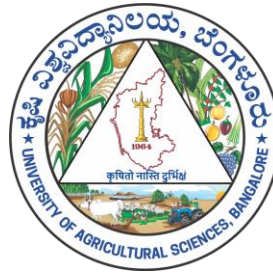


**COGNITIVE LEVEL AND ADOPTION  
BEHAVIOR OF EXOTIC VEGETABLE  
GROWERS IN BENGALURU RURAL  
DISTRICT OF KARNATAKA**



**PUNEETHKUMAR, M. S.  
PAMB 2129**

**DEPARTMENT OF AGRICULTURAL  
EXTENSION  
COLLEGE OF AGRICULTURE, GKVK  
UNIVERSITY OF AGRICULTURAL SCIENCES  
BANGALORE  
2025**

**COGNITIVE LEVEL AND ADOPTION  
BEHAVIOR OF EXOTIC VEGETABLE  
GROWERS IN BENGALURU RURAL  
DISTRICT OF KARNATAKA**

Thesis submitted to the  
**University of Agricultural Sciences, Bangalore**  
in partial fulfilment of the requirements for the  
Degree of

**Masters of Science (Agriculture)**  
**in**  
**AGRICULTURAL EXTENSION EDUCATION**

**By**  
**PUNEETHKUMAR, M. S.**

**PAMB 2129**

**UNIVERSITY OF AGRICULTURAL SCIENCES**  
**BANGALORE**

**2025**



**DEPARTMENT OF AGRICULTURAL EXTENSION  
COLLEGE OF AGRICULTURE, GKVK, BENGALURU  
UNIVERSITY OF AGRICULTURAL SCIENCES,  
BANGALORE**

**CERTIFICATE**

This is to certify that the thesis entitled “**Cognitive Level and Adoption Behavior of Exotic Vegetable Growers in Bengaluru Rural District of Karnataka**” submitted in partial fulfilment of the requirements for the degree of **Master of Science (Agriculture)** in **Agricultural Extension Education** to the University of Agricultural Sciences Bangalore is a record of *bona fide* research work carried out by **Mr. PUNEETHKUMAR, M. S. , PAMB 2129** during the period of his study in this University, under my guidance and supervision. The thesis has not been previously formed the basis for the award for any degree, diploma, associateship, fellowship or other similar titles.

**Bengaluru  
March, 2025**

**H.K. PANKAJA  
(Major Advisor)**

**Approved by:**

**Chairperson :**

\_\_\_\_\_  
**(H.K. PANKAJA)**

**Members :**

1.

\_\_\_\_\_  
**(VINAY KUMAR, R.)**

2.

\_\_\_\_\_  
**(B. LALITH ACHOTH)**



*Affectionately Dedicated To*

*My Beloved Parents*

*Shri Kumar M S and Smt.  
Sowbhagyalakshmi*

*and*

*My Sister*

*Smt. Mahalakshmi M S*

*and*

*“All the well-wishers”*



## ACKNOWLEDGEMENT

*"Acknowledgment is the art of gracefully embracing the light that others have shone upon our path, illuminating our journey with their kindness and wisdom."*

*Gratitude unlocks the fullness of life. It is the art of turning moments into memories, acknowledging life's gifts with an open heart. In the symphony of existence, it's the melody that resonates most deeply, harmonizing our souls with the universe's abundant grace. It turns what we have into enough, and more. Now it's my time to express my gratitude towards all those who helped me in each and every step of my life.*

*Firstly, I offer my salutations at the feet of God for every wonderful day, for everything that happened for me.*

*Teaching is more than imparting knowledge, it is inspiring change. I would like to take this opportunity to place my profound debt of gratitude on record to my teacher, esteemed major advisor and Chairperson of the Advisory Committee, **Dr. H. K. Pankaja**, Assistant Professor, Department of Agricultural Extension, College of Agriculture, GKVK, University of Agricultural Sciences, Bangalore, your wisdom, patience, and unwavering support have sculpted not only my research but also my character. Thank you for being the mentor who believed in me and helped me reach for the academic and kindly imbued the energy and enthusiasm through ramifying path of my thick and thin of the efforts and also for his valuable suggestions, encouragement, personal guidance, keen interest and inspiration given to me throughout my work and to complete my research successfully.*

*Guiding is a very noble profession that shapes the character, calibre and future of an individual. It gives me a great pleasure to express my heartfelt thanks to members of my advisory committee, **Dr. Vinay Kumar**, R Assistant Professor and Technical Officer to ADR Zonal Agricultural Research Station, V.C Farm, Mandya, **Dr. B. Lalith Achoth** Professor (Retd), Department of Agricultural Economics, College of Agriculture, UAS, GKVK, Bengaluru for their timely help and suggestions.*

*The task of the excellent teacher is to stimulate "apparently ordinary" people to unusual effort. They play an extraordinary part in our lives. It gives me a great pleasure to express my heartfelt gratitude and reverence to **Dr. Y. N. Shivalingaiah**, **Dr. C. Narayanswamy**, **Dr. M. T. Laxminarayan**, **Dr. C. M. Savitha**, **Dr. Ganesa Moorthi**, **S. Dr. Sagar**, **Dr. Mutteppa Chigadolli** for their invaluable and expert guidance, critical suggestions and encouragement provided during my investigation.*

*I could be inexcusable if I were to forget mentioning the service rendered by my senior and junior friends, **Abhineeth, R. Harthikote, Gunashree G N, Chaithrashree J, Rahul prasad, Chaithra N R, Prahlad Bhat, Shashank Reddy, Anil. K, Prashanth, Felix** for their kind cooperation throughout my Master's degree programme and for their direct and indirect encouragement, support and wishing.*

*Family is not an important thing. It's everything. We grow in different directions yet our roots remain as one as a family. Words fail to express my deep sense of gratitude to my parent's **Sri. Kumar M.S. and Smt. Sowbhagya lakshmi** and sister **Mahalakshmi**.*

*I am very glad to mention the sincere mental support, words of encouragement, boundless love, unflagging inspiration, interest and selfless sacrifice of my close and best friends **Chethan, Bharath, Rakesh, Shivu, Bindu, Bhoomika, Gopika, Pradeepti, Amar, Sameer and Deepak**.*

*The best kinds of people are the ones that come into our life and make us see the sun where we once saw clouds. It is my pleasure to acknowledge my deep thanks to my gifted brothers and sister as well as friends who represent a unique little world in my life, **Ganesh Sanjay gowda, Karthik Reddy, Puneeth H R, Dananjay**, for the unstinted cooperation, guidance, support, help, advice and was with me in every situation and add so much ecstasy and exultation in day-to-day living.*

*I could not forget the enormous and timely help rendered by **Mahesh anna, Kantha Bai aunty, Yashoda akka** and **other nonteaching staffs** of college for their help during course of research.*

*Finally, I express my sincere gratitude to College of Agriculture, GKVK, University of Agricultural Sciences, Bangalore for providing an opportunity for completing my Master's degree programme.*

***“Omission in this small manuscript doesn't mean lack of gratitude”***

**Bangalore**

**April, 2025**

**(PUNEETHKUMAR, M. S.)**

# Cognitive level of Exotic Vegetable Growers in Bengaluru Rural District



M. S. PUNEETHKUMAR, PAMB 2129

Department of Agricultural Extension Education, University of Agricultural Sciences, CoA, GKVK



## INTRODUCTION

Modern agriculture has been largely successful in meeting the energy needs of poor population in developing countries. Agriculture is the largest private enterprise in India and will continue to be the life line of the Indian economy even in foreseeable future. Horticulture sector cover only 8.00 per cent of total crop area in the country and it contribute 24.50 per cent to G.D.P. and 54.55 per cent to export earning in agricultural sector. It ranks second in fruits and vegetables production in the world, after China. As per National Horticulture Database (Second Advance Estimates) published by National Horticulture Board, during 2019-20, India produced 99.07 million metric tonnes of fruits and 191.77 million metric tonnes of vegetables.

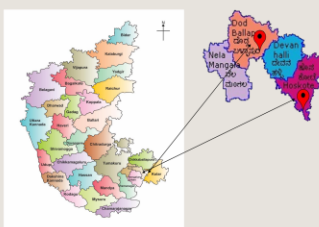
The cognitive level of exotic vegetable growers plays a crucial role in the successful cultivation and commercialization of these unique crops. The cultivation of exotic vegetables requires a deeper understanding of various agricultural practices, market dynamics, and consumer preferences. Exotic vegetable growers must possess a high level of cognitive skills to navigate the complexities of crop selection, soil management, pest control, and marketing strategies. The knowledge level of growers helpful in contributing to growth of exotic vegetable industry as whole.

## OBJECTIVE

❖ To examine the cognitive level of exotic vegetable growers.

## MATERIALS & METHODS

**Research design:** Ex-post facto research design  
**Locale of the study:** Bengaluru Rural district of Karnataka state.



**Selection of Respondents:** Bengaluru Rural district was selected based on Exotic vegetable production. 50 farmers each from Hoskote and Doddaballapura were selected for collection of data..

**Analysis of Data:** Mean, standard deviation, frequency and percentage.

## RESULTS AND DISCUSSION

Table 1: Cognitive level of Exotic vegetable growers on cultivation Practices

Technologies	Broccoli(n <sub>1</sub> =50)		Lettuce(n <sub>2</sub> =50)	
	CCL(%)	ICL(%)	CCL(%)	ICL(%)
Type of soil	100.00	0.00	100.00	0.00
Recommended pH	40.00	60.00	46.00	54.00
Suitable climate	74.00	26.00	74.00	26.00
Nursery bed preparation	36.00	64.00	42.00	58.00
Seedling rate	56.00	44.00	60.00	40.00
Varieties/Hybrid	82.00	18.00	82.00	18.00
Transplanting	66.00	34.00	56.00	44.00
Spacing	54.00	46.00	52.00	48.00
FYM Application	44.00	56.00	42.00	58.00
Chemical Fertilizer	52.00	48.00	54.00	46.00
Type of Irrigation	100.00	0.00	100.00	0.00
Frequency of irrigation	58.00	42.00	62.00	38.00
Intercultural operation	70.00	30.00	76.00	24.00
Disease management				
Damping off	58.00	42.00	52.00	48.00
Ideal stage of harvesting	48.00	52.00	46.00	54.00
Recommended Yield	64.00	36.00	72.00	28.00

Correct Cognitive Level- CCL, ICL-Incorrect Cognitive Level, % - Percentage

Table:2 Overall Cognitive level of exotic vegetable growers on cultivation practices

Category	Broccoli (n <sub>1</sub> =50)	Lettuce (n <sub>2</sub> =50)	Overall (n=100)
Low(<10.30)	15.00 (30.00)	15.00 (30.00)	30.00 (30.00)
Medium (10.30-12.42)	18.00 (36.00)	19.00 (38.00)	37.00 (37.00)
High(>12.42)	17.00 (34.00)	16.00 (32.00)	33.00 (33.00)

Mean = 11.35

SD = 2.11

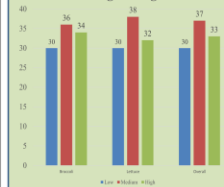
\*Figures in the parenthesis indicates percentage

Table 1 indicates that cent per cent of the exotic crop growers had correct cognition with respect to type of soil and type of irrigation. The probable reason might be that most of the exotic growers are progressive farmers with good external agency contact along with cosmopolitanness which enable them to get correct cognition with respect to exotic crops.

Majority of exotic vegetable growers had incorrect cognitive level with respect to nursery bed preparation, FYM application and ideal stage of harvesting since the farmers directly purchase seedlings from nursery hence they are not having correct cognitive level.

lack of awareness on impact of organic fertilizers on plant and further regarding ideal stage prioritize market demand instead of ideal stage leads to incorrect cognitive level.

Overall cognitive level of exotic vegetable growers



## Data collection



## SUMMARY

Majority of the broccoli and lettuce cultivators had medium to high level cognitive level. Further, with respect to some practices, farmers cognitive level is very low. Hence, there is a need for awareness and training programmes at institutional level to enhance the production of exotic crops.

## REFERENCES

TEJASHREE, S., 2022, Cognitive and adoption behaviour of horticulture crop growers towards precision farming technologies in eastern dry zone of Karnataka M.Sc. Thesis (Unpub.), Univ. Agric. Sci., Bangalore.

## ADVISORY COMMITTEE

**Chairperson:**

**Dr. H. K. Pankaja**

**Members:**

**Dr. Vinay Kumar, R**

**Dr. B. Lalith Achoth**

# **COGNITIVE LEVEL AND ADOPTION BEHAVIOR OF EXOTIC VEGETABLE GROWERS IN BENGALURU RURAL DISTRICT OF KARNATAKA**

**PUNEETHKUMAR, M. S.**

## **ABSTRACT**

The present study was conducted in Bengaluru Rural district of Karnataka in the year 2023-2024 to study the cognitive level and adoption behavior of exotic vegetable growers towards scientific farming technologies. Hoskote and Doddaballapura taluks were selected for the study. From each taluk, 25 farmers each growing broccoli and lettuce were selected for the study. Thus, making a total sample size of 100. The findings of the study revealed that more than one-third (36.00 %) of broccoli growers had medium cognitive level, followed by high (34.00 %) and low (30.00 %) about scientific crop production technologies. Nearly two-fifth (38.00 %) of the lettuce growers belonged to medium cognitive level category, followed by high (32.00 %) and low (30.00 %) categories. Thirty-eight per cent of broccoli growers had medium adoption, followed by high adoption (34.00%) and low adoption (28.00%). More than one-third (36.00 %) of lettuce growers had medium adoption, followed by low adoption (34.00 %) and high adoption (30.00 %) category. Majority of the exotic vegetable growers possess medium to high economic performance. The variables *viz.*, education, extension contact, extension participation, risk orientation, innovativeness and scientific orientation had positive and significant association with adoption level of exotic vegetable growers. The major constraints expressed by exotic vegetable growers were market price fluctuations, non-availability of timely skilled labour, perishability of produce and occurrence of pest and diseases. The major suggestions given by the exotic vegetable growers were encouraging contract farming practices, availability of quality and timely inputs, crop rotation practices and government support policies.

