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FIRST YEAR OF THE OPERATION OF THE NATIONAL SYSTEM MODERATING ICE DAMAGE

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ABSTRACT

Humanity has always been interested in the possibility of modifying and influencing the weather. Many researchers, physicists, and meteorologists have dealt with the subject, but have never reached significant results. With the development of technology, the scientific communities find it difficult to accept the fact that in reality, it is not quite possible to influence the weather. This, among other reasons, is why they have begun to inspect how different atmospheric phenomena may be caused and extinguished. A significant breakthrough in these experiments was first noted in the middle of the 1900s due to which not only the scientific community began to apply weather control measures, but also the military for martial purposes. In Hungary, the first such measure was taken due to societal needs toward reducing the damages caused by hail, and the NEFELA Southern Hungarian Hail Prevention Association was formed. The system, which covers three Transdanubian counties, was based on French example, it applies a soil-generator hail prevention method and began operation in 1976. Today, the extent to which hail causes damage has justified the implementation of a nationwide system. The National Agricultural Chamber was granted support for the purpose of building such a system via a tender issued within the framework of Rural Development Program.

I will examine the following hypotheses throughout my research:

1. I hypothesize that the hail damage reduction system will work efficiently and yield results.
2. I hypothesize that as a result of the system's function, damage to agricultural areas will be significantly decreased within the first year.

In order to test my hypotheses, I collected data at the National Agricultural Chamber, the National Meteorological Service and the Government Office of Békés County.

My examinations reflect that this year saw an exceptionally high number of rain showers compared to previous years, however, despite this fact, the amount of ice damage reported has decreased to half, almost a third, thus, my first hypothesis has proven to be true. Furthermore, the data supports my second hypothesis as well, according to which damage in the agricultural industry has decreased significantly. We can see that the per hectare ice damage reported for each storm is shown to have decreased despite the increase in the number of storms. While assessing my findings, I would like to note that the implementation of the system has only just begun, thus we only have one year's worth of data available to us. At the same time, it is apparent that there is a significant change in the reduction of ice damage.

The conclusion to be drawn from the results of my research is that the function of the National Ice Damage Reduction System is efficient, there are fewer instances of hail with larger ice crystals and the amount and value of agricultural damage have decreased.

Keywords: hail, moderation of damage done by hail, risk managemet, soil generator, System of Country's Moderation of Damage Done by Hail

INTODUCTION

Influencing and modifying weather conditions has long been a concern for mankind (Bartholy 2013) In the agricultural sector, besides drought, hail causes the greatest loss of yield, so the main goal was to reduce it (Belinszky 2018). In order to serve the emerging social demand, a nationwide system was established in Hungary. In addition, a network-based hail removal technology is used to perform the network. Our research deals with the effectiveness of ice reduction.

Many scientists, physicists and meteorologists have dealt with weather-changing activities, but no significant results have been previously recognized (Byers and

Braham 1949). In the experiments a significant breakthrough appeared only in the middle of the 1900s, after which the military, but also the army, started to apply the technologies of weather modification for military purposes. It is important to note that hail, as defined by the WHO, is a precipitate that falls in the form of ice cubes of 5 mm or more or irregular ice cubes. For the formation of ice crystals, there is a need for condensation, the so-called ice-forming particles (Váli 1995, Young 1993, and Geresdi 2004). It is well known that smaller or larger ice grains are formed in every thunderstorm, so the question is not whether it contains clouds of ice, but whether they reach the surface before they completely melt. (Knight C. A and Knight 2001, Csirmaz 2012). This is supported by model calculations, which show that there are ice eyes in every thunderstorm, if they do not melt until the soil surface is reached, then we are talking about hail (Geresdi 2004).

The first major experiment, which we can consider scientifically sound, was implemented by Vincent Schaefer in 1946 (Grabant 2010). The American meteorologist wanted to model the process of icing on the wings of aircraft, and developed a fog chamber to develop it. During a power outage, the chamber overheated, trying to cool with dry ice (crystalline carbon dioxide) and silver iodide. Then he discovered completely that the dry ice had a cloud effect (Hegyfoky 1989). Studying this phenomenon, it was concluded that with sudden changes in saturation vapor pressure, ice crystals are formed from over-cooled water droplets (Czelnai 1996). The scientist wanted the result to be tested in natural conditions. With his motorbike, he flew into a cloud of clouds of dry ice. Snow crystals appeared in the area under the cloud, snow was falling, but no such phenomenon was detected in the surrounding areas, so the result of the experiment was proven. (John, 1964)

After successful attempts, many countries have begun to deal with changes in atmospheric processes. In the United States, an attempt was made to modify a hurricane, causing a monsoon period in the Popeye operation during the Vietnam War (Pete 2000). Finally, in 1977, the international agreement was concluded under which the Geneva Convention was declared unlawful for military purposes.

In Hungary, the first system that specializes in mitigating and eliminating damage caused by hail was operating between 1976 and 1990, where missile hail removal was used. The high operating costs could not be met by the state budget, so the liquidation started. At the same time, in an increasingly large area, there has been a growing demand for an effective anti-hail protection system. In 1991, NEFELA Southern Hail Rescue Association was established to meet the demand. The association has commissioned a French model of soil generators, with which it has succeeded in introducing a proven method in Hungary.

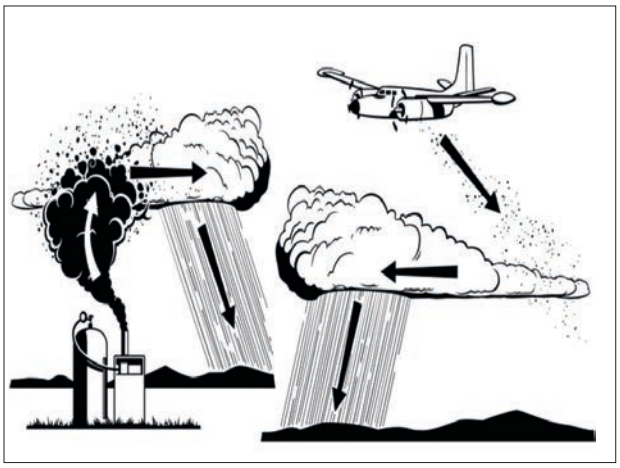

Figure 1: Experiment with motorized small machine

During the hail removal, ground-level generators produce silver iodide (AgI) crystal molecules. To exert their effects, AgI particles must be introduced into the thunderstorms before the formation of ice grains, where crystals form under the effect of low temperatures and promote the formation of ice crystals as condensation seeds. (Molnár 2016). During their development, the thunderstorm

