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ROMANIAN FARMERS' PERCEPTION ON THE IMPORTANCE OF POLLINATORS

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Abstract

To analyse the perception of Romanian farmers regarding the importance of pollinators, a survey was conducted between February and August 2024. A total of 122 farmers (small, medium and big) growing rapeseed and sunflower crops were selected from 13 counties of Romania. The main goal of this study was to assess farmers' perception on pollinators, and how perceptions are linked with management practices. Basically, in this study, farmers' perception towards the pollination of two oilseed crops, namely sunflower and rapeseed, were assessed. The farmers showed interest in pollinators; over 90% of respondents considered pollinating insects to be essential for their crops. The majority of interviewed farmers recognize the importance of pollinators, but also exhibit uncertainty about the extent of native pollinators' contribution to yield and how to best manage them. The majority of farmers growing sunflower and rapeseed consider pollination services necessary to improve the productivity of their crops and they are concerned about the pollination of their crops, but however there are some farmers who perceive limited benefits from bees, or from investing in pollinator-friendly practices. Among big farmers, it was noticed that majority of the farmers perceive the honey bees to be the primary species for the pollination activity. The good perception of big farmers on importance of pollination could change the view of small farmers through the example power, considered to be the safest form of education.

Key words*: farmer, perception, pollination, native pollinators, honey bees, oilseed crops, survey.*

INTRODUCTION

For pollen transport, plants depend on various vectors, such us wind, water, and animal pollinators like bats, moths, hoverflies, birds, bees, butterflies, wasps, thrips, and beetles, animal-based pollination contributing to approximately one-third of the total human dietary supply (Khalifa et al., 2021). In agricultural ecosystems, pollinators' diversity increases the quality and quantity of crop yield, but the pollinator groups are also useful in monitoring environmental pollution, aid in pest and disease control, and provide cultural and aesthetic value (Katumo et al., 2022).

Over 1,300 species of plants are believed to be grown worldwide for their fruits, spices, medicines etc., about 75% of these species being pollinated by animals (Diwan et al., 2022). Fruit, vegetable or seed production from 87 of the leading global food crops is dependent upon animal pollination, while 28 crops do not rely upon animal pollination, which is showing the importance of the animal pollination, while 60% of global production comes from crops that do not depend on animal pollination, 35% comes from crops that depend on pollinators, and 5% are unevaluated (Klein et al., 2007).

Among the different groups of pollinators, bees play a crucial role in maintaining the health and balance of ecosystems. They are essential pollinators, facilitating the reproduction of a wide variety of plants, including many food crops. However, preserving the delicate balance in pollination services for sustainable agroecosystems poses a substantial challenge (Sindhu & Shivalingaiah, 2023). Despite their obvious importance, bees face numerous threats that endanger their survival. Agriculture plays an ambivalent role in bee health; it provides essential food resources for bees, but it can endanger bee populations through the use of pesticides and monoculture practices. To support the fight against possible

crises that could arise due to the pollinators' population decline or species extinction, it is important that everyone values them and collaborates to maintain and even increase their populations.

Native bees (including honey bees) are the most important pollinators because of their diversity and specificity to many flowering plant species. Their population decline is a serious global concern due to their potential impact on ecosystems and human well-being. There are over 20,000 bee species worldwide (Locklear, 2023), of which 2,138 species are in Europe (Ghisbain et al., 2023). Although native wild pollinators are not efficient enough to replace honey bees in pollination, they are considered extremely important for ensuring the pollination of numerous wild or cultivated plant species or in certain weather conditions, when the efficiency of honey bees is reduced (Hanes et al., 2013).

