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PECULARITIES OF AGRICULTURAL LAND USE

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The aim of this study is to perform an analysis of agricultural land use in the municipality of Panevėžys district. Farmers' farms of Panevėžys district municipality of Panevėžys county of the Republic of Lithuania were selected as the object of this study. The scope of agricultural activity in the years 2010-2022 was analyzed, the need of Rural development land management projects to reorganize farm land holdings, and the accuracy of the data for preparing these projects were assessed. Analysis of cartographic material and official statistical data was carried out, interview and questionnaire survey methods were applied.
During the research the current dynamics of agricultural land use, forecasts of the future dynamics and the prevailing directions in the analyzed local and county municipalities were investigated. During this period the number of farms held by the farmers has decreased, but the land area managed by them and the average size of farms has increased. It was established that a large number of farmers (over 41%) implement the latest technologies and apply advanced tillage methods at work, so they should not have any difficulties in adapting to the new EU green rate rules. After conducting a survey of farmers, it was determined that a large number of farmers (31.5%) would like to reorganize their land holdings and participate in the land consolidation project if it is fully financed by the EU or the state.

Keywords: *agricultural land use, farmers' farms, Rural development land management projects to reorganize farm land holdings.*

INTRODUCTION

Carrying out economic activities, it is important to strive and ensure the rational use of land in order to comply with environmental protection requirements, not exhausting the soil, but at the same time having profitable farming. Not following the principles of sustainable agriculture may cause the beginning of soil degradation. It occurs as a result of various physical, biological and chemical processes caused directly or indirectly by human activities. About 60 percent of the world's terrestrial land area is considered degraded, and land degradation is one of the biggest challenges for both farmers and other land users (Guerra et al., 2017). Concerns about the loss of biodiversity and ecosystem functions on farmland have led to the development of agri-environmental policies aimed at reducing the burden of farming. Sustainable agricultural practices help conserve water, soil, sustainably manage land, preserve natural resources and ecosystems (FAO..., 2021). Since more than 60 percent of the territory of Lithuania is occupied by agricultural land, it is very important to preserve it and apply all measures that would help to ensure the most sustainable use of the land (Aleknavičius et al., 2014; Atkocevičienė et al., 2011). The new European Green Deal has the ambition to make the European Union the first climate-neutral continent by 2050. The Biodiversity Strategy has the ambition to set a minimum of 30 % of the EU's land area as protected areas, limit urban sprawl, reduce the pesticides risk, bring back at least 10 % of agricultural area under high-diversity landscape features (Montanarella, Panagos, 2021).

Lithuanian legal acts ensure good condition of soils used for agriculture and applicable relevant measures (Dirvožemio tvaraus..., 2023). In order to protect the soil from erosion, a greening requirement was already established in the previous EU support period, now it is replaced by a fulfilment standard, which contribute to the preservation of the soil potential and encourage farmers to grow as diverse agricultural crops as possible (Lietuvos..., 2022). Nutrient availability and plant diversity are important determinants of crop productivity in agricultural ecosystems (Ai et al., 2018).

According to the Land Law (Lietuvos..., 1994), "a rationally managed land holding is a land holding whose form and internal structure create favorable conditions and opportunities for economically efficient and sustainable farming activity". Territorial planning documents and proper implementation of their solutions are of great importance in Lithuania for the rational use of natural resources. In the general system of territorial planning and land management, land management planning documents are also quite important. One of the measures regulated by legal acts, which is intended to ensure the rational use of land, is the Rural development land management projects to reorganize farm land holdings. So far, such projects are rarely prepared in Lithuania, also they are relatively little investigated, such projects are not prepared in other countries at all. Aleknavičius and others (2016) proposed methodological provisions for the preparation of these projects, presented the opinion of interviewed managers of agricultural companies about the need for these projects. In the study of Klimovaitė (2018) has analyzed the accuracy of the cadastral data used for the preparation of these project, claiming that the information collected from spatial data sets about the agrochemical properties of the soil is not accurate enough.