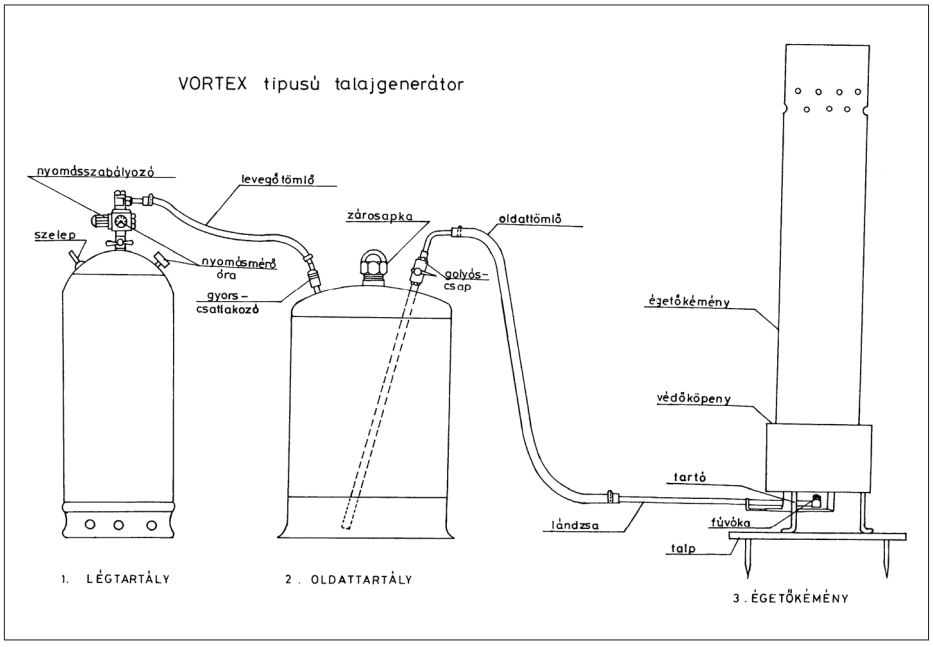

Figure 2: Main units of the soil generator used by NEFELA: air tank (1), solution tank (2) and incinerator (3)

clouds absorbed the warm, humid air near the soil, while "vacuuming" the areas below them, and the silver iodide particles enter the cloud. In the course of artificial intervention in the formation of ice, more and smaller ice is created than under natural conditions. The ice grains fall slower to the ground, allowing them to spend longer in the positive temperature range, reducing their size further due to melting. Luckily, it melts completely, reaching the ground as raindrops, or at least falling into much smaller grains of ice.

Ice damage is one of the most frequent damage events in Hungary, therefore the Rural Development Program states that it is of paramount importance to support hail protection at both national and producer level. The initiative is led by the National Chamber of Agricultural Economics. It was the first in Europe to build an ice-loss system covering the entire country. In the professional implementation, the ground generator technology was chosen based on the most favorable unit investment and operating costs. For nationwide coverage, 986 soil generators were needed, which were at the intersection of a 10x10 kilometer grid. Of the generators, 222 are automatic and the rest are "manual". In the operation of the system, the National Chamber of Agricultural Economics works closely with the National Meteorological Service. The system is switched on after the scratching received from OMSZ, and the affected people are informed about the weather conditions in three messages per day. The ice loss system started its operation on May 1, 2018, maintaining the 1.5 billion forints compensation from farmers' compensation payments, supplemented by government budget resources.

Soil-based hail removal works in a preventive way, and can not "blow out", "melt" already formed ice grains, so the ice cloud coming from outside the protected area will unfortunately continue to cause damage. With this in mind, on the basis of preliminary calculations of the Chamber of Agriculture, the annual value of the annual membership fee can be kept up to ten times the annual value of HUF 50 billion using the system.

Objective

In the course of the research, we examined the operation of the National Ice Harm Reduction System, which triggered the greatest social and media interest of the past period. We were looking for an answer to the question of whether there was a noticeable change in the amount of ice damage reported and the amount of ice damage paid as a result of the operation of the system. Many researchers have been involved in research on locally operating ice loss or hail development, but research into the new system has not yet been carried out.

Hypothesis 1: It is assumed that the ice reduction system works effectively and efficiently.

Hypothesis 2: It is assumed that damage to the agricultural area caused by the operation of the system has decreased significantly in the first year.

MATERIAL AND METHODS

During our analyzes, we analyzed the data published by the National Chamber of Agriculture, the National Meteorological Service, the Békés County Government Office and the Association of Hungarian Insurance Companies. We needed source data to examine the affected area from the weather, agriculture and insurance. First of all, we tried to get a comprehensive picture of the assumptions examined by using secondary research methods. In our work, we recorded the data in a table in the Microsoft Excel database management program, and then we performed correlations with basic statistical indicators. Pearson's correlation coefficient analysis was also used to support the hypotheses; the results of the analysis were only indicative because of the short operating time given, but our researcher demanded the application of the analysis.

RESULTS

As the first area of investigation, we examined the evolution of the number of thunderstorm days, to which the National Meteorological Service provided source data. The time period is the May-June-July period, which is important to mention because it is the period when the chance of thunderstorms is greatest.

Table 1: The number of thunderstorm days

Period	30-year average (1981-2010)	2015	2016	2017	2018
May	4	4,3	5,6	6,9	8,3
June	4,3	3,43	8,00	7,71	11,71
July	3	3,71	6,29	6,00	7,71
Total	11,3	11,43	19,86	20,57	27,71

From the 30-year comparison, which examines the period from 1981 to 2010, it can be seen that during the summer period, the number of thunderstorm days was similar for nearly 30 years. There is a significant difference in recent years. These values increased almost threefold by 2018 due to the 16% increase. On weekdays, it can be said that during the summer period, a thunderstorm with hail was recorded in Hungary on the 3rd day. In this case, we did not investigate the impact of climate change in our case, but the results of the co-researchers show that the number of extreme weather phenomena is constantly increasing due to climate change. These tendencies provided an appropriate basis for our research

Table 2: Amount of reported ice damage

Year of Ice Damage	Reporting Ice Damage (hetare)	Compared to 2018
2015	43 426	200%
2016	38 319	177%
2017	53 297	246%
2018	21 674	100%

Table 2 shows the evolution of reported ice damage per hectare. The year 2018 was chosen as the base year, because this year the operation of the ice-loss system was started and we assumed that there would be a decrease in the amount of ice damage here. The table clearly shows that in 2015, farmers were notified of more than 43,000 hectares. In 2016, the rate of reporting was lagging behind, but even so, to 317 hectares, ice damage was reported for 177% of the base year. The most striking, however, was in the year 2017 when more than 50,000 hectares had ice damage. With regard to these data, it can be clearly seen that there was a significant decline in reported ice damage in 2018.

Table 3: Békés County ice damage data

Year of Ice Damage	Reporting -cases	Field pieces	Hectare
2015	35 db	49	73,5
2016	64 db	569	897,5
2017	75 db	738	1037,1
2018	63 db	166	289,9

In our research, besides the national data, we also carried out local investigations, where we investigated the hail damage affecting the Békés county, the number of reported applications, the number of plots declared and the amount declared per hectare. In the analysis of the data, it was also observed that a strong upward trend was followed by a sudden decline. The year 2017 can be considered as a peak when the size of the areas affected by ice damage exceeded one thousand hectares. By way of illustration, this area is the same as the size of 1400 football pitches. According to our conclusions, this is due to the fact that in 2017, besides the locally emerging thunderstorms, large supercells or even supercells were experienced over Békés County.

