Journal of Scientific Research and Reports

Volume 30, Issue 9, Page 138-147, 2024; Article no.JSRR.122029
ISSN: 2320-0227

Rooting for Change: Unveiling Farmers' Bio-input Awareness and Knowledge Across Tamil Nadu's Agro-climatic Zones

B. Vishnu Priya [a++], N. Sriram [b#*], M. Senthil Kumar [c†], V. Saravanakumar [d#] and Patil Santosh Ganapati [e‡]

[a] Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore -641003, India.
[b] Directorate of Research, Tamil Nadu Agricultural University, Coimbatore-641003, India.
[c] Directorate of Extension Education, Tamil Nadu Agricultural University, Coimbatore-641003, India.
[d] Department of Agricultural Economics, CARDS, Tamil Nadu Agricultural University, Coimbatore -641003, India.
[e] Department of Physical Sciences and Information Technology, AEC&RI, Tamil Nadu Agricultural University, Coimbatore-641003, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author BVP contributed in collecting materials, analysis of results and interpretation and prepared the manuscript. Author NS guided to prepared the manuscript, reviewed, edited and supervised the study. Author PSG did data analysis and prepared the original draft. Author VS supervised the work and revised the manuscript. Author MSK edited and revised the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jsrr/2024/v30i92338

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/122029

Original Research Article

Received: 18/06/2024
Accepted: 20/08/2024
Published: 26/08/2024

[++] PG Scholar;
[#] Professor (Agrl. Extension);
[†] Associate Professor (Agrl. Extension);
[‡] Assistant Professor (Agrl. Statistics);
**Corresponding author: E-mail: ns73@tnau.ac.in;*

Cite as: *Priya, B. Vishnu, N. Sriram, M. Senthil Kumar, V. Saravanakumar, and Patil Santosh Ganapati. 2024. "Rooting for Change: Unveiling Farmers' Bio-Input Awareness and Knowledge Across Tamil Nadu's Agro-Climatic Zones". Journal of Scientific Research and Reports 30 (9):138-47. https://doi.org/10.9734/jsrr/2024/v30i92338.*

ABSTRACT

Aim: The purpose of this research is to analyse farmers' awareness and knowledge towards bio-inputs across six agro-climatic zones in Tamil Nadu, India.

Study Design: The study used an ex post facto research strategy with multistage random sampling.

Place and Duration of Study: The research was conducted in eight districts spanning six agro-climatic zones of Tamil Nadu. Data was collected between December 2023 to April 2024 using a well-structured interview schedule.

Methodology: A total of 240 farmers were surveyed, with 30 drawn from each of the eight districts. Participants were selected via snowball sampling. Data was gathered through structured interviews and evaluated using percentage analysis.

Results: The survey found that 55.56% of farmers across all districts were highly aware of bio-inputs, 26.64% were somewhat knowledgeable, and 17.79% were unaware. Thoothukudi district had the highest awareness rate (68%), followed by Thanjavur (66.66%) and Villupuram (64%). Kodaikanal was the outlier, with the lowest high awareness (24.50%) and the greatest low awareness (39.50%). The research identified various factors influencing these variances, including the efficacy of extension services, access to knowledge and resources, demonstration programs, peer influence, and socio-economic status.

Conclusion: The data show a significant gap between farmers' awareness and in-depth understanding of bio-inputs such as Rhizobium, Azotobacter, and Phosphate Solubilizing Bacteria (PSB), with noticeable regional differences. While overall awareness is good, the prevalence of medium knowledge levels suggests the need for additional practical, hands-on training and continuing education programs. This can be achieved through region-specific initiatives, including on-farm demonstrations, farmer-to-farmer knowledge sharing, and collaboration with local agricultural universities. Addressing these challenges has the potential to promote sustainable farming methods, ensuring food security and environmental health across Tamil Nadu's diverse agro-climatic zones.

Keywords: Bio-inputs; sustainable agriculture; organic farming; soil health; food security; environmental sustainability; Rural development.