On the other hand, little is known about the perceptions and knowledge base of the main stakeholders (farmers and beekeepers) within this system and how they make management decisions. In particular, little is known about the extent to which farmers perceive pollination service deficits (yield reductions due to inadequate pollination) and how they respond to these deficits (Hanes et al., 2013). While there is evidence that beekeepers consider crop and environmental risks when locating their beehives, particularly in Europe, there is limited research on how various environmental factors influence honeybee health, as well as the competition with other wild bee species. Studies highlight the need for a better understanding of how various factors, such as climate, food availability, and human activities, affect both managed and wild honeybee populations. Lack of knowledge hinders participants' intentions and behaviour to engage in critical environmental practices (Locklear, 2023).

There are financial supports for agri-environment schemes (AES) that encourage farmers to incorporate biodiversity-friendly farming practices. However, the implementation of biodiversity-friendly techniques and strategies into farming practices remains a central challenge for conservation and sustainability, in part because of information gaps and the lack of transdisciplinary communication and collaboration between science and practice (Maas et al., 2021).

Little is known about how different assessments and perspectives on biodiversity, ecosystem services, and conservation among agricultural stakeholders from science and practice influence AES implementation strategies (Maas et al., 2021).

Farmer perception of pollinators, particularly non-bee insects, is a rarely studied area, though it's crucial for understanding and supporting pollination services in agriculture. In practice, whether pollinating insects are declining or not is hard to prove for most wild pollinators taxa because there is a lack of systematic and standardised monitoring of species diversity and populations abundances (Vanbergen et al., 2014). While farmers, generally, they recognize bees as important pollinators, their awareness and appreciation of the roles of non-bee pollinators (like flies, beetles, and moths) are often limited, despite the significant contribution these insects can make to crop yields. There are few studies on farmers' knowledge of and attitudes towards the biodiversity of their land.

Pollinator conservation has become a key challenge to achieve sustainable agricultural landscapes and safeguard food supplies. Considering the potential negative effects of pollinating insects decline, international efforts have been developed to promote agri-environmental measures and pollinator-friendly management practices. However, little effort has been devoted to assess the farmers' perceptions and knowledge about pollinators, or to assess the farmers' role in enhancing pollination (Hevia et al., 2020). Some studies suggest that providing farmers with more information about pollinators, their role in crop production, and effective management practices can further increase their engagement and adoption of pollinator-friendly practices.

Pollinator declines and dependence on insect pollination, particularly in fruit and vegetable crops, create a pressing need to understand growers' interactions with pollinators and factors affecting pollination strategies (Hanes et al., 2013). Many farmers recognize the importance of pollinating insects for their livelihoods and actively take steps to protect and support them on their farms. Local and

traditional knowledge can provide some solutions to the current challenge of pollinators' decline, but there is no integration and analysis of this knowledge for its practical use (IPBES, 2016).

The few studies addressing farmer's knowledge reveal that local information about pollinators and pollination varies significantly based on regional, national, and crop-specific contexts (Osterman et al., 2021). This variation stems from differences in pollinator diversity, foraging behaviours, and the specific pollination needs of different crops, which influence farmer's management practices and perceptions. Understanding how farmers perceive pollinators is crucial for developing effective conservation strategies. Farmers' knowledge, attitudes, and practices directly influence pollinating insect populations and pollination services they provide. By understanding farmers' perceptions, one could tailor outreach programs and management recommendations to increase the adoption of pollinator-friendly practices.

A study focusing on university staff and students (Locklear, 2023), found that while most individuals recognize the importance of pollinators like bees, there's a significant gap in knowledge regarding their diversity and specific roles in the ecosystem. Specifically, a substantial number of participants struggled to identify different bee species, even though they acknowledged bees' vital role in pollination. This suggests a need for improved educational initiatives that go beyond simply stating the importance of pollinators and delve into their ecology and conservation.

On-farm experiences significantly influence farmers' knowledge, perceptions, and management practices related to pollinating insects. Farmers' direct observations and interactions with pollinators on their farms shape their understanding of the importance of different pollinator types, their contribution to crop yields, and the effectiveness of various management practices aimed at enhancing pollination services. This knowledge, in turn, impacts their decisions on how to manage their farms to support pollinators and optimize pollination (Osterman et al., 2021). In essence, on-farm experiences act as a crucial link between scientific understanding of pollinators and practical on-the-ground management.