One of the ways to improve land quality and reduce soil degradation is to plan crop rotation and rational land use (Miknius, 2008). Thus, it is necessary to apply rational crop rotations, apply agrotechnical measures more rationally and take into account the recommendations of specialists. When choosing directions of land use and in order to ensure rational use of agricultural land, it is important to have systematic information about the change in the use of these territories, make forecasts, and determine the reasons for the change.

The aim of this study is to perform an analysis of agricultural land use in the municipality of Panevėžys district.

Tasks:

1. To analyze the main indicators of farmers' farms in Panevėžys district municipality, compared to Panevėžys county.
2. Determine the needs of farmers for Rural development land management projects to reorganize farm land holdings and for land consolidation.

RESEARCH METHODS

The object of the study is agricultural land in the municipality of Panevėžys district, which is located in the southern part of Panevėžys county in Lithuania (Figure 1) and Rural development land management projects to reorganize farm land holdings.

Figure 1. Panevėžys county and Panevėžys district municipality

In Panevėžys county can be found productive soils ranging from 34.84 to 50.17 points. In Panevėžys district municipality, the average soil productivity grade is 45.06 points. Light sandy loam and light loam soils prevail in this municipality. Consequently, these soils pass moisture well, warm up quickly, and are easily cultivated. However, they accumulate significantly less moisture and nutrients, so minimal tillage and soil improvement through proper crop rotation are very relevant.

During the research, the statistical indicators of Panevėžys county and Panevėžys district municipality related to the use of agricultural land since 2010 were compared until 2022. Data summaries of the Land Fund of the Republic of Lithuania, data of the National Payment Agency under the Ministry of Agriculture, information from the Register of Farmers' Farms and information from other sources (Oficialios..., 2023) were used in the research.

Analysis of literature sources, cartographic material and official statistical data, mathematical statistical analysis, interview and questionnaire survey methods were used in the research. A questionnaire consisting of 27 questions was prepared. This article discusses the answers to 14 questions in more detail. With the help of this questionnaire, the aim was to find out whether farmers are familiar with Rural development land management projects to reorganize farm land holdings, as well as whether such projects would be useful to them, what information collected and prepared plans are most necessary for them. This survey was conducted in 2023 in the months of January – March on the online platform www.apklausa.lt. 42 farmers filled out the questionnaire. More than 85 percent respondents have been in business for more than 5 years.

RESEARCH RESULTS AND DISCUSSION

With the emergence of new requirements for sustainable farming, farmers will have to apply new and sustainable technologies in their farms.

During the research, first of all, the main indicators of farmers' farms in Panevėžys district municipality of Panevėžys county were analyzed (Table 1). Even though the areas of these farms are much larger, just 33 percent of them are owned by agricultural land municipality.

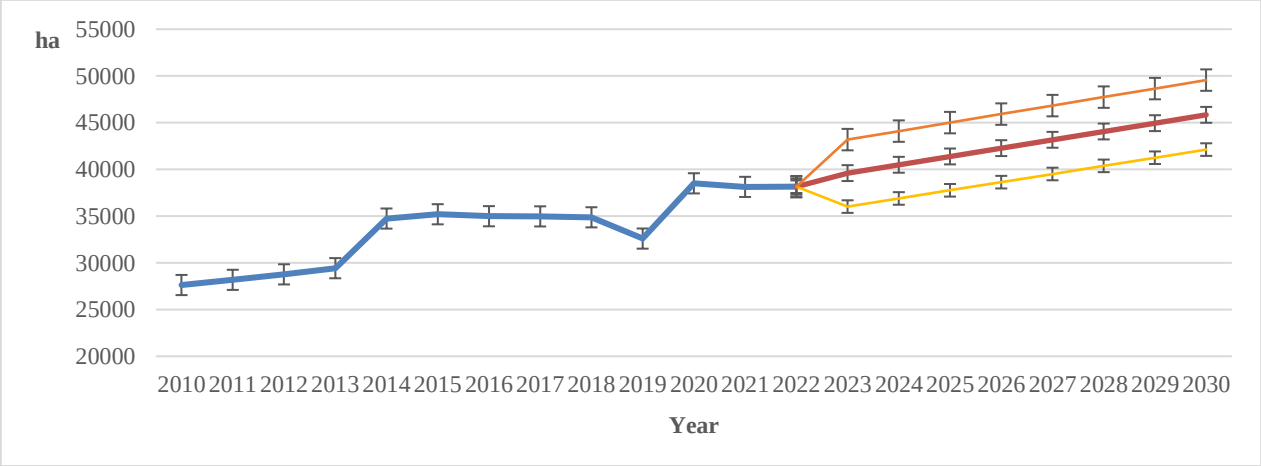
Table 1. Indicators of farmers' farms in Panevėžys district municipality in 2010-2022.