Table 4: Amount of paid ice damage

Year of Ice Damage	Report cases	Field pieces	Hectare
2015	35 db	49	73,5
2016	64 db	569	897,5
2017	75 db	738	1037,1
2018	63 db	166	289,9

Table 4 shows that the amount paid for ice damage for the full year, based on the data, was the highest in 2017, paying more than one and a half billion forints to farmers after the reported areas. At this point, it is important to note that the distribution of compensatory allowances per hectare is not the same for agricultural damage events. What does this mean? In the new agri-compensation scheme, we need to look at what the damage is and how it affects the yield reduction of plants. Damage claims can only be reported for adverse weather events, which is hail in the present case. When determining the payments, the reported damage event, its location and extent, as well as the yield reduction and the crop should be examined. It follows that a 50% reduction in yield per hectare of arable crops on the Great Plain will not be the same as the 50% yield reduction of the 1 hectare vineyard in the Villány wine region.

It can be seen from the table that, looking at the amounts paid per hectare, the cycle shows a lower but gradual increase after a significant increase. After the first year of the survey, data increased by 30%, followed by a steady 8% change. Paying for a thunderstorm for the reported hectares in the cycle fell by nearly half over the three-year period, rounded from $ 2,000 to $ 1250.

A comparison of the results showed that the amount paid for the full year was reduced to ice damage after the implementation of the ice-loss system, which can support the soundness of the system.

CONCLUSIONS

From the analysis of the first year of data following the commissioning of the ice mitigation system, we concluded that JÉGER's operation is successful. Larger but smaller ice crystals are formed in local and large-scale thunderstorms. As a result of this, damage to hail is reduced. Less damage causes less crop loss, and the amount of agri-compensatory payments made in this area is lower than in previous years. According to our studies, it can be seen that there was a significant change in ice reduction. As a result of the research, it can be concluded that the operation of the National Ice Harm Reduction System is efficient, that hail with larger ice crystals occurs less frequently, and the number and value of damage caused by agriculture has decreased.

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WATERING DEVELOPMENT APPLICATIONS FROM THE RURAL DEVELOPMENT FOUND IN BÉKÉS COUNTY

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ABSTRACT

Through our research it is presented what features irrigation cultivation in Hungary has been characterised by. The data related to Békés County is also covered. It is highlighted that – following world trends – developing the irrigation sectors is an enormous break point of the agriculture of our country. Based upon the community grants of 2014-2020 the Rural Development Programme launched two calls for proposals concerning irrigation development. In our research the data and figures of the project proposals – submitted from Békés County – of the Hungarian State Treasury as a paying agency are observed and examined. The number of submitted proposals within the county, the requested grant amounts, the fields to be developed, the current status of the evaluation process and the typical errors are presented. As a result of our survey it can be claimed that a large number of proposals have been submitted in the county with high grant amounts related to a wide range of topics. Simultaneously, due to the quality of content the number of rejected proposals is quite high as well. Applicants themselves also withdrew for some reasons. Nevertheless, projects to be implemented by all means have great influence on the agrarian economy of Békés county therefore available resources can reach the set policy objectives.

Keywords: watering, Rural Development Programme, Békés County, applications

INTRODUCTION

In the period of large cooperative farms considerable irrigation development occurred in Hungary. During the years after the democratic transformation, as a result of the fragmentation of property structures, a downturn took place in the size of irrigated farmlands. Nevertheless, in the past 8-10 years significant resources have been available to farmers to implement irrigation development projects. The accessibility of irrigation purpose tenders announced from the resources of the 2014-2020 Rural Development Program was a substantial step forward.

Plant cultivation on irrigated lands plays a crucial role in agricultural production. The water contained in the ground facilitates the accumulation of nutrients, and after their dilution in water the plants utilize them through nutrient uptake by their roots. In addition to this, irrigation has a humidifying effect, which reduces evaporation from plants during drier periods. Anti-freeze irrigation is a special form of irrigation, during which under freezing weather conditions the heat-energy generated by the freezing of the irrigation water increases the temperature of the micro-environment. This form of irrigation has an outstanding role in the case of plantation type cultivation (Vermes 2001).

When farmland is irrigated, choosing the proper form of irrigation is essential (Ángyán and Menyhárt 2004). Beyond satisfying the water demand of irrigated cultivated plants, we must also pay attention to the quality of irrigating water (pH level, salt content, etc.). According to the conclusions of Rétvéri (1986), among the methods of irrigation, rain-like irrigation may deteriorate the soil structure, and beyond this the quantity of irrigation water used is also excessive compared to water demand. The high salt content of irrigation water results in changes in the pH level of the soil, the accumulation of heavy metals and soil salinization. Because of the latter, nowadays special irrigation methods are more widespread (drip irrigation, micro-irrigation) (Oroszlány 1963). As a result of global climate change, we must place outstanding emphasis on spreading water-efficient irrigation solutions (Somlyódy 2002).

According to the description of Bálint et al. (1985), irrigation has a positive effect on agricultural production

security, thus on its profitability. As a consequence of irrigation, germination, thus crop binding and grain densification is more effective. Thereby, higher crop yields can be achieved. It also has a farmland availability increasing effect, thus higher revenues and profits can be realized (Dégen 1972). As a results of the conditions and requirements of today's era, the intensification of global market competition, the increasing effects of climate change as well as general rainfall and water shortages, in agricultural production it is essential to spread irrigation in plant cultivation as broadly as possible (Somlyódy 2002).

Watering areas in Hungary

Hungary's agricultural land area equipped for irrigation was around 350,000 hectares in the 1970s. In recent years its new peak was reached in 2014 with over 160,000 hectares. However, today the amount of irrigated farmlands is under 140,000 hectares (Figure 1). After an analysis of the data, we can conclude that the amount of irrigated farmlands and the quantity of water used for irrigation significantly fluctuated year to year in the past 15–20 years, sometimes growing and sometimes shrinking, but the total agricultural land area equipped for irrigation was unchanged compared to the situation in 2000 (Tanczné and Gyüre 2018).

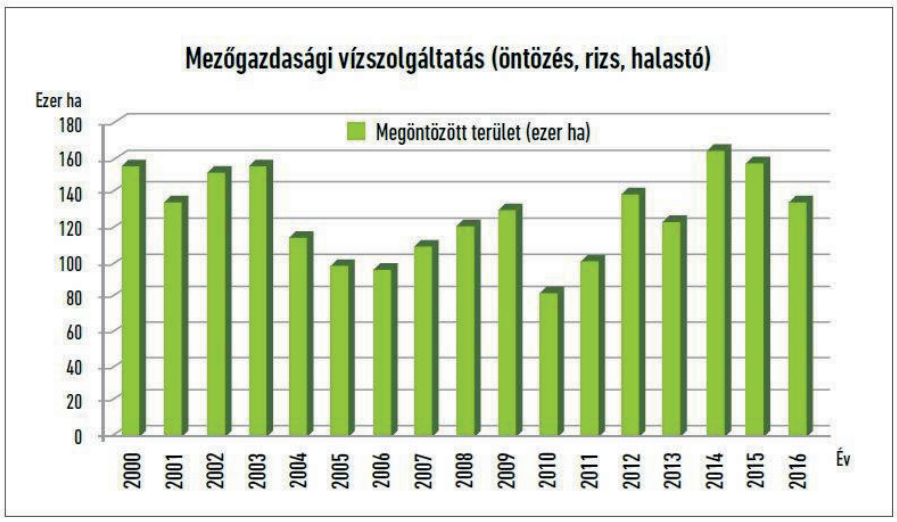

Figure 1: Agricultural water services (KSH 2017)

Forrás: KSH

The slow development of plant cultivation on irrigated lands has complex reasons. Hungarian agricultural production habits, farmland usage conditions and our fragmented agricultural land property structure significantly contribute to this. Irrigation development is a complex issue, which involves multiple competences, including water management that is the responsibility of the Interior Ministry, since irrigation can only be developed in consideration of water reserves and harmonized with flood protection. It also involves the Ministry of Agriculture in charge of rural development, since for development projects the farmers need financial resources (Tanczné and Gyüre 2018).

