European Research Studies Journal
Volume XXVIII, Issue 1, 2025

pp. 918-948

Transformation of a Beekeeping Farm as a Unique Family Business Model: Insights from Poland

Submitted 12/02/25, 1st revision 27/02/25, 2nd revision 13/03/25, accepted 30/03/25

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Abstract:

Purpose: *The article's main goal is to assess the development potential of beekeeping farms and identify the main barriers accompanying it in Polish zonal conditions.*
Design/Methodology/Approach: *In Poland, there is a clear regional differentiation of individual components characterizing the beekeeping sector - the number of bee colonies, obtained bee products, or people running apiaries is growing. Visible changes also appeared over the years under study (2015-2020) in terms of honey yield and price, species diversity of bee products, and the periods of honey bee collection. Among most surveyed beekeepers, recent years have resulted in implementing many innovative solutions in methods and production processes, products offered, forms, and sales channels.*
Findings: *Research on bee farms in the years 2015–2020 indicates a systematic increase in the number of bees and a broadening of beekeeping practices, which shows a growing interest in the traditional craft of beekeeping. The modernisation of production methods, while maintaining traditional principles, has contributed to the increase in the efficiency of apiaries and the diversification of bee products on offer. Adaptation to changing climatic and market conditions, including through the modification of harvesting periods and the expansion of sales channels, confirms the sector's flexibility. Despite the organisational, financial and demographic barriers, the prospects for the development of beekeeping remain optimistic. A key element of further development is integrated institutional support, which, together with the cultivation of family traditions, enables the harmonious combination of experience with modern solutions.*
Practical Implications: *The study demonstrates a significant increase in the average number of bee colonies per apiary, underscoring the need for enhanced management practices that can effectively handle rapid expansion. Diversification of bee products beyond traditional honey production opens new avenues for value addition and market expansion, thereby improving the economic resilience of family-run apiaries. Legislative changes and evolving consumer preferences are reshaping sales channels, which necessitates a strategic integration of both conventional and digital marketing approaches. Finally, these practical*

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implications highlight the critical role of targeted advisory services and supportive policies in ensuring the long-term sustainability and profitability of Polish apiary farms.
Originality/Value: *The motives guiding the modern apiary management process are mainly hobby-related, resulting from the continuation of multi-generational family traditions and less frequently from economic reasons.*

Keywords: *Family business, Polish apiaries, develompent potencial, beekeeping farms, development barriers, apiary management.*

JEL codes: *Q12, Q18, Q56, O12, L26.*

Paper type: *Research article.*

1. Introduction

The importance of family businesses in the global economy is undeniable. The authors of individual analyzes give different estimates. For example, Żukowska and Pindelski (2012) estimate that 90% of all businesses worldwide are family businesses. Ford, Porsche, Auchan, Leroy Merlin, Carrefour, and Bonduelle are just some examples of such companies. In Western Europe, 44% of large business entities have the form of family enterprises (Faccio and Lang, 2002).

On the other hand, Wach (2014) states that on average, in the EU, about 71% of all enterprises can be considered family businesses - with the highest number of at least 90% in Cyprus, Estonia, Spain, Germany, and Italy, and the lowest 35% in Latvia, Lithuania, and Poland. Knowledge about family businesses in Poland is limited. The entrepreneurs themselves do not identify themselves as running family businesses.

This happens, e.g., due to the lack of a universally applicable definition of a family business. Therefore, we do not know precisely how many companies fall into this category. However, it is estimated that in Poland, family businesses constituted from 35% (cautious estimates) to approx. 70-80% (optimistic estimates) of the total number of enterprises (Kowalewska, 2009; Lewandowska *et al.*, 2019; Central Statistical Office, 2022).

One of the sectors dominated by the form of a family business is agriculture and, more specifically, beekeeping. Although its share is small compared to other branches of agriculture, it actually plays a crucial role in achieving better quality and higher quantitative yields of various plants.

In addition to the pollinating function, we owe bees the production of valuable products, such as honey, wax, pollen, and royal jelly, and in recent years, apitherapy,

i.e., inhalation with air from the hive for people with health problems, has been gaining popularity. It is impossible to list all the advantages of the honey bee - so small and important for many world economies.

Nevertheless, as in the case of any economic activity, people running family apiaries, in addition to ecological and social motives, must consider the economic motives of the business. As emphasized by Wilde (2012), a beekeeper in Poland, in order to run his beekeeping farm profitably, must not only intensify beekeeping production but, above all, increase the number of beehives. In Polish conditions, with effective marketing of beekeeping products, obtaining a sufficient income from an apiary with 140-180 trunks is possible.

Unfortunately, statistics show that the average beekeeping farm in Poland is much smaller and has 23 bee colonies, so there is still a long way to reach this level. As the socio-economic analysis of Popovych (2019) shows, a beekeeping farm, in terms of form and content, corresponds to the definition of a family farm because it is based on the personal involvement in the activities of the beekeeper and his family members and is also capable of cost optimization and the proper organization works to generate an adequate income to support a household.

The functioning of family apiaries is a naturally defined process. It has a significant growth potential with a more detailed knowledge of the specifics of functioning, systematic expansion of the honeybee base, and establishing long-term relationships with farmers or fruit growers.

In view of the above, the article's main objective is to assess the development potential of Polish beekeeping farms and identify the main barriers accompanying it. The study uses a query of the literature on family businesses, an analysis of the existing data in the regional comparison of individual features specific to the Polish beekeeping sector, and the results of an empirical study conducted on a representative sample of owners of Polish apiaries.

2. Family Enterprises - Theoretical Background

The problem of defining family businesses was recognized in the 1960s and has gained a new perspective over the years (Więcek-Janka, 2013). The family enterprise has many definitions. It is, therefore, difficult to reach a consensus on how best to present a generally accepted definition. Nevertheless, like points Hernandez-Perlinesa et al. (2020), two characteristics are common to most definitions of a family business:

- ownership of capital. In family businesses, most shares are owned by one or more family members.
- management. In family businesses, several family members participate in the management of the business.

Table 1. *The chronological arrangement of family enterprises concepts*

YEAR	AUTHOR	THE CONCEPT OF THE FAMILY BUSINESS
1964	Donnelley	When a close relationship is identified between at least two generations of the family and the business, and when this link has both an impact on the business and the family's objectives and activities.
1975	Bernard	A business that is in practice run by members of one family.
1976	Barnes, Hershon	Controlled ownership remains in the hands of one person or several people from one family.
1982	Alcorn	A profit-making enterprise that is based on ownership or company rights. If part of the shares are publicly owned, the family is also obliged to carry out this activity.
1983	Davis	They make their policies and directions strongly dependent on the influence of one or more family members. This influence is obtained through arguments of ownership or sometimes direct participation of family members in the management of the business.
1985	Rosenblatt et al.	Any company with a majority shareholding ownership or control is in the hands of a single family and where two or more family members are or were once directly involved in the business.
1985	Davis, Targrun	A company in which two or more valid family members influence the direction of the company (quoted in Rothstern, 1992)
1986	Stern	A company that is owned by one or two families and is run by them.
1986	Pratt, Davis	A company in which one or more essential family members exert influence on the direction of the company by using blood ties, managerial positions or ownership rights.
1987	Babicky	It is a type of small enterprise established by one or more people who had an idea, worked hard to develop it and grew it, usually with a small amount of capital and keeping ownership (or most of it) in their hands.
1988	Lansburg, Perrow, Rogolsky	An enterprise in which family members have legally sanctioned control of property.
1989	Handler	An organisation in which critical business decisions and leadership transfer plans are influenced by family members who function in the company as its managers or sit on the board of directors (p. 262)
1990	Leach et al.	A company in which families and/or a group of families control more than 50% of the shares carrying voting rights, and/or a significant proportion of top management comes from one family.
1990	Dreux	It is a company that is run by one or more families who have some degree of influence over the management of the organisation, and this influence is sufficient to control the

