make Roundup Ready soybean and maize resistant to the *Roundup herbicide*. On the other hand, the possibilities of improving certain qualitative characteristics are probably little known to farmers.

The smallest differences in assessments relate to the possibilities of solving the problem of *global hunger* and the potential of using plants for the *production of medicines and vaccines*. When it comes to meeting food needs, there are doubts about the relatively low ratings of both farmers and experts. Even the limited effects of increased food production may be of significant importance in those regions of the world where there is a threat of hunger. Concerning the equally low ratings for the use of GMOs in the production of drugs probably the reasoning is different in the case of farmers and experts. According to the experts, such use of GMOs is technically possible, but not very profitable at the moment. The opinions of the farmers, on the other hand, are probably shaped by the popular opinion about the harmfulness of modified food to human health, which brings to mind that genetically modified plants cannot be used in medicine.

Figure 3 shows the structure of farmers' ratings, according to which for most GMO uses, positive ratings prevail, with the exception of the Medicines and Vaccines Production Target. About 20-30% of farmers could not clearly define their position. The most positive answers (absolutely yes and rather yes) are related to the increased *resistance to plant diseases/insects* (60%) and the *increased yields of crops* (58%).

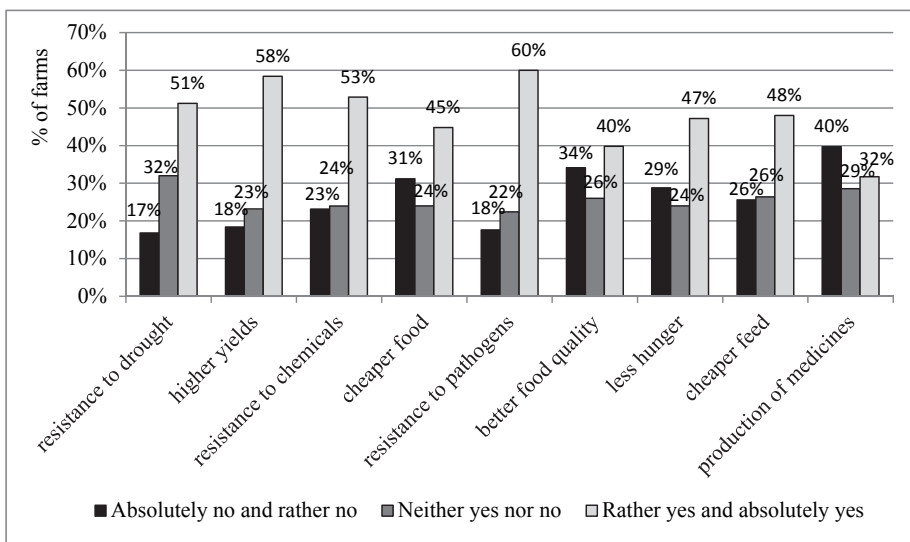


Fig. 3. The assessment of the potential of using genetic modifications to achieve the indicated goals.

Source: own study.

In the statistical analysis, it was found that there is a positive but weak correlation between the EOCI and the age of the respondents (0.2111). This means that the higher the farmer's age, the more his opinion differed from that of the expert. There is also a weak negative relationship (-0.1303) between the calculated index and the farm area, which could be interpreted as meaning that farmers managing larger farms had a better knowledge of the purposes of GM cultivation.

Further analysis showed that the average discrepancy with the opinions of experts, measured by the indicator of compliance with the expert opinion, was greater for farmers with primary/vocational and secondary education (13.53 and 12.57, respectively) and clearly lower for farmers with higher education (10.96). However, the relationship between education and the level of compliance with experts' assessments was not confirmed as statistically significant.

Table 2 summarizes the views of farmers in relation to the common negative opinions about GM crops, as well as the selected positive features of food from genetically modified plants.