Watering areas in Békés County

One of Hungary's most valuable agricultural regions is Békés County, where the significance of irrigated plant cultivation was great long before our times. Our County played a pioneering role in the development and spreading of irrigation in the past. Currently we are in third place nationwide, only Szolnok County and Hajdú-Bihar County is ahead of us from the aspect of the size of irrigated agricultural lands. This is not a coincidence, since the climate conditions of the County practically require farmers to mitigate the production shortfall caused by droughts by using water from our natural streams (Albel and Vincze 1963). It is evident that even in the 1960s irrigation development in our County was considered an outstanding opportunity. In this same volume the authors note that productivity had doubled as a result of the County's water management activity in past decades, and production security had increased.

Marjai et al. (1967) described that in the period of large cooperative farms further considerable irrigation development occurred, not just nationwide, but the size of irrigated farmlands in Békés County also grew, and significant irrigation developments were achieved.

Nowadays, our County is outstanding in the South Great Plains region, compared to the other two counties, from the aspect of agricultural lands that are irrigated at least once per year. Based on data from the National Statistical Office (KSH 2018) the size of agricultural lands that are irrigated at least once per year in our County exceeded 23,000 hectares in 2012, while it was the lowest in 2015 with 15,499 hectares (Table 1).

Table 1: At least watered area in Békés County (KSH 2018)

county	2011	2012	2013	2014	2015	2016	2017
Békés C.	*19 285*	*23 395*	*21 828*	*20 848*	*15 499*	*21 702*	*18 994*
Bács-Kiskun C.	11 052	14 274	12 142	9 071	6 660	8 950	9 499
Csongrád C.	16 147	21 203	15 119	12 760	9 752	18 284	13 581

When farmers submit their applications for agricultural subsidy, they have a reporting obligation in their so-called Uniform Application, even if they wish to irrigate their land in a specific year. In the course of the application, they report the location and size of the land intended to be irrigated. It is evident from the data of Table 2 that more land has been reported in the County since 2015 than the number of cases when the irrigation was actually performed. Based on the Table's data the trend is significant, according to which the land area planned to be irrigated continuously grew, while the size of agricultural land actually irrigated was reduced year after year.

Table 2: Watered area in Békés County from the Uniform Applicítion

year	number of applicítion	hectar
2015	337	16 432 ha
2016	313	21 839 ha
2017	279	19 129 ha
2018	252	18 591 ha

The Common Agricultural Policy's (CAP) watering applications

During the 2014-2020 cycle of the Common Agricultural Policy (CAP) the Rural Development Program provides numerous opportunities for the development of the agricultural sector, including irrigation. During this cycle, the total amount of available resources was HUF 1,310 billion. While during the 2007–2013 cycle a total of HUF 20 billion was spent on the development of agricultural water management (which included European Union developments, not just producers), in the 2014–2020 cycle HUF 49.5 billion is available for irrigation development, as well as a further HUF 19.3 billion for plantation establishment with the development of an irrigation option.

Two tender announcements were published for the above funds. One of them is VP-2-4.1.3.2.-16, entitled Subsidy for landscaping modernization, plantation establishment with the development of an irrigation option. The purpose of the subsidy is the usage of more modern technologies than current ones, the establishment of modern plantations, the modernization of species selection, improving average yield productivity and quality as well as irrigation modernization. Its further purpose is to increase fruit production competitiveness within the landscaping sector as well as raising added value by subsidizing the spread of new, innovative and environment friendly production technologies and production methods.

The other tender is VP2.-4.1.4-16 entitled Subsidy for the development of agricultural water management sector. The purpose of the subsidy is water retention for agricultural production security and in the interest of adapting to climate change, sustainable management of our water reserves, spreading water-efficient irrigation technologies, providing climate change resistant production methods and sustainable land use. It is also a subsidy for bringing surface and underground bodies of water into a good condition and/or preserving their good condition from the aspect of quantity (pályázat.gov.hu 2018).

MATERIAL AND METHODS

During our research we study the data of the Hungarian State Treasury as the funds payer agency of agricultural and rural development subsidies in Hungary, requesting the data from the Békés County Government Office as intermediary agent.

In our study we analyze the applications submitted in Békés County for the subsidies announced in the Rural Development Program's 2014-2020 cycle *VP-2-4.1.3.2.-16, entitled Subsidy for landscaping modernization, plantation establishment with the development of an irrigation option*, as well as *VP2.-4.1.4-16 entitled Subsidy for the development of agricultural water management sector*. We present the number of submitted applications for the tenders, their target areas, the tender amounts, the range of applicants, the size of the affected farmlands as well as the current situation in the approval of applications. In the analysis we also present the typical mistakes made by applicants in the tender process.

RESOULTS

For the tender announcement VP2.-4.1.4-16 entitled Subsidy for the development of agricultural water management sector, a total of 48 applications were submit-

Table 3: VP2.-4.1.4-16 The development of agricultural water management branch

status of application	applicaton (pieces)	support value (HUF)	farmer (pieces)	private entrepreneur (pieses)	economic company (pieces)	co-operative (pieces)
supported	21	778 219 541	9	4	8	0
rejected	20	417 657 757	7	7	5	1
decommitted	3	182 589 544	1	0	2	0
suspended	4	34 687 427	2	2	0	0
total application	48	1 798 119 490	19	13	15	1

ted in Békés County, in the amount of nearly HUF 1.8 billion. Of these 21 applications were approved, 20 applications were rejected and in the case of 4 application the approval process is still ongoing (Table 3).
The distribution of the applications according to economic actors is also significant (Table 4). The number of primary producers is high, the number of private businesses is lower. However, the former undertake lower amounts than business associations. In the case of approved applications the approved subsidy amount is somewhat lower than the requested amount.
Among the principal reasons for the rejection of applications in the case of several clients was that the quantity condition of body of water affected by the irrigation development was qualified lower than 'good'. It also happened that the applicant failed submit the water management permit even after a request of remedying this deficiency. It also happened that the clients had no settled ownership status regarding the properties affected by the development, the right of use was not certified, which the client failed to certify even after a request of remedying this deficiency. It occurred that the applicant failed to reach the minimally required agricultural activity revenue in the last business year (EUR 6,000), or his agricultural activity revenue did not reach the 50% of total revenue required by the tender announcement. The investment would have been useful for several agricultural producers, but the application was submitted in a consortium form.