		company's activities continuously.
1991	Lyman	All ownership must remain with the family, at least one of the owners must be employed in the business, and another member of the family must be employed in the business or assist in the business, even if he or she will not be officially employed by the business.
1991	Gallo, Sveen	A company in which one family owns the majority of shares and ultimately controls the business.
1991	Donckels, Frohlich	If family members own at least 60% of shares.
1992	Holland, Oliver	An enterprise in which ownership decisions or management shall be taken into account relationships with family members or relatives.
1993	Churchill, Hatten	It is what we usually call a family business. Here, it occurs or is expected that the young will take over from the senior management.
1994	Carsrud	The ownership and operation of the business is dominated by a group of people who are "emotionally close myself".
1998	Westhead, Cowling	A family business is one in which more than 50% of the shares are held by members of the most prominent single-family related by blood or marriage, and the company itself is perceived by its chairman or director as family-owned.
2003	Anderson, Reeb	Companies in which the founder or another family member is a manager, director or individual (group) own a significant shareholding.
2005	Venter et al.	A business owned by members of the same family who pursue an informal business vision through it and have the intention of passing the business on to the next generation or the business has already been passed on to the current owners by a previous generation.
2006	Bernard, Schoar	Family businesses are characterised by the concentration of ownership, control and the retention by family members of key management positions even after the founders of the companies withdrew.
2009	Sulkowski, Marjaski	An entity with a family structure in which the family exercises strategic control, its members participate in the management, and more than one generation is involved in the operation of the company

Source: *Żukowska and Pindelski, 2012; O'Boyle et al., 2013; Więcek-Janka, 2013.*

Sułkowski (2004) divides family business by core values and creates four groups:

1. Companies are creating family traditions. These are enterprises focusing permanently on one domain of activity and not changing this domain. Of the 40 companies studied by Sułkowski, 50% are in this category.
2. Family profit-oriented companies are "entities usually belonging to the SME group, which do not show attachment to one field of activity, but make domain changes guided by the profitability criterion of a particular sector."

3. Family corporations. The 'family corporations' group includes medium-sized and large family businesses.
4. Conglomerates of family-controlled business units are usually "entities with high financial resources and high managerial competence" and represent a small percentage of family businesses.

Family businesses are characterized by specific features, which Sobiecki *et al.* (2014) include:

- the interdependence of the business and the family, which manifests itself most often in the combination of ownership and management in the hands of the family;
- family succession strategies and methods - seeking to maintain continuity of ownership;
- family organizational structure, combining the loyalty and trust of family employees with the hermetic nature of the environment;
- striving for sovereignty and independence;
- a specific arrangement of property relations;
- the close link between the management and the owner's family;
- the location of the capital of a family business in the hands of one or more families;
- shaping the external image of the family business through the system;
- family values or families;
- capital issues - the primary funding source for small and medium-sized family businesses is the owner's and family's capital. We can include elements such as the owner's savings, family savings, inheritances, assets obtained through marriage, and loans from relatives and friends;
- integration of the corporate and family spheres;
- special care for customers, suppliers, and employees, which is one of the sources of competitive advantage.

Family businesses have several common characteristics that distinguish them from non-family businesses. Among the main criteria that distinguish family businesses from other companies are, first and foremost, the family's percentage of assets, their membership of bodies in the company's administrative bodies (supervisory board, board of directors), or their membership of the top management and the involvement of several generations in strategic business decisions (Arzubiaga *et al.*, 2017; Moresova *et al.*, 2021).

An essential issue in the management of family businesses is the process of transferring 'management' and 'ownership' to the next generation, which is due to the fact that one of the most critical non-economic objectives is the sustainability of the business across generations (Ferrari, 2021). This process is referred to in the

literature as succession. It should be well prepared in advance as it is a long-term process (Pawlak, 2014).

One of the factors posing a problem in the operation of family businesses is generational differences and even conflicts (Michel *et al.,* 2011; Zhang and Liu, 2011; French *et al.,* 2018). These differences can also affect the succession process, which is why it is necessary to look for goals that unite the generations involved in the succession process. Research Więcek-Janka (2018) has shown that the main goal uniting generations X and Z, who will start the succession process in no more than a decade, is the desire to grow.

Popovych's (2019) analysis of the beekeeping farm shows that it corresponds to the definition of a family farm. Considering the socio-economic analysis, the individual apiary meets the main criteria established for a family enterprise in agriculture. According to the author, this compliance is higher than observed in daily practice, so the beekeeping farm can be considered a family agricultural enterprise (Kołtowski, 2016).

3. Beekeeping Farms in Poland - Statistical Data

The importance of honey bees in the natural environment of Poland and other countries is enormous. Nothing reflects the usefulness of bees so perfectly as complex statistical data. The more so that all the numbers listed below result from meticulous calculations of research institutes of Polish and international organizations.

One thing is sure - bees are necessary for us because they not only produce honey but also pollinate plants, and by carrying pollen, they increase the quality and quantity of crops. There are thousands of species of plants that are food for humans and animals. According to Kołtowski (2016), 90% of all food resources in the world are 82 foodstuffs of plant origin.

Furthermore, as much as 77% of these articles would never have been created if not for the pollination of plants by bees. Aizen *et al.* (2008) point out that the scale of crop production that depends on pollinators has increased by over 300% over the past five decades, significantly linking human lives to the volume and work of bees.

As statistics show, the annual value of crops received through the work of pollinators globally reaches 153 billion euros (Gallai *et al.,* 2009); in Europe, it is estimated at 15 billion euros, and in Poland alone, it amounts to 4.5 billion zlotys per year (Dytrych *et al.,* 2018). This dimension, as the data presented, best illustrates the role of bees in the environment and in shaping the future of our civilization. Figure 1 below presents the most important beekeeping statistics for Polish voivodeships.

The first indicator to be compared is the level of beekeeping, i.e., the number of bee colonies per 1 km2 of the area. The average value of this indicator for Poland was 6.4. In individual voivodeships, the degree of beekeeping varies. The most significant number of bee colonies per 1 km2 is in the Lesser Poland, Lublin Province, and Subcarpathia voivodships. The lowest level of beekeeping was recorded in the Pomerania, Masovia, and Podlasie provinces. Interestingly, Poland's total number of bee colonies exceeded 2 million in 2021.

