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## Biofertilizer usage in hill vegetable cultivation

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### Abstract

Agriculture production has shown manifold increase due to green revolution but has not been able to ensure long-term agricultural sustainability. They also contributed to soil deterioration and a host of other environmental and health issues, which led to the creation of biocontrol products, which are good for the environment because they use naturally existing microorganisms, plants, and insects. In addition to examining the farmers' challenges in using biofertilizer products, this study focused into the farmers' awareness and level of satisfaction with those products among those who grow vegetables. In this study, 90 sample respondent farmers were selected from the Nilgiris district of Tamil Nadu. The tools employed for the analysis were the Garrett ranking and percentage analyses. The lack of bio fertilizer products in the nearby location was discovered to be a key barrier for farmers in using bio fertilizer for vegetables. The study offered suggestions for ways to encourage farmers to use biofertilizer products more effectively, including expanding the number of bio-retail input stores, raising awareness through advertising and offering training courses through extension organizations.

**Keywords:** Biofertilizer products, vegetable cultivation, constraints, garret ranking

### Introduction

The Indian economy is agrarian based. India's economy depends greatly on agriculture, which employs 54.6% of the country's total labor force (according to the 2011 Census) and contributed 18.6% of the country's Gross Value Added in 2021–2022, calculated at current prices. 42.4% of the entire geographical area was covered by the net area sown. Among total geographic area, 2% of the net cultivated area in the entire world is made up of organic farming. According to APEDA, organic farming area and production increased by 120% between 2016 and 2022, demonstrating a yearly increase. The success of India's green revolution and eventual independence in the production of food grains were significantly influenced by fertilizers. The country's food grains are now being produced multifold due to chemical fertilizer use. As a result, over the past few years, the demand for fertilizers has witnessed double-digit growth rates.

As long as agricultural practices involve the widespread application of artificial fertilizers, it is evident that sustainability will never be attained. Consequences regarding this included a downward trend in yield growth and a high reliance on chemical fertilizers, both of which led to poor soil health also a reduction in biological fertility (Khare and Arora, 2015) <sup>[4]</sup> by having an impact on the microflora and fauna of the soil (Gupta and Singh, 2008) <sup>[3]</sup>. It also had a negative impact on both human and animal health (Gupta and Singh, 2006; Khare and Arora, 2015) <sup>[4, 3]</sup>. As a result, bio-fertilizers have enormous promise for increasing soil fertility as well as for making efficient use of a variety of resources to boost crop yield on a long-term basis. Bio-fertilizer is a unique class of substances that include microorganisms that enable the soil to hold some crucial components required for plant nourishment. Since "bio" is short for "living thing," bio-fertilizers are naturally live microbial inoculants that are introduced to the soil. The usage of bio-fertilizer is becoming more and more important globally in terms of the environment. Biofertilizers assist in balancing many of the negative consequences of chemical-based technologies by making substances that are naturally rich and obtainable by plants in the soil or ecosystem (Ghosh, 2004) <sup>[2]</sup>. In addition to producing organic nutrients for the soil, they also greatly improve its fertility and combat disease. Biofertilizers aid in the mobilization of naturally occurring nutrients during harvesting.

### Importance of biofertilizers

Biofertilizers reduce the excessive reliance on chemical pesticides and fertilizers that has hampered agriculture. Natural pesticides are used in bio-fertilizer farming, maintaining the nutritional value of the produce. The bio-fertilizer produced product has much higher nutritional quality. Bio-fertilizers act as stimulators of vegetative and yield growth. It always has a positive impact on things like ecological health and soil fertility. Biofertilizers are beneficial for agriculture that is sustainable.

### Review of Literature

An Impact Study-Perception and Constraints of Organic Agriculture Farmers was undertaken by Namboothiripad *et al.* (2021) [4]. The survey found that, with weighted mean score of 4.82 and 4.67, the enhancement of soil health was in first place, followed by perceptions of domestic and economic motives. Lack of availability and high input costs, followed by a lack of premium price, were the main restraints mentioned by organic agricultural growers. These two factors came with the highest and second place, with mean scores of 62.40 and 60.34, respectively.

In the Bhadohi district of Uttar Pradesh, Pathak and Christopher (2019) [7] looked at the socioeconomic situation and obstacles that farmers experienced while trying to utilize bio-fertilizer. Most of the respondents, according to this study, were from middle-class families. The respondents reported that their main challenges were a lack of awareness of knowledge of bio fertilizer, inadequate understanding of its application, and a lack of availability of bio fertilizer. The respondents also mentioned that they had trouble in locating bio fertilizers in the quantities indicated by various crops, that there were no financing facilities accessible, that they knew little or nothing about seed treatment.

According to Neware *et al.* (2014) [5], the primary barrier to response was farmers' ignorance of using bio fertilizer and farmers' lack of access to bio fertilizer and the lack of availability of bio fertilizers in accordance with the advice of various crops, which was followed by a lack of technical knowledge regarding the use of bio fertilizer, a delay in processing, a lack of credit facilities, a lack of knowledge regarding seed treatment, the use of sticking agents during seed treatment, its quantity and methods, etc.

### Objective of the study

The study was conducted with the aim to analyze the constraints faced by the farmers in the usage of biofertilizers in hill vegetable cultivation.

### Research Methodology

#### Selection of study area

The Nilgiris district of Tamil Nadu was chosen because it is one of the potential districts for the cultivation of agricultural and horticultural crops, a significant portion of the farmers practice organic farming, and a major portion of the agricultural bio-input manufacturing companies in the district are doing well. The primary crops grown here employing organic agricultural practices include beans, cabbage, potatoes, carrots, beetroot and cauliflower.