1. INTRODUCTION

The Green Revolution, which began in the late twentieth century, sparked a global agricultural boom. By introducing new high-yielding seed types and expanding the use of synthetic fertilizers, insecticides, and other agrochemicals, the Green Revolution greatly increased plant productivity and agricultural yields [1]. The worldwide agricultural environment has altered dramatically since then. The widespread use of synthetic agrochemicals to increase crop output has harmed the biological and physicochemical health of arable soils, resulting in a decline in agricultural productivity worldwide over the last several decades [2,3]. Land resources are dwindling and biological richness is being depleted under the current situation. To meet the growing need for sustainable agriculture, agricultural crop yields and productivity must be improved at the same time as agricultural commodity output. There is no single or simple answer to the above-mentioned complex, ecological, socioeconomic, and technological issues in promoting sustainable agriculture [4].

Promoting sustainable agriculture through a gradual reduction in the use of synthetic agrochemicals and increased use of bio inputs [5], as well as the biological and genetic potential of crop plants and microorganisms, is an effective strategy for combating rapid environmental degradation while ensuring high agricultural productivity and better soil health [1].

Agriculture is critical to India's economic growth and global food security. However, the industry confronts various problems that have an influence on its long-term viability and productivity. Studies discuss numerous concerns that farmers face, including dependency on the monsoons and fertilizer and pesticide use [6]. Among these concerns, the misuse of chemical fertilizers and pesticides has arisen as a major worry owing to its negative impact on soil health and long-term agricultural sustainability [7,8].

In accordance to these issues, there is a greater focus on bio-inputs in agriculture. The Indian biofertilizer market has expanded significantly, with output more than doubling between FY09 and FY15 [9]. This trend is likely to continue, fuelled by strong government efforts encouraging bio-agriculture. Tamil Nadu, in particular, has emerged as a pioneer in this sector, recognizing the advantages of biofertilizers in boosting soil health and production [10].

The Tamil Nadu government has established a number of projects to encourage the usage of biofertilizers. According to the Tamil Nadu Department of Agriculture, these programs include the Chief Minister's Dryland Development Mission, the Sustainable Cotton Cultivation Mission, and the National Food Security Mission. These initiatives attempt to disperse enormous amounts of biofertilizers such as Rhizobium, Azotobacter, Azosprillum etc., across vast regions of agricultural land used to produce a variety of crops [11-13].

While these studies seem promising, their success is ultimately dependent on farmers' adoption. However, there is meagre documents on farmers' existing awareness and knowledge of bio-inputs. Understanding these factors is critical for a various reasons, including evaluating the effectiveness of existing outreach and education programs, identifying knowledge gaps that must be addressed in future initiatives, providing insights into potential barriers to bio-input adoption, and informing policy decisions to tailor future programs to farmers' needs.

This work seeks to meet two key objectives:

1. To assess farmers' Awareness of bio-inputs in agricultural and horticultural crops.
2. To evaluate farmers' knowledge of bio-inputs in agricultural and horticultural crops.

2. METHODOLOGY

Biofertilizers increase soil fertility in agricultural regions, hence it is important to assess farmers' attitudes regarding bio inputs. The ex-post facto research design was used for the study. The pilot survey was conducted for the assessment of the study. The purpose of the pilot study was to identify and eliminate potential problems with the questionnaire, Given the novelty of biofertilizers, a multistage random sampling procedure was used to get a representative sample of farmers who use them.

Eight districts will be chosen from the five agroclimatic zones of Tamil Nadu. This research will include 30 samples from each district picked using snowball sampling approaches. As a result, 240 samples would be taken from the selected eight districts of Tamil Nadu (Table 1). The gathered data was analysed using basic percentages. Percentage analysis was utilized in the descriptive analysis procedure to get basic and calculated percentages. To get percentages, multiply a category's frequency by 100 and divide by the total number of respondents. To guarantee accuracy, all percentages were rounded to two decimal points. In this study, the respondents were divided into various categories using the mean and standard deviation. High level was defined as mean plus one standard deviation, and low level as mean minus one standard deviation. The range between the plus and minus standard deviations represented the medium level.