Table 2

The level of compliance of farmers' opinions with the statements regarding genetically modified food (on a scale of 1-5, where: 1 – I strongly disagree, 5 – I strongly agree)

| Statements: | Farmers' average rating | Standard deviation | Coefficient of variation | Average expert opinion | Average grade difference |
|--|-------------------------|--------------------|--------------------------|------------------------|--------------------------|
| is difficult to digest for humans | 3.17 | 1.38 | 44% | 1.00 | 2.17 |
| is allergic for humans | 3.27 | 1.31 | 40% | 1.00 | 2.27 |
| causes the degradation of the internal organs | 3.18 | 1.26 | 40% | 1.00 | 2.18 |
| causes infertility | 3.14 | 1.31 | 42% | 1.00 | 2.14 |
| changes hereditary features in the human body | 3.02 | 1.30 | 43% | 1.00 | 2.02 |
| is just to generate high profit for corporations | 3.42 | 1.48 | 43% | 3.50 | -0.08 |
| can be a source of vitamins and minerals | 2.68 | 1.35 | 50% | 5.00 | -2.32 |
| is more durable and fresh | 3.19 | 1.39 | 44% | 4.00 | -0.81 |
| is cheaper than food without GMOs | 3.25 | 1.48 | 46% | 4.25 | -1.00 |

Source: own study.

Statements assessed by the respondents largely concerned the impact of genetically modified food on the human body. Farmers’ average scores were close to 3.0 on a five-point scale and were characterized by a greater level of differentiation (variation index between 40 and 50%). The responses of the respondents significantly differed from the responses of the experts, who in this case were very clear in their opinions, rejecting the negative aspects, while accepting the positive features of GM food.

The presented assessments of the farmers are in line with the popular opinions, which, according to many experts, do not have any substantive foundations but are often presented in social media. They might be based on the reports of some scientists who, referring to their work, firmly question the safety of GMO crops (Cichosz & Wiąckowski, 2012). However, the credibility of these reports is often questioned, because “since 30 years of widespread use of GM varieties in agriculture, there has been no report on the harmfulness or negative effects of genetically modified plants”(Twardowski, 2018). It seems that such opinions about the safety of GMO food are based on a solid scientific basis of research, while the publications of GMO opponents usually seem strongly biased. Nevertheless, this article focuses solely on presenting the results of research on farmers’ awareness of GM crops and is not intended to settle doubts as to the credibility of these opinions.

Chart 4 shows that the minds of farmers are dominated by negative opinions expressing the belief that food from genetically modified crops is harmful to humans.

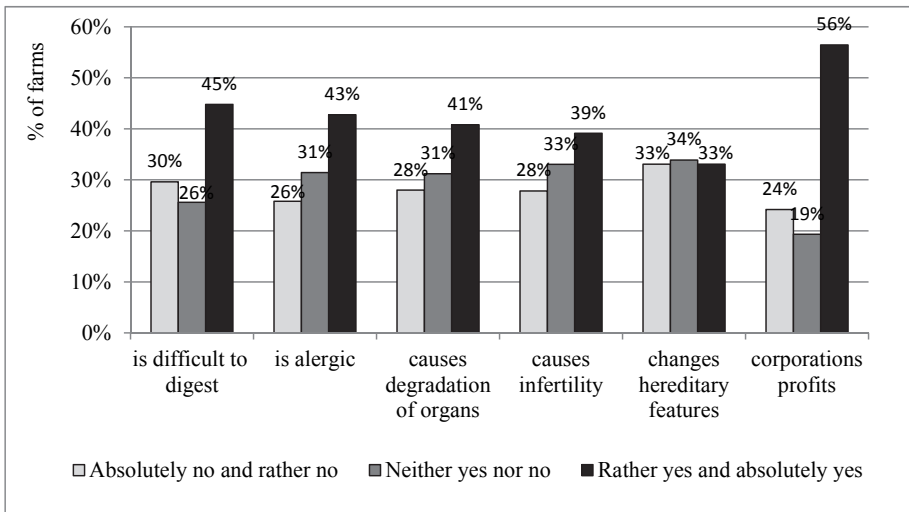


Fig. 4. The level of compliance with negative statements about GMO food (No – disagree, Yes – agree).

Source: own study.