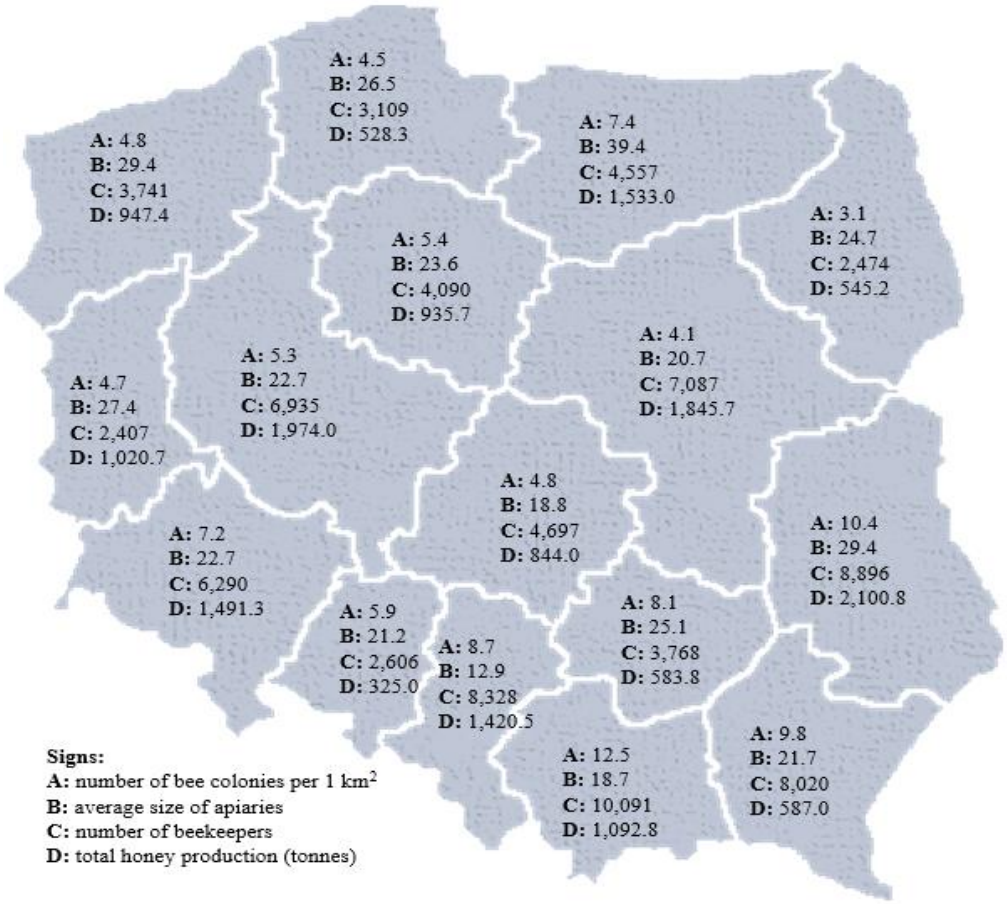
Based on national sectoral studies on beekeeping (Semkiw, 2021; Kołacz, 2021), the following types of apiaries are distinguished:

- small (amateur), in which the number of bee trunks does not exceed 20, and the activity is conducted out of passion rather than the desire to derive additional profits;
- medium-sized (backyard), in which the number of bee trunks is between 21-50, and the activity is an additional source of income for working or retired people;
- large, where the number of bee trunks is between 51-80, and the activity is more time-consuming and heterogeneous, both in terms of the location of the apiaries, the type of products obtained, and their quantity;
- entities classified in special sections of agricultural production, in which the number of bee trunks is in the range of 81-149, and the activity is, as a rule, of a specialist nature and begins to be subject to taxation; professional (commercial), in which the number of bee trunks exceeds 150, and the activity is the fundamental source of income for owners of apiaries with extensive theoretical and practical knowledge.

The average size of the Polish apiary calculated based on the data in Figure 1 is 23 bee colonies. Analyzing the size structure of voivodeships, we can see that in most of them (12 out of 16 voivodeships), medium-sized backyard apiaries dominate, and in four regions - i.e., in Silesia, Lesser Poland, Lodz Province, and Masovia - small amateur apiaries predominate. The above structure of answers is undoubtedly related to the higher level of urbanization of these four regions and the limited rural areas where an apiary farm can be run. In 2021, there were 443 professional apiaries in Poland under the care of nearly 123,000 bee colonies.

Another comparative criterion is the number of beekeepers operating in a given area. Polish statistics include only entities in the Poviat Veterinary Inspectorates list for which complete documentation is kept. The total number of beekeepers in 2021 was 87,096. The largest percentage of them run beekeeping farms in Lesser Poland (11.6%), Lublin Province (10.2%), and Silesia (9.6%). The smallest percentage (not exceeding 3% for each voivodeship) of people running apiaries in 2021 was recorded in Opole Province, Podlasie Province, and Lubusz Province. Compared to the previous year, the number of beekeepers increased by 6%.

Figure 1. *The beekeeping sector in Poland in 2021 – provincial approach*



Source: *Own study based on Semkiw (2021).*

Finally, the scale of honey production was subjected to regional comparison, considering the correction of bee colonies' losses after wintering 2020/2021 and in the beekeeping season 2021.

In the beekeeping season of 2021, domestic apiaries produced 18.4 thousand tons of honey. The largest amount of honey by share in national production was obtained in the Lublin region (11.4%), Greater Poland (10.7%), and Masovia (10.0%).

The least "liquid gold" was produced in the following voivodeships: Podlasie Province (3.0%), Pomerania (2.9%), and Opole Province (1.8%). The distinguished structure of answers is related not only to the level of beekeeping and the number of beekeepers operating in a given area but also results from the area of agricultural land located in a given voivodeship and the diversification of crops towards the broader inclusion of melliferous plants.

It is worth emphasizing here that Poland is an important link in the structure of the international honey trade. According to Semkiw (2021), in 2020, the level of imports of honey from abroad was higher than the level of exports of Polish honey by 12.5 thousand tonnes. The main direction of exports was the countries of the European Union, while most honey were purchased in Ukraine and China. Most of the honey imported from abroad remained on the domestic market. Undoubtedly, the very low supply of domestic products contributed to this.

The last aspect discussed briefly in this subchapter will be the reference to basic statistical data showing the Polish beekeeping sector's role in the EU countries' Community production. According to the latest data from the European Commission, in 2020, EU countries were the second largest honey producer after China, with a 12% share in the global production of this raw material.

A total of over 218,000 tons of honey was obtained from just over 20 million bee colonies in EU countries (EC, 2022). Poland is in the top four EU countries regarding the number of bee colonies (10% share among EU countries), giving way only to Spain, Romania, and Greece. Poland ranks even higher (2nd place behind Germany) in the number of beekeepers in EU countries, with an 11.34% share (EC, 2020a).

As a result of the national apiculture programs, which have been implemented for several years and are co-financed by the European Union, both the number of beekeepers in the EU and their hives have increased over the last five years (2017-2021) by respectively 8.62% and 22.12%. The presented data confirm the importance of Poland and the bees working here and beekeepers for the protection and flourishing of the community's natural environment. In view of the above, it seems reasonable to present the characteristics and specificity of Polish beekeeping farms in the context of their development potential.

4. Research Methodology

The empirical analysis of various aspects of the development potential of Polish beekeeping farms presented in the other part of the article is based on a fragment of research conducted in 2021-2022. The main inspiration to attempt to assess the development potential, the accompanying barriers, and the motives behind the conducted beekeeping activity in recent years were the co-author's own experience in connection with owning an apiary farm and the desire to explore individual dimensions of the development of Polish family apiaries in a broader cognitive context.

The main quantitative study, both exploratory and explanatory, was conducted on a representative sample of beekeeping farm owners in Poland. The selection of the sample for the study was purposeful. Based on the author's questionnaire, the CAWI (Computer-Assisted Web Interview) method was used to obtain the primary data.

The research tool, in the form of a questionnaire, was sent electronically to regional associations and beekeeping organizations in Poland and posted on the most important social networking sites associated with apiary owners.

Being aware that a large percentage of people running beekeeping farms is in retirement age and do not necessarily have to use a computer, some of the questionnaires were delivered personally by the authors of the research to beekeepers in a traditional paper form and courtesy of local departments of the Agency for Restructuring and Modernization of Agriculture.

The representativeness of the sample was based on the following four criteria: the location of the apiary (by voivodship), the age of the apiary owner, the form of running the apiary (individually or as a family business), and the minimum 3-year period of operation of the apiary. The size of the research sample was established by assuming that:

- in 2021, the number of beekeepers for whom full documentation is kept by Poviat Veterinary Inspectorates amounted to 87 096 (Semkiw, 2021),
- confidence level p = 0,95,
- fraction size is 0,5,
- the maximum error is 0,05.