Percentage = (Frequency / Total no. of respondents) × 100

$$\boldsymbol{x} = \Sigma\ \mathbf{xi}\ \boldsymbol{n}$$

where, x = Arithmetic mean, $\sum$xi = Sum of observation score, n = Total number of respondents

$$S = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

where, S = Standard deviation, $\sum$ = means 'sum of' xi = each value of data set, x = mean of all value in the data set, n = number of values in the data set

CV = (σ / μ) * 100

Where: CV = Coefficient of Variation σ (sigma) = Standard Deviation μ (mu) = Mean

Range = Maximum value - Minimum value

Where: Maximum value = The highest number in the data set Minimum value = The lowest number in the data set.

Table 1. Sample area distribution

Sl.no	Zones	District	Crops	Sample size
1	Western Zone	Erode	Pulses	30
2	Cauvery Delta Zone	Tanjavur	Paddy	30
3	North Eastern Zone	Villupuram	Oilseed	30
4	North Eastern Zone	Thiruvannamalai	Millets	30
5	Western Zone	Theni	Vegetables	30
6	Southern Zone	Tuticorin	Millets	30
7.	Hilly zone	Dindigul	Hilly banana	30
8.	Cauvery Delta Zone	Pudukottai	Maize	30
		Total		**240**

3. RESULTS AND DISCUSSION

3.1 Awareness of Farmers Regarding Bio Fertilizers and Pesticides

In Thanjavur, the majority of farmers (66.66%) have a high degree of understanding of bio-inputs, while a minor number (6.66%) have poor awareness and 26.66 per cent have medium awareness. In Tiruvannamalai, a similar pattern emerges, with 63.33 per cent of farmers having high awareness, 10.00% having poor awareness, and 26.66 per cent having medium awareness. Theni has a more even distribution of awareness, with the biggest proportion of farmers having high awareness (47.34%), a significant number (20.00%) having low awareness, and 32.66 per cent having medium awareness. In Villupuram, the distribution is largely in the high awareness group (64.00%), comparable to Thanjavur and Thiruvannamalai, with 10.00 per cent of farmers having low awareness and 26.00 per cent having moderate awareness. Erode has a rather uniform distribution, with half of farmers having high awareness (50.00%) and the remainder falling between low (16.66%) and medium (33.33%) awareness levels. In Pudukkottai, the majority of farmers are in the high awareness group (60.66%), but the low and medium awareness categories are closer in proportion (16.00% and 23.33%, respectively). Thoothukudi has the greatest proportion of farmers with high awareness (68.00%) of all districts, with a substantial number (23.50%) having low awareness and 8.50% having medium awareness. Kodaikanal is an exception, with the largest proportion of farmers with low awareness (39.50%), the lowest with high awareness (24.50%), and 36.00% with medium awareness. (Table 2) Studies evidence that the majority of farmers had a high degree of awareness but only a medium level of understanding [14]. Investigation provided more evidence for this claim. Other studies revels that the majority has a high degree of awareness [13].

Based on the findings, it was determined that 17.79% of farmers in all districts of Tamil Nadu have poor knowledge of bio-inputs, while the medium awareness group has an average of 26.64%, and the majority of farmers have high awareness, averaging 55.56%. This indicates that most districts have a larger proportion of farmers with high knowledge of bio-inputs, with the exception of Kodaikanal, which has a higher low awareness rate. The medium awareness group is very constant throughout all districts.

According to the statistics on farmer awareness of bio-inputs in Tamil Nadu, Thoothukudi has the greatest degree of awareness, with 68.00% of farmers classified as having high awareness.

Table 2. Awareness level of farmers towards bio fertilizers and bio pesticide

Sl.no	District	Low %	Medium%	High%
1.	Thanjavur	6.66	26.66	66.66
2.	Thiruvannamalai	10.00	26.66	63.33
3.	Theni	20.00	32.66	47.34
4.	Villupuram	10.00	26.00	64.00
5.	Erode	16.66	33.33	50.00
6.	Pudukkottai	16.00	23.33	60.66
7.	Thoothukudi	23.50	8.50	68.00
8.	Kodaikanal	39.50	36.00	24.50
	Total	**17.79**	**26.6425**	**55.561**

This is closely followed by Thanjavur (66.66%) and Villupuram (64.00%). These districts' farmers have a strong awareness of bio-inputs, suggesting that information or resources on agricultural methods are well disseminated in these places (Table 2).