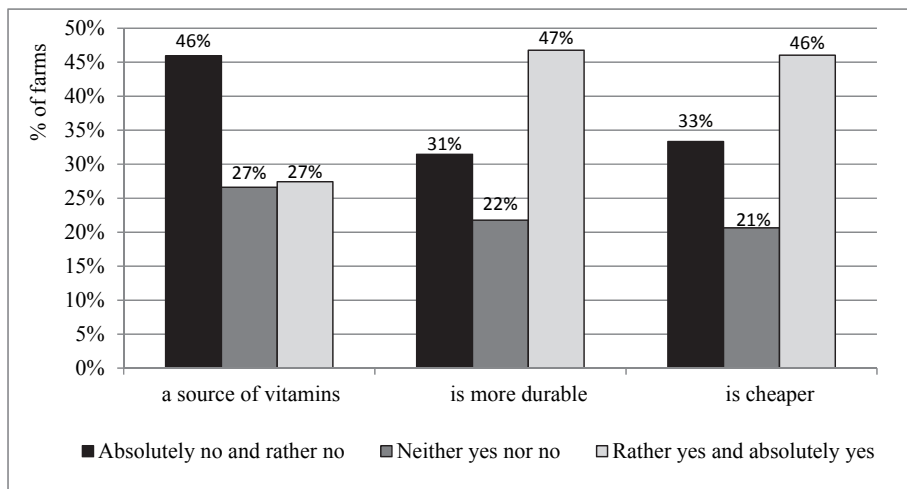


Fig. 5. The level of agreement with positive statements about GM food (No – disagree, Yes – agree).

Source: own study.

The majority of the above-mentioned statements are dominated by *rather yes* and *absolutely yes* answers, and only about 30% of the respondents do not share the critical assessments. As in the previous question, around 30% of the farmers could not express a more clear opinion. The most divided are opinions regarding the statement *changes hereditary features*. This is probably due to the limited knowledge of the respondents about genetics. This is the only issue raised where the responses *I have no opinion* prevailed. A very high percentage of respondents (56%) believe that the development of GMO crops is used to ensure profits for companies producing seeds, which can be read as a manifestation of the impact of conspiracy theories on the awareness of both food producers and consumers.

Regarding the selected positive features of GMO food, the vast majority of respondents (46%) do not agree that genetic modification can increase the content of vitamins and nutrients (Figure 5). This popular opinion is refuted by the example of the aforementioned “golden rice”.

Most of the farmers agree with the view that genetic modification has a beneficial effect on the shelf life and cost of food production, but over 30% of the respondents answered *absolutely no and rather no*.

Interesting results are provided by answers to the question about the presence of modified organisms in food (Table 3).

Table 3

Opinions on the presence of modified organisms in food products

| Products | Farmers' answers | | Experts' answers | |
|-----------------|------------------|-----|------------------|------|
| | Yes | No | Yes | No |
| Canola oil | 63% | 37% | - | 100% |
| Canned GMO corn | 69% | 31% | 100% | - |
| Sugar | 41% | 59% | - | 100% |
| Potatoes | 54% | 46% | 100% | - |
| Feed | 79% | 21% | 100% | - |
| Meat | 57% | 43% | - | 100% |
| Milk | 55% | 45% | - | 100% |

Source: own study.

The farmers concluded that all products contain GMOs, although to a different extent, while the experts clearly said Yes for unprocessed products and No for food produced by natural processes (milk, made by the body of the cow) or industrial processing (oil, sugar, cold cuts). According to the experts, rapeseed oil and sugar cannot contain GMOs because these products do not contain proteins encoded by selected genes of genetic modification. In the case of cold cuts and milk, no studies confirm that the proteins modified in plants were transferred to animal products.

The reason for the discrepancy between the opinions of experts and farmers may be the lack of knowledge about the content of GMOs in food. Organizations such as "GMO-free Poland" or Greenpeace disseminate information about the harmfulness of GMO crops and organize campaigns to discourage people from doing genetic engineering. Despite experts refuting false information, such campaigns leave consumers in the dark. Lack of easily accessible, objective sources of knowledge leads to uncertainty and aversion to the new and unknown.

An expression of a generally critical attitude towards food from GM crops seems to be behind the answers to the question about the acceptance of the use of genetically modified plants in industries other than food processing (Table 4).