**March, 2025**

Dept. of Agricultural Extension  
UAS, GKVK, Bengaluru

**(H.K. PANKAJA)**  
Major Advisor

## ಕರ್ನಾಟಕದ ಬೆಂಗಳೂರು ಗ್ರಾಮಾಂತರ ಜಿಲ್ಲೆಯ ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರ

### ಅರಿವಿನ ಮಟ್ಟ ಮತ್ತು ಅಳವಡಿಕೆ ನಡವಳಿಕೆ

ಪುನೀತ್‌ಕುಮಾರ್, ಎಂ. ಎಸ್.

### ಪ್ರಬಂಧ ಸಾರಾಂಶ

ಪ್ರಸ್ತುತ ಅಧ್ಯಯನವನ್ನು ಕರ್ನಾಟಕದ ಬೆಂಗಳೂರು ಗ್ರಾಮಾಂತರ ಜಿಲ್ಲೆಯಲ್ಲಿ, 2023-2024 ನೇ ಸಾಲಿನಲ್ಲಿ ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರ ವೈಜ್ಞಾನಿಕ ಕೃಷಿ ತಂತ್ರಜ್ಞಾನಗಳ ಕುರಿತು ಅರಿವು ಮತ್ತು ಅಳವಡಿಕೆ ನಡವಳಿಕೆಯನ್ನು ಅಧ್ಯಯನ ಮಾಡಲು ಕೈಗೊಳ್ಳಲಾಗಿತ್ತು. ಹೊಸಕೋಟೆ ಮತ್ತು ದೊಡ್ಡಬಳ್ಳಾಪುರ ತಾಲ್ಲೂಕುಗಳನ್ನು ಅಧ್ಯಯನಕ್ಕೆ ಆಯ್ಕೆ ಮಾಡಲಾಗಿತ್ತು. ಪ್ರತಿ ತಾಲ್ಲೂಕಿನಿಂದ 25 ಬ್ರೂಕೊಲಿ ಮತ್ತು 25 ಲೆಟ್ಯೂಸ್ ಬೆಳೆಗಾರರನ್ನು ಆಯ್ಕೆ ಮಾಡಲಾಗಿದ್ದು, ಎರಡು ತಾಲ್ಲೂಕಿನಿಂದ ಒಟ್ಟು 100 ಬೆಳೆಗಾರರನ್ನು ಆಯ್ಕೆ ಮಾಡಿ ಮಾಹಿತಿ ಸಂಗ್ರಹಿಸಲಾಯಿತು. ಈ ಅಧ್ಯಯನದ ಸಂಶೋಧನೆಯಿಂದ ತಿಳಿದು ಬಂದಿದ್ದೇನೆಂದರೆ: ಪ್ರತಿಕ್ರಿಯಿಸಿದವರಲ್ಲಿ ಮೂರನೇ ಒಂದು ಭಾಗಕ್ಕಿಂತ ಹೆಚ್ಚು (36.00 %) ಬ್ರೂಕೊಲಿ ಬೆಳೆಗಾರರು ವೈಜ್ಞಾನಿಕ ಕೃಷಿ ತಂತ್ರಜ್ಞಾನಗಳ ಕುರಿತು ಮಧ್ಯಮ ಮಟ್ಟದ ಅರಿವಿನ ತಿಳುವಳಿಕೆಯನ್ನು ಹೊಂದಿರುತ್ತಾರೆ, ಉಳಿದವರು ಹೆಚ್ಚಿನ (34.00 %) ಮತ್ತು ಕಡಿಮೆ (30.00 %) ಅರಿವಿನ ಮಟ್ಟವನ್ನು ಹೊಂದಿರುತ್ತಾರೆ. ಸುಮಾರು ಐದನೇ ಎರಡರಷ್ಟು (38.00 %) ಲೆಟ್ಯೂಸ್ ಬೆಳೆಗಾರರು ಮಧ್ಯಮ ಮಟ್ಟದ ಅರಿವನ್ನು ಹೊಂದಿರುತ್ತಾರೆ, ಉಳಿದವರು ಹೆಚ್ಚಿನ (32.00 %) ಮತ್ತು ಕಡಿಮೆ (30.00 %) ಅರಿವಿನ ಮಟ್ಟವನ್ನು ಹೊಂದಿರುತ್ತಾರೆ. ಶೇಕಡಾ ಮೂವತ್ತೆಂಟು ಬ್ರೂಕೊಲಿ ಬೆಳೆಗಾರರು ವೈಜ್ಞಾನಿಕ ಕೃಷಿ ತಂತ್ರಜ್ಞಾನಗಳನ್ನು ಮಧ್ಯಮ ಮಟ್ಟದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಂಡವರಾಗಿದ್ದು, ಉಳಿದ ಶೇಕಡ 34.00 ಮತ್ತು ಶೇಕಡ 28.00 ರಷ್ಟು ಬೆಳೆಗಾರರು ಕ್ರಮವಾಗಿ ಉನ್ನತ ಮತ್ತು ಕಡಿಮೆ ಮಟ್ಟದ ಅಳವಡಿಕೆಯ ವರ್ಗದಲ್ಲಿ ಕಂಡು ಬಂದಿರುತ್ತಾರೆ. ಲೆಟ್ಯೂಸ್ ಬೆಳೆಗಾರರಲ್ಲಿ ಮೂರನೇ ಒಂದು ಭಾಗಕ್ಕಿಂತ ಹೆಚ್ಚು (36.00 %) ಬೆಳೆಗಾರರು ವೈಜ್ಞಾನಿಕ ಕೃಷಿ ತಂತ್ರಜ್ಞಾನಗಳನ್ನು ಮಧ್ಯಮ ಮಟ್ಟದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಂಡವರಾಗಿದ್ದು, ಉಳಿದ ಶೇಕಡ 34.00 ಮತ್ತು ಶೇಕಡ 30.00 ರಷ್ಟು ಬೆಳೆಗಾರರು ಕ್ರಮವಾಗಿ ಉನ್ನತ ಮತ್ತು ಕಡಿಮೆ ಮಟ್ಟದ ಅಳವಡಿಕೆಯ ವರ್ಗಕ್ಕೆ ಒಳಗೊಂಡಿರುತ್ತಾರೆ. ಹೆಚ್ಚಿನ ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರು ಮಧ್ಯಮದಿಂದ ಅಧಿಕ ಆರ್ಥಿಕ ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಹೊಂದಿರುತ್ತಾರೆ. ಶಿಕ್ಷಣ, ವಿಸ್ತರಣಾ ಸಂಪರ್ಕ, ವಿಸ್ತರಣಾ ಭಾಗವಹಿಸುವಿಕೆ, ಅಪಾಯದ ದೃಷ್ಟಿಕೋನ, ನವೀನತೆ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ದೃಷ್ಟಿಕೋನ ಈ ಗುಣಗಳು ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರ ಅಳವಡಿಕೆ ಮಟ್ಟದೊಂದಿಗೆ ಸಕಾರಾತ್ಮಕ ಮತ್ತು ಗಮನಾರ್ಹವಾಗಿ ಸಂಬಂಧಿಸಿರುವುದು ಕಂಡುಬರುತ್ತದೆ. ಅತಿ ಹೆಚ್ಚು ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರು ಮುಖ್ಯವಾಗಿ ಮಾರುಕಟ್ಟೆ ಬೆಲೆ ಏರಿಳಿತಗಳು, ಸಮಯಕ್ಕೆ ಸರಿಯಾಗಿ ನುರಿತ ಕಾರ್ಮಿಕರ ಲಭ್ಯವಿಲ್ಲದಿರುವುದು, ಉತ್ಪನ್ನ ಬೇಗ ಹಾಳಾಗುವ ಗುಣ ಮತ್ತು ಕೀಟ ಮತ್ತು ರೋಗಗಳ ಸಂಭವ ಸಮಸ್ಯೆಗಳನ್ನು ಎದುರಿಸುತ್ತಿರುವುದಾಗಿ ತಿಳಿದು ಬಂದಿದೆ. ವಿದೇಶಿ ತರಕಾರಿ ಬೆಳೆಗಾರರು ನೀಡಿದ ಪ್ರಮುಖ ಸಲಹೆಗಳೆಂದರೆ: ಒಪ್ಪಂದದ ಕೃಷಿ ಪದ್ಧತಿಗಳನ್ನು ಪ್ರೋತ್ಸಾಹಿಸುವುದು, ಗುಣಮಟ್ಟದ ಮತ್ತು ಸಕಾಲಿಕ ಒಳಹರಿವುಗಳ ಲಭ್ಯತೆ, ಬೆಳೆ ಸರದಿ ಪದ್ಧತಿಗಳು ಮತ್ತು ಸರ್ಕಾರದ ಬೆಂಬಲ ನೀತಿಗಳನ್ನು ಜಾರಿಗೆ ತರುವುದು.

ಮಾರ್ಚ್, 2025

ಕೃಷಿ ವಿಸ್ತರಣಾ ಇಲಾಖೆ  
ಯುಎಎಸ್, ಜಿಕೆವಿಕೆ, ಬೆಂಗಳೂರು

(ಎಚ್. ಕೆ. ಪಂಕಜ)  
ಮುಖ್ಯ ಸಲಹೆಗಾರರು

## CONTENTS

<b>Sl. No.</b>	<b>Chapter Particulars</b>	<b>Page No.</b>
I	INTRODUCTION	1
II	REVIEW OF LITERATURE	10
III	METHODOLOGY	37
IV	RESULTS AND DISCUSSION	55
V	SUMMARY	110
VI	REFERENCES	115
	APPENDICIES	i

## LIST OF TABLES

Table No.	Title	Page No.
01	Cognitive level of broccoli growers about scientific crop production technologies	57-58
02	Overall cognitive level of broccoli growers about scientific crop production technologies	61
03	Cognitive level of lettuce growers about scientific crop production technologies	62-63
04	Overall cognitive level of lettuce growers about scientific production technologies	66
05	Extent of adoption of scientific crop production technologies by broccoli growers	69-70
06	Overall extent of adoption of recommended scientific technologies by broccoli growers	73
07	Extent of adoption of scientific crop production technologies by lettuce growers	76-77
08	Overall extent of adoption of recommended scientific technologies by lettuce growers	80
09	Personal, socio-economic and psychological characteristics of farmers practicing exotic vegetables	86-87
10	Association between personal, socio-economical and psychological characteristics and cognitive level of exotic vegetable growers	89
11	Association between personal, socio-economical and psychological characteristics of exotic vegetable growers with their adoption behavior	92
12	Marketing practices followed by the broccoli growers	95

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
13	Marketing practices followed by the lettuce growers	96
14	Cost of cultivation of exotic crops per acre in Rs	99
15	Returns from cultivation of exotic vegetable crop per acre	100
16	Economic performance of exotic vegetable growers	101
17	Constraints faced by broccoli growers	103
18	Constraints faced by lettuce growers	104
19	Suggestions as expressed by broccoli growing farmers	105-106
20	Suggestions as expressed by lettuce growing farmers	106

## LIST OF FIGURES

<b>Fig. No.</b>	<b>Title</b>	<b>Page No.</b>
01	Map showing the study area	39
02	Conceptual framework of the study	54
03	Overall cognitive level of broccoli and lettuce growers about scientific crop production technologies	67
04	Overall adoption level of broccoli and lettuce growers about scientific crop production technologies	80
05	Economic performance of broccoli growers	102
06	Economic performance of lettuce growers	102

## LIST OF PLATES

<b>Plate No.</b>	<b>Title</b>	<b>Between pages</b>
1	Glimpses of data collection	54-55
2	Interaction with the exotic vegetable growers	109-110

# **INTRODUCTION**

# I INTRODUCTION

India, with its diverse agro-climatic zones and a rapidly evolving consumer market, has emerged as a significant player in the production and consumption of exotic vegetables. Traditionally known for cultivating staples and indigenous crops, the country has witnessed a paradigm shift toward high-value crops like exotic vegetables in recent decades. Vegetables, viz., broccoli, zucchini, lettuce, asparagus, and bell peppers that were once considered niche products are now increasingly finding space in Indian kitchens, markets and export baskets.

The potentiality of horticulture sector to increase farm income, secure livelihoods, and generate foreign cash through exports has led to its growing recognition as a sunrise industry. India is able to produce a wide variety of horticultural crops throughout the year due to its varied agro-climatic conditions, high crop diversity, and genetic resources. For instance, every year India produces sub-tropical fruits like apples and tropical fruits like mangoes within the same season. Fruits, vegetables, flowers, spices, plantation crops like coconut, beverages like tea and coffee, and various aromatic and medicinal plants are testimony to the diversity of horticultural sector in India.

Man's most nutrient-dense diet consists of vegetables, which also boost vitality and energy levels of consumers. Consuming vegetables on a regular and balanced basis gives you the most important nutrients like vitamins and minerals for maintaining and promoting health. Vegetables are an essential component of the human diet and include nutrients that help the body to overcome common ailments, including anaemia, deficiency diseases, and other illnesses. An adult should consume roughly 280 grams of vegetables daily for a healthy diet, of which 85 grams should be made up of root vegetables, 110 grams of leafy vegetables, and 85 grams of miscellaneous vegetables. However, less than 81 grams are consumed on average nationwide (More *et al.*, 2021). The current vegetable marketing strategy is insufficient, because of this vegetable growing farmers face a variety of issues such as price volatility, lack of market infrastructure etc., Lack of accurate market information appear to be the main obstacles to the long-term growth of vegetable production and marketing. To overcome this situation, the government has given top

priority for building marketing infrastructure. Therefore, efforts must be made to pinpoint the precise issues with vegetable marketing and to enhance the vegetable market system.