With such criteria, the minimum sample size should be 382 entities (Kaczmarczyk, 2011). A total of 435 completed questionnaires were received, but several contained significant gaps in the answers, resulting in their rejection. Finally, the answers of 420 owners of apiary farms in Poland were thoroughly analyzed. The detailed structure of the surveyed entities is presented in Table 2.

Table 2. *Characteristics of the examined entities (n=420)*

CRITERION	PERCENTAGE SHARE (%)
Apiary location:	
Lower Silesia	2.86
Kuyavia-Pomerania	12.14
Lublin Province	3.57
Lubusz Province	2.62
Lodz Province	3.33
Lesser Poland	1.67
Masovia	35.95
Opole Province	2.86
Subcarpathia	5.00
Podlasie Province	8.81
Pomerania	0.95
Silesia	2.86
Holy Cross	1.43

Warmia-Masuria	6.90
Greater Poland	7.62
West Pomerania	1.43
Age of the apiary owner:	
18-35	24.05
36-50	33.81
51-65	26.43
Over 65	15.71
Apiary management type:	
Occasional help from family members	52.86
Regular help from family members	46.43
Help from seasonal workers	0.71
Help from permanent employees	0.00
Apiary period:	
Up to 5 years	31.43
5-15 years	36.90
16-25 years	13.57
Over 25 years	17.38
Apiary as the main source of income:	
Yes	6.18
No	91.92
Refusal to answer	1.66
Belonging to the Regional Beekeepers' Union:	
Yes	70.48
No	25.00
Refusal to answer	4.52
Nature of the main sales market:	
Shrinking	5.00
Stable	39.76
Growing	55.24
Application of innovations in the last 5 years:	
Yes	70.95
No	26.43

Source: *Own elaboration.*

The inference of the population of the surveyed owners of apiary farms in Poland, carried out using the criterion of the location of the apiary, allows us to conclude that the group of beekeepers from the Masovia Voivodship is the largest (about 36%). Next, in the data sheet we have a beekeepers from Kuyavian-Pomeranian Voivodeship, and Podlasie, Greater Poland, and Warmia-Masuria - the share of surveyed beekeepers oscillates between 7-12% of a given sample. The smallest group of respondents are beekeepers running their apiaries in Pomerania. They constitute less than 1% of respondents.

Considering the next criterion - the age of the owner of the apiary - it turns out that the age structure in three out of four groups is quite similar (24-34%). The largest

percentage of respondents are beekeepers between 36 and 50 years old, who constitute 1/3 of the sample. On the other hand, the smallest share in the surveyed population of apiary owners belongs to people in the post-productive age (i.e., over 65 years old). It should be assumed that the presented age range of respondents results from the dominant form of sharing the questionnaire in electronic form.

Looking at the management structure of the surveyed apiaries, one can see a minimal advantage of running beehives individually with occasional help from family members (about 53%), overrunning them in the form of family businesses (about 46%). Only single respondents indicated that they use seasonal workers to run the apiary. None of the surveyed beekeepers employ permanent workers to help.

According to the article's authors, the above structure of responses may result from two reasons. Firstly, the significant advantage among the respondents of people running small and medium-sized apiaries, i.e., not exceeding 50 bee trunks. Secondly, the dominant stationary type of beekeeping farms enables work organization within the place of residence or available bee resources.

The analysis in terms of the next criterion - i.e., the time of running the apiary - allows the respondents to be divided into three categories. The first, i.e., sectoral explorers, include beekeepers who have been running apiaries for no longer than five years (31.4%). The second, i.e., sectoral transformers, among which there are beekeepers with work experience with bees ranging from 5 to 25 years (50.5%). Furthermore, the third, i.e., sectoral stoics, i.e., the most experienced people who have been dealing with beekeeping for a quarter of a century (17.4%).

In addition to the criteria on which the sample's representativeness was based, another indicator was also used to characterize the respondents - the apiary as the main source of income. For the vast majority of respondents (nearly 92%), the apiary is not the main source of income. It is classified by the beekeepers as a source supplementing the home budget, which is based, as a rule, on professional work, a farm, or other economic activity not related to apiculture. However, the sample identified a percentage of beekeepers (over the 6%) who live only from running an apiary.

A large volume of legal regulations does not regulate beekeeping in Poland. It is worth noting that the owner of an apiary in a given area who introduces bee products to the market is subject to the obligation to register apiary farms with the Poviat Veterinary Inspectorate.

A slightly different situation occurs in the case of the desire to belong to the Regional Beekeepers' Union, a voluntary association of beekeepers. On the one hand, being a member of a beekeeping organization requires systematic fulfillment of reporting and activation obligations.

However, on the other hand, it allows obtaining material funding and intangible support for your apiary. For these reasons, this aspect was also distinguished in part characterizing the tested sample. Most of the respondents belong to the Regional Beekeepers' Union (70.5%), and one in four did not join this organization. Moreover, 4.5% of respondents refused to answer this question.

The largest group of surveyed beekeepers (55.2%) assesses the market on which they sell the obtained bee products in the 5-year perspective as a constantly growing market. A slightly smaller percentage of respondents define the primary sales market as a stable market (39.8%), and only 5.0% of respondents indicate that the main sales market has shrunk over the last five years.

The last analyzed criterion was the introduction of innovations in the beekeeping farm in the last five years. Extremely interesting results were obtained in this area because, given the relatively low innovativeness of Polish small business entities, which, as a rule, did not exceed 30% (Skowrońska and Tarnawa, 2022), the owners of small and medium-sized apiaries in nearly 71% declared the use of an innovative solution in the past period. The high percentage of apiary innovators in the sample is a consequence of the ubiquitous changes not only in the methods of obtaining bee products but also in their processing and broadly understood marketing and sales.

The presented characteristics of the surveyed owners of beekeeping farms constitute the background for further analyzes of the results of empirical research. In conclusion, it can be noted that the Polish apiaries under study are:

- located in all provinces of the country with varying intensity,
- run, as a rule, by people over 50 for min. five years,
- run to a similar extent individually by their owners with the occasional help of family members and in the form of a family business,
- an additional source of income for owners and their households,
- present on sales markets that show a growing trend,
- open to new solutions, and improvements of a product, process, organizational and marketing nature,
- an entity that willingly co-creates the Regional Beekeepers' Union.

5. Results

The development potential of Polish apiary farms was assessed using a questionnaire based on comparative data for 2015 and 2020 obtained directly from apiary owners. The following areas were compared: the type of apiary, the number of bee colonies, the number and type of bee products obtained, the dominant periods of honey collection by bees, the prevailing type of honey obtained, the breed of bees owned, productivity per hive, the level of honey prices, and the forms of sale used.

On their basis, changes in size or category during the five years under study were determined. In addition, in the other part of the questionnaire, the motives for running an apiary, further development prospects, and the accompanying main limitations were identified, which will also be presented in this chapter and will constitute a specific contextual background for the described changes.

First, the respondents were asked to specify the number of bee colonies in their apiaries in 2015 and 2020. The answers received were classified according to size into the categories of apiaries: small, medium-sized, large, special departments of agricultural production, and professional (Table 3).

Table 3 also includes the level of the estimated percentage increase in the number of bee colonies between the indicated years and the percentage of entities in which the volume of owned beehives decreased or remained at the same level.

Table 3. *The structure of the examined apiaries by size (n=420)*

	2015	**2020**
Kind of apiary:	Percentage share (%)	
No apiary	7.62	0.00
Small apiary	64.52	44.52
Medium-sized apiary	20.48	38.33
Large apiary	3.09	8.10
Entities classified in special divisions of agricultural production	1.67	4.52
Professional apiary	2.62	4.52
Volume changes (2015 vs 2020):	Percentage share (%)	
Increasing the number of bee colonies	76.19	
No increase in the number of bee colonies	11.67	
Reducing the number of bee colonies	12.14	

Source: *Own elaboration.*

The answers show precisely the range of changes in the number of bee colonies that occurred in the examined apiaries between 2015 and 2020. It is worth noting that during this period, the average number of bee colonies per researched entity doubled from 20 in 2015 to 40 for five years later. In the analyzed sample, the largest percentage are amateur apiaries - not exceeding 20 bee colonies - but their share in the structure between 2015 and 2020 decreased by 20 percentage points.