The mean percentage of individuals with low awareness regarding bio inputs is 17.79%. This indicates that a smaller segment of the population lacks significant knowledge about bio inputs. However, the standard deviation of 10.41 shows a high degree of variability within this group, meaning that while some individuals have very little awareness, others may have slightly more, but still not enough to move out of the low category. The coefficient of variation (CV) at 58.51% further emphasizes the inconsistency in awareness levels, suggesting that the distribution of knowledge in this group is uneven. The range of 32.84 highlights a substantial spread in awareness, possibly due to differences in access to information, educational levels, or exposure to bio inputs initiatives. This wide range and high variability may be reflective of underlying disparities in information dissemination or engagement with agricultural practices (Table 3).

The average percentage of individuals with medium awareness is 26.64%, indicating a moderate level of knowledge about bio inputs among this group. The standard deviation of 8.53 points to a moderate variability, suggesting that awareness levels are relatively more consistent here than in the low group. The coefficient of variation (32.01%) shows moderate relative variability, indicating that while there is some diversity in awareness levels, it is less pronounced. The range of 27.50 suggests a moderate spread, which could imply that information dissemination has been more effective in reaching this group uniformly. However, the existence of variability within this group might be due to differences in how individuals' access or engage with bio inputs information (Table 3).

With a mean of 55.56%, the majority of the population falls into the high awareness category, reflecting a relatively widespread knowledge of bio inputs. The standard deviation of 14.63 indicates considerable variability within this group, suggesting that while many individuals have high awareness, the depth of knowledge varies. The coefficient of variation, at 26.34%, is the lowest among the three groups, indicating that awareness levels are more consistent here. The wide range of 43.50 suggests a broad spectrum of knowledge even within the high awareness group, where some individuals may be highly knowledgeable while others have just enough awareness to be categorized as "high." This variability could be due to differences in engagement, educational background, or the extent to which individuals have applied their knowledge in practice (Table 3).

3.1.1 Discussion

3.1.1.1 Low awareness

Farmers in specific districts of Tamil Nadu have limited understanding of bio-inputs, which may be caused by several circumstances. Geographic remoteness often restricts access to agricultural information and services, and language issues may impede farmers from comprehending available resources. Farmers' capacity to obtain and grasp bio-input information may be hampered by a lack of knowledge and literacy. Strong loyalty to conventional agricultural techniques may lead to resistance to new approaches. The lack of local success stories and obvious instances of bio-input advantages may inhibit adoption. Poor infrastructure and restricted access to technologies further impede information transmission. Economic constraints may lead farmers to prioritize immediate returns over long-term sustainable methods. Inadequate communication efforts by agricultural departments or non-governmental organizations (NGOs) in certain regions, along with the possible spread of disinformation, lead to low awareness levels (Fig. 1).

3.1.1.2 Medium awareness

Farmers with a medium level of knowledge of bio-inputs are generally in a transitional phase. They may have some exposure to material but lack a thorough comprehension. Mixed messages on the effectiveness of bio-inputs from various sources might cause misunderstanding. These farmers often have academic knowledge but little practical experience utilizing bio-inputs. Scepticism regarding the advantages of bio-inputs over traditional approaches may remain. Time and budgetary restrictions might impede the thorough examination of bio-input methods. Generational disparities in knowledge and adoption rates may also contribute to this ambiguity of awareness. This category comprises farmers who are aware of bio-inputs but have not completely committed to or comprehended its use (Fig. 1).

3.1.1.3 High awareness

Farmers' high knowledge of bio-inputs is often the consequence of competent extension programs that provide ongoing training and assistance. Strong instructional initiatives, such as farmer field schools, workshops, and seminars, are essential. Extensive media outreach via local agriculture programs on many platforms' aids in the widespread dissemination of information. Successful demonstration plots in communities provide visual proof of bio-input advantages. Government actions, such as supporting policies and subsidies, boost interest and adoption. The growing market demand for organic products encourages farmers to learn about bio-inputs. Peer influence, in which innovative farmers share information with their communities, raises awareness. The easy availability of bio-inputs in local markets also helps to raise awareness. This combination of elements provides an atmosphere in which farmers may easily get knowledge on bio-inputs and fully understand and appreciate their benefits (Fig. 1).