For the tender announcement VP-2-4.1.3.2.-16, entitled Subsidy for landscaping modernization, plantation establishment with the development of an irrigation option, a total of 23 applications were submitted in Békés County, in the amount of nearly HUF 300 million. Of these 8 applications were approved, 6 applications were rejected, 8 were withdrawn by the applicants and 1 is currently in suspended status (Table 5).
The overwhelming majority of approved applicants are in primary producer status and primary producers undertook a significant portion of the requested funds as well. The land areas affected by the developments are plantations in excess of 47 hectares. In the case of approved applications the approved subsidy amount is somewhat lower than the requested amount (Table 6).
The rejections occurred because of the following 'typical' mistakes. It happened that the applicant couldn't fulfil the minimal requirements of the plantation type specified in the application. Some applications were submitted where based on the lease agreements it was uncertain if the property's use would be permitted for the entire period of the development project. It was also a reason for rejection if the submitted plantation development plan failed to contain the soil protection, or the irrigation and soil protection plan, or the client in his application failed to include the certifying document regarding the fulfilment of the minimal requirement system of the plantation type specified in the application.

Table 4: The dismolition of the supported applications in detail

category	supported (pieces)	applicationed value (HUF)	supported value (HUF)
farmer	9	107 889 072	107 748 192
private entrepreneur	4	228 005 429	226 402 422
economic company	8	442 325 040	437 284 721
total	21	778 219 541	771 435 335

Table 5: VP-2-4.1.3.2.-16 The modernisation of a nursery - onto the support of plantation setup with the opportunity of the forming of watering

status of application	applicaton (pieces)	applicationed value (HUF)	farmer (peces)	private entrepreneur (pieses)	co-operative (pieces)
supported	8	10 627 689	5	2	1
rejected	6	76 290 161	4	1	1
decommitted	8	200 900 310	6	0	2
suspended	1	3 298 138	1	0	0
total application	23	291 116 298	16	3	4

Table 6: The dismolition of the supported applications in detail

ügyfél kategória	supported (pieces)	applicationed value (HUF)	supported value (HUF)	area (ha)
farmer	5	94 041 835	93 920 706	30,87
private entrepreneur	2	7 552 739	6 264 041	11,97
economic company	1	4 682 115	4 685 246	4,39
total	8	106 276 689	104 869 993	47,23

CONCLUSIONS

A significant number of clients submitted applications for the 2 tenders announced in the 2014-2020 cycle of the Common Agricultural Policy (CAP) the Rural Development Program. There were a large number of rejections, but these all happened as a result of objective factors. In the case of both tender types the number of withdrawals was also high. At the same time, the subsidized and approved investment projects can considerably contribute to the agricultural performance of the County.

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APICULTURE SUPPORT PAYMENTS AND THEIR CHARACTERISTICS IN BÉKÉS COUNTY

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ABSTRACT

Due to its outstanding agricultural conditions, several branches are operated successfully in Hungary. The existence of branches representing high added value is of key importance as well. Apiculture activities are also highly valuated. Honey from Hungary has an excellent, world-class quality. During the research the supports and opportunities provided by the Commission and the State available for beekeepers are studied. Based on the data received from the Government Office of Békés County, the development of the number of apiaries registered in Békés County and the grants and supports awarded have been examined. It has been stated that only a part of apiaries claim for supports and only for some particular measures. It can be claimed that in terms of making support resources known, there are opportunities to expand, improve Hungarian apiaries and increase national frames.

Keywords: honey, apiculture, agricultural support, Common Agricultural Policy

INTODUCTION

Due to its outstanding agricultural conditions, several activities and branches can be found in the agrarian sector in Hungary. Besides the classical branches of plant production, livestock farming and other conventional types of agrarian activities, apiculture with a long-standing tradition is also of particular importance. When looking back into the history of apiculture, from the initial production of beeswax and pastry with honey, we have experienced a large-scale development by nowadays even to bees kept in hives with frames in modern equipment. Apiculture in Hungary is characterised by an excellent natural environment, the diversity of producing conditions and yields and the territorial fragmentation of producers and merchants. As honey production in the world is concerned, Hungary is at the forefront, our exporting activity is covered by roughly three fourths of the honey produced on national level.

The EU support system does have programmes including apiculture as well, however the real significant aid nowadays is provided by national grants and supports. The current year, the field of apiculture receives special attention in Hungary, the year of 2019 has been designated as the year of pollinators. It is targeted to make the apicultural branch competitive and increase health conditions of existing bee census therefore the Ministry of Agriculture has developed a new support construction. Apiaries can receive several non-refundable types of aid or grant within the Hungarian Apicultural National Programme.

Even the Hungarian conquerors knew the basics of apiculture, its significance used to be larger than today because they made fundamental products such as beeswax, pastry and dough made with honey or mead. Production and its 'sales industry' started to decrease in the 18th century because new products such as animal fat, sugar and lighting with oil became popular as well as taxes on apiculture increased. Mátyás, Bél (1729) mentions a beekeeping technology from the 18th century, which used willow twigs formed in a skep (Figure 1.).

The first professional work on apiculture in Hungarian language, János Gedde's 'Angliai méheskert' (Bee Garden from England) was issued in 1795. From that time onwards, practical and professional workbooks were being published in large numbers, the system of keepers for moving was established, and the first interest representative groups were born as well (Shareholding Association of Beekeepers in Magyaróvár in 1861). The modern hives with a frame and

Figure 1: 18th century beehives (skeps)

movable panels gave a new basis for apiculture, it had its renaissance all over the world (Nagy 2007).

To provide regulations on the market, the Treaty of Rome signed in Paris on 25th March 1957 declared the introduction of a common politics in the field of agriculture, which covered agriculture as well as commercial activities with agricultural products. The Common Agricultural Policy (CAP) was for a long time the exclusive community politics that directly influenced the situation of rural areas. Its objectives were the followings: to increase agricultural productivity by enhancing technological advancement, rationalising production and using productivity factors, especially labour force, to the greatest extent. Further aims included ensuring proper living standards for farmers, increasing their revenue, stabilising agricultural markets, ensuring food supply and satisfying customer demands. To realise them, according to the Treaty, one or more orientation and warranty fund can be created. The council of EEC made a decision on setting up the European Agricultural Guidance and Guarantee Fund (EAGGF) in 1962 to finance agrarian politics measures. It had two large parts, of which one was linked with market and agricultural supports, the other one focused on restructuring the agrarian system (Hard 2015).

To reach the set aims, the first task was to isolate agricultural market from world market. For that, prices of high profit content were necessary to create, which highly exceeded world market prices. A system of intervention was launched to ensure purchasing unsellable products, extremely high duties were set up on agricultural products to prevent internal market. With the high prices set and stable market conditions, production was given a boost thus resulting in a high-level self-sufficiency in the 70s. Production volumes and farmers' revenue increased, which resulted in compiling large stocks. Simultaneously, another weakness of CAP appeared, which caused problems on international level and contributed to distorting the world market of agricultural products. The system in such a form existed until 1992 when CAP was reviewed and new reforms were launched. During the first reform prices were frozen, quantities were limited and the set-aside schemes were compensated. The demand for a subsequent reform was defined in the Agenda 2000 programme, according to which it would be needed to reduce prices, increase the competitiveness of the agricultural sector, reinforce the European agricultural model built on family farming and award grant and supports in a correct manner. At the period of interim reviewing for CAP, it was demanded to launch new reforms. The uniform farming support system, the application of the compulsory cross-compliance, modulation, financial discipline were introduced, while the second pillar of CAP was reinforced and its market policy pillar was revised. 2 new funds were created on 1st January 2007, the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD). The EAGF is aimed at providing finances for market measures, while EAFRD was established to finance rural development programmes (Kiss 2008).