In India, agriculture is plagued by erratic weather patterns, groundwater depletion, low production and productivity, small agricultural holdings, less marketable surplus, insufficient storage and transportation, lack of mechanisation, and other issues. The country's population is expected to reach 1.66 billion by 2050. India is alarmed by the country's rising population and needs to boost food grain production by at least 4% annually to feed its enormous population. In addition, the per capita availability of land is 1.08 ha (2021), which is expected to drop by 0.07 ha by 2050. This means by 2050, only one hectare of cultivable land will be available for every 14 people to produce necessities such as food, fiber, fodder, fuel, and so on (Harshal *et al.*, 2006).

Consumption patterns in the global food system have undergone a significant transformation, moving away from staple foods to more varied diets in both urban and rural regions, as well as within various family classes. These changes are the results of increased income, awareness, and preference for nutrient-dense diets. To accommodate this diverse and nutrient-dense diet, production systems are shifting towards the growth of high-value crops. High-value crops yield a large premium price per unit area when compared to traditional staple food crops (Hewett, 2012). These are also referred to as specialty or non-traditional crops, that include floral, vegetable, fruit, and medicinal crops. These valuable crops have the potential to be an excellent means of reducing farmer poverty (Singh, 2013). Because of their educated consumer base and greater market penetration potential, these crops command a premium price.

Vegetables are classified into indigenous and exotic based on their place of origin. Indigenous vegetables, often known as local vegetables, are native to a specific country or region. Exotic vegetables, by contrast, are foreign types that are cultivated or consumed in a non-native setting. (Oladele, 2011 and Iyiade, 2013). The market for exotic vegetables is expanding quickly on a global scale. With its enormous potential, India is in a strong position to compete in the exotic vegetable export and local markets. Compared to

conventional vegetable crops, growing exotic vegetables can result in higher returns and is more profitability (Palaniappan and Radhakrishnan, 2020).

Several main elements are fueling the expansion of the exotic vegetable market. These include the growing food service industries, increased customer knowledge and demand, and supply chain improvements. This entails combining digital payment systems, delivery platforms, and contemporary retail and e-commerce (Baireneni and Nagnur, 2022).

Exotic vegetables are mostly consumed by consumers as ingredients for salads, pizza toppings, sandwiches, smoothies, and other dishes. High-end retail chains like Spencer's, More, Reliance Fresh and online marketplaces like Big Basket, Blinkit, Swiggy instamart, five-star hotels, quick-service eateries like McDonald's and Subway as well as workplaces and social gatherings, are the main markets for these vegetables. The market for exotic vegetables is expected to increase further due to rising consumer demand and the growth of the organized food service industry. It is anticipated that increased supply chain capabilities, particularly in tier II cities, will increase the availability and use of these veggies and turn non-consumers into consumers (Baireneni and Nagnur, 2022).

India has varied climate guarantees that every type of fresh vegetable is available. Many changes have been brought about by globalization in developing countries, including a change in lifestyle and living conditions, the development of large food chains that introduce foreign cuisines into eating habits, and a transformation in food tastes, particularly among the younger population. The rapid development of a variety of exotic vegetables in the everyday diet is being aided by people's growing awareness of the value of these veggies as sources of dietary fiber, antioxidants, and nutraceuticals. Globally, the demand for exotic vegetables is expanding quickly. India has a great deal of opportunity to compete in the developing exotic vegetable export and local markets. Profitability and a greater return on vegetable farming can be achieved by growing exotic veggies. Broccoli, purple broccoli, lettuce, coloured capsicum, baby corn, asparagus, parsley, leek, cherry tomato, celery, thyme, chinese cabbage, red cabbage, zucchini, are examples of exotic

vegetables that are used in current cuisines. These exotic vegetables are fetching a higher price than our traditional vegetables in the market (Palaniappan and Radhakrishnan, 2020).

Plant species that are introduced to a nation or region uncommon in native crop production or traditional cuisine are known as exotic veggies. Growing exotic vegetables is a lucrative endeavour that provides farmers with a means of subsistence and greatly enhances the nation's food security (Badmus and Yekinni, 2011). Maharashtra alone is responsible for half of India's unusual vegetable production. Exotic vegetables, such as cherry tomatoes, leeks, lettuce, red cabbage & baby corn, broccoli, lettuce, leeks, Chinese cabbage, snow peas, and parsley, are exported by a number of private companies, including Siddesh English Exotic Vegetables, W-Mumbai, PMS Agrotech Trading Company, Nagpur, and Indogreen Nature Farm PVT LTD, Bangalore.

The exotic vegetable market is developing at a pace of 15 to 20% per year and is increasing by the day. India imports more than 85% of exotic vegetables. Exotic vegetables primarily serve two niche markets: the hotel business and export. It is more profitable to grow exotic fruits and vegetables than typical Indian crops. These vegetables are grown in a very small number of places in India, including Pune, Nasik, Mahabaleshwar, Bangalore, Uttarkhand, Ooty, Himachal, and Jammu & Kashmir (Rao and Sasanka, 2015). In comparison to global markets, India's exotics industry is still in its infancy. In order to accelerate expansion, it is necessary to solve the issues of large investments, seed shortages, high perishability, premium pricing, and reduced customer acceptance. There is a great chance to increase exotics' market share in India if these issues are resolved.

The rising demand for exotic vegetables is driven by changing consumer preferences, influenced by urbanization, globalization, and an increasing awareness on health and nutrition. Additionally, the booming hospitality sector, growing food processing industry, and exposure to international cuisines have significantly contributed to the popularity of these vegetables.

### **Importance of exotic vegetable farming**

- ❖ Exotic vegetables as economic source

- ❖ Nutritional and medicinal value
- ❖ Exotic Vegetable as home garden
- ❖ Exotic Vegetable for commercial purpose

### **Benefits of cultivating exotic vegetable**

- Exotic vegetables are having unique characteristics like colour, flavor, shape and texture that results in higher market demand and thereby farmer fetches good prices.
- Crop diversification helps in improving the income of the growers by reducing the dependency on one crop, which aids to overcome risk and uncertainty associated.
- Exotic vegetables are still in their nascent stage in India, growing these crop will have less competitors compared to traditional crops.
- Exotic crops are adaptable to different climatic condition which helps the farmers to grow at different parts of the world.

### **Exotic crop farming in Indian context**

Major challenges of Indian agriculture are deteriorating resource base, gaps in technology adoption, lack of contemporary, technologically sophisticated technical centers, lack of specialist farming software, the low economic standing of the typical Indian farmer, etc. The production of agriculture and its related sectors must be promoted in an efficient and sustainable way to increase agricultural output, stakeholders' income, environmental protection, climate change, etc. In India, the cultivation of exotic crops is urgently needed. Farmers who practice exotic crop farming should employ technologies such as mulching, fertigation, micro-irrigation, polyhouses, and greenhouses to produce a favourable microclimate and boost output.

### **Potential of growing exotic crops in Karnataka**

Farmers in Karnataka are introducing exotic crops that were formerly limited to backyards, farm boundaries, and terraces into their fields. Karnataka's various climate and

soil types provide enormous potential for developing exotic vegetable crops. Karnataka's climate varies from tropical to moderate, allowing for the production of a diverse range of exotic crops. The state's diverse soil types, ranging from sandy to clay, promote the development of several exotic vegetables. Farmers have an opportunity to avail training, advice, and research support from the Indian Institute of Horticultural Research, Bengaluru. Karnataka's infrastructure and geographic location make exporting easier, giving growers of exotic vegetables access to international markets. Farmers in Karnataka can increase their revenue, access new markets, and support the expansion and diversification of the state's agriculture industry.

### **Statement of problem**

The increasing demand for high-quality, healthy food products, coupled with the fragmentation of land holdings and declining agricultural revenue, has spurred interest in exotic vegetable cultivation as a viable alternative for improving farmers' livelihoods. However, despite the potential economic benefits, many farmers in Bengaluru Rural District face challenges in adopting exotic vegetable farming practices due to a lack of awareness, information, and skills, which results in suboptimal yields. The cognitive level of farmers has shaped by their perceptions, attitudes, and beliefs. These plays a critical role in shaping their adoption behavior of exotic vegetable cultivation. This research aims to examine the cognitive factors influencing the adoption of exotic vegetable cultivation in Bengaluru Rural District and identify barriers in adoption, with a focus on how knowledge dissemination, attitude changes, and skill development can enhance both adoption rates and productivity. The findings will offer valuable insights for designing effective strategies to promote exotic vegetable farming, thereby improving the economic sustainability of farmers in the region. In light of the aforementioned information, the current study, "Cognitive level and adoption behavior of exotic vegetable growers in Bengaluru Rural District," was carried out with the following specific objectives

1. To find out the cognitive level and adoption behavior of exotic vegetable growers
2. To investigate the marketing behavior of farmers cultivating exotic vegetables

3. To understand the economic performance of exotic vegetable growers
4. To assess the profile characteristics of exotic vegetable growers and their association with cognitive and adoption level
5. To elicit the constraints faced by exotic vegetable growers and seek their suggestions

### **Scope of the study**

The exotic vegetable farming through proper cultivation and management practices will help in improving the socio-economic status of the farmers. In this context, the study was conducted to find out the cognitive level and adoption behavior of exotic vegetable growers in Bengaluru Rural District of Karnataka. The study functionally helps to know the extent of adoption of exotic crop production technologies by the farmers. The study will document the profile characteristics of the exotic vegetable growers and will find out their association with the cognitive level and adoption behaviour. The research study will document economic performance of exotic vegetable cultivation. The study on cognitive level, adoption behaviour of exotic vegetable growers helps researcher, extension agent and policy makers to have better insights into extent of adoption of exotic crop production technologies by the growers and to formulate new policies and technologies. Study of constraints faced by farmers in cultivating exotic crops helps researcher to work out the suitable extension strategies for promoting exotic farming technologies. The study will also focus on the suggestions given by the exotic farming technology practising farmers to overcome the problems faced by them in adoption of exotic crop production technologies.

### **Limitations of the study**

The present study was conducted using Ex-post facto research design which has its own limitations as the cause and effects have already occurred. Most of the data collected was based on the opinion expressed by the growers, which may vary according to the situation and time. The study found to have its own limitations of time and resources as it was carried out as part of curriculum framework. As the study was confined to only Bengaluru Rural District of Karnataka State, generalizations made out of the study may not

be suitable for other agro climatic zones of the state and the country. However, the possible efforts were made to make the study scientific, systematic and as precise as possible.

### **Presentation of the study**

The thesis is divided into six chapters. The first chapter deals with the introduction where in the importance, statement of the problem, specific objectives, scope and limitations of the study are detailed. The second chapter deals with the review of literature and related studies in light of present investigation. The third chapter devoted to the details of methodology used in the process of investigation, followed by presentation of results and findings of study have been discussed in fourth chapter and the fifth chapter summarizes the study followed by references in sixth chapter and appendices.

### **Hypothesis of the study**

The study was conducted with the following hypothesis,

- ❖ There is no significant difference in cognitive level of exotic vegetable growers about exotic crop production technologies.
- ❖ There is no significant difference in extent of adoption of scientific technologies in exotic vegetables by its growers.
- ❖ There is no significant difference in economic performance of exotic vegetable growers.
- ❖ There is no significant difference in personal, socio-economic and psychological characteristics of exotic vegetable growers and their association with cognitive and adoption level.

### **Operational Definition**

#### **Cognitive level**

It is operationally defined as exotic vegetable growers understanding about crop production technologies of exotic vegetables.

**Adoption**

Adoption is operationalized as the decision to make use of exotic crop production technologies in crop cultivation by exotic vegetable growers.

**Economic performance**

Economic performance is defined as the ratio of output to total expenditure incurred by exotic vegetable growers.

# **REVIEW OF LITERATURE**

## II REVIEW OF LITERATURE

Review of literature is an integral part of any investigation. The systematic presentation of the relevant aspects drawn from various literatures not only provides a strong base for the empirical investigation but also facilitates to arrive at a proper understanding of the different components of the problem.

In this chapter, an attempt is made to present the available literature related to the selected variables, which draws meaningful relation to the objective of the study. The present study is concerned with “Cognitive level and adoption behavior of exotic vegetable growers in Bengaluru Rural District of Karnataka”. The review of literature is presented under following broad headings;

- 2.1 Cognitive level of exotic vegetable growers about scientific production technologies
- 2.2 Adoption behavior of exotic vegetable growers about scientific production technologies
- 2.3 Economic performance of exotic vegetable growers
- 2.4 Marketing behavior of exotic vegetable growers
- 2.5 Personal, socio-economic and psychological characteristics of the exotic vegetable growers
- 2.6 Association between personal, socio-economic and psychological characteristics of exotic vegetable growers with their cognitive, adoption behavior
- 2.7 Constraints as expressed by exotic vegetable growers in cultivation
- 2.8 Suggestions expressed by the exotic vegetable growers to overcome the constraints

### **2.1 Cognitive level of exotic vegetable growers about scientific production technologies**

Gauttam *et al.* (2014) revealed that more than two-third (67.50 %) of the farmers possessed medium level of knowledge, followed by 16.67 and 15.83 per cent of farmers possessed high and low levels of knowledge about drip irrigation system, respectively.

Nithiya (2014) stated that 51.90 per cent of the respondents had high level of knowledge and about one-fourth (25.90 %) of the respondents had medium level of knowledge on sugarcane cultivation under Precision Farming.

Yadav *et al.* (2014) observed that majority (65.83 %) of respondents were having medium level of knowledge. While 19.17 per cent and 15.00 per cent respondents were belonged to low and high level of knowledge about improved tomato production technology.

Greena (2015) observed that more than three-fourth (76.67 %) of the respondents had medium level of knowledge followed by 17.50 per cent with high level of knowledge and the remaining 5.83 per cent of the respondents had low level of knowledge on precision farming technologies.