3.2 Farmers Knowledge Regarding the Bio Inputs

In Thanjavur, 31.67% of farmers have extensive understanding of bio-inputs, 56.00% have intermediate knowledge, and 12.33% have little knowledge. Thiruvannamalai reveals that 16.67% of farmers have high knowledge, a vast majority of 73.33% have medium knowledge, and 10% have little understanding. In Theni, 20.00% of farmers have advanced knowledge, 66.66% have intermediate knowledge, and 13.34% have little knowledge. In Villupuram, 30.00% of farmers have advanced knowledge, 50.00% have intermediate knowledge, and 20.00% have little knowledge. (Table 3). Erode has 33.34% farmers with high knowledge, 56.66% with medium knowledge, and 10.0% with poor knowledge. In Pudukkottai, 40.00% of farmers have advanced knowledge, 53.33% have intermediate knowledge, and 6.66% have little knowledge. Thoothukudi data reveal that 40.00% of farmers have high knowledge, 34.00% have medium knowledge, and 26.00% have poor knowledge. Kodaikanal is an exception, with 30.00% of farmers having high knowledge, 32.00% having medium knowledge, and a staggering 48.00% having poor knowledge.

Table 3. Statistical analysis of farmers' awareness levels on bio-inputs in Tamil Nadu, India

Sl.no	Awareness level	Mean	SD	CV	Range
1.	Low	17.79	10.41	58.51%	32.84
2.	Medium	26.64	8.53	32.01%	27.50
3.	High	55.56	14.63	26.34%	43.50

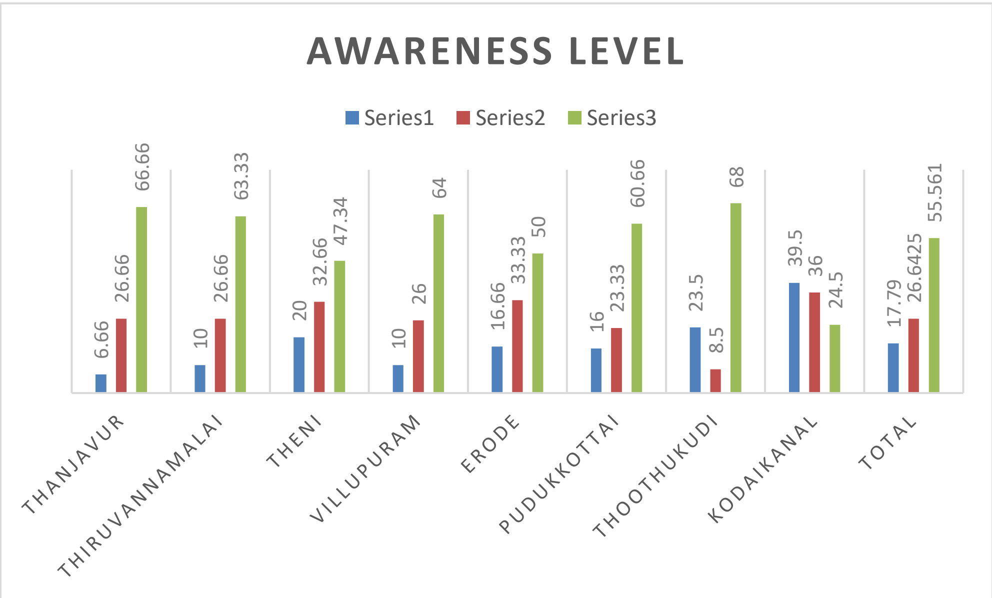

Fig. 1. Awareness output

Pudukkottai and Thoothukudi had the greatest levels of farmer knowledge of bio-inputs, with 40.00% of farmers in each district being classified as having good knowledge. These districts' farmers have a strong awareness of bio-inputs, suggesting that information or resources on agricultural methods are well disseminated in these places (Table 4).

