

Farmer's Knowledge on Importance of Pollinators and Pollination in Karnataka State

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Received : September 2023

Accepted : September 2023

ABSTRACT

The study was conducted in two districts of Karnataka state during 2020-2021 to analyse the knowledge level of farmers on importance of pollinators and pollination. A total of 120 (60 small and 60 big) crop growers were selected by using simple random sampling technique from twelve villages from two districts. Personal interview method was used to collect data and appropriate statistical tools were applied to analyse the data. The findings revealed that nearly half (45.83%) of the crop growers belonged to average category followed by poor (28.33%) and better (25.84%) knowledge level. Irrespective of the landholding of farmers, characteristics like education, mass media exposure, extension participation and extension contact were revealed to have positive and significant association at one per cent level of significance. Whereas social participation, participation in training programme, value orientation, risk orientation, achievement motivation, scientific orientation and cosmopolitaness. Major constraints were found to be extensive use of chemical pesticides (Rank I) followed by increase in pest incidence (Rank II), deforestation (Rank III), less cultivated land and fragmented land scape (Rank IV), environmental pollution and pollinator deficit (Rank V) climate change (Rank VI) and lack of flora during the non-season (Rank VII) was least considered problem. Major suggestions by farmers to conserve pollinators was to conduct training and awareness programmes (81.67%) as most important suggestions, followed by judicious use of pesticides (50.00%), financial and incentive support from government with 57.50 per cent as important suggestion offered by big farmers, crop diversification 45.00 per cent, planting floral plants around the main crop (60.00%) and installing nesting and feeding sites (38.33%) are the important suggestions expressed by the farmers.

Keywords : Knowledge of farmers, Pollinators, Pollination, Problems in conserving pollinators

BIODIVERSITY and ecosystem services are pivotal for human well-being. Among these, pollination stands out as a crucial service, offering a multitude of advantages, from sustenance and medicine to genetic diversity, aesthetics and ecosystem robustness. An astonishing two-thirds of global crop plants, including essential food sources and medicines, rely on pollination by insects or animals to produce viable seeds. Beyond their direct contributions, pollinators bolster crop productivity, food security, livelihoods and the conservation of biological

diversity in both agricultural and natural ecosystems. However, achieving a delicate balance in pollination services for sustainable agroecosystems presents a substantial challenge.

On a global scale, animal-mediated pollination adds an estimated value of USD 235-577 billion to agricultural production, underscoring its significance. Insect pollinators, in particular, play a pivotal role in the productivity of at least 75 per cent of crucial crop species, accounting for 35 per cent of global food

production (Klein *et al.*, 2007). In India, insect pollination contributes a staggering Rs.1,12,615.73 crores (USD 22.52 billion) annually, encompassing benefits like enhanced quality traits, increased seed production and improved breeding efficiency. Nevertheless, many farmers lack awareness of the vital role of pollinators and the need to conserve them through their land management practices. The absence of pollinators also threatens native plant species, potentially leading to their extinction and affects food sources for numerous bird and mammal species, including humans (Arindam *et al.*, 2018)

Furthermore, self-incompatibility in over 300 plant species across 70 families hinders self-pollination, resulting in reduced seed production. The quest for equilibrium in pollination services for present and future crop production remains a substantial challenge in designing sustainable agro ecosystems. Reduced pollinator abundance and distribution within agro-ecosystems have multifaceted impacts, influencing not only crop yields but also various agro-ecosystem functions, profoundly affecting farmers. The arrangement of terrain and habitat components plays a pivotal role in shaping these dynamics.

Efforts to identify and manage pollinator diversity hold the promise of significant conservation outcomes, ultimately enhancing agricultural yield in terms of both quality and quantity. Thus, it becomes imperative to gauge farmer's awareness of the importance of pollination and pollinators within the broader context of production and management factors. In light of these considerations, this study was conducted with the specific objective of assessing farmer's knowledge regarding the significance of pollinators and pollination.

METHODOLOGY

Ex-post facto research design was adopted for the study. Kolar and Chikkaballapur districts of Karnataka were identified as locale for the study. These districts are situated in the western part of Bangalore division. Both, agriculture and horticulture are prime occupations of the people in this region.