Dhiman *et al.* (2016) revealed that the mean score for knowledge was found out to be 11.75 out of maximum score of 25. The majority of farmer had medium level (45.00 %) of knowledge followed by high (30.00 %) and one-fourth (25.00 %) had very low level of knowledge level of liliun growers on production technology.

Potale (2016) revealed that 66.25 per cent of the flower cultivators had medium level knowledge regarding protected floriculture technology, while 17.50 per cent of them had low level of knowledge and only 16.25 per cent of them had high level of knowledge.

Chauhan *et al.* (2017) revealed that 61.00 per cent of the respondents were having medium level of knowledge, followed by 22.00 per cent of them had low level of knowledge and 17.00 per cent of respondents had high level of knowledge about low-cost greenhouse technology.

Nasrin *et al.* (2017) revealed that the majority (62.50 %) of the respondents had medium level of knowledge. Whereas, 21.25 and 16.25 per cent of the respondents had high and low level of knowledge regarding low-cost polyhouse technology, respectively.

Kasinath *et al.* (2018) revealed that 45.83 per cent of respondents possess medium level of knowledge. Only 22.50 per cent of farmer have high knowledge, while 31.66 per

cent have low level of knowledge of most recent techniques and technologies for growing vegetables.

Prasad and Venkataramulu (2018) observed that majority (74.00 %) of retail and non-retail (76.00 %) farmers possessed medium level of knowledge about vegetable cultivation under control condition.

Jethi *et al.* (2019) observed that the majority (68.60 %) of the adopted farmers possessed medium level of knowledge followed by high level of knowledge (31.40 %). He also found that the majority of the non-adopted farmers possessed medium level of knowledge (79.70 %) followed by low (17.50 %) and only 2.70 per cent of the non-adopted farmers possessed high level of knowledge on scientific practices of vegetable cultivation.

Sehgal (2019) revealed that majority of the farmer (87.00 %) had the knowledge about AINSH type of polyhouses followed by followed by NVPH (71.00 %). More than three fourth (79.00 %) of the farmers had the knowledge about the MIDH programme, followed by awareness programme (69.00 %) and 62.00 per cent farmers had the knowledge about the training programme initiated by the government for the use of polyhouses. Most of the farmers (67.00 %) had the knowledge about the source of availability of polyhouses and 56.00 per cent farmers had the knowledge about the source of subsidy on polyhouse.

Malla (2019) revealed that majority (77.50 %) belonged to medium knowledge level category followed by high (12.50 %) and low (10.00 %) on knowledge level of KVK trained vegetable growers.

Mukherjee *et al.* (2019) revealed that 34.30 per cent of respondent were in medium category followed by high 28.60 per cent, very high 20.00 per cent, low 14.30 per cent and very low (2.80 %) knowledge level of farmer's producer organization members about improved hill agricultural practices.

Pawar *et al.* (2019) revealed that majority (65.71 %) of the farmer were having medium level of knowledge about package of practices for tomato cultivation, while 18.57 and 15.71 per cent farmers fall in high and low knowledge level category, respectively.

Barla *et al.* (2020) revealed that the 39.17 per cent of the respondents had medium level of knowledge followed by 33.30 per cent high level of knowledge and 27.50 per cent had low level of knowledge regarding off-season cultivation of vegetable.

Jayasankar *et al.* (2020) found that majority of the respondents had medium (55.00 %) followed by high (30.00 %) and low level (15.00 %) of knowledge about the grape cultivation with drip irrigation technology.

Raghuwanshi *et al.* (2020) revealed that majority of solar pump users (70.83 %) belonged to middle level of knowledge, followed by high level of knowledge (15.83 %). Whereas, only 13.34 per cent solar pump users were belonged to the low level of knowledge.

Yadav (2021) reported that 61.67 per cent of the vegetable growers belonged to medium knowledge level category, followed by 26.66 per cent in high and 11.67 per cent vegetable growers in low knowledge level category about soil testing technology.

Pramod *et al.* (2022) revealed that medium knowledge level was possessed by 41.66 per cent respondents, followed by high knowledge level (33.34 %) and low knowledge level of 25.00 per cent respondents. In case of beneficiaries of scheme, maximum number of respondents i.e., 48.34 per cent of respondent belonged to medium level of knowledge, followed by 46.66 per cent respondent had high level of knowledge and 5.00 per cent had low level of knowledge.

## **2.2 Adoption behavior of exotic vegetable growers about scientific production technologies**

Vinayak (2014) revealed that 35.83 per cent of the respondents belonged to medium adoption category in cultivation of arecanut followed by 34.17 per cent of the respondents to low and 30.00 per cent of the respondents to high adoption category.

Greena (2015) observed that majority of the respondents (82.50 %) had medium level of adoption of precision farming technologies, followed by 17.50 per cent of

respondents with low level of adoption and there were no respondents with high adoption level.

Patel *et al.* (2015) studied about adoption of new techniques in cultivation of tomato crop in south Gujarat and found that 65.8 per cent respondents had medium level of adoption followed by 24.2 per cent respondents were belonged to high level of adoption 10.00 per cent are those respondents who have low level of adoption.

Naik and Deshmukh (2016) reported that 43.33 per cent of the banana growers were in the medium level of adoption of recommended package of practices, 32.5 per cent of them were in the high and 24.17 per cent of them were in low level of adoption.

Pasha *et al.* (2016) found that about 38.33 per cent of the pomegranate farmers belonged to high adoption category, while 31.67 per cent of the respondents belonged to low adoption category and 30.00 per cent of the respondents belonged to medium adoption category.

Sivashankar and Shashidhar (2016) revealed that majority of respondents 43.00 per cent have medium level of adoption, 34.00 per cent of respondents were belonged to low adoption category and 23.00 per cent respondents were found in high level of adoption with regard to recommended practices in jasmine cultivation.

Kaur *et al.* (2017) revealed that the maximum number of respondents (64.37 %) grown capsicum in protected structures followed by 58.62 per cent for cucumber and 21.84 per cent for tomato crops in protected structure. Majority of growers preferred poly house for cultivation of these crops followed by net house. The study was conducted to know the adoption status of various recommended sowing practices in protected cultivation of vegetables.

Pawar *et al.* (2019) revealed that majority of the respondents (57.14 %) had medium level of adoption followed by 28.57 per cent of tomato grower had low and rest 14.28 per cent of the tomato growers had high level of adoption with respect to nursery management. He also observed that overall adoption level of respondents is 67.14 per cent of farmer were

found to be in medium adoption while, 21.43 per cent farmers were in high adoption level respectively only 11.43 per cent of farmer were in low adoption level respectively.

Harisha *et al.* (2020) revealed that majority of the respondents belonged to partial adoption category with respect to adoption behaviour of tomato crop cultivation practices under shade net and none of the farmer adopted the recommended tomato cultivar under shade net. In the case of cultural practices, concerning ploughing, nearly two-thirds (62.50 %) of the respondents partially adopted the recommended number of ploughings (2-3times). Whereas more than half (53.75 %) of the respondents had partially adopted the recommended size of the bed and nearly half (48.75 %) of the respondents belonged to partial adoption category of bed treatment @ 4% formalin for tomato cultivation.

Nayak *et al.* (2020) revealed that 46.67 per cent of farm women of the KVK adopted villages had medium level of adoption and 35.00 per cent respondent had high level of adoption of improved off season tomato production technology, whereas only 18.33 per cent of farm women were found to be the low adopters of the technology. He also observed that more than 60.00 per cent farm women of the KVK adopted villages fully adopted the general production technology of off-season vegetable farming with higher adoption rate in water management (85.00 %), weeding or Intercultural (78.33 % full and 21.37 % partial adoption) and selection of suitable variety (71.67 %).

Rajesh (2020) found that cent per cent of the capsicum growers had fully adopted soil testing practices, irrigation and drainage, supporting system followed by pinching (76.00 %) and recommended spacing and specification of bed (56.00 %). More than three-fifth of the growers (62.00 %) partially adopted grading in marketing of capsicum followed by, harvesting method (58.00 %), using recommended growing media (56.00 %), plant protection measures (54.00 %) and recommended variety and application of recommended quantity of nutrients (52.00%).

Verma and Sharma (2020) reported that 62.82 per cent of respondents were found to be medium adopters and 20.94 per cent respondents were low adopters, while 16.24 per cent of respondents were categorized as high adopters of drip irrigation system.

Ajaykumar and Muragod (2021) revealed that 13.30 per cent had partially adopted the cultivation practices like providing training for labours regarding picking, grading, and packing, crop rotation. The reason could be the lack of technical guidance and lack of capital. The majority of the tomato growers fully adopted practices like procuring varieties of seedlings from private companies, planting time of tomato, number of pre ploughing, spacing, frequency of irrigation, mulching, fertigation, supporting system, and training for labours regarding picking, grading, and packing. The possible reason for adoption might be to get higher yields.

Prakash *et al.* (2021) revealed that more than half (50.86 %) of respondents were found in medium adopter category, followed by (8.62 %) respondents were belonged to low adopter category and 40.51 per cent of respondents were found in high adopter category of protected cultivation.

Ruli *et al.* (2022) revealed that majority (54.17 %) of the respondents had medium level of adoption followed by high (26.67 %) level of adoption and low (19.17 %) level of adoption of Protected Cultivation Technologies.

## **2.2 Economic performance of exotic vegetable growers**

Ganeshprasad (2010) revealed that majority (73.33%) of the sugarcane growers were found to be in medium economic performance category followed by high (13.34%) and low (13.33%) categories.

Harish (2010) found that majority (54.00 %) of the crossandra growers were found to be in medium category with respect to their economic performance. Whereas, 25.00 per cent of the respondents were found to be in low and 21.00 per cent of the respondents were found to be in high categories, respectively.

Laxmi (2012) revealed that 35.83 per cent of the cotton growers had medium economic performance, followed by 33.33 and 30.83 per cent of the respondents belonging to low and high economic performance categories, respectively.

Rao *et al.* (2013) found that under shade net the capsicum yield was increased by 80.00 per cent over open field cultivation along with water saving of about 40.00 per cent in covered cultivation.

Vinayak (2014) observed that 65.00 per cent of arecanut growers were found to be in medium level of economic performance, 20.83 per cent of them were found to be in low and 14.17 per cent of the respondents were found to be in high level economic performance.

Praveen *et al.* (2015) studied the economic analysis of cucumber cultivation under polyhouse and open field conditions made on per acre basis. The result revealed that, cost of cultivation of cucumber under polyhouse was higher (2,83,684.40) compare to open field condition (98,003.39). At the same time, the net returns under polyhouse was also higher (1,44,614.19) but in open field it was lower (47,475.51).

Choudhary (2016) reported that in protected cultivation, high-value cash crops, vegetables, and flowers are grown and managed under controlled conditions with higher per unit productivity and profitability.

Kumar *et al.* (2016) found that gross returns over variable cost and net return were also higher in case of poly house as compared to open field conditions in tomato cultivation.

Amarnath *et al.* (2017) conducted a study on an economic analysis of cut flower marketing in Tamil Nadu. It was taken up in Hosur block of Krishnagiri district of Tamil Nadu. For the marketing of the cut flowers in the study region, there were four channels namely two commission agent channels, one a wholesaler channel and another a retailer channel. The price spread analysis revealed that, marketing channel-IV namely, the retailer channel was the efficient marketing channel because of better pricing mechanism, lesser price spread and better regulation that was prevalent in the channel.

Bishnoi *et al.* (2017) found that producers obtained maximum share in consumer rupee from direct marketing of capsicum i.e., more than 90.00 per cent which may be due to non-existence of market intermediaries between producers and consumers.

Patil (2017) revealed that there are various channels of grapes distribution. However, Producer→ Commission agent/Wholesaler→ Retailer→ Consumer is the major channel of distribution followed by direct marketing by farmers to consumers. From the price spread, it could be seen that the producer's share in consumer rupee was 40.00 per cent. It means that the producers get the maximum share in the consumer rupee.

Bindu (2018) reported that more than half (52.50 %) of the chrysanthemum growers have high overall economic performance followed by medium (30.00 %) and low (17.50 %). Among jasmine growers, more than half of them (55.00 %) have low economic performance and rest of them have medium (45.00 %) economic performance. More than half (55.00 %) of the crossandra growers have medium economic performance followed by high (25.00 %) and low (20.00 %).

Parveen *et al.*, (2018) found that in protected structures, production of vegetables and flowers are higher than open field conditions and productivity is also higher. Gross and net return were higher in these structures as compared to open conditions.

Bharath (2022) observed that less than half (42.50 %) of the Chrysanthemum growers belonged to low level of economic performance, followed by 30.83 per cent and 26.67 per cent belonged to medium and high level of economic performance, respectively.

Pachiyappan *et al.* (2022) revealed that the cultivation of flowers and vegetables under protected cultivation was highly lucrative with high investment. The protected cultivation of rose and capsicum had higher cultivation cost (300%), gross return (250%) and net return (190%) as compared to open cultivation.

Ruli *et al.*, (2022) before the adoption of the protected cultivation technologies was found to be Rs. 104890.59 and after the adoption of protected cultivation technologies it was reported to be 187126.3 percentage change of 78.40 per cent.

## **2.4 Marketing behaviour of exotic vegetable growers**

Sridevi and Sekar (2014) concluded that with respect to forms of sale, the practice of estate processed coffee is the major form of sale (76.00 %) followed by wet parchment

form (20.00 %). Regarding mode of packing gunny bag (77.14 %) was reported to be predominant among majority of the respondents and head load (41.14 %) was found to be the major mean of transportation of coffee. Further, the study revealed that local traders / middleman (58.29 %) found as a major purchaser of processed coffee followed by curing factory (21.14 %).

Maratha (2015) stated that the majority (70.00 %) of the respondents were having medium level of marketing behaviour followed by respondents having high (16.66 %) and low (13.33 %) level of marketing behaviour, respectively.