During the five years under study, the number of backyard apiaries in the structure of the surveyed entities increased significantly from 20.5% to 38.3%. In the following three size categories (large apiary, entities classified in special divisions of agricultural production, and professional apiary), there was also an increase in their share in the structure of the analyzed apiaries over the last five years. The presented

data confirm the development of the surveyed entities in terms of the number of bee colonies.

Notably, for most of the surveyed beekeepers (76.2%), the number of bee colonies in apiaries increased between 2015 and 2020. In the case of some entities (11.7%), their owners did not decide to expand their beekeeping activities. In turn, in the case of 12.1% of respondents, mainly due to age and health problems, they decided to limit their bee colonies.

The type of beekeeping is directly related to the number of beehives owned. In view of the increase in the size of the surveyed apiaries between 2015 and 2020, the expansion of migratory apiaries by 4.5 percentage points (from 6.9% in 2015 to 11.4% in 2020) and mixed forms - i.e., partly stationary and partly migratory - by nearly 11 percentage points (16.4% in 2015 compared to 27.1% in 2020) in a given configuration of the type of apiary management.

However, stationary apiaries are still dominant (69.1% in 2015 compared to 61.4% in 2020), located near their owners' residences. The increase in the importance of migratory and mixed apiaries in the study sample may, on the one hand, indicate their development in the context of the growing volume of bee colonies and, thus, the need to search for new benefits and optimize honey production. However, on the other hand, it may also result from emerging barriers limiting biodiversity (more on this in Diagram 6), such as crop monoculture or excessive concentration of pollinator families in a given area.

Another sphere of the development potential of Polish beekeeping farms identified in the research questionnaire was the number and type of bee products obtained (Table 4).

Table 4. *Acquired bee products - 2015 vs 2020*

	2015	**2020**
Number of sourced products:	Percentage share (%)	
0	7.62	0.00
1	46.43	42.62
2	21.43	20.95
3	18.10	20.95
4	5.48	11.19
5	0.95	3.33
6	0.00	0.95
Type of obtained products:	(n=388*)	(n=420)
Only Honey	52.06	42.62
Honey and other products (variant mixes)	48.86	57.38

Note: **The number of sample observations is reduced by beekeepers not yet running an apiary in 2015.*
Source: *Own elaboration.*

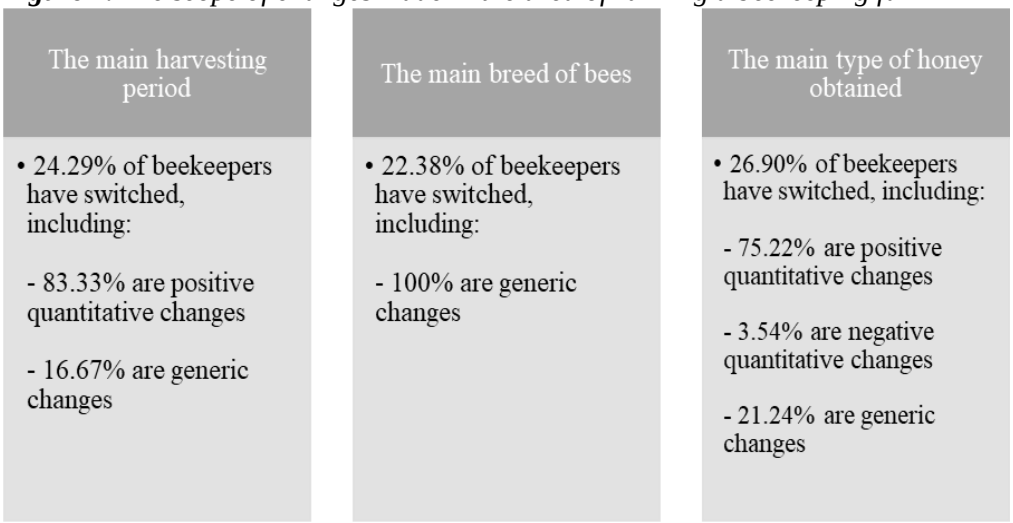
Comparing the study sample from the point of view of the number of bee products obtained, it is clear that between 2015 and 2020, there was a decrease in smaller values in favor of an increase in a larger number of products resulting from bee work. The vast majority of owners of Polish beekeeping farms (nearly 68% in 2015 and 63.5% in 2020) obtained one or two bee products. The percentage of respondents obtaining three types of bee products was comparable (approx. 20%) in the analyzed years.

In the remaining categories (4.5 and 6 products), the scale of increases in 2015-2020 is more pronounced. It is worth noting that apart from honey, which is the basic bee product obtained by all beekeepers, the most frequently mentioned among the respondents were: beeswax, propolis, pollen, and beebread.

Moreover, for the beekeepers included in the research sample, the proportion of sourcing only honey versus mixes variant changed over the five years analyzed. While in 2015, the proportions of both categories were similar (difference of 2 percentage points), in 2020, beekeepers more often opted for the extended variant (57.4%), i.e., they obtained other bee products besides honey. Consequently, the above data clearly show quantitative and generic changes in the obtained products, which prove the development of Polish beekeeping farms.

From the point of view of the discussed research issues, it is also worth making a short analysis of the changes made over the years 2015-2020 in terms of the next three factors indirectly translating into the development potential of apiaries. These are the dominant period of harvesting, the dominant breed of bees, and the dominant type of honey obtained (Figure 2).

Figure 2. *The scope of changes made in the area of running a beekeeping farm*



Source: *Own elaboration.*

Climate change, which is being observed more and more clearly, impacts the functioning of beekeeping farms. They imply the need to undertake various actions to limit the harmful effects of these changes and adapt to the new environmental realities. In the surveyed sample, nearly every fourth respondent over the last five years changed the collection period, mainly by extending the time interval (83.3%) of collecting nectar and pollen by bees.

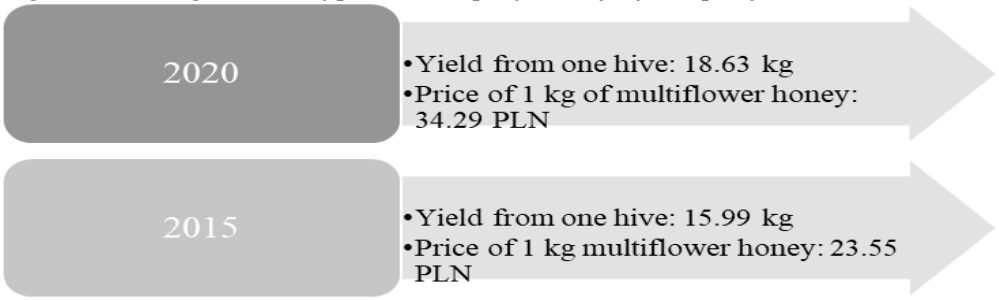
Some respondents (16.7%) made generic changes, resigning primarily from harvesting early May honey flows in favor of seasonal harvests in June and July. This period of collecting bee nectar prevails in various configurations in the tested sample; therefore, the most frequently obtained type of honey is poly floral. Looking more closely at the species structure of the selected honey between 2015 and 2020, it can be seen that the surveyed beekeepers focus on multi-varietal orientation.