Farmers of these districts extensively grow tomato, potato, carrot, chilli, mango, pomegranate, sapota, etc. as cash crops along with agricultural crops, mulberry and dairy farming. The study area was purposively selected because of diversified farming system and high production along with high productivity of various crops especially horticulture crops. One potential taluk was selected from each district. Srinivasapura taluk from Kolar district and Chintamani taluk from Chikkaballapur district were selected purposively as they have more area under horticultural crop production. Six villages from each taluk were selected for the study. From each village, ten farmers were randomly selected of which five small farmers and five big farmers. Thus, 120 farmers were selected from 12 villages of two potential taluks.

The independent variables selected for the study were age, education, land holding, experience in farming, annual income, social participation, mass media exposure, extension participation, extension contact, participation in training programmes, value orientation, risk orientation, achievement motivation, scientific orientation and cosmopolitaness.

The 'Teacher made test' was employed to measure the knowledge level of respondents. All the important aspects to check the knowledge of farmers on importance of pollination and pollinators were listed. A total number of 29 statements were selected out of 35 listed statements in relation to pollination and pollinators. The questions and answers were carefully formed by consulting subject matter specialists of University of Agricultural Sciences, Bangalore along with review of related literature. The statements were subjected to thorough scrutiny and editing to avoid ambiguity of meaning, eliminate duplication of ideas and to achieve clarity and specificity of question. The answers elicited from the farmers were quantified by giving score one to correct answer and zero to incorrect answer. The obtained scores were added and used in the given formula to get the knowledge index of respondents.

knowledge index = (number of correct responses ÷ total number of knowledge items) x 100

Overall Knowledge Level of Farmers About Importance of Pollinators and Pollination

Among small farmers, the trend observed was nearly half (46.67%) of them were under average knowledge category followed by poor (28.33%) and better (25.00%) levels of knowledge. In the case of big farmers, more than two-fifth (45.00%) of the farmers were categorized under average level of knowledge followed by poor (28.33%) and better (26.67%) levels of knowledge. In total, nearly half (45.83%) of the farmers belonged to average level of knowledge, followed by more than one-fourth (28.33%) were under poor level of knowledge and nearly one-fourth (25.84%) belonged to better level of knowledge. The results are in line with the study conducted by Frimpong *et al.* (2013). The reason behind the medium level of knowledge among the farmers might be due to most of the farmers have middle age, medium level of education, extension contact and participation in training and awareness programmes related to different environmental and ecological services beneficial to their crop production, which help them to have good idea about the importance of those services along with medium level of value orientation which makes the farmers to have better ethical knowledge about the surrounding

environment. More than one-fourth of them had poor knowledge about importance of pollinators and pollination. The probable reason may be that lack of awareness about its contribution towards increasing the productivity of crops. It may be useful to understand the knowledge structure among farmers. Management decisions among farmers can have a meaningful impact on pollinator abundance and pollination services, so laying the foundation for effective communication campaign with farmers may be useful for conservation efforts. Findings implies that the conservation of other pollinator groups apart from honeybees in the areas is at jeopardy. For instance, even syrphidae was least identified by the respondents even though dipterans are second dominated pollinator group.

Statement wise Knowledge Level of Pooled Farmers about the Importance of Pollination and Pollinators

Statement wise knowledge of pooled farmers about importance of pollinators and pollination was presented in Table 4. More than three fourth of the farmers (75.83%) had correct knowledge about insects as visitors to their crops. Further, 63.33 per cent of farmers says that honeybees are useful only for honey production and nearly three fifth (59.17%) of them had correct knowledge about decline in production over the year, 57.50 per cent of them think

TABLE 1
Overall Knowledge level of farmers about importance of pollinators and pollination (n=120)

Knowledge level	Respondents					
	Small farmers (n ₁ =60)		Big farmers (n ₂ =60)		Total farmers (n=120)	
	No	%	No	%	No	%
Poor (<16.67)	17	28.33	17	28.33	34	28.33
Average(16.67-20.20)	28	46.67	27	45.00	55	45.83
Better (>20.20)	15	25.00	16	26.67	31	25.84
Total	60	100	60	100	120	100

Mean : 18.44; SD : 3.53

TABLE 2
Statement wise knowledge level of pooled farmers about the importance of pollination and pollinators.
(n=120)