Year*	Area of agricultural land in the municipality, ha	Farmers' farms							Average size of organic farm, ha	The share of the area of organic farms in % of the total area of farmers' farms
		Number of farmers	Distribution of the number of farms according to agricultural activities carried out %			Total land area for agricultural activities, ha	As a percentage of the agricultural land area in the municipality	The average size of the farmer's farm, ha		
			Crop production	Livestock	Mixed					
2010	134856.1	1842	61	13	25	27622.49	20.48	15	x	x
2015	119259.0	2125	65	14	21	35195.07	29.51	16.56	114.93	20.1
2020	122795.8	2184	71	16	14	38504.99	31.36	17.63	121.81	15.13
2022	123131.9	1793	74	15	11	38142.57	30.98	21.27	134.14	21.84

Source: compiled according to the data of the Agricultural and Rural Business Register and the Register of Farmers' Farms
Note: * - in the beginning of the year, x – no data

It was established that the number of farmers' farms in the analyzed municipality is decreasing, but the area they manage is increasing. Currently, in the municipality of Panevėžys district, the main activity of farmers' farms is crop production, which in 2022. at the beginning, about ¾ of all analyzed farms were engaged in this activity, and the number of farms engaged in this activity is also increasing only 15 percent. The main activity of the farms is animal husbandry. The number of mixed production farms decreased significantly during the analyzed period. Depending on the ratio of production prices and working capacity, the number of livestock, areas of grain and technical crops in Panevėžys district municipality changes every year, but this change does not pose a threat to the stability of production, although looking at long-term forecasts, the volume of livestock production in Panevėžys district municipality will continue to decrease in the future. This situation is not favorable.

During the study, the dynamics of the total area managed by farmers' farms was reviewed and a forecast of its dynamic was made in the analyzed municipality and, for comparison, in the entire Panevėžys county (Figure 2).