In Hungary, agriculture has always been in the focus, almost the entire area of Békés County is cultivated as agricultural lands. One of its branches having products of excellent quality is apiculture. Its primary aim is to manufacture honey and products made from it (propolis, royal jelly, pollen, etc.), while pollination – the inevitable process for agriculture – and sustaining ecological balance are of equal importance (KHS) as well. Our most significant bee pasture is acacia in a territory of an approximately 450 thousand hectares, the second one is sunflower with 600 thousand hectares. As regards both fields, as compared to previous years extremely good results were born in 2017, approximately 25 thousand tons of honey were produced. Nearly two thirds of honey manufactured in Hungary is used as a basic ingredient and transported for export purposes from the country in barrels of 300 kilos, the remaining 7-8 thousand tons of honey is then sold on national level. The largest markets of export are Italy, France and Germany. The low level (0,7 kg/person/year) of consuming honey is in contrast with our production, in which we are major powers. 10% of honey production on EU level is provided by Hungary, and the so called bee population (bee colonies/square kilometres) is the highest in our country not only within the EU but in the world as well (NCA 2017).

According to a study conducted in 2000, there was an average of 46 bee colonies for each beekeeper in Hungary. As compared to the national average, the largest difference tended to be in the southern great plain region including an average size of 58 bee colonies. Although the beekeepers were the largest in number in the northern great plain region, the southern great plain region was the first as regards the size of bee colonies (Nagy 2007).

MATERIAL AND METHODS

In my research, I am studying apiculture supports. I have made comparative analyses based on the data received from the Government Office of Békés County. When making the analyses, I have compared the data available on claims for supports with the number of apiaries registered. I would like to highlight in what proportion beekeepers in Békés county submit and use claims for supports. Therefore, I have examined the eligible titles for supports, the number of applicants and the grant amounts awarded within the Hungarian Apiculture Programme. I have also touched upon the claims of de minimis aid to be provided for purchasing apiculture related vehicles.

RESULTS

In Hungary, traditionally small scale (hobby) apiaries are most widespread, however the proportion of professional apiaries has become 3,6% by today that is 17,2% of Hungary's

bee population. As regards the period of 2014-2018, it can be claimed that the number of apiaries having breeding code was the highest in 2015 when 1.367 apiaries were considered as registered ones (Table 1). That number was reducing in the subsequent years; last year it was 1.306 apiaries registered in the system. The number of bee colonies (beehives) tended to increase for the same period until 2016 – showing the highest number of bee colonies with a peak value of 68.303 registered ones – as opposed to the decreasing number of apiaries. According to the latter data, less beekeepers had more bee colonies. In the last 2 years however the number of beehives decreased, which meant 65.834 bee colonies in 2018. A general process of dying and weather anomalies can cause decrease but the exact reasons for that have not even been identified by experts. It is important to take care of the bee population because bees are essential for Hungarian agriculture as regards pollination.

Table 1: Number of bee colonies in 2014-2018 (Source: Government Office of Békés County)

Year	Number of bee colonies examined	Number of apiaries having breeding code	Number of persons in charge of examining bee health
2014	62 524	1 290	59
2015	68 236	1 367	60
2016	68 303	1 356	58
2017	67 769	1 346	60
2018	65 834	1 306	62

The support defined by Regulation 4/2014. (I.27.) issued by the Ministry of Rural Development can be claimed for by beekeepers who operate any vehicle carrying equipment related to beekeeping or a moving beekeeping house during the period of 1st March and 31st October for the current year. Applications can be submitted for grants supporting the purchase of vehicles carrying equipment related to beekeeping or moving beekeeping house and their maintenance. Compared to the year 2014, for the year 2017 the payments doubled. Applicants submitting claims was the highest in number last year with 50 clients, which decreased to 17, more than half the previous amount by 2019 (Table 2).

Table 2: Tendency of calims for purchasing vehicles of beekeeping between 2014-2019 (Source: Government Office of Békés County)

4/2014. (I.27.) Regulation of MRD – De minimis operation support for vehicles of beekeeping		
Year	Amount (HUF)	Number of clients (ppl)
2014	2 280 214	29
2015	4 074 343	38
2016	4 675 370	44
2017	5 953 092	49
2018	5 595 271	50
2019	1 819 550	17

The Regulation of 1308/2013/EU of the EU Parliament and Council on creating the common organisation of agricultural markets, and repealing former council regulations of 922/72/EEC, 234/79/EC, 1037/2001/EC and 1234/2007/EC; - provides that member states are allowed to develop national programmes of three years related to apiculture to improve general conditions of manufacturing and selling/marketing products of apiculture. Referring to that, Hungary created its own National Apiculture Programme. As regards the period of 2013-2016 it can be claimed that within the programme supports were used at almost maximum level, it was definitely successful. The opportunities provided by the programme was used in 98,76% in 2013/2014, in 99,51% in 2014/2015 (National Apiculture Programme – Ministry of Agriculture).

According to the Regulation of 4/2017 (I. 23.) issued by the Ministry Agriculture, which provides rules on using supports run by the central budget within the period of 2016-2019 based on the National Apiculture Programme in co-financing with the European Agricultural Guarantee Fund, each beekeeping farmer (applicant) being a member of the Hungarian National Beekeepers' Association (HNBA) is entitled to claim for support.

The supports mentioned above can be used for the above activities included in Table 2. While examining the three measures attracting the largest interest the followings can be claimed.

The support claimed and used in the largest proportion was 'Protection against varroa mites with medicines', for which 6.710 claims had been submitted that included 363 applications from Békés county. On county level that means an awarded grant amount of 42 million HUF, which covers more than half of the total grants awarded in relation to all the measures. The subsequent popular type of support was 'Supporting the purchase of new equipment and tools for moving bees' with 1.566 claims submitted, which means an awarded grant amount of more than 10 million HUF. The next group of support attracting the largest interest in the third place was 'Supporting the purchase of new equipment for extracting and packing honey and apicultural products and for storing comb' in the period of 2017/2018. In terms of grant amount awarded, it meant more than 9 million HUF for the county. As regards the other measures and actions, supports with more modest amounts were claimed for and paid (Table 3).

CONCLUSIONS

As the supports provided by the National Apiculture Programme in Hungary within the implementation period, it can be claimed on the whole that the supports aroused great interest among beekeepers. The proportion of their claim and use was nearly 100%. However, in the implementation period of 2017/2018, a total rate of 40% of the 1.300 apiaries having breeding code used the supports.