Particulars	Knowledge level			
	Correct knowledge		Incorrect knowledge	
	No	%	No	%
Are the same crops being cultivated over years (if yes, how many years)	66	55.00	54	45.00
Is there any decline in production over the year?	71	59.17	49	40.83
Did you observe any insects visiting flowers in your field?	91	75.83	29	24.17
Do you know that pollinator visits flowers for its food?	55	45.83	65	54.17
Do you know that flowers contain male and female parts?	57	47.50	63	52.50
Are you aware of pollination?	63	52.50	57	47.50
Do you know pollinators other than bees?	51	42.50	69	57.50
Do you think your crop needs pollinators?	57	47.50	63	52.50
Do you believe pollination increases the crop yield?	63	52.50	57	47.50
Do you think increase in pollinator population will increase the crop yields further?	48	40.00	72	60.00
Do you think there is a need to conserve pollinators?	53	44.17	67	55.83
Do you think honeybees are useful only for honey production?	76	63.33	44	36.67
Are you aware of any training programmes related to pollinators management or conservation?	25	20.83	95	79.17
Pollination is done in following crops is through				
1. Mango - housefly	6	05.00		
2. Cucurbits - bumble bees/squash bees (Tharini <i>et al.</i> , 2015)	7	05.83	80	66.67
3. Sunflower - honey bees (Sanganna <i>et al.</i> , 2021)	9	07.50		
4. Redgram - hymenopterans	6	05.00		
5. Flowers - butterflies/wasps/bees/flies.	12	10.00		
Do you think pesticides also kill beneficial insects like pollinators?	69	57.50	51	42.5
Do you think that decline in pollination can result not only in reduced yield but also inferior fruits and seeds?	41	34.17	79	65.83
Do you know pollinators will influence the fruit set in vegetables, pulses, edible oilseeds, fruits etc	51	42.50	69	57.50
Do you think that Beekeeping in farm enhances crop yield and income of farmers?	56	46.67	64	53.33

that pesticides also kills beneficial insects like pollinators. More than half of them says that same crops being cultivated over the years (55.00%) and 52.50 per cent of them are aware of pollination and they believe that pollination increases the crop yield. More than three-fourth of the farmers had incorrect knowledge about training programmes organized by KVKs and other organisations about pollination and

conservation of pollinators (79.17%) followed by incorrect knowledge about crop specific pollinators (66.67%), incorrect knowledge about importance of pollination on increasing yield getting superior quality fruits and seeds (65.83%), incorrect knowledge about other pollinators other than honeybees (57.50%), incorrect knowledge about conserving pollinators (55.83%).

Relationship Between Personal, Socio-Economic, Psychological and Communication Characteristics of Farmers with their knowledge Level about the Importance of Pollination and Pollinators

With the aim of measuring the association that exists between personal, socio-economic and psychological characteristics with their knowledge level of farmers, chi-square test was employed and tested for the statistical significance. Table 5 projects the data in relation to association between personal, socio-economic and psychological characteristics with knowledge level of small, big and pooled farmers on importance of pollination and pollinators. Irrespective of the landholding, characteristics like education, mass media exposure, extension participation and extension contact are revealed to have positive and significant association at one per cent level of significance. Whereas social participation, participation in training programme, value orientation, risk orientation, achievement motivation, scientific orientation and

cosmopolitanism had positive and significant association at five per cent level of significance. However age, farming experience and annual income had non-significant association with knowledge level on importance of pollination process and services provided by pollinators.

Education and Knowledge about Importance of Pollination and Pollinators

Education is an important factor in affecting the knowledge level of farmers and it was found that the education is associated significantly with their knowledge level. The results were in conformity with the study conducted by Gugulethu *et al.* (2020). The defining reason for this association might be the benefits that an individual gains from education in the form of knowledge acquisition, widening the mental horizon, empowerment to reach higher accomplishments. Farmers with literacy have a ability to understand the surrounding environment and

TABLE 3
Association of personal, socio-economic and psychological characteristics of farmers with their knowledge level

(n=120)