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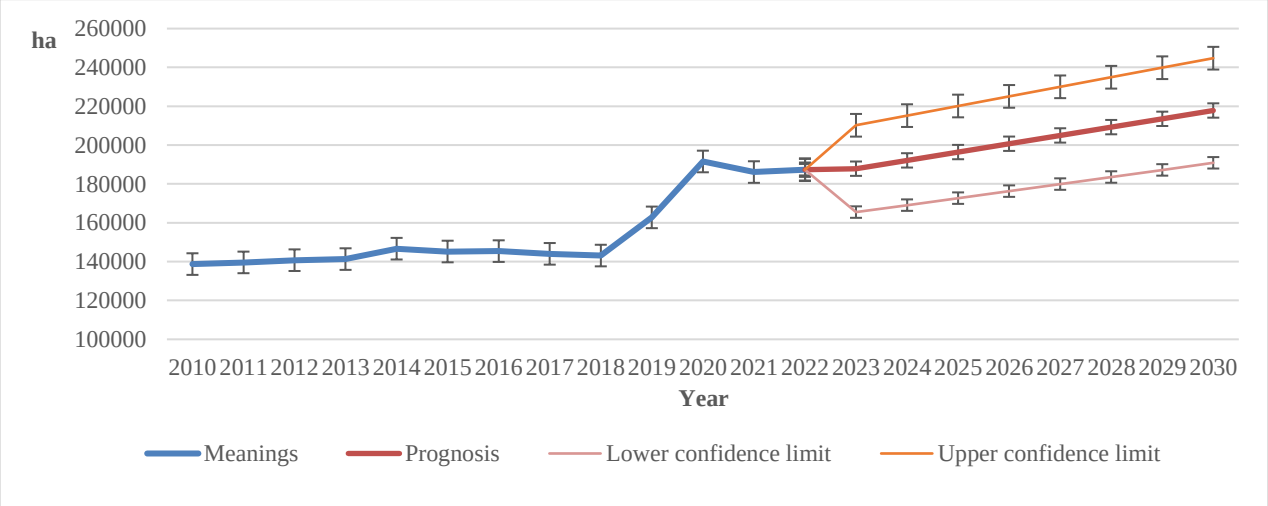

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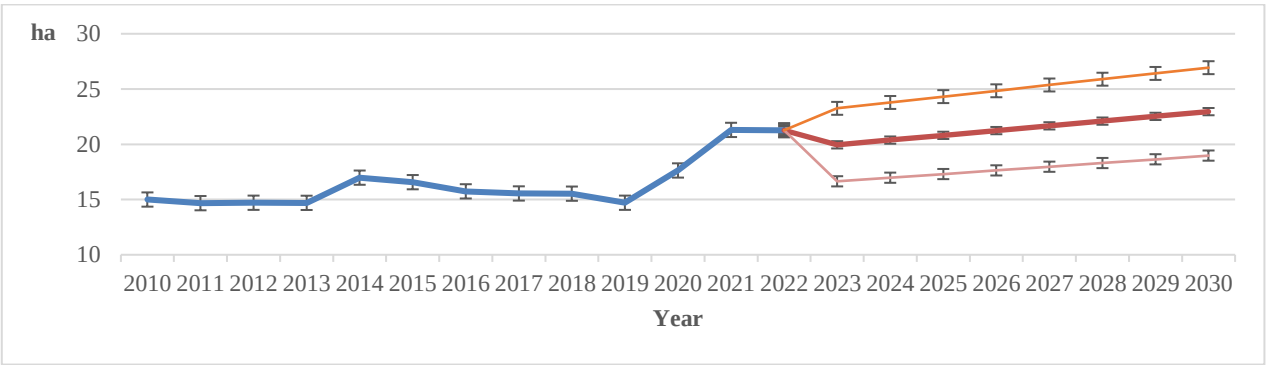
Figure 2. Changes in 2010 - 2022 (January 1) and prognosis of the total area of farmers' farms in: (**a**) Panevėžys district municipality and (**b**) Panevėžys county (compiled according to the data of the official statistics portal)

During the analyzed period, the area of land used by farmers' farms in the municipality of Panevėžys district increased almost constantly, however only in 2019 the increase was smaller. At the same time, in the entire Panevėžys county until 2018, the land area used by farmers' farms remained relatively the same and its increase was more significant in 2019 and 2020. A constant increase in the analyzed areas is predicted in the future as well.

The average size of the farmer's farm over 10 years period in Panevėžys district changed relatively little, more significant increase was in 2020 and 2021, and in the entire county, a more significant increase was recorded already from 2019 (Figure 3).