Table 4

The level of compliance of farmers' opinions with the statements regarding the acceptance of the use of GMOs in the non-food industry (on a scale of 1-5, where: 1 – I strongly disagree, 5 – I strongly agree)

| Purposes of the use of GMOs | Farmers' average rating | Standard deviation | Coefficient of variation | Average expert opinion | Average grade difference |
|-----------------------------|-------------------------|--------------------|--------------------------|------------------------|--------------------------|
| Medicine/pharmacology | 2.48 | 1.53 | 62% | 5.00 | -2.52 |
| Feed industry | 2.67 | 1.53 | 57% | 5.00 | -2.33 |
| Environmental protection | 2.50 | 1.54 | 61% | 5.00 | -2.50 |
| Biofuels production | 3.51 | 1.52 | 43% | 5.00 | -1.49 |
| Paper industry | 3.28 | 1.58 | 48% | 5.00 | -1.72 |

Source: own study.

Even the most neutral, from the perspective of human safety, applications for the production of biofuels or for the needs of the paper industry were rated low by the respondents. In each case, there were very clear discrepancies with the experts' assessments. At the same time, a strong polarization of opinions emerged, with a relatively small share of the answers *I have no opinion* (Figure 6).

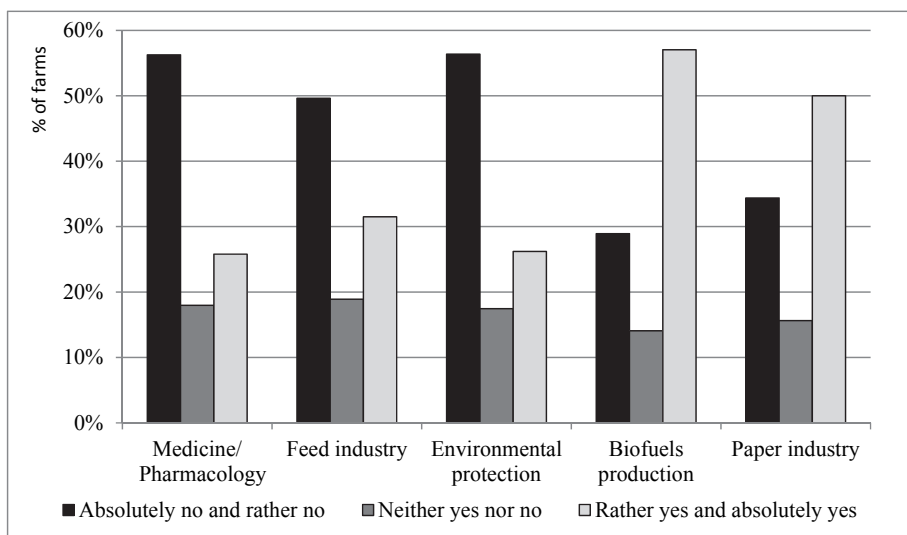


Fig. 6. The acceptance of the use of GMOs outside the food industry (No – I do not accept, Yes – I accept).

Source: own study.

About 50% of the respondents do not accept the use of GMOs in pharmacology, medicine, the feed industry and environmental protection (Figure 6). The production of biofuels and the paper industry are much more accepted (50% of the respondents

answered *rather yes and absolutely yes*). However, the presented results may suggest that there is a dominant negative attitude towards the use of GMOs, regardless of whether it is directly related to humans (medicine, animal feed) or not. In terms of environmental protection, opinions are being repeated about the negative impact of GMOs on biodiversity, harmfulness to plant pollinating insects or the formation of superweeds. Most often they do not have a scientific basis, and there have also been cases of citing research that was then questioned or rectified. Referring to the research, the opponents of GMOs also overinterpret the results in order to prove the compliance with the pre-set thesis (Filipecki, 2012).

Further analysis shows that there is a weak positive correlation between the indicator of compliance with experts and the age of farmers (0.175). This means that older farmers are more likely to negatively evaluate the use of GMOs for purposes listed in the question. There is also a weak negative correlation between the EOCI and the farm size (0.1179), which means that the larger the farm is, the more often farmers accept the use of GMOs in industries other than food.

The mean value of the EOCI calculated for farmers with primary and vocational education, secondary education, and higher education was 11, 11.25, 8.62, respectively. A lower value of the index among people with higher education may indicate a better understanding and greater knowledge about the use of genetic modifications. However, this relationship was not confirmed as statistically significant.