Less than 27% of the respondents declared changes in the type of honey obtained - both quantitative and variety changes. In this question, several answers could be selected in the questionnaire. Thus, apart from multiflorous honey, the following honey was indicated as the main type: acacia, honeydew, buckwheat, phacelia, and goldenrod. Interestingly, the most invariable factor was the breed of bees owned. It can be assumed that this is because changing the dominant honey bee subspecies in an apiary is a time-consuming and labor-intensive process, often also quite expensive if a queen bee of a new species is purchased.

On average, every fifth respondent in the analyzed period decided to change genre. While in 2015, most of the examined apiaries were dominated by the Carniolan bee (nearly 65%), compared to the 14% percentage of individual honeybee subspecies, in 2020, there was an inevitable shift towards the Buckfast bee (about 33%), and the Central European (around 21%).

Due to the fact that for the majority of the surveyed respondents, the apiary is an additional source of income, only the average values for two variables will be given here: productivity from the hive and the price of 1 kg of multiflorous honey (Figure 3).

Figure 3. *Average values of production profitability of an apiary in 2015 vs 2020*

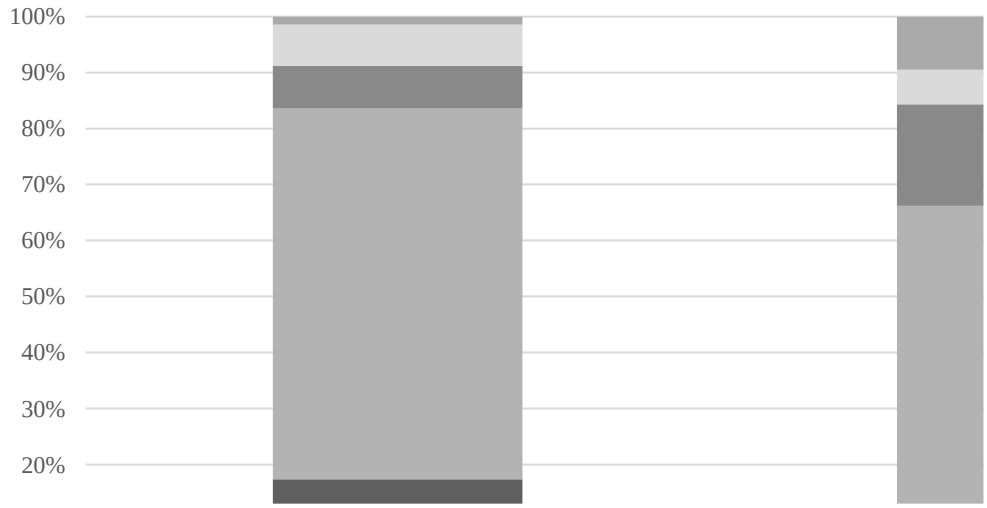


Source: *Own elaboration.*

Comparing the data for 2015 against the data for 2020, an upward trend was observed for both variables highlighted in Diagram X. The average yield per hive increased by nearly 16.5% in the period under review. In turn, the selling price of 1 kg of multi-floral honey in 2020 was higher than five years earlier by an average of 45.6%.

A higher level of production efficiency is most likely related to several modernization and improvement measures undertaken by the owners of the examined apiaries. The higher selling price of the obtained honey reflects the growing direct and indirect costs associated with running a modern innovative beekeeping farm. In the next part of the questionnaire, the respondents were asked to indicate all forms of selling honey and other bee products introduced to the market in 2015 and 2020 (Figure 4).

Figure 4. *Comparison of the sales channels used for honey and other bee products (2015 vs 2020)*



Source: *Own elaboration.*

Analyzing and evaluating the percentage share of the sales channels used for bee products in the analyzed years, we can see that:

- firstly, there was a decrease in the share of owners of apiaries using honey exclusively for their own needs and bee colonies by five percentage points (the remaining 7.6% in the No sale subgroup are people who do not have an apiary and do not sell in 2015);
- secondly, there was an increase in the percentage of beekeepers using Agricultural Retail Trade (7.6% in 2015 vs. 18.1% in 2020);
- thirdly, none of the surveyed respondents sold honey and other bee products at collection points;

- fourthly, a similar share of beekeepers' responses was recorded in the subgroup Other forms, which include, for example, selling honey to the family or online sales;
- fifthly, the percentage of respondents using several sales channels increased significantly (1.4% in 2015 vs. 9.5% in 2020).

The above structure of answers is undoubtedly the result of legislative changes introduced in Poland in 2017-2018 in the field of retail agricultural trade (Act on Retail Agricultural Trade[4], Regulation of the Ministry of Agriculture and Rural Development[5] containing, among others, rules for the sale of bee products, a catalog of bee products eligible for sale under the ART, quantitative restrictions on the sale of unprocessed bee products depending on the number of bee colonies, and imposing the obligation to keep appropriate financial and reporting documentation.

It is worth emphasizing after Wasilewski (2021), that such a form of sale, which is Agricultural Retail Trade, allows the sale of produced honey and other products directly to consumers, as well as indirectly using intermediaries for this purpose (e.g., as part of fairs) or establishments conducting retail trade intended for the final consumer (e.g., restaurants, catering companies), with some differences and territorial limitations.

In addition, as the authors of the article assume, the covid-19 pandemic and the accompanying restrictions have translated into an increase in online sales, limiting direct contact between the seller and the buyer. In addition, the visible expansion of the number and type of sales forms used is related to the growing market and consumer requirements, as well as the desire to generate more profit from the conducted beekeeping.

The last part of the questionnaire was open-ended. It allowed the surveyed apiary owners to freely express themselves in three areas: the main motives for running an apiary, the most significant development barriers accompanying it, and further development prospects of the apiary farm and planned investments/modernizations.

The surveyed beekeepers answered the above topics extensively; therefore, the answers obtained were sorted and subjected to the categorization process. The distinguished categories and their percentage share and sample answers are presented below in diagrams 5-7. The sum of the answers in diagrams 5 and 6 below exceeds 100% because some respondents indicated several answers included in different categories.

[4]*Act of 16 November 2016 amending certain acts in order to facilitate the sale of food by farmers, Journal of Laws pos. 1961 as amended.*
[5]*Regulation of the Minister of Agriculture and Rural Development of 16 December 2016 on the maximum amount of food sold as part of retail agricultural trade and the scope and method of its documentation, Journal of Laws pos. 2159.*

Analyzing the obtained results in terms of the motives behind running an apiary, three main groups of categories can be distinguished: prevailing motives, primary motives, and secondary motives. The largest percentage of respondents (40.0%) pointed to various motives related to hobby issues, and these answers are among the prevailing motives.

The second group of categories, i.e., primary motives, consists of answers classified into sources related to family tradition and personal reasons, which were indicated by 28.3% and 26.6% of the surveyed beekeepers, respectively.

Figure 5. *Why are you engaged in beekeeping?*

Hobby themes (40.00%)	It is my passion
	Interesting side job
	I am a bee fancier
Family tradition (28.33%)	Generational apiary
	Inheriting an apiary from a sick or deceased family member - no one else wanted to take care of the apiary
	Earlier, I helped my grandfather with the apiary, with time I decided to set up my own apiary
Individual motives (26.67%)	I like working with bees
	Sourcing real honey for personal and family use
	Running an apiary has always been my dream
Ecological motives (16.67%)	Fascination with nature and the world of bees
	Interest in sustainable economic development
	Working outdoors as a springboard for professional work
Economic motives (10.00%)	A niche market in my place of residence
	Additional income
	Running my own family business

Source: *Own elaboration.*

What should be emphasized in the case of answers classified as family traditions, one can distinguish the form of continuation of running an apiary voluntarily and for reasons beyond the control of the respondents (such as serious illness, old age, or

death of their predecessors) and the lack of another person who could continue farming beehive. Ecological and economic motives are distinguished as secondary motives.