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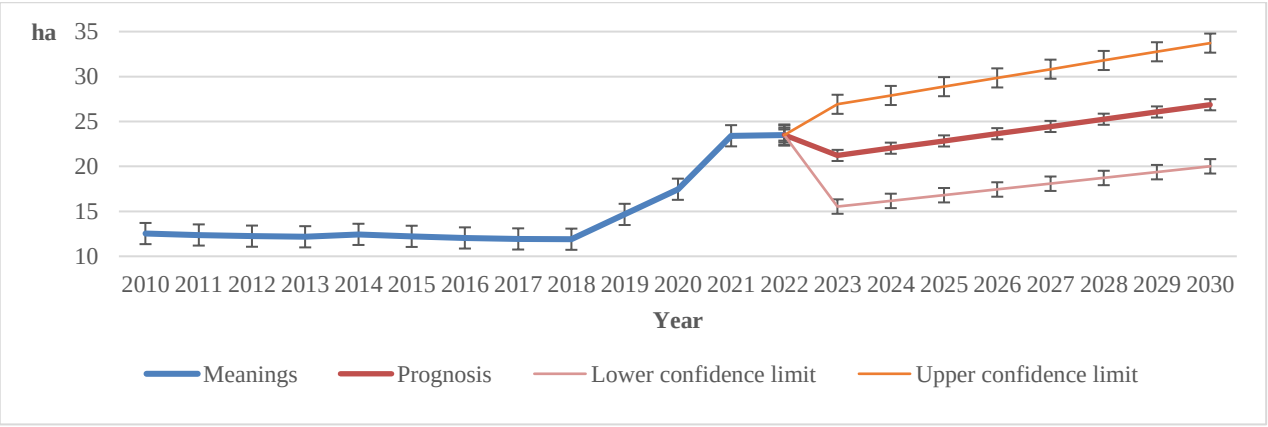

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Figure 3. Changes of the average farmer‘s farm area in 2010-2022 (January 1) and prognosis in: (**a**) Panevėžys district municipality and (**b**) Panevėžys county, in hectares (compiled according to the data of the Agricultural and Rural Business Register and the Register of Farmers' Farms)

Panevėžys district in the municipality there are about 1,800 farmers' farms of various sizes, the average farm size in 2022 was 21.27 ha. During the analyzed period, the average area of a farmer's farm in the municipality increased by almost 30 percent.

The number of farmers is decreasing due to economic aspects, some farms are ceasing operations, others are increasing their holdings at the expense of liquidated farms. As we can see, both the areas used by farmers' farms and the average size of farms are increasing, and such trends are predicted in the future as well.

In order to find out whether the measures ensuring the rational management of land holdings are known, whether the support provided by rural development programs is used, what is the attitude of farming persons towards farming regulations, etc., a survey by questionnaire of farmers was conducted.

One part of the survey was focused on Rural development land management projects to reorganize farm land holdings. The main goal of such projects is to form plots of agricultural land with similar characteristics and determine their recommended use (composition of planned agricultural plants and rotation in crop rotation. To the question "Is it necessary for a farm to have such a project and prepared plans with the information marked on them?" already a large part – i.e. 66.7 percent of respondents answered "yes, necessary".

During the survey, it was also aimed to find out which plans and collected information would be the most useful in the course of this project (Table 2).

Table 2. The number of respondents' answers according to the plans of the prepared Rural Development Land Management Project and the need for information

Assessment \ **Plans provide information**	**Much needed**		**Needed**		**Is not necessary**		**Not required**	
	number	**%**	**number**	**%**	**number**	**%**	**number**	**%**
Assessment of productivity of agricultural land in points	8	19.5	20	48.8	13	31.7	0	0
Restrictions on economic activity (special land and forest use conditions)	13	31.7	18	43.9	9	22.0	1	2.4
The network of public roads, including municipal roads and other roads of local significance used by the farm	9	21.4	14	33.3	18	42.9	1	2.4
Farmland fields of similar characteristics, indicating their numbers, area and average productivity points	9	22.0	17	41.5	13	31.7	2	4.9
Areas of drained land and their condition	10	25.0	13	32.5	17	42.5	0	0
Boundaries of cadastral plots, indicating the ownership of plots (to the farm, the state, other legal entities and individuals) Boundaries of cadastral plots, indicating the ownership of plots (to the farm, the state, other legal entities and individuals)	14	34.1	19	46.3	8	19.5	0	0
Soil types and granulometric composition	12	30.0	17	42.5	10	25.0	1	2.5
Agrochemical properties of soil	12	30.0	17	42.5	11	27.5	0	0
Abandoned and soiled land areas, indicating their possible further use	9	22.5	12	30.0	18	45.0	1	2.5