Independent variables	Small farmers (n ₁ =60)	Big farmers (n ₂ =60)	Pooled Farmers (n=120)
	Chi-square statistic	Chi-square statistic	Chi-square statistic
Age	2.38 ^{NS}	4.15 ^{NS}	05.59 ^{NS}
Education	23.87 ^{**}	25.72 ^{**}	31.73 ^{**}
Farming experience	3.05 ^{NS}	4.98 ^{NS}	06.91 ^{NS}
Annual income	2.68 ^{NS}	3.62 ^{NS}	4.69 ^{NS}
Social participation	9.48 [*]	11.73 [*]	12.18 [*]
Mass media exposure	26.26 ^{**}	28.59 ^{**}	31.76 ^{**}
Extension participation	21.89 ^{**}	25.35 ^{**}	30.01 ^{**}
Extension contact	23.61 ^{**}	27.94 ^{**}	33.43 ^{**}
Participation in training programmes	10.68 [*]	11.21 [*]	12.75 [*]
Value orientation	9.48 [*]	9.82 [*]	10.22 [*]
Risk orientation	9.51 [*]	9.95 [*]	10.27 [*]
Achievement motivation	10.27 [*]	13.12 [*]	13.19 [*]
Scientific orientation	11.38 [*]	12.39 [*]	12.50 [*]
Cosmopolitanism	9.89 [*]	10.95 [*]	11.44 [*]

NS- Non-Significant; *- Significant at 5 per cent level; **- Significant at 1 per cent level

ecological services provided in nature for their benefit in a better perspective and take the decision accordingly and implement in their field to conserve those cost-free services. Education enhances the capacity of farmers to plan, organize, take decision and manage their farms in a better and environmentally friendly manner.

Massmedia and Knowledge about Importance of Pollination and Pollinators

Mass media has a significant role in creating awareness and increasing knowledge about new technologies and innovative practices. Mass media exposure was found to be associated significantly at one per cent. Growers with higher mass media exposure are able to get enlightened with knowledge of importance in maintaining the ecological balance for further sustainable crop production and productivity. Conserving aspects related to pollinators which help them for proper planning and decision making in taking up of farm operations to enhance their macro climate around their farms.

Extension Participation, Extension Contact and Knowledge about Importance of Pollination and Pollinators

The study also revealed that extension participation and extension contact are positively and significantly associated with knowledge level of farmers in regard to importance of services provided by pollinators and their conservation as need of the hour. The cause of this positive association is that more the contact with extension personnel and participation in extension activities like field days, demonstrations, trainings and other awareness programmes related to enhancing the knowledge and practices in regard with recognizing the significance of pollination process in increasing the crop production, productivity and practices to be adopted for conserving the pollinators. The contact with extension agents would make the farmers the earliest individuals to know the beneficial technologies for future sustainability of their farmlands.

Social Participation, Cosmopoliteness and Knowledge about Importance of Pollination and Pollinators

Both social participation and cosmopoliteness were found to have significant and positive association with knowledge level of farmers. Higher cosmopoliteness and social participation of the crop growers ensures a lot of scope for the exchange of facts, thoughts and feelings related to the outside society perspective in terms of importance of unappreciated ecological services which intensifies their mental capabilities and also decision taking abilities of farmers in order to adopt the same perspective if it is benefitting them in the long run. Social participation encourages the farmers to take up a healthy competition to achieve their determined goals in terms of enhanced productivity and develop leadership ability by involving in various activities in society. Crop growers are also motivated to visit the successful farm units to understand and learn the practical application of practices adopted for conserving the pollinators there by maintaining the stability and sustainability in their yield.

Value Orientation, Risk Orientation and Knowledge about Importance of Pollination and Pollinators

The Table 5 also depicts that value orientation and risk orientation are associated with knowledge level of farmers on importance of pollinators in a positive and significant manner. The conceivable reason for above association of value orientation with knowledge level might be that the farmers have concern about the contributions done by nature for the benefit of mankind and also solicitude towards the pollinators. The risk orientation would help to gather recent updated information related to different cropping practices which help them naturally to conserve the pollinators. So the farmers with high risk orientation would take up the risk of going to different farming practices including natural and organic farming leaving out the chemical farming to enhance the pollinator activity.

Participation in Training Programmes and Knowledge about Importance of Pollination and Pollinators

Participation in training programmes related to pollination and pollinators had a positive and significant association with knowledge of farmers. Training brings up a good chance for farmers to enhance their knowledge base and improve skills to be operative and efficient in the workplace. So the farmers who attended more training and awareness programmes related to importance of pollination and pollinators in the crop production enhancement programme definitely have more knowledge level.