Srinivas *et al.* (2014) indicated that 88.33 per cent farmers they harvest at the stage of half ripened, 85.84 per cent of the farmers have used wooden box for packing, 71.67 per cent of the farmers used tempo to transport the produce, 64.17 per cent of the farmers were not practicing the grading and about 96.67 per cent of farmer used 15 kg box as standard weight, cent per cent of farmers indicated that price of the produce was determined by open auction and 85.83 per cent of farmers payment was made on the spot. Further, found that 53.33 per cent of the tomato growers belong to medium level of marketing practices category followed by high (25.00 %) and low (21.67 %).

Chendake and Chauhan (2015) observed that majority of the respondents (75.60 %) market their produce through commission agents followed by one fourth of respondents directly sell to the consumers and majority of the respondents (75.60 %) collected the information on market price from commission agents followed by other farmers (25.50 %).

Srinivas *et al.* (2016) revealed that, majority (48.33 %) per cent of the vegetable growing farmers sold their produce immediately after harvest in the nearby markets in tempo to transport their produce, 46.67 per cent used plastic crates as packing material, whereas 71.67 per cent farmers opinioned that, they receive full payment on the spot after sale. Commission agents (95.83 %) and neighbours/relatives (66.67 %) were the important source of market information.

Kumar *et al.* (2018) revealed that most of the vegetable growing respondents 69.16 per cent used to sell their farm produce at distant mandis (60-100 Km) located in foothills

of Haldwani and nearby towns, few of them used to sell their produce at nearby market of Almora, Ranikhet, Bhawali, and Khairana (30-40 km). More than a quarter of the respondents (30.83%) used to sell their produce at village level.

## **2.5 Personal, socio-economic and psychological characteristics of the exotic vegetable growers**

### **2.5.1 Age**

Greena (2015) showed that nearly half (49.17 %) of the respondents were found to be old aged followed by 37.50 per cent middle aged and the remaining 13.33 per cent were young.

Maratha (2015) revealed that 63.33 per cent of the vegetable growers belonged to middle age group, followed by 20.00 per cent in young age group and rest of the 16.66 per cent belonged to old age group.

Bagheri and Shabanalifami (2016) in their study on “Potato growers” risk perception: A case study in Ardabil province of Iran” showed that (44.15 %) respondents were in the middle age category.

Borah (2016) revealed that most of the vegetable growers 41.66 per cent were in the young age group (between 18-35 years), while 35.84 per cent were middle aged (36-50 years) and the old farmers were only 22.50 per cent (above 50 years).

Kowshalya (2016) inferred that, slightly more than half (51.88 %) of the IFSD beneficiaries were belonged to middle age group and with respect to non-beneficiaries, 65.00 per cent were middle aged followed by old (17.50 %) and young (17.50 %) aged.

Harisha (2017) presented that, more than two-fifth (43.75 %) per cent of the respondents belonged to middle age group followed by young age (28.75 %) and old age groups (27.50 %).

Rawal (2017) studied extension needs of vegetable growers in Kumaon region of Uttarakhand revealed that, majority of the respondents (64.38 %) belonged to middle age

group, followed by (18.75 %) of the respondents belonged to old age group and only (16.87 %) of the respondents belonged to young age group.

Singh *et al.* (2017) in their study revealed, that majority (52.50 %) of the Cabbage growers belonged to middle age group followed by old age group (40.00 %) and young age group (7.50 %) respectively.

Khating *et al.* (2018) in their study revealed, that majority (44.17 %) of the onion growers belonged to middle age group followed by young age (35.83 %) and old age group (20.00 %).

Ravi and Patil (2019) in their study on constraints experienced and suggestions by farming community in adaption to climate change in Karnataka stated that, half of the respondents (50.42 %) were found in the old age group (>46 yrs), followed by (29.58%) of the respondents were found in the middle age group (36-45 yrs) and (20.00%) of the respondents were found in the young group (<35 yrs), respectively.

### **2.5.2 Education**

Greena (2015) found that 35.83 per cent of the precision farming beneficiaries had education up to middle level followed by secondary level (23.33 %), illiterate level (17.50 %), PUC level (10.00 %), degree level (5.83 %), primary education (2.50 %) and functionally literate, diploma and post-graduation (1.67 %) respectively.

Shirur (2015) observed that 36.67 per cent of the respondents did graduation, 31.67 per cent of the respondents did up to PUC/Diploma, 15.00 per cent of the respondents belonged to each of the category of respondents with education level up to high school and post-graduation and above. Only 1.66 per cent of the respondents had their education level up to primary school. However, no illiterate was found among the respondents.

Yashodhara (2015) inferred that, more than half of the irrigated farmers (56.60 %) were having high school to graduation level of education. Whereas, 42.20 per cent of rainfed farmers had high school to graduation level of education.

Kowshalya (2016) concluded that, more than three-fifth (62.50 %) of the IFSD beneficiaries were having medium level of education. Whereas, nearly three-fourth (72.50 %) of the non-beneficiaries were having medium level of education.

Potale (2016) observed that 40.00 per cent of the flower growers were educated up to college level followed by 27.5 per cent up to higher secondary level of education and only 5.00 per cent of the respondents were educated up to primary level.

Syed and Nayan (2016) reported that, the majority of the respondents (32.50 %) were found to be illiterate followed by secondary education (23.33 %), middle school (19.17 %) followed by an equal proportion (12.50 %) were educated up to primary and graduate and above level, respectively.

### **2.5.3 Family size**

Yashodhara (2015) identified that, more than half (51.10 %) of the irrigated farmers were found to have nuclear family. Whereas, exactly half (50.00 %) of the rainfed respondents were equally distributed in nuclear and joint type of family.

Kowshalya (2016) concluded that, nearly two-third (65.00 %) of the IFSD beneficiaries fitted under medium family size. Whereas, slightly more than half (52.50 %) of the non-beneficiaries fitted under medium family size.

Patil and Nagnur (2016) observed that 80.00 per cent of respondents belonged to medium family followed by, 16.00 per cent belonged to large family and 04.00 per cent were belonged to small family.

Parushni (2017) revealed that 49.16 per cent respondents belonged to small size family, followed by 39.16 per cent and 11.66 per cent of medium and big size family, respectively.

Jha and Das (2019) observed that 75.00 per cent of them had medium family size, followed by small sized family 18.75 per cent and only 06.25 per cent of them had large sized family.

Thakur *et al.* (2020) concluded that 79.17 per cent of chilli growers had medium size of family, followed by 11.67 per cent had small size of family, followed by 09.17 per cent belonged to big size of family.

Bandu (2021) illustrated that more than half (51.67%) of the growers had medium family size, followed by 39.17 per cent and 09.16 per cent had small family and big family size, respectively.

#### **2.5.4 Annual income**

Greena (2015) observed that 44.00 per cent of the respondents had medium income level, followed by 38.00 per cent having low income level and less than 18.00 per cent at high level of income.

Karangami (2017) in her study revealed, that majority (67.50 %) of the rice growers were having medium annual income, while 24.16 and 8.34 per cent of the growers had low and high annual income, respectively.

Pathade (2017) in his study revealed, that majority (60.00 %) of the respondents had medium net income followed by low (23.33 %) and high (16.67 %) net income.

Jha and Das (2019) observed that 68.75 per cent of the chilli growers had annual income between Rs.30, 000 to Rs.70, 000, followed by 18.75 per cent of them having annual income of Rs.70, 000 to Rs.1, 10,000, 06.25 per cent of them had annual income more than Rs.150000 and 04.17 per cent of them had annual income Rs.1,10,000 to Rs.150000 and 02.08 per cent of them had annual income less than Rs. 30,000.

Natwadia (2021) showed that majority (83.33 %) of the vegetable growers had medium level of annual income followed by, high (10.84 %) and low (5.83 %) levels of annual income.

#### **2.5.5 Farming experience**

Greena (2015) reported that 64.17 per cent of the respondents had medium level of farming experience followed by 20.00 per cent at high and 15.83 per cent at low levels of farming experience.

Ashok and Aski (2016) in their study revealed, that 43.33 per cent of the cabbage growers had the medium level experience followed by 31.67 per cent of the respondents had the high experience, whereas only 25.00 per cent of the growers had low experience in cabbage cultivation.

Omoruyi (2016) in his study revealed, that 58.00 per cent of the farmers have been engaged in cabbage production for 6 – 15 years, 18.00 per cent of the farmers had farming experience of between 16 – 30 years and 24.00 per cent of the farmers had farming experience of above 30 years.

Shanabhoga (2016) reveals that, 45.00 per cent of the pomegranate growers had medium level of farming experience followed by high (32.50 %) and low (22.50 %) level of farming experience.

Darade (2017) reported that, majority of the maize growers (63.34 %) had experience of 11 to 20 years in maize cultivation followed by (33.33 %) respondents who had experience up to 10 years and (03.33 %) of the respondents had experience above 20 years in maize cultivation.

Chaudhary (2016) observed that 45.56 per cent of the respondents had medium experience (5 to 8 years) in precision farming followed by high (>8 years) and low experience (<5 years) i.e. 32.22 and 22.22 per cent, respectively.

### **2.5.6 Land holding**

Nithiya (2014) showed that majority (80.00 %) of the beneficiaries had more than 2.5 acres of land and 20.00 per cent of the beneficiaries had marginal farm size.

Ashok and Aski (2016) in their study revealed, that majority (44.17 %) of the cabbage growers belonged to medium size of land holding followed by semi-medium (24.17 %) and big (20.83 %) farmers, respectively. A meagre percentage of the farmers were small (8.33%) and marginal (2.50 %) farmers.

Mishra *et al.* (2018) expressed that majority (80.90%) of the farmers had large size land holding, followed by small size (11.81%) and marginal size (7.27%) land holding.

Rajesh (2020) found that 45.00 per cent of the respondents were small farmers followed by marginal farmers (36.00 %) and big (19.00 %) farmers.

Natwadia (2021) found that majority of vegetable growers (67.50 %) had land holding above 2.0 ha.

### **2.5.7 Extension agency contact**

Kudari (2014) found that 42.10 per cent of the farmers had medium level of extension contact, followed by high (34.21 %) and low (23.68 %) levels of extension contact.

Greena (2015) reported that more than half (55.83 %) of the respondents had medium level of contact and nearly one fourth of the respondents were found at high (22.50 %) and low (21.67 %) levels of contact with extension and other agencies.

Mutteppa (2018) observed that 41.67 per cent of the turmeric growing farmers had high extension contacts level followed by medium level and low-level extension contacts with 35.00 per cent and 23.33 per cent respectively.

Sundresha (2018) found that nearly half (46.25 %) of the respondents belonged to high extension contact category followed by 30.00 per cent in medium and 23.75 per cent in low level of extension contact category, respectively.

Shrikrishana (2015) indicated that, nearly three-fifth (56.67 %) of the pigeon pea growers were having medium extension contact, while 24.17 per cent of them had low extension contact. Further, it was found that 19.16 per cent of the respondents had high extension contact.

Veena (2017) revealed that, nearly three-fifth of IR-64 paddy variety growers (58.33 %) and Jyothi (53.34 %) variety growers had medium extension contact, followed by high with 25.00 per cent and 28.33 per cent, low with 16.67 and 18.33 per cent, respectively. In pooled condition, 55.83 per cent of rice growers had medium extension contact followed by high (26.67 %) and low (17.50 %) extension contact.

### **2.5.8 Extension Participation**

Doddamani (2014) noted that two-third (66.66 %) of the grape growers had medium level of extension participation, while equal percentage (16.67 %) of the respondents had high and low levels of extension participation.

Ashokkumar (2015) in his study indicated that, 23.33 per cent of the farmers participated occasionally in training programmes and 60.00 per cent of the farmers never participated in training programme and also indicated that, 20.33 per cent of farmers were participated occasionally in demonstration and 69.67 per cent of farmers never participated in demonstration.

Harisha (2017) reported that 48.75 per cent of the respondents belonged to medium level extension participation category, followed by high (35.00 %) and low level (16.25 %) extension participation categories.

Mutteppa (2018) observed that, 39.17 per cent of the turmeric growing farmers belonged to medium class of extension participation followed by low with 32.50 per cent and high with 28.33 per cent extension participation groups, respectively.

Sundresha (2018) reported that more than one third (36.25 %) of the ginger growers belonged to medium category of extension participation followed by high (35.00 %) and low (28.75 %) category.

Rajesh (2020) revealed that two-fifth of the respondents belonged to medium category (40.00 %) followed by low (37.00 %) and high (23.00 %) level of extension participation.

### **2.5.9 Achievement motivation**

Rituraj *et al.* (2015) highlighted that majority (61.67 %) of the farmers belonged to medium achievement motivation category followed by high (20.83 %) and low (17.50 %) achievement motivation category.

Somvanshi *et al.* (2016) in their research “Entrepreneurial behaviour of vegetable growers” reported that majority of the respondents (62.50 %) had medium level of achievement motivation.

Ahuja *et al.* (2016) reported that majority of the small category of farmers (>71.00 %) were having low to medium level of achievement motivation while its medium to high level (86.04 %) was observed among the medium category of farmers.

Karat and Baby (2020) observed that slightly more than half (53.30 %) of the respondents had medium level of achievement motivation, while 26.70 per cent had low level of achievement and only 20.00 per cent belonged to the category of high level of achievement motivation.

Bhattacharjee *et al.* (2021) reported that among organic farmers 58.20 per cent has belonged to the medium category. 23.60 per cent of them were in the high category while only 18.20 per cent of them were in a low category of achievement motivation.

Kumara *et al.* (2015) indicated that among vegetable grower’s majority (43.00 %) of the respondents had medium achievement motivation followed by low (33.00 %) and high (24.00 %) achievement motivation, respectively.

### **2.5.10 Risk bearing ability**

Hanjabam (2014) found that majority of precision farmers are highly risk oriented (61.67 %) followed by 38.33 per cent in medium level.

Shitu (2014) revealed that majority (68.57 %) of the participant farmers had high level of risk orientation.