It was found that almost all the plans that are made during the preparation of the analyzed project are necessary for farmers. The respondents are most interested (80 percent said that they are needed) in cadastral land plot boundary plans, indicating the ownership of the plots by colour. And more than 50 percent of the other information provided in the project explanatory note is important for farmers. They are less interested in information about the condition of roads, drainage systems and areas of abandoned land.

In addition, both in Lithuania and in many other countries, there is a sensitive problem – non-compact land holdings consisting of many plots of land, where agricultural activities are carried out. Respondents were asked how many plots of land they carry out their activities. On average, farmers operate from 15 to 30 plots, there are 5 farmers who operate from 32 to 72 plots.

Therefore, it was sought to find out whether it is necessary to prepare land consolidation projects (Figure 4).

It was noticed that half of the survey participants do not know whether it is necessary to prepare such a project in the areas where the land plots they use are located. One farmer did not answer this question. Only 19 percent respondents see the need to prepare these projects.

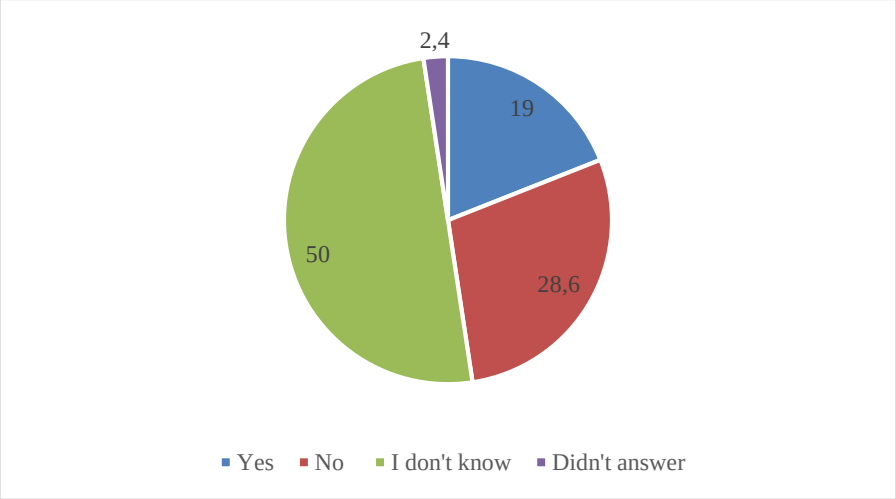

Figure 4. Distribution of the number of respondents' answers about the necessity of land consolidation projects, in percentage

The answer to the question "Would you like to participate in land consolidation?" was as follows: "yes" – 21.4%, "no" – 23.8%, "don't know" – 52.4%. Thus, in order to get a more favorable attitude towards land consolidation projects, it is necessary to educate farmers that participation in such projects would be economically beneficial, improve farming conditions, and save considerable time and costs.

The respondents indicated in which case they would participate in the land consolidation project (Table 3).

Table 3. Respondents' answers to the question: "In what case would you participate in a land consolidation project?" (multiple answers possible)

Answers about the desire to participate in the project	**Number**	**%**
If it were fully financed by EU or state funds	28	31.5
If designed roads were built	12	13.5
If designed water reservoirs were to be installed	6	6.7
If the reclamation systems were managed	24	27.0
If only the borders of the land parcels were to be restructured	19	21.3

It was determined that the two main conditions that would encourage farmers to participate in the land consolidation project were if it was fully financed by EU or state funds (indicated by 32 percent of the respondents) and if the land reclamation systems were fixed (27 percent). The installation of water bodies has the least impact on participation in land consolidation projects. This criterion is not very attractive to farmers, because according to Lithuanian policies the special land use conditions and restrictions apply to plots of land near water bodies.