The main goal of this study was to assess farmers' perception on pollinators, and how perceptions are linked with management practices. Basically, this study evaluated farmers' perceptions on pollination of two oilseed crops, namely sunflower and rapeseed.

In fact, these two crops have a special significance in Romania due to their contribution to the national economy, being the cornerstones of the agricultural sector. Romania occupies a prominent position in the EU, both in terms of the cultivated area with oilseed crops and the production of oilseeds. In addition, the sunflower and rapeseed crops are an important source of nectar and pollen for wild bee species and managed honeybees. Pollination is an important bio-input for enhancing the productivity of these two oilseed crops. In the case of sunflower (*Helianthus annuus* L.) there are strong evidences that insufficient pollination can significantly minimize the grain yield. According to the existing data regarding the efficiency of pollination performed by honey bees, it was found that an increase of about 36.2% in sunflower grain yield is due to honey bees (Sanduleac, 1960). Rapeseed (*Brassica napus* ssp. *napus* L.) is a crop that benefit by a mixed pollination system (self-pollination and cross-pollination). Yellow flowers with sticky pollen and high volume of nectar play an important role in attracting different pollinators (Ion, 2024). With the ongoing global decline in wild and managed pollinators, there is a growing concern that their negative impact will become pronounced on oilseed crops.

By interviewing farmers, context-dependent preferences can be identified which can help identify effective practical management strategies that farmers are willing and able to implement (Osterman et al., 2021).

The hope is that by understanding the farmers' perception, preferences and knowledge gaps regarding the interrelations between honeybees and crop pollination can be identified, as well as potential collaborations between farmers and beekeepers and effective actions can be formulated (Breeze et al., 2019).

Understanding farmers' perception on pollinators' importance in oilseed crops can help develop strategies to reduce the negative attitudes and influence the change in attitudes and opinions towards the adoption of

environmentally friendly farming practices by farmers (Munyuli, 2011).

MATERIALS AND METHODS

As it was mentioned in the above section, oilseed crops, namely sunflower and rapeseed, are ones of the most important and dynamic crops of Romanian agriculture, both for farmers and beekeepers.

The study areas were selected from the agricultural landscape dominated by sunflower and rapeseed crops highly (Figure 1). More precisely, the respondents came from the areas favourable for sunflower and rapeseed cultivation in Romania.

Figure 1. Romanian map with the marked areas showing distribution of surveys

Farmers growing sunflower and rapeseed, from 13 counties responded to the performed survey by filling a structured questionnaire designed to assess knowledge, attitude and perception of pollinators' importance (Table 1). In total, 122 of completed questionnaires were collected.

The survey was conducted between February and August 2024. The questionnaires were distributed to farmers at the end of the professional courses organised in different counties by the UnivAgx Association in association with the farmer cooperatives of Romania.

The first part of the questionnaire was referring to the personal data of the respondent (age, gender and educational level), location (county), and acreage of the farm (number of hectares). The following section, assessed the implemented strategies by farmers to improve the pollination services (if any) and their willingness to receive beehives.

Table 1. Counties and number of farmers who responded to the performed survey

No.	County	No. of respondents
1	Argeș	19
2	Bacău	3
3	Brăila	21
4	Buzău	1
5	Călărași	1
6	Constanța	12
7	Galați	18
8	Ialomița	1
9	Ilfov	1
10	Iași	11
11	Neamț	5
12	Olt	2
13	Teleorman	5
Total		*100*
1	Farmers who did not declare the county	3
2	Farmers who did not declare the identification data	19
Total		*22*

Furthermore, a series of other questions have been addressed to gain further insights about their beliefs regarding pollination service increases or its perceived limitations. The last part included a series of open questions in order to examine the farmers' perceptions towards the adoption of policy incentives for the provision of pollination services in agricultural systems. Farmers were asked if they are willing to adopt their crop management as to attract more beekeepers, as well as to identify practices for the provision of wild pollinators within their farmlands. Additionally, there were 5 questions to assess the attitude of farmers towards pollination services, respectively related to (1) farmers' perception of pollination services, (2) current status of pollination services, (3) the farmer-beekeeper relationship, (4) how it is determined the number of beehives per hectare for pollination of rapeseed and sunflower crops, and 5) current agricultural practices in relation to pollination.