Harisha (2017) reported that 41.25 per cent of the respondents belonged to medium risk orientation category followed by high (32.50 %) and low (26.25 %) level categories.

Kolgane *et al.* (2018) reported that majority 60.42 per cent of pomegranate farmers had medium risk bearing ability further 20.83 per cent and 18.75 per cent of the respondents had low and high risk bearing ability respectively.

Rajesh (2020) revealed that nearly half of the farmers (47.00 %) had medium level of risk bearing ability followed by 31.00 per cent of them had high level and 22.00 per cent of farmers had low level of risk bearing ability.

### **2.5.11 Cosmopolitaness**

Kumara *et al.* (2015) observed that among vegetable growers in Karnataka majority 45.00 per cent of the respondents had medium level of cosmopolitaness followed by low 43.00 per cent and high 12.00 per cent level of cosmopolitaness, respectively

Ahuja *et al.* (2016) observed that majority of farmers in each category i.e., small, medium and large had medium level of orientations towards outside his social system hence it can be inferred upon that majority of farmers were having medium level of 'cosmopolitaness'.

Karat and Baby (2020) observed that majority (66.70 %) of the polyhouse farmers had medium level of cosmopolitaness, while 23.30 per cent had high and 10.00 per cent had low level of cosmopolitaness.

Sahana and Gayathri (2022) revealed that among fruits and vegetable growers more than half the farmers had medium level of cosmopolitaness in public (55.00 %), co-operative (62.50 %) and private (67.50 %) market interventions.

### **2.5.12 Innovativeness**

Kudari (2014) revealed that, half (51.32 %) of the farmers had medium level of innovative proneness, followed by 26.31 per cent and 23.37 per cent of the respondents having high and low level of innovative proneness respectively.

Bhirde (2015) revealed that 40.84 per cent of the respondents had high innovativeness followed by 38.34 per cent had medium and 20.82 per cent had high innovativeness.

Somvanshi *et al.* (2016) in their research "Entrepreneurial behavior of vegetable growers" reported that more than two-third of the respondents (66.25 %) had medium level of innovativeness.

Ahuja *et al.* (2016) reported that majority of the small category of dairy farmers possessed medium level of innovativeness (47.62 %) while medium category of dairy farmers had medium to low level of innovativeness (74.41 %). On the other hand, medium to high level of innovativeness was observed in the large category farmers (75.01 %). On the whole, the respondents possessed low to medium level (70.01 %) of innovativeness.

Akkamahadevi Naik (2016) indicated that, half (50.00 %) of the respondents had medium innovativeness, followed by high (33.33 %) and low (16.67 %) level of innovativeness.

Parushni (2017) revealed that 50.84 per cent of the ginger growers were found in medium innovativeness category followed by 34.16 per cent and 15.00 per cent of respondents were distributed in low and high innovativeness categories respectively.

Reddy (2017) observed that 69.33 per cent of respondents were observed in medium level of innovativeness, followed by 16.67 per cent of respondents were observed in low level of innovativeness and 14.00 per cent respondents were having high level of innovativeness.

### **2.5.13 Mass media participation**

Kudari (2014) reported that, 53.95 per cent of the farmers belonged to medium mass media participation category, followed by low (26.32 %) and high (19.74 %) categories, respectively.

Shitu (2014) revealed that 74.29 percent and 48.57 per cent of the participant and non-participant farmers had medium level of mass media utilization respectively.

Harisha (2017) reported that more than one third (35.00 %) of the respondents belonged to large and medium mass media utilization categories followed by low (30.00 %) mass media utilization category.

Sumana (2017) indicated that more than one third (36.67 %) of grape growers exhibited medium level of mass media participation, whereas, 35.56 and 27.77 per cent of them exhibited low and high levels of mass media participation, respectively.

Rajesh (2020) found that more than two-fifth of the horticulture crop growers (43.00 %) belonged to medium mass media exposure category followed by 34.00 per cent and 23.00 per cent of farmers belonged to high and low mass media exposure category.

#### **2.5.14 Scientific orientation**

Kumari (2015) revealed that 46.00 per cent of FLD beneficiaries had high scientific orientation, followed by 38.00 per cent had medium and 16.00 per cent had low scientific orientation. While, in case of non-beneficiaries of FLD programme, 46.00 per cent had medium scientific orientation, followed by 28.00 per cent had low scientific orientation, while 26.00 per cent had high scientific orientation.

Parmar (2015) concluded that slightly less than three-fifth (58.34 %) of the respondents had high level of scientific orientation about bio-fertilizers, followed by 34.16 per cent, 5.00 per cent and 2.50 per cent of respondents had medium, very high and low level of scientific orientation about bio-fertilizers, respectively.

Umretiya (2015) reported that out of the total chickpea growers, 44.17 per cent had medium level of scientific orientation, followed by 32.50 per cent had high and 23.33 per cent had low level of scientific orientation.

Lohare (2017) observed that nearly half (46.50 %) of the respondents had medium scientific orientation, followed by 29.00 per cent and 24.50 per cent had low and high scientific orientation, respectively.

Chaudhary (2018) indicated that more than half (55.00 %) of beneficiary farmers had medium level of scientific orientation, followed by 23.33 per cent and 15.00 per cent had high and very high level of scientific orientation, respectively. Similarly, more than two-fifth (43.33 %) of non-beneficiary farmers had medium level of scientific orientation, followed by 21.67 per cent and 15.00 per cent had high and very high level of scientific orientation, respectively.

Kumar (2019) reported that majority (60.83 %) of the red gram growers had medium scientific orientation, followed by low (21.67 %) and high (17.50 %) level of scientific orientation.

Singh (2019) revealed that in case beneficiaries of FLD programme, majority of the respondents 56.67 per cent had medium scientific orientation, followed by 28.33 per cent had high and only 15.00 per cent had low scientific orientation. Similarly, in case non-beneficiaries, 51.67 per cent had medium scientific orientation, followed by 25.00 per cent had low and 23.33 per cent had high scientific orientation.

Suman (2019) in their study “Socio-economic and psychological characteristics of vegetable growers” reported that majority of the respondents belonged to medium level category of scientific orientation.

Mansuri (2020) concluded that majority (81.66 %) of the red gram growers had medium scientific orientation, followed by low (11.67 %) and high (6.67 %) level of scientific orientation.

## **2.6 Association between personal, socio-economic and psychological characteristics of exotic vegetable growers with their cognitive, adoption behavior**

Sundresha (2018) revealed that education, achievement motivation, risk orientation, cosmopolitanism, economic motivation and mass media participation were significantly and positively associated to their extent of knowledge of ginger growers at 5 per cent level, management orientation, extension contact and extension participation were positive and significant at 1 per cent level. Whereas, the other characteristics namely age, land holding, annual income, farming experience and social participation were found not significant but they are positively associated with knowledge.

Wankkhade (2018) noticed that, education, annual income, source of information and farming experience were found to have positive and significant association with adoption of protected cultivation technology by capsicum growers at 5 percent level of significance. Whereas, age, landholding is not significant.

Rajashree *et al.* (2019) revealed that scientific orientation, training exposure, utilization of mass media and cosmopolitan outlook had significant association with the adoption of eco-friendly technologies in vegetable cultivation at 5 per cent level of significance. Remaining independent variables like age, education, annual income, size of

family, farming experience, achievement motivation, economic orientation, innovative proneness and risk orientation does not have any association with adoption level.

## **2.7 Constraints as expressed by exotic vegetable growers in cultivation**

Chauhan (2015) observed that major constraints faced by the farmers were weed control through herbicide is technically complex phenomenon (92.72 %) constraint followed by lack of knowledge about improved technologies of seed, weedicides and plant protection measures (89.24 %), absence of assured marketing of remunerative price and insurance policy facility (86.39 %), lack of operational skill in the plant protection equipments (86.39 %) and frost, high wind velocity and low temperature affect the growth of crop and productivity (86.08 %).

Das *et al.* (2015) indicated that major constraints like faulty or improper marketing system, high humidity and rainfall aggravates more diseases and pest complex, lack of high yielding/hybrids resistant or tolerant to diseases or pests, High cost of hybrid seeds, Lack of soil testing facility, Little or lack of multipurpose storage and processing facility were mainly faced by the vegetable growers.

Dhurwey *et al.* (2015) in their study “Constraints perceived by farmers in production and marketing of major cole vegetable crops in Bemetara district of Chhattisgarh state” reported that the majority 80.00 per cent of small farmer’s stated the non-availability of timely labour. However, 75.00 per cent of small farmers expressed problem of production losses due to insects, pests and diseases and 56.00 per cent opined another most important constraint, i.e., lack of adequate training facility to the farmer. It was observed that 49.00 per cent of small farmers expressed lack of technical knowledge and 35.00 per cent small farmer reported lack of soil testing facilities. Further, they faced non-availability of timely input (32.00 %). The other constraint was lack of financing at the reasonable interest rate (31.00 %).

Mahadevappa (2015) stated that cent per cent of the respondents had expressed problem of lack of literature or package of practices on organic vegetable production followed by low yield comparatively conventionally growing (96.66 %) and lack of support

from the government agencies and other relevant departments in the form of subsidy and financial assistance (92.50 %). Further, study noticed that all the respondents expressed the problem of lack of minimum support price for organically grown vegetables followed by non-availability of market exclusively for organic produce (96.66 %), absence of premium price for organic vegetables in local market (78.33 %) and inability to identify marketing networks for organic vegetables (60.83 %).

Rohit *et al.* (2017) revealed that highly perishable nature of product resulted in post-harvest loss with the Garrett score of 58.12 was the number one constraints among all marketing constraints followed by market and price fluctuation (Garrett score 55.53) and middlemen mal practices (Garrett score 55.07) were the most prominent constraints faced by the respondents.

Jayswal *et al.*(2019) revealed that major constraints perceived by gram growers were, unavailability of vermicompost as per recommendation (86.67 %) ranked at first position followed by lack of knowledge about plant based botanical insecticides and pesticides (85.56 %), unavailability of farm yard manure (82.22 %), Non-availability of fertilizers in time (70.00 %), No information about seed treatment (64.44 %), Lack of knowledge about bio fertilizer (50.00 %), Lack of guidance about recommended technology (48.89 %), Non availability of NPV in market (46.67 %) and Non availability of improved seed (43.33 %).

Wongnaa *et al.* (2019) revealed that farmers ranked high input cost, land tenure insecurity, and high cost of irrigation as major challenges they faced in urban exotic vegetable production.

Jaiswal *et al.* (2020) in their research “Entrepreneurial behaviour of vegetable growers at Gangeo block of REWA District (M.P.)” reported that non-availability of improved seeds (I Rank) followed by lack of insurance of vegetables (II Rank), lack of training about scientific production technology of vegetable (III Rank) are major constraints in vegetable production as enterprise.

Karthikeyan *et al.* (2020) in their study to measure the constraints in adoption of integrated pest management practices in cabbage revealed that lack in knowledge about ETL estimation and natural enemies' conservation (94.12%) ranked first, followed by the lack of technical knowledge about IPM (91.18%), access to the pheromone traps due to its non-availability in local market (85.29%) and lack of knowledge about bund crops (82.35%) were the major problems faced by them.

More *et al.* (2021) revealed that that cent per cent of the growers revealed that fluctuation in the market price was the major problem, followed by high commission charges (90.00 %) and high cost of transportation (85.00 %). While absence of storage facilities (75.00 %), lack of market information (60.00 %), inadequate physical facilities in the markets (54.17 %), prolonged transaction (50.00 %), faulty system of weighing (46.67 %), followed by no grading facilities (34.17 %), illegal deduction while selling (24.17 %), lack of processing facilities (21.66 %), markets are far away (19.17 %) were the constraints reported by the vegetable growers in marketing of vegetables. fluctuation.

Satpathy *et al.* (2021) revealed that the majority of farmers were reported the problems of lack of appropriate irrigation facility ranked 1<sup>st</sup> (80.00 %), lack of uninterrupted electric supply ranked 2<sup>nd</sup> (77.50 %), lack of proper training on vegetable cultivation ranked 3<sup>rd</sup> (73.33%), poor co-ordination and co-operation among grass root level extension workers ranked 4<sup>th</sup> (69.16%), non-availability of production inputs timely ranked 5<sup>th</sup> (65.00 %), lack of awareness about new technologies related to vegetable cultivation ranked 6<sup>th</sup> (57.50 %), grazing of field by stray cattle's ranked 7<sup>th</sup> (40.83%) and less availability of agricultural farming/market related newspapers, literatures, farm magazines, television programs, ranked 8<sup>th</sup> (30.00 %) respectively.

## **2.8 Suggestions expressed by the exotic vegetable growers to overcome the constraints**

Siddayya and Reddy (2015) indicate that majority of the farmers expresses to antidote the constraint related to sharing Information on marketing rates (85.00 %) and reducing the length of Intermediaries in the marketing channel (80.00 %) were major suggestions suggested by the farmers in the study area. The farmers also suggest that flow

of credit should be to make credit available to needy person (73.00 %) and minimal transport charges (63.00 %) considered under policy issues.

Gurjar *et al.* (2017) revealed that more than three-fourth (77.50 %) of the potato growers suggested that the proper price of produce should be ensured, whereas (69.16 %) of them suggested that the more number of cold storage should be established. About 66.33 per cent of the potato growers suggested that the proper marketing facilities should provide.

More *et al.* (2021) indicates that majority of the respondents (95.83 %) suggested for providing access to market information, 88.33 per cent suggested to display the prices at each market place whereas, 85.00 per cent suggested for fixing minimum price for the produce whereas, followed by fixing minimum labour charges (75.00 %), providing concession in transportation charges (72.50 %), procurement at nearby places (70.83 %), providing loading and boarding facilities at market places (54.17 %) and establishing separate markets for their major produce (35.00 %) were the suggestions offered by vegetable growers for marketing their produce in a better way.