Table 3: Implementation period 2017-2018 of the Hungarian National Apiculture Programme (Source: Government Office of Békés County)

National Apiculture Programme (Hungary)	Implementation period of 2017/2018			
Definition of the activity	Number of applicants national data (ppl)	Awarded grant national data (HUF)	Number of applicants Data of Békés county (ppl)	Awarded grant Data of Békés county (HUF)
Supporting the visits of demonstration apiaries	51	20 658 122	3	1 404 482
Supporting the creation and operation of phenological and meteorological bee observation networks	1	4 082 579	0	0
Supporting the creation of identifying systems for beehives and beekeeping equipment and its maintenance, supporting the operation of the beehive identifying system within provisions and the operators' activity	11	705 056	0	0
Supporting trainings enhancing the recognition of bee diseases and knowledge transfer on protection	6	1 175 566	1	207 307
Supporting bee health and environmental impact monitoring examinations	7	26 319 203	0	0
Supporting the national coordination of apiculture trainings, and the collection and dissemination of bee health studies	9	9 670 689	0	0
Supporting laboratories analysing apicultural products	1	5 394 735	0	0
Supporting the purchase of new equipment for extracting and packing honey and apicultural products and for storing comb	*1 139*	*122 606 327*	*74*	*9 251 852*
Supporting organising works of and participation in a regional event, congress, international event, conference, exhibition, study visits, and the transfer of theoretical knowledge	396	72 492 975	13	2 324 405
Supporting the operation of the network of professional consultants	12	126 849 040	0	0
Supporting the purchase of new equipment and tools for moving bees	1 566	135 706 926	101	10 589 582
Supporting alternative protecting measures against varroa mites – purchase of a hygienic bottom planks	82	5 340 782	8	813 000
Supporting miscellaneous applied research, professional studies and degree works	1	38 000 000	0	0
Protection against varroa mites with medicines	6 710	840 709 546	363	42 802 678
Total amount	**9 992**	**1 409 711 546**	**563**	**67 393 306**

Of them, protection against varroa mites with medicines is the most popular type. In terms of support provided for operating vehicles related to beekeeping, it can be said that as compared to the 6 million HUF grant amount paid for the implementation period of 2017 and 2018, this year it has hardly reached 2 million HUF.

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FUNDOKLIA-VALLEY: A CASE STUDY ON THE SOCIAL DEMANDS FOR NATURE TRAILS AND THEIR DEVELOPMENT

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ABSTRACT

Nature trails in protected areas are valuable tools of environmental education and awareness raising. However, the public demands on the facilities related to these trails are not well-understood. Present study attempts to assess the need and priorities of the visitors based on an online survey about the development of a nature trail in Central Hungary. Results conclude that these trails are both important scenarios of education and recreation and there is a strong public need on the maintenance and development of the good condition of these "open-air classrooms".

Keywords: ecotourism, nature trails, environmental education, public survey, Fundoklia-valley

INTRODUCTION

Nature trails situated in protected areas can be considered as open-air classrooms exhibiting the natural and cultural values of the region (Kiss 1999). Visitors of the trails acquiring knowledge interactively (Kiss 2007), thus these are to be considered as one of the most efficient and picturesque tools of environmental education in the field (Kollarics 2013). Besides their educational value trails have entertainment and value preserving role (Kiss 2007). Nature trails became more and more popular in the past decades and their number increased: in 2015 there were 466 trails in Hungary (Kollarics 2015).
To make a nature trail attractive to visitors, multiple aspects should be considered during the phase of planning and implementing (Fodor & Révész 2019). The most common problems are the inaccessibility of the trail and the bad quality of routes (Kollarics 2006), bad interpretability of directional signs, the badly thematized, monotone interpretation panels (Bajor-Lampert 2014) and the absence of resting areas or waste bins (Király 2010). Furthermore, it is challenging to demonstrate the values of the area to a broad audience without the endangerment of their preserving (Selmeczi-Kovács 2004).

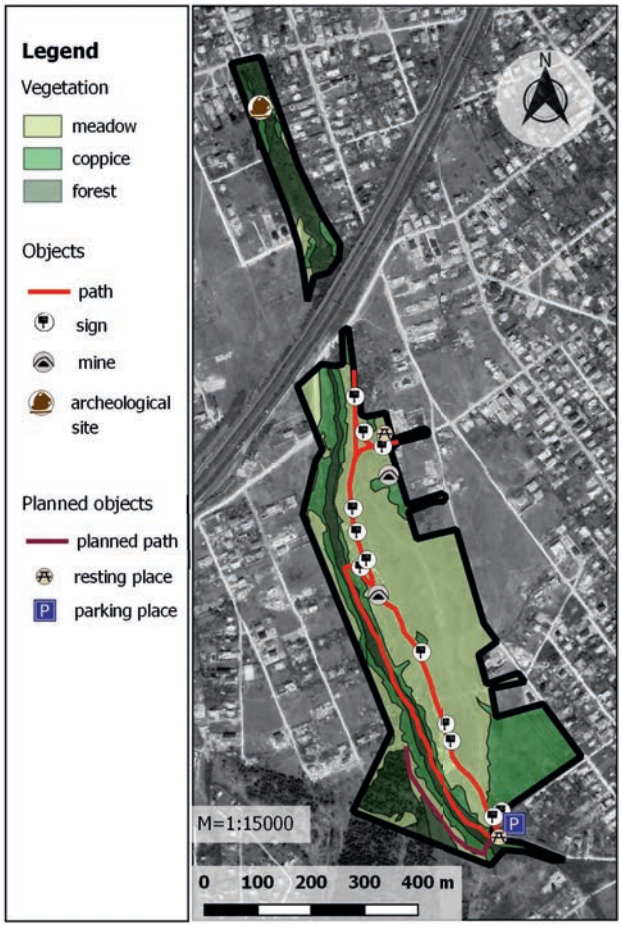

Figure 1: The map of the Fundoklia-valley with the educational trial

The Fundoklia-valley is situated on the Tétény Plateau (Tétényi-fennsík) (Dövényi 2010) near the town of Érd (Pest county, Hungary) and it is a characteristic representative of the Hungarian nature trails (Figure 1). The valley pre-

Figure 2: *Adonis vernalis* is one of the protected plants of the Fundoklia-valley

sents plenty of natural assets (Halász 2009). The national protected area of Fundoklia-valley is inhabited by twelve different habitat types resulted by the various formations of the Sarmatian limestone and microclimatic features of the Aszóvölgy (Halász et al. 2011, Balázs 1989). About 15% of the representatives of the Hungarian flora can be found at this 21 hectare area (Figure 2), for example *Seseli leucospermum*, *Dianthus plumarius* subsp. *regis-stephani* (Kállayné & Szerényi 2016). Its fauna consists of species like *Carabus hungaricus*, *Saga pedo* or *Ablepharus kitaibelii*, but further novelties are reported from time to time (Gergely et al. 2008). Furthermore, the valley has a cultural historical importance because of hunting settlement of Neanderthal hominids unearthed in 1960's (Gáboryné 1991) and the remnants of a deep-excavated limestone mine (Kubassek 2000). The purpose of the facility is the demonstration of these values and curiosities in a 1.7 kilometres long trail consisting of 12 stations (Kállayné 2009).

Figure 3: Damaged interpretation panel

The nature trail was created in 2009 (Ádám 2009). Throughout the years its stairs and railings were damaged, the interpretation panels became worn and road sings were gone missing (Figure 3). In 2019, a nature conservation management plan was completed which envisages the development of the Fundoklia trail including the restoration of its existing facilities and the construction of new resting areas, environment friendly parking places, rain shelters, open-air classroom and bicycle route. Furthermore, an archaeological showroom and mine pit are planned (Gergely et al. 2019).