RESULTS AND DISCUSSIONS

The socio-economic characteristics of the farmers

Of the 100 farmers who responded to the survey with identification data (filling their name and county), 84 farmers declared the area they manage (Table 2). Together they manage a total

of 87,788 ha of land. On average, a farmer owns 1,045 ha, with variations from 37 ha up to 6,800 ha. Of all farmers, 26.2% manage large farms (between 1000 and 6,800 ha), 27.4% manage medium-sized farms (between 300 and 999 ha), and 46,4% manage small farms (under 300 ha). The large farms count 80% of the total area of the studied farms.

Of the 94 of farmers who declared their gender, 89.4% are men and 10.6% are women (Table 3). While farming has historically been perceived as men-dominated, there is a growing trend of women participation and leadership in the agricultural sector. Some regions show a higher proportion of women farmers. Although men still hold a disproportionate number of leadership positions and farm ownership, women are increasingly taking on roles as primary producers, farm managers, and entrepreneurs.

Table 2. Number of farmers per county who declared the area they manage and their farms size

County	Argeș	Bacău	Brăila	Buzău	Constanța	Galați	Ialomița	Ilfov	Iași	Neamț	Olt	Teleorman	Total
No. of farmers per county who declared their farm area	19	1	18	1	11	14	1	1	9	3	2	4	**84**
Surface (ha) of farms with more than 1,000 ha (big farms) and number of farmers	1800	-	1000	6200	-	5200	-	5000	6800			5000	**22 farmers (26.2%)**
	1550	-	-	-	-	4000	-	-	6500	-	-	5000	
	1000	-	-	-	-	1300	-	-	6000	-	-	2200	
	1000	-	-	-	-	1182	-	-	2100	-	-	2000	
	-	-	-	-	-	-	-	-	2000	-	-	-	
	-	-	-	-	-	-	-	-	1850	-	-	-	
	-	-		-	-	-	-	-	1800	-	-	-	
	70,482 ha												
Surface (ha) of farms with 300-999 ha (medium farms) and number of farmers	930	-	550	-	500	530	-	-	720	-	-	-	**23 farmers (27.4%)**
	800	-	400	-	500	433	-	-	320	-	-	-	
	800	-	400	-	460	400	-	-	-	-	-	-	
	750	-	300	-	326	-	-	-	-	-	-	-	
	600	-	300	-	-	-	-	-	-	-	-	-	
	500	-	-	-	-	-	-	-	-	-	-	-	
	400	-	-	-	-	-	-	-	-	-	-	-	
	315	-	-	-	-	-	-	-	-	-	-	-	
	314	-	-	-	-	-	-	-	-	-	-	-	
	11,548 ha												
Surface (ha) of farms with less than 300 ha (small farms) and number of farmers	250	280	270	-	280	150	220	-	-	140	170	-	**39 farmers (46.4%)**
	220	-	260	-	260	150	-	-	-	60	87	-	
	200	-	250	-	210	113	-	-	-	50	-	-	
	160	-	170	-	195	110	-	-	-		-	-	
	157	-	150	-	172	92	-	-	-		-	-	
	37	-	125	-	80	40	-	-	-	-	-	-	
	-	-	120	-	60	38	-	-	-	-	-	-	
	-	-	115	-			-	-	-	-	-	-	
	-	-	100	-	-	-	-	-	-	-	-	-	
	-	-	80	-	-	-	-	-	-	-	-	-	
	-	-	77	-	-	-	-	-	-	-	-	-	
	-	-	60	-	-	-	-	-	-	-	-	-	
	5,758 ha												

Women own and operate farms of various sizes, including large ones, though they are more likely to operate smaller farms. Indeed, the average size of farms operated by women is often smaller than those operated by men.