In this respect, an average of 18.00% of farmers in all districts of Tamil Nadu have little understanding of bio-inputs, while the medium knowledge group has an average of 52.03%. The above findings are consistent with the findings [13], who found that the majority of farmers had a medium level of knowledge about the use of biofertilizer and 30.016% had a high level of knowledge. Another studies also reported that the majority of farmers had a high level of knowledge [9]. According to the statistics, most districts have a larger proportion of farmers with medium understanding of bio-inputs. Studies indicated that the majority of farmers had a medium level of expertise, which differs from this research in that they reported a low degree of knowledge [15]. This variation may be owing to the responder size, since this was concluded with a sample size of around 60, and it does not cover a larger region, focusing just on Gujarat. Studies found in their research that the majority of farmers had a medium degree of understanding of bio inputs, which matches our findings [10].

The mean percentage of farmers with low knowledge regarding bio inputs is 18.29%. This indicates that a smaller segment of farmers lacks significant knowledge about bio inputs. However, the standard deviation of 13.76 shows a high degree of variability within this group, meaning that while some farmers have very little knowledge, others may have slightly more, but still not enough to move out of the low category. The coefficient of variation (CV) at 75.23% further emphasizes the inconsistency in knowledge levels, suggesting that the distribution of knowledge in this group is highly uneven. The range of 41.34 highlights a substantial spread in knowledge, possibly due to differences in access to information, educational levels, or exposure to bio inputs initiatives. This wide range and high variability may be reflective of underlying disparities in agricultural extension services or engagement with modern farming practices (Table 5).

The average percentage of farmers with medium knowledge is 52.75%, indicating that the majority have a moderate level of knowledge about bio inputs. The standard deviation of 14.05 points to considerable variability, suggesting that knowledge levels are somewhat inconsistent in this group. The coefficient of variation (26.63%) shows moderate relative variability, indicating that while there is some diversity in knowledge levels, it is less pronounced than in the low group. The range of 41.33 (assuming the 241.33 in the table was a typo) suggests a significant spread, which could imply that while many farmers have gained some knowledge about bio inputs, the depth of understanding varies widely. This variability might be due to differences in how farmers access or engage with bio inputs information, or the varying effectiveness of training programs across different regions (Table 5).

With a mean of 30.21%, a substantial portion of farmers falls into the high knowledge category, reflecting a good level of expertise in bio inputs among a significant minority. The standard deviation of 8.35 indicates moderate variability within this group, suggesting that while these farmers have high knowledge, the depth of expertise varies. The coefficient of variation, at 27.64%, is similar to the medium group, indicating relatively consistent knowledge levels among highly informed farmers. The range

Table 4. Farmers knowledge towards bio inputs

Sl.no	District	Low%	Medium %	High%
1.	Thanjavur	12.33	56.00	31.67
2.	Thiruvanamallai	10.00	73.33	16.67
3.	Theni	13.34	66.66	20.00
4.	Villupuram	20.00	50.00	30.00
5.	Erode	10.00	56.66	33.34
6.	Pudukkottai	6.66	53.33	40.00
7.	Thoothukudi	26.00	34.00	40.00
8.	Kodaikanal	48.00	32.00	30.00
	Total	**18.00**	**52.03**	**30.016**

Table 5. Statistical analysis of farmers' knowledge levels on Bio-inputs in Tamil Nadu, India

Sl.no	Knowledge level	Mean	SD	CV	Range
1.	Low	18.29	13.76	75.23%	41.34
2.	Medium	52.75	14.05	26.63%	241.33
3.	High	30.21	8.35	27.64%	23.33

of 23.33 suggests a narrower spectrum of knowledge within the high category compared to the other groups. This could indicate that once farmers reach a high level of knowledge about bio inputs, their understanding becomes more uniform, possibly due to specialized training, practical experience, or active engagement with bio input practices (Table 5).

3.2.1 Discussion on levels of knowledge about bio-inputs among farmers in Tamil Nadu

3.2.1.1 High level of knowledge

Effective Extension Services: Districts such as Pudukkottai and Thoothukudi, where a large proportion of farmers are knowledgeable with bio-inputs, are likely to benefit from strong agricultural extension services. These services include training programs, seminars, and frequent visits from agricultural agents who educate farmers on the advantages and applications of bio-inputs.