In Poland, the main ingredient of animal feed is soybean meal from GMO crops in the United States and South America. Since 2006, the Polish government has been trying to prohibit the use of feed with the addition of genetically modified plants, although Polish agriculture does not assure “self-sufficiency in terms of providing domestic protein for animal nutrition” (Wysoczańska, 2019).

Figure 7 presents the respondents’ answers to the question whether it is acceptable to import GM soybeans and maize for the production of concentrated feed and the reasons for the negative answers.

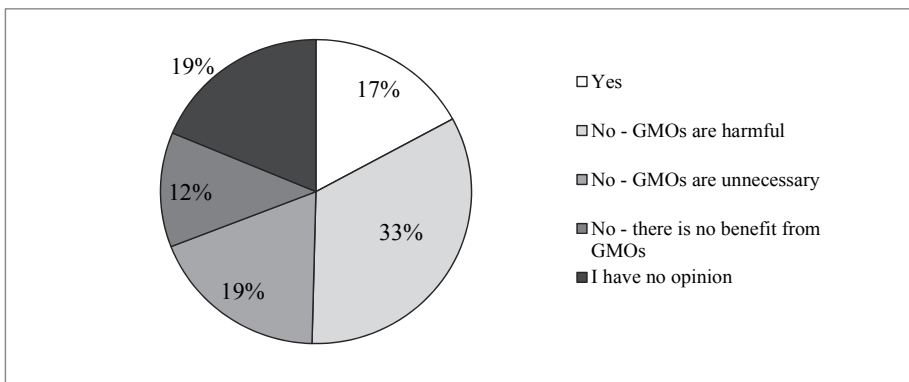


Fig. 7. The structure of respondents’ answers to the question regarding the acceptance of import of GMO soybeans and corn for the production of concentrated feed (Yes – I accept, No – I do not accept).

Source: own study.

Nearly 64% of the respondents do not accept the imports of GMO soybeans and corn for feed production. More than half of the farmers who expressed their disapproval cited the harmfulness of GMO crops as the reason. Every fifth respondent replied that import is unacceptable and GMO is unnecessary. Farmers' opinions suggest that they are not fully aware of the situation on the feed market.

The statistical analysis did not show any correlation between the acceptance of the import of GMO crops and the age of the respondents.

Similar was the question regarding the potential interest of farmers in the cultivation of GMOs on farms, if there was such a possibility.

Table 5

Farmers' interest in the possibility of cultivating GM plants on farms in the event of lifting the ban

| Possible answers | Forage plants | Potatoes | Wheat | Beetroot | Vegetables | Industrial plants |
|------------------------------------|---------------|----------|-------|----------|------------|-------------------|
| Yes | 21% | 12% | 20% | 10% | 10% | 23% |
| No – GMOs are harmful | 30% | 33% | 27% | 28% | 36% | 24% |
| No – GMOs are unnecessary | 17% | 19% | 24% | 21% | 19% | 17% |
| No – there is no benefit from GMOs | 9% | 9% | 7% | 8% | 6% | 6% |
| I have no opinion | 23% | 27% | 23% | 33% | 29% | 30% |

Source: own study.

Responses suggest that the farmers would prefer to grow GMO crops that are not directly consumed by humans (forage plants, wheat, industrial plants). However, less interest in the cultivation of other crops may also result from the fact that vegetables and beets in particular are grown on a small number of specialized farms. As in the question about the import of soybeans and corn, the farmers pointed to the harmfulness of modifications as the reason for their aversion to GMOs, and a significant percentage of the respondents believe that GMO is unnecessary.

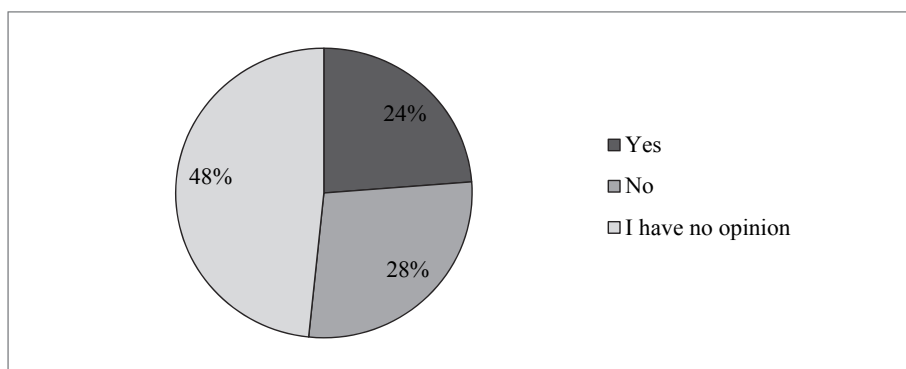


Fig. 8. Would the introduction of GMO crops in Poland be profitable for farmers?