Ecological reasons, indicated by almost 17% of respondents, may be related not only to the desire to commune with nature and save nature, including bees, for future generations but also to the growing awareness of the importance of plant and animal biodiversity and the advantages of reducing pesticides used in agriculture for the development of civilization in line with the expansion of the immediate environment.

Due to the inclusion of the income from the apiary in the category of sources supplementing the household budget, the smallest percentage of the surveyed beekeepers in the sample indicated economic motives (10.0%) as the ones that guided them when starting their beekeeping business.

Interestingly, respondents indicating economic motives did not supplement this answer with motives classified in other categories. The situation was different in the case of indications of non-economic motives. At that time, the surveyed beekeepers more often presented several different sources that inspired them to start beekeeping.

Secondly, the surveyed beekeepers were asked to indicate the most significant barrier to the further development of the beekeeping farm. Some respondents did not limit themselves to indicating only one limitation, so the presented statistics of Figure 6 included all the answers entered.

The barriers mentioned with the most significant frequency were limitations of the following nature: organizational and logistic (38.3%), financial (33.3%), and environmental (28.3%). The dominance of these three groups of barriers did not surprise the authors of the study, who know the specifics of running an apiary farm.

It might seem that work at the apiary is seasonal - nothing could be more wrong. Not only the optimization of production but also the efficiency of the entire process of obtaining honey depends on the proper preparation in the off-season in various spheres. Every fourth respondent pointed to demographic and social barriers as the most burdensome.

The above indication is strongly related to the age structure of the sample. Interestingly, barriers typical of the beekeeping sector are a significant limitation only for 15.0% of respondents. Not all barriers directly depend on beekeepers - wildly unpredictable weather conditions, rising inflation, and limited willingness to cooperate shown by farmers or fruit growers.

The following barriers were mentioned least often among the respondents, legal and administrative (6.7%) and infrastructural (5.0%).

In the case of the first group, the indicated limitations result from changes introduced in Polish law or the amount and type of EU aid granted to beekeepers under specific financial perspectives.

Unfortunately, not all local governments undertake bottom-up initiatives to support local beekeepers, not only in the form of subsidies but also in intangible forms. Perhaps the voice of the owners of local apiaries is still poorly heard on the public forum, and there are still too few media debates in this area to take real action at the local government level.

Among the surveyed beekeepers, less than 2% of the respondents indicated that they did not see any barriers to further developing their beekeeping farms. An open question summarizing the entire questionnaire was a request addressed to the respondents regarding assessing further development prospects of the beekeeping farm. The answers obtained were classified into the following three categories: positive, stable, and negative (Figure 7).

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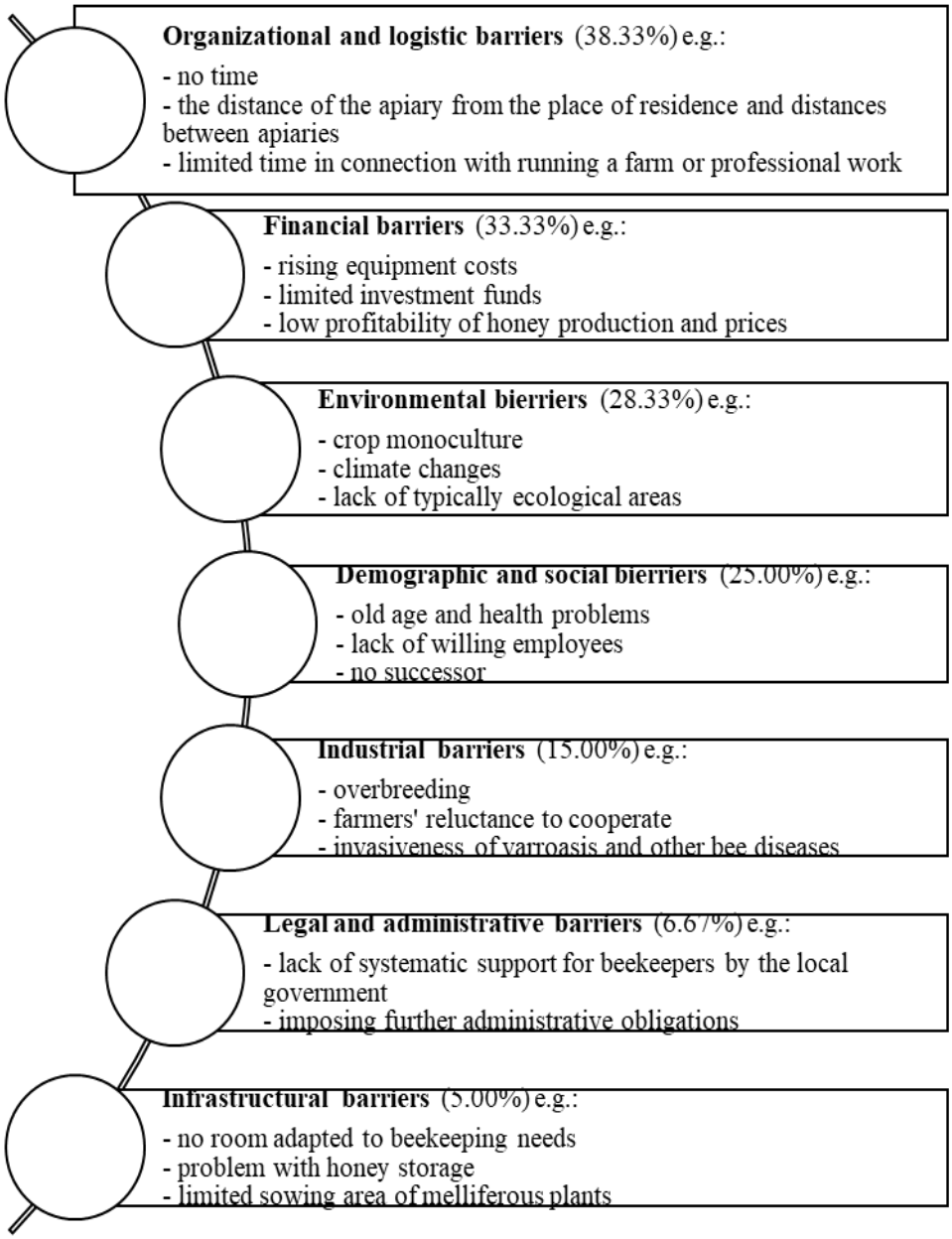
The percentage of positive development perspectives in the sample is satisfactory - approximately half of the respondents plan to make further improvements and investment projects in the field of, among others: increasing the number of bee colonies and cultivated honey plants, expanding knowledge in the field of conducting a nomadic beekeeping economy, purchasing modern equipment and machines used in the production of honey, the construction of appropriate rooms for storing the obtained products and the use of new forms and sales channels for honey.

Nearly every fifth respondent sees the future of their apiary more realistically and indicates that due to the barriers mentioned above of various origins and restrictions accompanying the covid-19 pandemic, in the coming years, the apiary economy will remain at a similar level. In turn, 30.0% of the beekeepers in the sample are pessimistic about the future and anticipate a reduction in bee colonies and the level of current honey production.