Access to Information: The availability and accessibility of information via different channels, such as agricultural colleges, research organizations, and government programs, may considerably improve farmers' understanding. Regions with greater literacy rates and internet penetration tend to have higher levels of awareness and knowledge.

Demonstration Programs: Government or NGO-led demonstration programs demonstrating the efficacy of bio-inputs may also help to increase knowledge levels. When farmers witness the practical advantages of bio-inputs, they are more likely to accept and fully comprehend them.

Peer Influence and Farmer Networks: Farmers with strong networks and associations may share information and experiences more easily. Districts with active farmer organizations often have greater levels of knowledge owing to peer-to-peer learning and collaborative problem-solving techniques (Fig. 2).

3.2.1.2 Medium level of knowledge

Partial Exposure: Farmers in regions with medium knowledge may have had some exposure to bio-inputs but lack a thorough understanding. This might be attributed to infrequent training sessions, restricted demonstration projects, or uneven information transmission.

Mixed Results from Bio-Inputs: If the use of bio-inputs has produced mixed results in certain places, farmers may be dubious or only partly persuaded of their advantages, resulting in intermediate understanding.

Financial and Resource: Restrictions may limit farmers' capacity to fully study and use bio-inputs. Medium knowledge levels might occur when farmers are aware of bio-inputs but cannot afford to utilize them widely.

Limited Extension Services: Extension services may exist, but they are insufficiently strong or ubiquitous, resulting in only partial knowledge transmission. Farmers may have fundamental knowledge but lack deeper insights on the use and advantages of bio-inputs (Fig. 2).

3.2.1.3 Low level of knowledge

Lack of Awareness Programs: Districts with low knowledge levels, such as Kodaikanal, may have a lack of awareness programs and insufficient extension services. Farmers continue to be uninformed of the potential advantages of bio-inputs due to a lack of educational programs.

Geographical and Socioeconomic Barriers: Remote and economically poor areas often lack access to information and resources. Geographic remoteness may limit the accessibility of extension services and agricultural education initiatives.

Traditional Practices: Farmers in certain places may be firmly entrenched in traditional agricultural methods and reluctant to change. A strong devotion to traditional procedures might lead to a lack of understanding and acceptance of emerging technology such as bio-input.

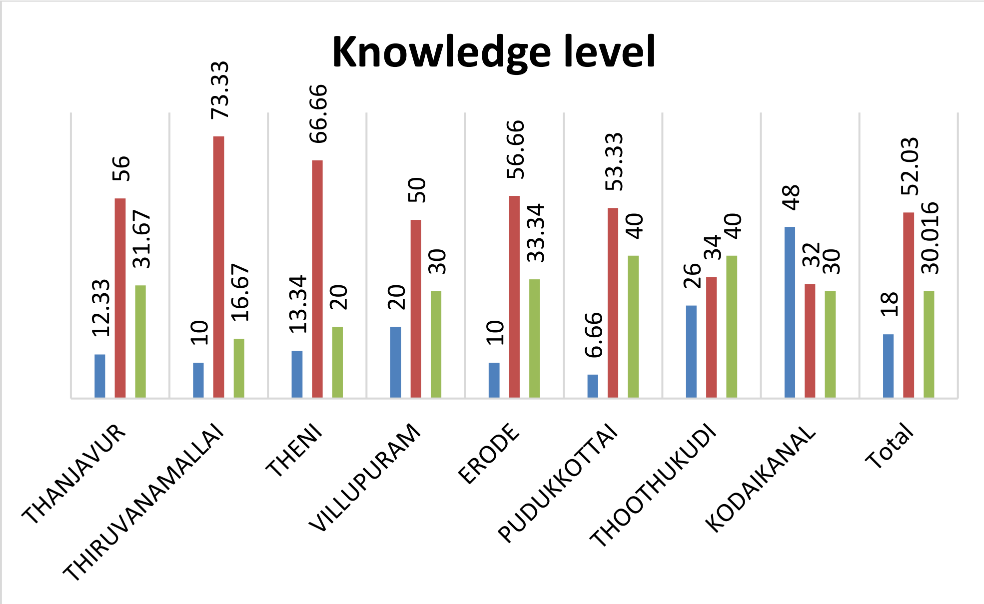

Fig. 2. Farmers knowledge

Misinformation and Preconceptions: In certain circumstances, farmers are misinformed or have preconceptions regarding bio-inputs, which leads to hesitation and a lack of expertise. Negative prior experiences or anecdotal evidence against bio-inputs may also contribute to this (Fig. 2).