Source: own study.

Almost half of the farmers are not able to determine whether the introduction of GMO crops would be profitable for them, only 24% of respondents see profitability. However, the literature provides a lot of evidence that the introduction of GM crops brings financial benefits for farmers, which is due, among others, to better protection of crops as well as lower production costs (Lisowska & Gudyka, 2012).

Conclusions

The research confirmed that the opinions of the farmers in Poland about genetically modified plants are consistent with the stereotypes in the Polish society. GMO crops and food are considered harmful by a significant proportion of the respondents, and are marketed mainly for the profit of seed-producing companies. However, there is a group of farmers who see benefits such as higher yields, resistance to pathogens, and lower production costs. Despite this, the level of acceptance of GMOs among the surveyed farmers can be regarded, on average, as low. Even the use of modified plants in other sectors of the economy than food production was assessed relatively critically by the surveyed farmers. Similar observations result from the only so far research on the awareness of Polish farmers conducted in a group of 250 people from the Opolskie Province (Kudelka & Strzelecki, 2018) and previous surveys by the Polish Federation of Biotechnology (2004). As in the research by Kudelka and Strzelecki (2018), farmers younger in age, better educated and running larger farms are characterized by greater openness to GMO cultivation.

The research indicates that the lack of knowledge is an important factor shaping the views on GMO crops which is also consistent with the observations of other authors. This is indicated, *inter alia*, by a strong discrepancy between the opinions of the farmers and the views of the experts, a significant percentage of the farmers stating I have no opinion or a negation of financial benefits for agriculture, despite the fact that all the data from the available studies indicate a high profitability of using GMOs crops in cultivation and food production. This observation is confirmed by the opinion of an expert, who says that “the level of biological knowledge in an average citizen is very limited. It is a great facilitation for spreading anxiety through appropriately manipulated, pseudoscientific information about the alleged threat from the side of GMOs” (Filipecki, 2012).

The general conclusion is that there is a need for a substantive discussion about the cultivation of GM crops with the participation of experts, farmers and other stakeholders.

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GMO W OPINII ROLNIKÓW

Abstrakt

Uprawa roślin modyfikowanych genetycznie budzi wiele kontrowersji. W polskim społeczeństwie zdecydowanie głośniejszy jest głos przeciwników GMO głoszących, że jest to szkodliwe, niepotrzebne oraz nieetyczne, niż ekspertów w dziedzinie biotechnologii potwierdzających, że nie ma powodu do obaw, a modyfikacje genetyczne służą osiągnięciu niekwestionowanych korzyści. W artykule przedstawiono opinie 128 rolników z województw świętokrzyskiego i opolskiego na temat upraw i żywności GMO, które zostały porównane z ocenami ekspertów w dziedzinie biotechnologii. Wyniki badań wskazały na negatywny, przeciętnie, stosunek respondentów i niewielki poziom wiedzy o GMO. Rolnicy wyrazili małe zainteresowanie uprawą roślin genetycznie modyfikowanych, przekonani o jej szkodliwości, jakkolwiek zdając sobie sprawę z zalet modyfikacji (m.in. odporność na patogeny, niższe koszty, lepsze cechy jakościowe). Większą otwartość na uprawy GMO wykazali rolnicy młodszy wiekiem, lepiej wykształceni, prowadzący gospodarstwa obszarowo większe. Brak odpowiedniej wiedzy wśród rolników, a nawet fałszywe wyobrażenia na temat GMO wskazują na potrzebę szerszej zakrojonych badań w społeczności rolników w Polsce, a także potrzebę rzeczowej dyskusji o korzyściach i potencjalnych zagrożeniach.

Słowa kluczowe: GMO, opinie rolników, rolnictwo.

Accepted for print: 29.09.2020.

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