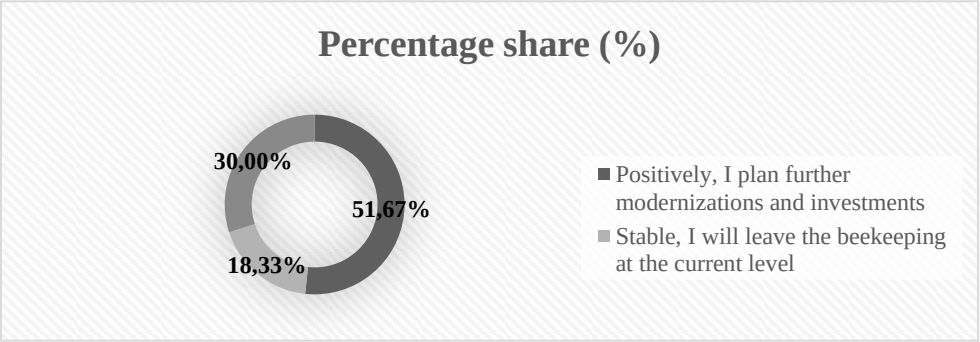
The indicated structure of answers may give hope that further expansion in the case of the majority of the surveyed bees will bring better results for the environment of pollinators than planned quantitative reductions by some of the respondents. Perhaps the fact that family members are involved in running most of the examined apiaries will result in deciding in the coming years to continue the existing beekeeping tradition or to instill a new passion for beekeeping in subsequent generations.

Figure 6. *What is currently the biggest development barier for your apiary?*



Source: *Own elaboration.*

Figure 7. *How do you define the develompent prospects of your beekeeping farm?*



Source: *Own elaboration.*

6. Discussion

Many factors influence the development of apiary farms. It should be taken into account that the production of honey and other beekeeping products takes place in many countries with different potentials, but because of its broad importance, it is supported and developed.

Beekeeping production is fraught with risk. Insuring apiaries should offset the risks of attack by wild animals or theft. Local climatic conditions and the incidence of diseases are essential factors. Farmers' organizations and public institutions should implement appropriate support programs, as well as farm advisory services, to make beekeepers more aware of the risks and precarious management practices, such as keeping proper accounting records, adopting modern techniques and modern techniques and managing plant diseases in the region (Karadas and Birinc, 2018).

Developing public awareness of the benefits of bees and their impact on the environment is an aspect that cannot be underestimated and will translate into opportunities for apiary farms (Urbisci, 2011). The importance of bees for the future of our civilization is evidenced by the numerous changes implemented in the policy of protecting pollinating insects at the international, community, and national levels (Hall and Steiner, 2019; Hill *et al.*, 2019; European Commission, 2020b).

However, there are also accusations against small beekeepers in the USA (Andrews, 2020) or Australia (Philips, 2014) regarding excessive biosecurity, transforming the beekeeping craft into commercialized activities aimed at the expansion of nomadic apiaries and the "honey chase."

An economic analysis of the Greek market showed that beekeeping is a profitable agricultural sector. However, it employs older and less educated farmers; a third is outside their primary employment, which could hinder the sector's development. On these farms, honey is an essential product. It was noted that an increase in the

production of other beekeeping products could improve the economic performance of beekeepers.

In addition, the researchers showed that technological changes could significantly reduce the inputs incurred while maintaining the same production level (Makri *et al.*, 2015). The profitability of beekeeping production despite small apiaries has also been reported in Romania (Popescu, 2013) and Moldova (Morei, 2011), contributing significantly to increasing and diversifying the income of many rural households in the UK (Adgaba *et al.*, 2014), Iran (Vaziritabar and Esmaeilzade, 2016).

Hinton *et al.* (2020) showed that market development and capacity building for small-scale beekeeping farms are key ways they benefit. In contrast, to increase the productivity and profitability of small-scale beekeeping, it is necessary to develop technical skills, which a training system should provide. Organic products are an important segment of today's market.

Opportunities for developing organic beekeeping in Bulgaria are seen in stimulating the quality and competitiveness of production in line with the requirements of European markets and consumers, as well as by providing opportunities for the sustainable development of this production (Dirimanova and Stoeva, 2020).

As family-run businesses, in order to be able to develop, beekeeping enterprises must look for new sources of income by offering new products based on beekeeping production. In their considerations, Semkiw and Skubida (2021) point to the possibility of bee bread production, the scale of which depends on the intensity of pollen flow and the method of managing bee colonies.

In their study, the authors showed that satisfactory financial results could be obtained from this production. Studies in various countries indicate the development potential of apiary farms. However, they need support because of their fragmentation. It should be noted, however, that they can be the basis for building family businesses on a scale appropriate to the owners' needs.

7. Conclusion

The importance of pollinating insects, especially bees, for the natural environment, agriculture, and every human being is extremely important. Currently, no replacement has been found for the work of these small helpful creatures to whom we owe food security in global terms.

Running an apiary economy depends on many factors - from the willingness and actual involvement of bee fanciers in the development of biodiversity through the selection of the appropriate breed of bees to the size and variety of cultivated or shared forage, as well as climatic conditions prevailing in a given part of the world.

In addition, it is also important to ensure the smoothness of the entire production process, especially outside the summer season. It is impossible not to mention the hard physical work and large amounts of time that should be spent on the profitable running of the apiary, effective marketing, and diversified sales of the obtained products. In addition, there are still too few initiatives to protect bees.

The attention of various organizations and local, national, and international authorities should be focused on increasing support for the beekeeping sector to strengthen its supply-demand side, especially in countries with good prospects for developing this form of agricultural economic activity. Polish apiaries are run in the vast majority through family businesses.

However, due to their size (dominance of amateur and backyard apiaries), relatively low profitability of production (despite the increase in productivity and increase in honey prices), and several barriers accompanying their activity, only every second respondent declares further development investments.

Despite this, the development potential of Polish beekeeping farms over the years 2015-2020 should be assessed positively. Despite challenging economic conditions, the covid-19 pandemic and the accompanying restrictions, as well as dynamically changing weather conditions, the surveyed beekeepers conduct innovative activities.

It should be noted that the conducted research procedure, a fragment of the results presented in this article, is subject to certain limitations. Their sources should be sought both in the research technique used, the research tool built and in the regional cross-section of the respondents of the surveyed sample. The key advantages of the online survey method (CAWI) include faster access to the data obtained compared to direct interviews (PAPI) or telephone interviews (CATI), no need to hire interviewers, and thus no risk of making a mistake.

The main disadvantages of the technique of collecting primary information include, among others: lack of control over who fills in the questionnaire and limitation of the use of this type of research only concerning respondents with access to the Internet and able to use a computer, which age structure of beekeepers was a significant obstacle. Referring to the questionnaire used in the survey, it is impossible not to agree that the respondents' answers are always accompanied by a specific risk of subjective assessments, which may partly refer to their opinions rather than the facts (Cyfert, 2012).

However, being aware of this limitation, the questionnaires were made available directly to the owners of apiaries so that their opinion reflected the actual state of their apiary farms (Zakrzewska-Bielawska, 2018). In the case of the regional structure of the sample, although it was possible to obtain answers from the owners of apiaries located in all sixteen voivodeships, their relation to the number of actually operating beekeepers in a given region is somewhat disturbed.

However, a relatively large percentage of beekeepers was analyzed to be able to talk about meeting the condition of representativeness.

Of course, the issues listed in the article do not close the list of current challenges and needs of the beekeeping sector in Poland. However, they can be a starting point for further, in-depth analyzes in the field of, for example, the scope and volume of applied ecological innovations, their impact on the efficiency and profitability of production, or the process of building awareness of the apiary brand and products obtained in it, not only among the local community.

Both global organizations (IPBES, 2019; OECD, 2019; European Commission 2020b; WEF, 2020; FAO, 2022) and scientists (Breeze *et al.*, 2011; Garibaldi *et al.*, 2013; Potts *et al.*, 2016; Osterman *et al.*, 2021) emphasizes the deepening crisis of biodiversity and the strain on ecosystems, the negative consequences of which are visible in many areas of life.

Therefore, in the coming years, scientists should continue research in this area, which will update the changing needs of beekeepers in relation to the adopted assumptions of the support policy at various levels.

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