Satpathy *et al.* (2021) revealed that majority (95.83 %) of the respondents suggested that cold storage/ ware house facilities should be available in the study area had rank 1<sup>st</sup> followed by declaration of support prices by the government (84.16 %) ranked 2<sup>nd</sup>, provision of better physical facilities in the market (82.5 %) ranked 3<sup>rd</sup>, timely availability of quality inputs to get desired yield (81.66 %) ranked 4<sup>th</sup>, irrigation facilities should be provided (80.83 %) ranked 5<sup>th</sup>, uninterrupted power supply to the irrigation points (79.16 %) ranked 6<sup>th</sup>, procurement of produce by the local co-operatives (74.16 %) ranked 7<sup>th</sup>, establishment of block level vegetable mandis (68.33 %) ranked 8<sup>th</sup>, training programs should be conducted related to vegetable production and marketing (67.5 %) ranked 9<sup>th</sup>, formation of kanji house for stray cattle (65.83 %) ranked 10<sup>th</sup>, proper market information (related to price/time) should be provided at time (40.83 %) ranked 11<sup>th</sup> and agriculture related TV channels/programs focusing on the state and local conditions (22.5 %) ranked 12<sup>th</sup> respectively.

Chandran and Podikunju (2021) revealed that majority of the respondents suggested the introduction of MGNREGS workers to agricultural sectors will reduce the

constraints of labour scarcity and high wage rate (75.00 %), more than three-fifth of farmers (63.00 %) pointed out that the arrangements for supply of inputs, loan and other needed information in time. Fifty-eight percent suggested the need for intervention by the Government for fixing minimum support price for organic produce followed by promotion of value addition technologies and facilities (52.00 %), inclusion of accessible and low cost technologies (43.00 %), arrangement for certification of produce for getting better price (40.00 %) were the other expressed suggestions. Around 36.00 per cent respondents suggested establishment of separate market facility for the sale of organic produce.

# **METHODOLOGY**

## **III METHODOLOGY**

Methodology chapter deals with research methods and techniques used in the study. The study was conducted in Bengaluru Rural district of Karnataka state during the year 2023-24. The procedure followed in the selection of district, taluks and respondents, description of the study area, variables and their measurement procedure, data collection method and use of statistical tools are outlined in this chapter under following headings.

3.1 Locale of the study

3.2 Description of the study area

3.3 Research design

3.4 Selection of villages and respondents

3.5 Operationalization and measurement of variables

3.6 Procedure followed to identify the constraints and suggestions of respondents

3.7 Instruments used for data collection

3.8 Statistical tools used for analysis of data

3.9 Conceptual model of the study

### **3.1 Locale of the study**

The present study was carried out in Bengaluru Rural district during the year 2023-24. The district was purposively selected because of the potential exotic crop cultivation.

### **3.2 Description of the study area**

Bengaluru Rural district, 16<sup>th</sup> largest district in the State has a geographical area of 2,295 sq Km. It has four talukas viz., Nelmangla, Hoskote, Devanahalli and Doddaballapura. The proximity to Bangalore city has its own influence on the district. In the absence of major rivers, irrigation facilities are limited and thus rainfed farming is the characteristic feature of the district. The district is blessed with salubrious climate.

Ragi is the main crop and horticulture sector contributes significantly to the economy of the district. For many years, allied agricultural activity like dairy and sericulture (Mulberry cultivation, silk worms, and silk production and weaving) were the major occupation for a large part of the population. Keeping in view the infrastructure and linkage support available Other agri-allied activities needs to be supported.

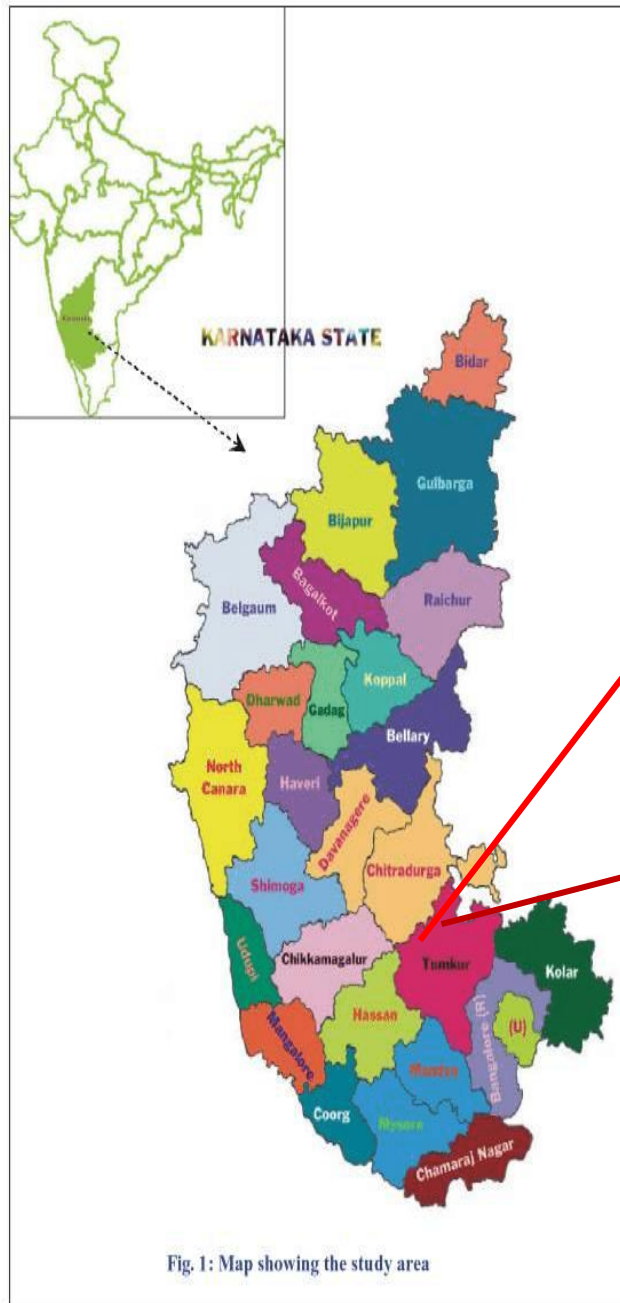
In the recent past the Karnataka State Government is providing various subsidies and schemes to promote horticulture, including the *National Horticulture Mission (NHM)*, which has led to the establishment of numerous orchards, vegetable farms, polyhouses and nurseries in Bengaluru Rural. In 2020, it was reported that horticulture contributed around 30-35 per cent of the total agricultural area in Bengaluru Rural. The district's overall agricultural area is approximately 3.5 lakh hectares, with a significant portion devoted to fruits, vegetables, and other high-value crops. Broccoli cultivation in Bengaluru Rural district accounts for about 800 to 1000 hectares and in case of lettuce it accounts for about 300 to 500 hectares (Anonymous, 2022). Therefore, the district was selected purposively for the study.

### **3.3 Research design**

Research design is the most significant and essential part of the research methodology. Keeping in view, “*ex-post facto*” research design was used for the present study. This design was considered as most appropriate, since it is a systematic enquiry for measuring the phenomenon, which has already occurred and is continuing. The researcher has no control on independent variables as their manifestation has already occurred or they are inherent and non-manipulative.

### **3.4 Selection of villages and respondents**

The study was conducted in Bengaluru Rural district of Karnataka state. Two potential taluks i.e., Hoskote and Doddaballapura were selected for the study. Further, from each taluk 25 broccoli growers and 25 lettuce growers were selected, making the sample size of 50 exotic vegetable growers from each taluk. Thus, the total number of respondents for the study were 100 farmers. Snowball sampling technique was employed in selection of respondents.



**Fig.1: Map showing the study area**

### 3.5 Operationalization and measurement of variables

#### 3.5.1 Operationalization and measurement of dependent variables

The dependent variables selected for the study were cognitive level, adoption and economic performance.

##### 3.5.1.1 Cognitive level

Cognitive level is operationalized as exotic vegetable growers understanding about different aspects of crop production technologies. Procedure followed by Sai Tejashree (2022) with modifications was used in the present investigation. The important aspects to check the cognitive level of exotic vegetable growers on crop production technologies were listed by taking package of practice as reference from Meghalaya for broccoli and for lettuce from GKVK. The response from the farmers were quantified by giving score of 'one' to correct answer and 'zero' to wrong answer. The score of the entire individual item were summed to assess the cognitive level of the respondents. The maximum and minimum score in case of broccoli was 21 and 0 respectively whereas for lettuce it was 22 and 0.

Based on the scores obtained, the respondents were grouped into three categories using mean and half standard deviation as a measure of check as mentioned below;

Category	Criteria
Low	(< Mean – ½ SD)
Medium	(Mean ± ½ SD)
High	(> Mean + ½ SD)

##### 3.5.1.2 Extent of adoption

Extent of adoption is operationalized as the decision to make use of innovative production technologies in exotic crop production. Procedure followed by Sai Tejashree (2022) with modifications was used in the present investigation. The schedule was developed to measure the extent of adoption of crop production technologies by exotic

vegetable growers. Based on the review of literature, number of statements with suitable sub statements were selected for the study. Further, the list of items to assess the adoption level was finalized in consultation with subject matter specialists of University of Agricultural Sciences, Bangalore. Adoption of each technology was measured on three-point continuum. Highest score of '3' was given for full adoption, followed by partial adoption (2) and no adoption (1). Similarly, the scores for all the practices were worked out and finally the scores were added to arrive at the adoption score of a respondent. The respondents were categorized as low, medium and high using mean and standard deviation. The maximum and minimum score obtainable in case of broccoli was 63 and 0, whereas in case of lettuce it is 65 and 0 respectively. For extent of adoption, per centage analysis was worked out to study the practice wise adoption level of exotic vegetable growers on crop production technologies.

Category	Criteria
Low	(< Mean – ½ SD)
Medium	(Mean ± ½ SD)
High	(> Mean + ½ SD)

### 3.5.1.3 Economic performance

Economic performance is defined as the ratio of output to total expenditure incurred in growing exotic vegetables. The procedure developed by Shankaraiah and Crouch (1977) was used in the present investigation. The total expenditure incurred for one year is estimated by considering the expenditure incurred on total inputs, labour, irrigation, repair and maintenance and other expenses. The value of total output for one year was also estimated by considering the revenue obtained from the sale of exotic vegetable. Economic performance index (EPI) for an exotic vegetable grower was calculated by using the following formula

$$EPI = \frac{\text{Value of total output in rupees for a period}}{\text{Total expenditure in rupees incurred for a period}} \times 100$$

Based on the economic performance index (EPI), the growers were grouped into three categories with mean and standard deviation as a measure of check.

Category	Criteria
Low	(< Mean – ½ SD)
Medium	(Mean ± ½ SD)
High	(> Mean + ½ SD)

### 3.5.2 Operationalization and measurement of independent variables

A	Dependent variable	
1	Cognitive level	Procedure followed by Sai Tejashree (2022) with slight modifications
2	Adoption	Procedure followed by Sai Tejashree (2022) with slight modifications
3	Economic performance	Procedure followed by Shankaraiah and Crouch (1977)
B	Independent Variables	
1	Age	Chronological age of the respondents
2	Education	Procedure followed by Shashidhar (2004)
3	Family size	Procedure developed by Trivedi (1963)
4	Farming experience	Procedure followed by Lakshminaryana (1997)
5	Annual income	Schedule developed for the study was used
6	Land holding	Followed Karnataka Land Reforms Act 38 of 1966
7	Extension contact	Procedure followed by Hiremath (2000)
8	Extension participation	Procedure followed by Hiremath (2000)
9	Achievement motivation	Procedure followed by Sushma (2007) was used
10	Risk bearing ability	Scale followed by Supe (1969)
11	Cosmopolitaness	Procedure followed by Shashidhar (2004)
12	Innovativeness	Procedure followed by Moulik and Rao (1973) with slight modifications
13	Mass media participation	Procedure followed by Patil (1990)
14	Scientific orientation	Scale followed by Supe (1969) with slight modifications

### 3.5.2.1 Age

Age was operationalized by considering the chronological age of the exotic vegetable growers completed in years at the time of enquiry. The respondents were asked to respond to their age in completed years as on the date of interview and classified them into three categories namely 'Young', 'Middle' and 'Old'. The results were expressed in frequency and percentage.

<b>Category</b>	<b>Age (in years)</b>	<b>Score</b>
Young	35 years and below	0
Middle	36-50 years	1
Old	Above 50 years	2

### 3.5.2.2 Education

It was operationalized as the number of years of formal education completed by the respondents. This was quantified by using the items and weights used by Shashidhar (2004). The different levels of education and their weights adopted in the study are as follows. Based on the scoring procedure, the maximum score an individual could obtain was 5 and the minimum was 0.

<b>Level of education</b>	<b>Score</b>
Illiterate	0
Primary school	1
Middle school	2
High school	3
Pre-university	4
Graduation and above	5

### 3.5.2.3 Family size

Family size was operationalized as total number of members in the family of respondents. The size of the family was categorized as small, medium and large. The procedure followed by Trivedi (1963) was adopted to categorize the growers.

Category	Criteria	Score
Small	1- 3 members	1
Medium	4-6 members	2
Large	>6 members	3

### 3.5.2.4 Annual income

Annual income was operationalized as the income earned by the members of the family from all the sources during the previous year and expressed in terms of rupees. Based on the total annual income obtained, the respondents were classified into low, medium and high category based on mean and standard deviation as measure of check.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.5 Farming experience

Farming experience refers to a total number of years of experience in farming. The procedure adopted by Lakshminarayana (1997) was used to categorize this variable.

Category	Years of farming experience	Score
Low	<10	1
Medium	Between 10-20	2
High	>20	3

### 3.5.2.6 Land holding

The extent of land actually possessed by the farmers was recorded. According to Karnataka Land Reforms Act 38 of 1996, one acre of wet or garden land was considered and equated to 2.50 acres of dry land. It is taken as the absolute number of standard acres of land a farmer owned at the time of information gathering including the leased land. The degree of land owned by every classification of farmers is given below.