4.CONCLUSION

This research found that farmers in Tamil Nadu's agro-climatic zones had variable degrees of awareness and understanding regarding bio-inputs. While overall awareness is promising (55.56% high), there is a significant difference between awareness and in-depth knowledge (30.016% high). Significant geographical variances underscore the need of targeted approaches. Key suggestions include improving practical training, overcoming adoption hurdles, and incorporating successful models from high-awareness districts. These activities are critical to encouraging sustainable agriculture, guaranteeing food security, and preserving environmental health throughout Tamil Nadu's diversified agricultural terrain. Write specific recommendation

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ACKNOWLEDGEMENTS

The authors are grateful to the farmers who participated in this research and were willing to share their insights and experiences with us. We also want to express our deepest thanks to the family members who have been unwaveringly supportive and helpful during this research Their support and understanding were invaluable. Special thanks to the persons accompanied for the data collection in all districts. In addition, we would like to thank all of our research scholars for their participation, insights, and companionship. Their efforts and assistance have significantly enhanced this research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Langumaran G, Smith DL. Plant growth promoting rhizobacteria in amelioration of salinity stress: A systems biology perspective. Front Plant Sci. 2017;8:1768.
2. Yang X, Fang S. Practices, perceptions, and implications of fertilizer use in East-Central China. Ambio. 2015;44(7):647-652.
3. Bishnoi U. Agriculture and the dark side of chemical fertilizers. Environ Anal Ecol Stud. 2018;3:EAES.000552.2018.

4. Kesavan PC, Swaminathan MS. Modern technologies for sustainable food and nutrition security. Curr Sci. 2018;115:1876-1883.
5. Fascella G, Montoneri E, Francavilla M. Biowaste versus fossil sourced auxiliaries for plant cultivation: The Lantana case study. J Clean Prod. 2018;185:322-330.
6. Singh J, Kumari M. Socio-economic Impacts of Agricultural Technologies on Farmers' Livelihood. Natl Acad Sci Lett. 2023;46(1):1-5.
7. Pathak AK, Christopher K. Study of socio-economic condition and constraints faced by the farmers in adoption of Bio fertilizer in Bhadohi district (Uttar Pradesh). J Pharmacogn Phytochem. 2019;8(2):1916-1917.
8. Basu A, Prasad P, Das SN, Kalam S, Sayyed RZ, Reddy MS, et al. Plant growth promoting rhizobacteria (PGPR) as green bioinoculants: Recent developments, constraints, and prospects. Sustainability. 2021;13(3):1140.
9. Reddy SP, Srinath B, Kishore S, Naidu BV, Satyanarayana R. Knowledge and adoption levels on organic farming in mulberry cultivation with the farmers in Chittoor district of Andhra Pradesh. Crop Res. 2012;43(1-3):284-8.
10. Priyadarshni P, Padaria RN, Burman RR, Singh R, Bandyopadhyay S, Aiswarya S. Farmers' Perception and Factors Influencing Adoption of Organic Farming. Indian J Agric Sci. 2022;58(3):51-5.
11. Liu J, Ma K, Ciais P, Polasky S. Reducing human nitrogen use for food production. Sci Rep. 2016;6:30104.
12. Mokhale SU, Deshmukh AN, Holi SS, Shambarkar YB. Technological knowledge of farmers about the use of biofertilizer. Agric Update. 2010;5(3-4):277-8.
13. Parmar NR, Patel PC, Panchasra BR. Comprehensive awareness of farmers regarding bio-fertilizers. Interaction. 2016;34(1):85-8.
14. Thomas S, Vijay A, Nair DS, Varghese T, Mathew MA. A study on farmers' awareness and perception towards biofertilizers. J Res Admin. 2023;5(2): 2443-53.
15. Diptesh C, Chauhan NM. Constraints faced by biofertilizer users. Gujarat J Ext Educ. 2016;27(1):49-52.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/122029