Table 3. Number of farmers who declared their gender

County	No. of farmers who declared their gender		
	Total, out of which:	Men	Women
Argeș	19	15	4
Bacău	3	3	0
Brăila	20	18	2
Buzău	1	1	0
Constanța	12	10	2
Galați	15	14	1
Ialomița	1	1	0
Ilfov	1	1	0
Iași	11	10	1
Neamț	5	5	0
Olt	2	2	0
Teleorman	4	4	0
Total	*94*	*84 (89.4%)*	*10 (10.6%)*

Farmers perception regarding pollination services

1. Farmers' perception on pollination services and collaboration with beekeepers:

- 60% of interviewed farmers believe that pollinating insects are necessary for agricultural crops in their area and they believe that the yield of these crops does not depend only on the cultivation technology and climatic conditions (these farmers know the importance of pollination);
- 33% of interviewed farmers believe that pollinating insects are necessary for agricultural crops in their area, but they believe that the yield of these crops depends only on the applied cultivation technology and climatic conditions (these farmers know the role of pollinating insects but do not know the importance of pollination);
- 8% of the interviewed farmers did not give a concrete answer, respectively they answered "I don't know" or "Yes" to the question of whether pollinating insects are necessary for agricultural crops in their area, and thus they contradicted the answer at the question of whether the yield of these crops depends only on the cultivation technology used and climatic conditions.

Farmers' perceptions in the oilseed crops industry are complex, with most recognizing the importance of pollinating insects, but also exhibiting uncertainty about the extent of native pollinators' contribution to yield and how to best manage them. A large majority of farmers (over 90%) acknowledge that pollinating insects are crucial for crop production.

The perceptions of farmers in the oilseed crop industry span a wide range of views on sustainability, profitability, and the impact of farming practices. These perceptions are influenced by factors like farm size, experience, access to information, and the specific context of their farming operations.

2. Current status of pollination services.

Regarding the importance of pollination services, the results highlight that the large majority of farmers consider pollination services necessary to improve the productivity of their crops (Table 4).

Table 4. Farmers' answers regarding the yield decrease in the absence of pollination insects

Yield decrease in the absence of pollination insects	Number of respondent farmers	Farmers answer at the question of whether the recorded losses by sunflower and rapeseed crops in the absence of pollination are negligible		
		No	I don't know	Yes
More than 50%	26	15 (57.7%)	6 (23.1%)	5 (16.2%)
Less than 50%	70	43 (61.4%)	12 (17.2%)	15 (21.4%)
Uncertain answer	4	-	-	-
Total	100	58 (58%)	18 (18%)	20 (20%)

70% of the interviewed farmers (70 farmers) responded that in the absence of pollinating insects, the yield of sunflower and rapeseed crops would decrease by less than 50%, but when asked whether the losses recorded in the absence of pollination were negligible, 61.4% of them answered "no".

26% of the interviewed farmers (26 farmers) claimed that in the absence of pollinating insects, the yield of sunflower and rapeseed crops would decrease by over 50%, but when asked whether the losses recorded in the absence of pollination were negligible, 57.7% of them answered "no". Some oilseed crop growers perceive limited benefits from bees, or from investing in pollinator-friendly practices, due to a combination of factors, such as dominance of managed bees, a lack of understanding about the contribution of wild pollinating insects, and the perception that managed bees are sufficient for pollination. Additionally, some farmers may not see a direct, immediate, or significant increase

in crop yield from pollinator-friendly practices. There are more reasons:

- Dominance of managed bees: many farmers rely heavily on managed bees, particularly honeybees, for pollination services; these are often seen as a more reliable and controllable option, and farmers may not fully appreciate the role of wild insects in crop pollination.
- Limited understanding of importance of the wild pollinating insects: some farmers may not be aware of the diversity and importance of wild pollinating insects in their local ecosystem; they may not realize that wild bees can contribute significantly to pollination, especially in certain crops or regions.
- Focus on managed bees: there can be a tendency to focus on the benefits of managed bees (e.g., honey production, pollination services) while overlooking the potential benefits of other pollinators; this can lead to a perception that managed bees are the primary or even sole solution for pollination needs.
- Perceived insufficient yield increase: some farmers may not see a substantial and immediate increase in crop yield from investing in pollinator-friendly practices or from relying on wild pollinating insects; this can lead to the perception that the benefits are limited or not worth the effort or cost.