The aim of this study is to discuss the social demands for the development of nature trails in Hungary exemplifying the development plans of Fundoklia-valley trail. The study was made on behalf of the municipality of Érd.

MATERIALS AND METHODS

The assessment of social demands was carried out via questionnaire published on online surfaces answered by the citizens of Érd exclusively. The survey consisted of 17 questions, most of them were simple choice questions but contained 3 explanatory questions too. Questions 1-10 were aimed to assess the habits and opinions of the local citizens regarding the trail. Questions 1-9 was simple choice questions where the respondents could rate various aspects of the trail on a 1-5 scale. Question 10 was an explanatory one where opinion could be worded. Questions 11-17 aimed to assess the necessity of the developments planned and besides the evaluation of the planned actions it was possible to add further ideas. The questionnaire was active for a 30-days period.

The data acquired was analysed and interpreted in form of charts. The answers of the explanatory questions were searched for keywords and a well-interpretable pattern was found which allowed the analysis via charts.

The full questionnaire can be found on the following link:
https://docs.google.com/forms/d/e/1FAIpQLSf1bOftbV4yrCll8ubC7MYK4BOewKkLjC3Ps6P7egRaqPARig/viewform?usp=sf_link

RESULTS

90 respondents answered the questionnaire. The majority of the repliers, 62%, was in the 36-64 years cohort. Proportion of people aged 19-35 years was 20%. Proportion of pensioners and children was not significant.

80% of the respondents visit occasionally the trail, mostly with family members or friends. The half of them arrives by car, only 9% rides a bicycle during the visit.

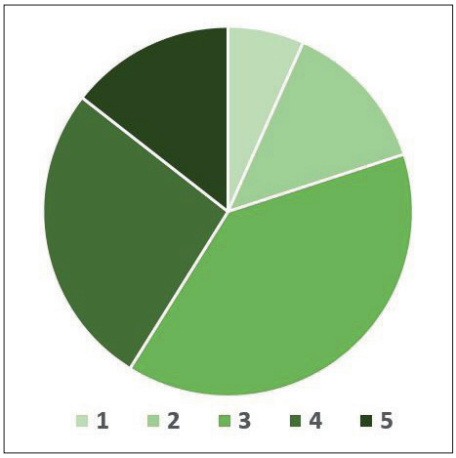

Figure 4: Ratios of repliers' opinion about the condition of facilities on the 1-5 scale

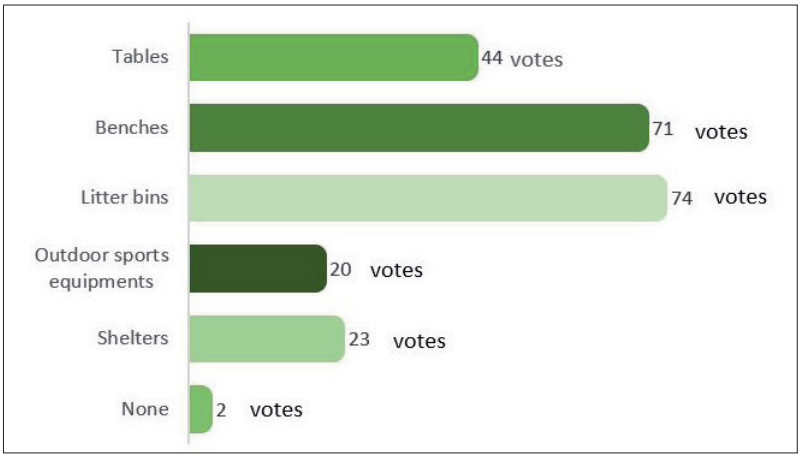

Figure 5: Importance of each existing infrastructural element for the public

75% of the repliers arrives with recreational purpose, the second most popular activity is dog walking. Results showed that 82% read the contents of the interpretation panels. Opinions regarding the condition of the facilities of the trail was varying: majority of the respondents gave 3 points out of 5 and the proportion of positive responses were higher than the proportion of negative ones (Figure 4). 66% completed the optional explanatory question on the reasons of the discontentment. The answers showed that discontent is mostly influenced by the condition of the interpretation panels and the presence of illegally disposed waste.

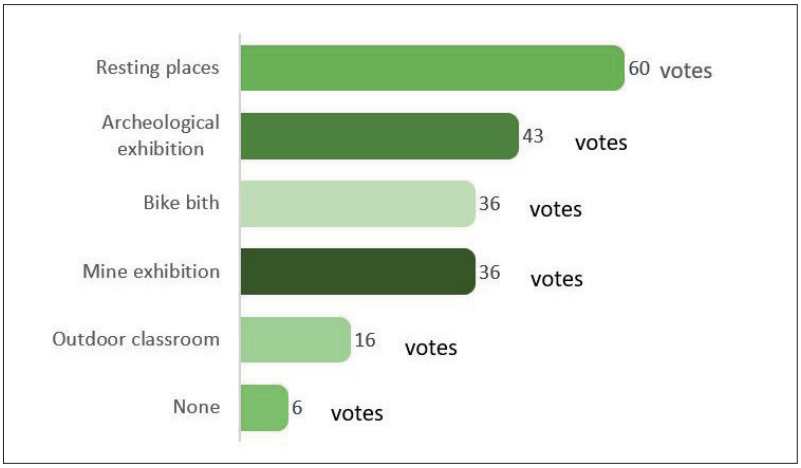

Figure 6: The public demand on the development of new facilities

Regarding the development plans, 62% of the respondents support the idea of the construction of parking places. This proportion is higher than the number of the repliers who claimed to reach the trail with car. Among the planned new facilities benches and waste bins were the most demanded ones (71 and 74%). Tables, rain shelters and outdoor sport equipments were not found necessary (Figure 5). The bicycle route, built mine-pit and outdoor educational space were slightly supported (Figure 6). Individual suggestions were given by only a few respondents; thus, this question was not evaluable. However, restoration and preservation of facilities and security of the infrastructure was mentioned.

DISCUSSION

The 90 responses received represents well the habits, opinions and demands of the visitors. A positive aspect of the responses regarding the habits was that visitors mostly read the interpretation panels. This fact concludes that the trail fulfils its purpose as means of environmental educational facility.

Results show that in course of the development of the trail restoration and expansion of infrastructure should be prioritized. Renewal of routes and stairs along with the construction of benches and resting areas are basic needs of the visitors. Furthermore, the responses justify the need for the construction of parking area. Besides these, the aesthetics, the orderly environment and cleanliness of the trail are crucial aspects too. This demand can be fulfilled with the regular maintenance of the facilities and elimination of illegal waste disposal.

Among the facilities of interpretation and education the archaeological showroom was highly supported; thus, its construction is corroborated. Furthermore, the public demand justifies the construction of renewed route with more stations and interpretation panels. Other, new recreational facilities (e.g. bicycle route or outdoor sport equipment) was not found to be necessary, so their construction is not justified.

The survey can be considered as successful and it showed the public need on the planned development and restoration. Furthermore, it is to be concluded that there is

strong public demand for the educational aspect of informative, well-structured and awareness raising nature trails.

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