Achievement Motivation and Knowledge about Importance of Pollination and Pollinators

Achievement motivation was associated in a significant and positive manner to the knowledge level of farmers. The inference drawn about the significant association of achievement motivation is due to the reality that the farmers expectancy for increase their crop production, productivity, incentive worth of success and to maintain the ecological balance for sustainable yields in the future with minimum resources they would take the decision to go for organic based farming or diversification for protecting the process of pollination and pollinators population even though the practices might involve moderate risk of reduced yield in first few years of adoption. The reason of taking this decision would be high need of achievement of goals which are above than all other aspects and this achievement motivation requires a proper channel of knowledge and awareness about the notable aspects and additional benefits provided by pollinators.

Scientific Orientation and Knowledge about Importance of Pollination and Pollinators

The study revealed that the scientific orientation is positively and significantly associated with knowledge of farmers. The possible reason for the above trend is that scientific orientation helps farmers to know the environmental friendly technologies and modern practices developed to maintain the stability of ecosystem and protecting the natural services by

the nature. Farmers with high scientific orientation will have an attitude of taking up new farming methods which are the modified versions of existing methods in order to enhance the eco-friendly and productive crop cultivation which definitely requires acquisition of knowledge in regard to all the aspects related to pollination and pollinators and significance of their role in balancing the ecosystem.

Problems Faced by Farmers in Conserving the Pollinators and Safeguarding the Pollination Process

Studying problems faced by farmers in conserving pollinators will help in understanding the reasons obstructing in the conservation process and helps to establish and execute rational and global policies that enable and promote activities to safeguard and manage pollinators. Pollination concerns are often an incising issue and policies should be designed to consolidate pollinator and pollination considerations not only into the conditions of sustainable agricultural adaptation, but also over many diversifying sectors (for example forestry and health).

Table 4 depicts an overall picture of problems related to pollinators of which the major constraints were found to be extensive use of chemical pesticides (Rank I), followed by increase in pest incidence (Rank II), deforestation (Rank III), less cultivated land and fragmented land (Rank IV), environmental pollution and pollinator deficit (Rank V) climate change (Rank VI) and lack of flora during the non-season (Rank VII) was least considered problem.

Further, the data in Table 4 indicates that major problems faced by farmers in conserving the pollinators were lack of awareness and training programmes (55.00%), lack of ability to identify pollinators (41.66%), followed by lack of organic practices (45.83%) and fear of handling insects (44.17%) respectively, at larger extent.

Further, the major constraints expressed by the farmers in relation with threat to pollinators and pollination was extensive use of harmful pesticides, followed deforestation which destroys their feeding

TABLE 4
Problems of overall farmers in regarding conservation of pollinators and pollination (n=120)

Problems	Extent of problems						Score	Rank
	Greater Extent		Moderate Extent		Lesser Extent			
	f	%	f	%	f	%		
<i>A. Problems related to pollinators and pollination</i>								
Deforestation	36	60.00	17	28.33	07	11.67	149	II
Less cultivated land	35	58.34	17	28.33	08	13.33	147	III
Fragmented landholding	35	58.34	19	31.66	06	10.00	149	II
Lack of flora during non-cropping season	07	11.67	36	60.00	17	28.33	110	VIII
Loss of food and nesting sites	43	71.66	10	16.67	07	11.67	156	I
Increase in incidence of pest and diseases	20	33.33	33	55.00	07	11.67	133	V
Extensive use of chemical pesticides	29	48.33	19	31.67	12	20.00	137	IV
Pollinator deficit	32	53.33	09	15.00	19	31.67	133	V
Environmental pollution	17	28.33	36	60.00	07	11.67	130	VI
Climate change	16	26.66	34	56.67	10	16.67	126	VII
<i>B. Problems faced by farmers in conservation of pollinators and pollination</i>								
Lack of awareness about the pollination and training programmes related to pollination	22	36.67	20	33.33	18	30.00	144	II
Inability to identify pollinators (to differentiate harmful and useful insects)	32	53.33	16	26.67	12	20.00	151	I
Lack of interest in conservation of pollinators	17	28.33	35	58.34	08	13.33	129	III
Fear of handling insects	09	15.00	08	13.33	43	71.67	86	V
Inadequate usage of organic fertilizers and biopesticides	21	35.00	13	21.67	26	43.33	115	IV

f - Frequency; % - per cent

and nesting sites, also few of them mentioned about the climatic changes might be the reason for threat of extinction to the pollinators. The above findings are relatively similar to findings of Mudssar *et al.* (2020). However, the problems faced by farmers to

conserve were lack of awareness and knowledge about the pollination process and pollinator activities. Most of the farmers also expressed that identifying the beneficial insects from harmful insects is one of the major constraints and also convincing themselves to