The survey also sought to find out whether farmers participate in the measures of the Rural Development Program and what is their attitude towards agricultural policy issues. It was determined that more than 59 percent respondents have received support under Rural Development Programs. Getting support under the measures of the Rural Development Program is more difficult for those farmers engaged in crop production. This is regulated in the rural development support rules (Lietuvos kaimo..., 2014), according to which more funds are expected to be allocated to livestock and vegetable farms. Respondents were asked: "If the current support program were to be terminated, what action would they take?". I would continue to test my activity above 42 percent. of the farmers who participated in the survey, they would reduce the volume of farming – about 22 percent, and would stop their activities – 2.4 percent. farmers and the rest of the farmers don't know what to do.

Although it is affirmed that the prepared EU green course is a straight path to more sustainable agriculture, the farmers' fears about the directions of the green course were observed during this survey. More than 65 percent respondents have a negative opinion about these directions, about 3 percent of farmers said that they did not went deep into the new requirements, while the rest expressed specific proposals for the implementation of the EU green course in agriculture. It is said that a constructive discussion with farmers is needed, so that directions are focused on farms of different sizes and various specializations, leaving the possibility not only for large farms to remain competitive.

In addition, farmers listed the main problems of farming:

1. The biggest problem is the increased prices of production raw materials, agricultural machinery, parts;
2. Unstable farm products purchase prices, which complicate investment planning;
3. Excessive requirements of the green rate and instability in the decisions of management institutions;
4. Increasing bureaucracy.

Summing up the questionnaire survey, it can be said that the majority of farmers (over 42%) master the latest farming technologies on their farms, and it will not be difficult for them to adapt to the new EU green rate rules. Therefore, it is necessary to educate and encourage farmers to take a more responsible approach to more sustainable farming principles. Also, a small number of farmers have heard or are otherwise familiar with the rural development land management projects that are being

prepared, which can help them even more to achieve and implement the requirements of the EU green course and turn in the right direction towards more sustainable farming.

CONCLUSIONS

1. In the analyzed period of 2010-2022, the number of farmers' farms in the Panevėžys district is decreasing, but the land area managed by them and their average size of farm holding is growing (in 2015 it was 16.57 ha, and in 2022 – 21.27 ha). There is a significant increase of arable land used by farmers in Panevėžys county. It was determined that the area managed by farmers' farms and the average farm size will grow in the future in both, in Panevėžys district and Panevėžys county. The number of organic farms in the municipality is decreasing, but organically certified areas are increasing (in 2015 they amounted to 4402.00 ha, and in 2022 – 5708.45 ha). A similar trend prevails in Panevėžys county.
2. There are about 1,300 crop farms in the municipality of Panevėžys district. It was determined that the largest areas of arable land in 2022 was occupied by cereals, in the municipality – 57165.0 ha (67.30%), in Panevėžys county – 229938 ha (71.74%). According to the forecast, it can be said that these areas will increase in the future. This growth is related to the possible effects of climate change, increasing demand for food raw materials. The need to apply crop rotation and rational land use will limit the rapid increase in cereal areas. Similar trends prevail in areas occupied by rape.
3. According survey results the majority of interviewed farmers (66 percent) have heard about Rural Development land management projects to reorganize farm land holdings. These projects are the right direction towards sustainable farming. These projects offer soil improvement measures and appropriate crop rotation, taking into account the physical properties of the land plots, so that the farmer can rationally use the managed land plots, protecting them from soil degradation.
4. It was also established that a large number of farmers (31.5%) would like to reorganize their land holdings and participate in the land consolidation project if it is fully financed by the EU or the state.

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