#### Selection of sample respondents

The sample respondents are included from Udhamandalam (35 samples), Coonoor (26 samples), and Kundah (29 samples) blocks in the Nilgiris district. For the study of farmers' awareness, satisfaction, and constraints in usage of biofertilizers, a total of 90 sample respondents were examined.

### Data collection and analysis

Percentage analysis and Garrett ranking was used to analyze the socio-economic characteristics and constraints faced by the farmers respectively.

### Constraints on usage of biofertilizers

Using the below formula, Garrett ranking was calculated

$$\text{Per cent position} = 100 X (R_{ij} - 0.5) N_j$$

Where

$R_{ij}$  = Ranking given to the  $i$ th attribute by the  $j$ th individual

$N_j$  = Number of attributes ranked by the  $j$ th individual

In this study, Garrett ranking was used to identify the constraints faced by farmer in usage of biofertilizer products.

### Results and Discussion

#### Socio-economic characteristics of sample respondents

The socioeconomic data from the sample respondents was examined to gain a better understanding of the individuals. The socio-economic profile of the 90 respondents is broken down in enormous detail. Age, gender, education, occupation, annual income, and the size of the property holding are socioeconomic characteristics.

**Table 1:** Demographic characteristics of respondents

Demographic characteristics of respondent's farmers		
Gender	No of respondents (n=90)	Percentage (100%)
Male	84	93
Female	6	7
Age (Years)		
15-24	4	4
25-34	8	9
35-44	42	47
45-54	26	29
55 and above	10	11
Marital status		
Unmarried	9	10
Married	81	90
Family type		
Nuclear	70	78
Joint	20	22
Family size		
Small	18	20
Medium	49	54
Big	23	26
Educational status		
Illiterate	11	12
Primary school	17	19
Higher secondary	41	46
Graduation	17	19
Post graduate	4	4
Farming experience (Years)		
20 or less	45	50
21-30	32	36
31-40	8	9
41-50	3	3
Above 51	2	2
Farm size		
Marginal farmer	8	9
Small farmer	41	46
Medium farmer	36	40
Big farmer	5	5
Occupation type		
Agriculture	47	52
Agriculture + other	43	48

The demographic details of the respondents were presented in table 1. The survey found that male respondents (93%) used bio fertilizer products at a higher rate than female respondents. According to the report, the largest age group of farmers is between the ages of 35 and 44 (47%) and 45 and 54 (30%). Married respondents (90%) outnumbered those who were not married in terms of total respondents. Similar to family

structure, joint families (22%) were less common than nuclear families (78%). The majority of respondents (50%) have less than 20 years of farming experience, and the medium family size (54%) was greater than other types. Under the farm size, small farmers (46%) were more likely to use bio fertilizer products. Finally, the primary occupation of the farmer respondents was agriculture (52%).

### Constraints faced by farmers in usage of bio fertilizer products

**Table 3:** Constraints faced by farmers in usage of bio fertilizer products

S. No	Constraints	Garret scores	Rank
1	Lack of availability of biofertilizers at nearby location	67.74	I
2	Lack of knowledge on usage of biofertilizers	61.38	II
3	Does not show immediate results	55.16	III
4	Lack of interest among farmers in usage of biofertilizers	54.97	IV
5	Lack of technical guidance	54.08	V
6	Variation in product quality	51.85	VI
7	Lack of awareness about the usage of biofertilizers	50.94	VII
8	Do not receive high price for the produce	41.75	VIII

The study found that, with a Garrett score of 67.74, the lack of availability of bio fertilizer products at nearby location was the main barrier to farmers using these products. This result coincides with that of Pankaj Kumar *et al.*, (2018) [6]. Followed by lack of knowledge about bio fertilizer products, does not show immediate results, lack of interest among farmers in usage of biofertilizers, lack of technical guidance, variation in product quality, lack of awareness about the usage of biofertilizers and do not receive high price for the produce are the constraints faced by the farmers in the usage of biofertilizers.

### Suggestions

**Awareness and Education:** Creating awareness and educating the farmers about the benefits and proper usage of biofertilizers. Conducting training programs, workshops, and demonstrations to highlight their effectiveness and providing guidelines on application methods can enhance the usage of biofertilizers.

**Research and Development:** Investing in research and development to enhance the quality, efficacy, and compatibility of biofertilizers with different crops and soil types. Encouraging the scientific studies to identify and develop new strains of beneficial microorganisms for specific crops will improve the usage among the farmers.

**Quality Control:** Implementing stringent quality control measures to ensure the production and distribution of high-quality biofertilizers. Setting up certification programs and quality standards to maintain consistency and reliability in the market.

**Packaging and Labelling:** Clearly labelled biofertilizer products with detailed information on their composition, recommended dosage, application methods, and storage conditions should be made. Maintaining user-friendly packaging for viability and shelf life of the biofertilizers will be more helpful to the farmers for the usage of biofertilizers.

**Collaboration and Partnerships:** Fostering collaboration between researchers, manufacturers, agricultural extension services, and farmers to exchange knowledge and experiences. Encouraging partnerships to facilitate the availability and

accessibility of biofertilizers in rural areas will enhance the farmers to use biofertilizers.

**Subsidies and Incentives:** Providing subsidies, tax incentives, and financial support to farmers for adopting biofertilizers. This can help reduce the cost burden and encourage wider adoption of these eco-friendly alternatives.

**Demonstration Farms:** Setting up demonstration farms or pilot projects where farmers can observe the benefits of biofertilizers firsthand. These farms can serve as learning centers and inspire farmers to adopt biofertilizers in their own fields.

**Integrated Nutrient Management:** Promoting the concept of integrated nutrient management, which combines the use of biofertilizers with organic manures and crop residues. This approach optimizes nutrient availability, reduces reliance on synthetic fertilizers, and improves soil health in a sustainable manner.

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