TABLE 5
Suggestions of overall farmers for conservation of pollinators and pollination (n=120)

Problems	Most important		Important		Least important		Score	Rank
	f	%	f	%	f	%		
Judicial use of pesticides/ use of organic fertilizers or bio pesticides	60	50.00	36	30.00	24	20.00	276	II
Planting of floral plants around the main crop	24	20.00	72	60.00	24	20.00	240	V
Installation of nesting sites and feeding sites for the insect pollinators	15	12.50	46	38.33	59	49.17	196	VI
Conducting awareness and training programmes about conservation practices about pollinators	98	81.67	13	10.83	09	7.50	329	I
Incentives and financial support from government agencies for bee keeping	69	57.50	40	33.33	11	9.17	265	III
Crop diversification	25	20.84	54	45.00	41	34.16	224	IV

f - Frequency; % - per cent

initiate organic farming is a problem faced as it requires long years to produce sustainable yields.

Suggestions Perceived by Farmers in Conserving the Pollinators and Safeguarding the Pollination Process

Suggestions helped in addressing connection between pollinators and human health, nutritious diets, pesticide exposure and the provision of ecosystem services and functions, beyond food production. Acknowledging pollinators as part of holistic farming systems, an important agricultural input and an essential part of the ecosystem maintenance and its integrity. Administering environment-based solutions and strengthen positive interactions (*e.g.* on-farm diversification, integrated pest management, restoration to increase landscape connectivity, ecological intensification).

The Table 5 reveals that one of the major suggestions offered by farmers to conserve pollinators was to conduct training and awareness programmes (81.67%) as most important suggestions, followed by

judicial use of pesticides (50.00%), financial and incentive support from government with 57.50 per cent as most important suggestion, crop diversification 45.00 per cent, planting floral plants around the main crop (60.00%) and installing nesting and feeding sites (38.33 %) were the important suggestions expressed by the farmers.

The farmers had a better perception with regard to use of organic nutrients but were expecting to get some incentives or subsidies to use organic fertilizers instead of chemical fertilizers. Respondents also interpreted that reduction of chemical fertilizer by their own might be difficult instead ban of harmful chemicals causing harm to beneficial insects by the government and there by encouraging less harmful chemicals may be one of the ways to conserve pollinators.

Designing sustainable agro ecosystems today faces a significant problem in balancing pollination services to ensure both current and future crop output. Amounting to between US\$235 and US\$577 billion worldwide, animal-mediated pollination directly

contributes to agriculture. Because pollinators maintain ecosystem health and function and balance wild plant reproduction, they are inextricably related to human well-being. Without awareness of and conviction in the significance of ecosystem services, it may be challenging for farmers to participate in their conservation. Most farmers are unaware of how to manage their property to improve ecosystem balance by protecting pollinators and promoting pollination services.

Results of the study indicated that nearly half (45.83%) of the farmers belonged to medium level of knowledge, followed by more than one-fourth (28.33%) were under low level of knowledge and nearly one-fourth (25.84%) belonged to high level of knowledge. Among small farmers, the trend observed was nearly half (46.67%) of them were under medium knowledge category followed by low (28.33%) and high (25.00%) levels of knowledge. In the case of big farmers, more than two-fifth (45.00%) of the farmers were categorized under medium level of knowledge followed by low (28.33%) and high (26.67%) levels of knowledge. Association between personal, socio-economic and psychological characteristics with knowledge level of farmers on importance of pollination and pollinators. Characteristics like education, mass media exposure, extension participation and extension contact are revealed to have positive and significant association at one per cent level of significance. Whereas social participation, participation in training programme, value orientation, risk orientation, achievement motivation, scientific orientation and cosmo politeness had positive and significant association at five per cent level of significance. However age, farming experience and annual income had non-significant association with knowledge level on importance of pollination process and services provided by pollinators.

The gap in knowledge refers to difference between improved practices and existing practices of the farmers. This gap obviously varies considerably with time and space depending upon the existing level of knowledge of the farmers. Gap in knowledge would

be bridged efficiently if appropriate extension strategy is worked out for each component. The gap in knowledge level could be due to lack of awareness, lack of motivation or conviction, lack of resources etc. Mass media approach and group led extension may be needed to create awareness about importance of pollinators and pollination along with exposure visit to successful entrepreneur field.

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