3. The farmer-beekeeper relationship

The obtained results highlight that farmers, who recognized a deficit in pollination services, adopt multiple management strategies to address it. To the question "Are you concerned about the pollination of rapeseed and/or sunflower crops?", the answers were as follows (Table 5):

- 80.8% of the interviewed farmers (76 farmers) responded that they are concerned about the pollination of rapeseed and sunflower crops, of which 85.5% have good and fairly good relations with beekeepers (65 farmers). There was only one case of conflicting relationship.
- 11.7% of the interviewed farmers (11 farmers) responded that they are not concerned about pollination of rapeseed and sunflower crops, but 81.8% of them responded that they have good and fairly good relationships with beekeepers.
- 6.4% of the interviewed farmers (6 farmers) did not answer whether they are concerned about the pollination of rapeseed and sunflower crops, but all of them stated that they have good and fairly good relationships with beekeepers.

Table 5. Farmers′ answers regarding concerns on pollination of rapeseed and/or sunflower crops as well as regarding the relationship with beekeepers

Are you concerned about the pollination of rapeseed and/or sunflower crops?	Number of respondents	How is the relationship between you (farmer) and beekeepers?				
		Very Good	Good	Fairly good	Conflictual	No answer
Yes	76 (80.8%)	1	53	12	1	9
No	11 (11.7%)	-	4	5	-	2
No answer	6 (6.4%)	-	4	2	-	-
Farmer with his own apiary	1 (1.1%)	-	-	-	-	-
Total	*94, out of which:*	***1***	***61***	***19***	***1***	***11***

Among the interviewed farmers, there is one farmer who owns his own beehives.

The relationship between farmers and beekeepers is a symbiotic one, crucial for both agricultural production and the health of bee populations.

Farmers rely on bees for pollination, which is vital for crop yields. Beekeepers, in turn, benefit from the access to various nectar and pollen sources provided by farms, which contributes to honey production and overall hive health.

Some farmers and beekeepers developed long-term partnerships, with the beekeeper managing hives on or near the farm, ensuring a consistent pollination service and a healthy bee population. Long-term partnerships between farmers and beekeepers should become increasingly common, as they are beneficial for both parties. These partnerships, often involving pollination services and honey production, can lead to improved agricultural practices, enhanced environmental sustainability, and increased economic opportunities for both farmers and beekeepers. Partnerships farmer - beekeeper can strengthen rural communities by creating new

economic opportunities and promoting collaboration among stakeholders.

4. Determining the number of beehives per hectare for pollination of rapeseed and sunflower crops

For this category, the answers to two questions were correlated, namely; "What do you think is the number of beehives per hectare for pollination of rapeseed and sunflower crops?" and "How is the number of beehives/ha calculated?", the results being the following:

- 15% of the interviewed farmers (14 farmers) turn to beekeepers and know the correct answer. The majority of farmers who turn to beekeepers know the optimal number of hives per unit area (9 out of 14 farmers who turn to beekeepers answered that the number of hives for pollination is between 2 and 6), while 5 out of the 9 farmers who turn to beekeepers declared that they have no idea.
- 45% of the interviewed farmers (42 farmers) calculate the number of honeybee colonies/ha based on the beekeepers' indications. From this category, it is noted that almost half of the farmers (45%) have no idea about the necessary number of honeybee colonies for pollination (19 farmers out of 42).
- 22% of the interviewed farmers (21 farmers) leave the pollination process to chance, although a good portion of them (28%, i.e. 6 farmers out of the 21 interviewed) have solid knowledge about the number of beehives needed per unit area.
- 18% of the interviewed farmers (17 farmers) did not answer any questions.

Farmers often rely on beekeepers to calculate the optimal number of honeybee colonies needed for pollinating their crops. This is because the number of required beehives varies based on several factors, including the specific crop, its attractiveness to bees, the presence of other pollinators, and environmental conditions. Beekeepers, with their expertise in honeybee behaviour and colony health, can assess these factors and recommend the appropriate hive density to maximize pollination and crop yield

Farmers and beekeepers should collaborate to find a balance that benefits both their industries and the environment. This collaboration is crucial for sustainable agriculture and the health of pollinator populations.

The beekeeper's expertise in honeybee behaviour and colony management, combined with the farmer's knowledge of the crop and local conditions, ensures optimal pollination and healthy harvests. By working together, they can optimize crop yields, protect bees from harmful pesticides, and ensure the long-term viability of both farming and beekeeping. Regular communication between farmers and beekeepers is essential to understand each other's needs and concerns.

5. Agricultural practices

For this category, the results were the following: 90% of large farmers (20 farmers) responded that they are willing to modify agricultural practices on their farm to protect bees and half of them consider pollination to be an important production factor in the same way as other agricultural inputs and rank pollination with a score of 10 as a production factor (on a scale from 1 to 10).

Farmers are increasingly interested in practices that support native pollinators. This interest stems from the recognition that healthy pollinator populations are crucial for crop production and ecosystem health.

Generally, farmers understand the importance of native pollinating insects, especially as a form of insurance against honeybee colony losses and poor weather conditions. While native pollinating insects are acknowledged as crucial, particularly in providing pollination services during unfavourable weather conditions when honeybees are less effective, there's a strong reliance on rented honeybee colonies for pollination. This reliance is partly due to a lack of clarity regarding the impact of native pollinating insects on yield and difficulty in monitoring their populations.

Farmers are interested to adopt strategies like planting native flowering plants, creating pollinator-friendly habitats, and implementing practices that support native pollinators, such as wildflower strips and hedgerows, but require more knowledge and resources to implement them effectively.

Farmer' decisions about implementing pollinator-friendly practices are heavily influenced by the perceived costs associated with these practices, even when they understand the ecological benefits. These costs can include direct financial investments in things like

planting bee-friendly cover crops or restricting pesticide use, as well as opportunity costs, such as using land for pollinator habitat instead of more profitable crops. Growers also weigh the potential benefits of increased yields or reduced pollination service costs against these costs.

CONCLUSIONS

The farmers showed interest in pollinators; over 90% of respondents considered pollinating insects to be essential for their crops. The majority of interviewed farmers recognize the importance of pollinators, but also exhibit uncertainty about the extent of native pollinators' contribution to yield and how to best manage them.

The majority of farmers growing sunflower and rapeseed consider pollination services necessary to improve the productivity of their crops and they are concerned about the pollination of their crops, but however there are some farmers who perceive limited benefits from bees, or from investing in pollinator-friendly practices.

Among big farmers, it was noticed that majority of the farmers perceive the honey bees (*Apis mellifera*) to be the primary species for the pollination activity. The good perception of big farmers on importance of pollination could change the view of small farmers through the example power, considered to be the safest form of education.

Farmers often rely on beekeepers to establish the optimal number of honeybee colonies needed for pollinating their crops.

The performed survey led to the identification of the following needs:

- Bridging the Knowledge Gap: Scientists and extension experts need to provide farmers with more information on pollination importance, native pollinator ecology and management practices.
- Demonstrating Value: More research is needed to quantify the contribution of native pollinators to yield and to develop effective methods to monitoring their populations.
- Promoting Sustainable Practices: Encouraging the adoption of pollinator-friendly practices is crucial for long-term sustainability.

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