<b>Category</b>	<b>Criteria</b>
Marginal farmers	Below 2.5 acres
Small farmers	2.5 to 5.0 acres
Big farmers	Above 5.0 acres

### 3.5.2.7 Extension contact

Extension contact was operationally defined as the degree of contacts made by the farmers with different extension workers in order to seek information on different aspects of exotic cultivation. This variable was quantified using procedure followed by Hiremath (2000) with slight modification.

<b>Extension contact</b>	<b>Score</b>
Once in a week	4
Once in fortnight	3
Once in a month	2
Once in a while	1
Never	0

The score for an individual respondent was summated, the respondents were then classified into three categories based on the mean and standard deviation of the total scores.

The maximum and minimum score obtained based on scoring procedure was 24 and 0 respectively.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.8 Extension participation

Extension participation variable was operationalized as the degree of participation of farmers in various extension educational activities organized by extension personnel's or institutions. This variable was measured by following the methodology as pursued by Hiremath (2000).

The degree of participation of the farmers in extension activities, various exercises were recorded and respondents were asked to indicate their participation as regularly, occasionally and never with 2, 1 and 0 scores, respectively. The maximum and minimum score obtainable were 16 and 0, respectively. By considering the total score obtained by each respondent they were grouped into three categories *viz.*, low, medium and high extension participation based on the mean and standard deviation.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.9 Achievement motivation

Achievement motivation refers to striving to do a good work with a standard of excellence. The variable was measured by using procedure followed by Sushma (2007) with slight modification. It consists of six statements, which is to be rated on a three-point continuum namely strongly agree, agree and disagree with the scores of 3, 2 and 1, respectively. The maximum and minimum score obtained based on scoring procedure was 18 and 6 respectively. Based on scores obtained, the respondents are grouped into three categories using mean and standard deviation as a measure of check.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.10 Risk bearing ability

Risk bearing ability is the degree to which a farmer is oriented towards risks and uncertainty in agriculture and has the courage to face the various risks involved in agriculture. The scale developed by Supe (1969) was used with slight modifications to measure risk orientation of farmers growing exotic vegetables. The scale contained five statements. The fourth statement was negatively scored and other statements were positively scored. In case of positive statements, a score of one was assigned if the response was 'agree' and zero score for 'disagree' statement. Whereas, scoring pattern was reverse in case of negative statement. The maximum and minimum score obtained based on scoring procedure was 5 and 0 respectively. Based on scores obtained, the respondents were grouped into three categories using mean and standard deviation as a measure of check.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.11 Cosmopolitaness

Cosmopolitaness is defined as the degree to which an individual is oriented towards his immediate social system. The Cosmopolite farmer is likely to be a unique individual in that he/she motivated to look beyond his environment when most others are content to maintain a legalistic frame of reference. The variable was measured using the procedure followed by Shashidhar (2004). Two dimensions of the variable are considered in this case.

- a. The frequency of visit to the nearest town.
- b. The purpose of visit to the town.

The items and scoring pattern followed in quantifying the frequency of visit and purpose of visit were as follows.

No.	Frequency of Visit	Score	Purpose of Visit	Score
a.	Two or more times in a week	5	All visits relating to agriculture	5
b.	Once in a week	4	Some visits relating to agriculture	4
c.	Once in fifteen days	3	Personal / Domestic	3
d.	Once in a month	2	Entertainment	2
e.	Seldom	1	Others	1
f.	Never	0	No response	0

The cumulated maximum score obtainable was 10 and the minimum was 0. Further, the respondents were categorized as low, medium and high based on the mean and standard deviation.

Category	Criteria
Low	$< (\text{Mean} - \frac{1}{2} \text{SD})$
Medium	$(\text{Mean} \pm \frac{1}{2} \text{SD})$
High	$> (\text{Mean} + \frac{1}{2} \text{SD})$

### 3.5.2.12. Innovativeness

Innovativeness refers to the behaviour pattern of an individual who has interest and desire to seek changes in the farming and to introduce changes in the practice when found practicable and feasible. In this study, farmer's inventive inclination was estimated by utilizing the scale developed by Moulik and Rao (1973) with appropriate modifications. Five statements of the scale were fitted against a five point continuum viz., 'strongly agree', 'agree', 'undecided', 'disagree', 'strongly disagree', with the scores of 5, 4, 3, 2 and 1, for the statements. Respondents were categorized as low, medium and high based on mean and standard deviation as a measure of check. The score ranged from 25 to 5.

Category	Criteria
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.13. Mass media participation

Mass media participation was operationally defined as the degree of exposure of an individual to different mass media. Keeping the focus of the study in view, the possession/owning of the media gadgets was scored by assigning one score for possessing each gadget and thereafter degree of participation was measured by the procedure suggested by Trivedi (1963) with little modification.

Scores of two for "regular" use, one for "occasional" use and zero for "never" were assigned separately for each of the selected mass media items as detailed below. The total score obtained by each respondent formed the mass media score. The score ranged from 0 to 18.

Extent of exposure to mass media	score
Regularly	2
Occasionally	1
Never	0

Considering the total score of the respondents, they were grouped into three categories taking their mean and standard deviation as a measure of check.

<b>Category</b>	<b>Criteria</b>
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### 3.5.2.14 Scientific orientation

Scientific orientation was characterized as farmer's orientation to utilize the scientific techniques in practicing different farming systems. The variable was quantified by using the scientific orientation scale of Supe (1969), with slight modifications. The scale has eight statements in which second and last statements were negative statements and rest were positive statements. Responses were recorded on three-point continuum as strongly agree, agree and disagree. The responses for each statement were rated on three-point continuum as 2, 1 and 0, respectively for positive statements and vice-versa for negative statements.

The summation of the score obtained by a farmer for all the six statements indicates scientific orientation. The total score ranged from 0 to 16. The level of scientific orientation was categorized using the mean and standard deviation as a measure of check.

<b>Category</b>	<b>Criteria</b>
Low	< (Mean - ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

### **3.6 Procedure followed to identify the constraints and suggestions of respondents**

Constraints are operationalised as the problems faced by the farmers in growing exotic vegetables. Based on the review of literature and pre-test results, ten statements were taken and the responses were recorded on three-point continuum like ‘more severe’, ‘severe’ and ‘less severe’ and based on the severity the scores of 2, 1 and 0 were given respectively. The score for each statement was summed up and based on the score, rank was assigned and arranged in a descending order.

Suggestions are operationalised as the ideas given by the farmers to overcome the constraints in cultivating exotic vegetables. Farmers Suggestions to overcome the constraints faced in growing exotic vegetables were documented. Based on the previous pre-test and review of literature, six suggestions were taken to the farmers on four-point continuum as ‘more important’, ‘important’, ‘less important’ and ‘ignored’ and the scores were given from 3 to 0 in the decreasing order respectively. Based on the total score of each statement, the statement with highest score was given highest rank and the statement with lowest score was given least rank.

### **3.7 Instruments used for data collection**

Keeping the objectives of the study in view, a structured interview schedule was prepared with the help of experts in the field of agricultural extension and horticulture that included all the variables of the study. After the pre-test, the minor ambiguous items were re-constructed with the suggestions given by the experts and interview schedule was finalized. Data collection was done by the personal interview method with the help of the structured pre-tested interview schedule. The data collection was undertaken during the month of June 2024.

### **3.8 Statistical methods used for data analysis**

Appropriate statistical tools were used for data analysis. The data collected from the respondents were scored, analysed and tabulated using the following statistical tools and techniques.

### 3.8.1 Frequency

Frequency distribution was used to quantify the different personal, social, psychological and economic characteristics of the farmers. It was also used in the response analysis of constraints and suggestion statements.

### 3.8.2 Percentage

Percentage was used to make simple comparison of different groups where ever needed.

### 3.8.3 Mean

Mean is the sum of the observed values of a set divided by the number of observations in the set.. The calculated mean was used for grouping the respondents

Mean formula:

$$\bar{X} = (\sum X_i) / n$$

Where,

$\bar{X}$  =sample mean

$X_i$ = all of the X-values

n = number of items in sample

### 3.8.4 Standard deviation

The positive square root of the variance is called standard deviation. It explains the average amount of variation on either side of the mean.

Standard Deviation formula:

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

Where,

X = Each value

$\bar{x}$  = Sample mean

s = Sample standard deviation

n = number of values in sample

### 3.8.5 Chi- square test

It is the non-parametric test used to know the association between the dependent and independent variables.

Chi-square formula

$$\chi^2 = \sum (O_i - E_i)^2 / E_i$$

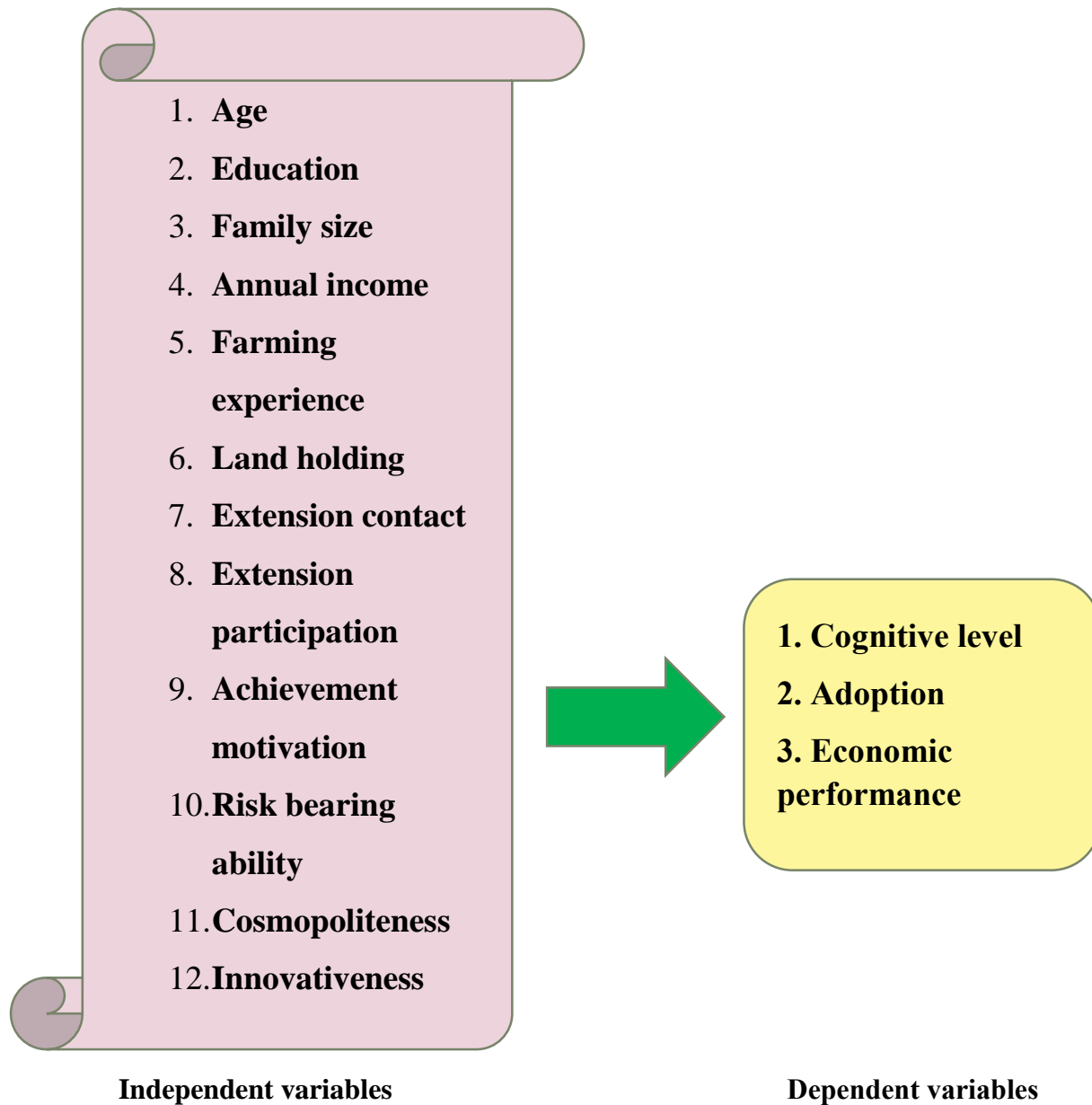
where,  $\chi^2$  = Chi-Square

$O_i$  = observed value

$E_i$  = expected value

### 3.9 Conceptual model of the study

Conceptually the variables under the study and the assumed relationship between dependent and independent variables are presented in figure 2. It is conceived that the dependent variables i.e. cognitive level, adoption and economic performance is been influenced by the independent variables like age, education, family size, annual income, farming experience, land holding, extension contact, extension participation, achievement motivation, risk bearing ability, cosmopolitaness, innovativeness, mass media participation and scientific orientation.



**Fig. 2: CONCEPTUAL FRAMEWORK OF THE STUDY**



Plate 1 Glimpses of data collection

## **RESULTS AND DISCUSSION**

## IV RESULTS AND DISCUSSION

The present research study focuses on exotic farming to study the “Cognitive level and adoption behavior of exotic vegetable growers in Bengaluru Rural District of Karnataka”. This chapter deals with the interpretation and discussion of the research findings of the study. Results are presented under the following sub-headings:

- 4.1.Cognitive level of exotic vegetable growers about scientific crop production technologies
- 4.2.Extent of adoption of scientific crop production technologies by exotic vegetable growers
- 4.3.Personal, socio-economic and psychological characteristics of exotic vegetable growers
- 4.4.Association between personal, socio-economic and psychological characteristics of exotic vegetable growers with their cognitive level
- 4.5.Association between personal, socio-economic and psychological characteristics of exotic vegetable growers with their adoption level
- 4.6.Marketing behavior of exotic vegetable growers
- 4.7.Economic performance of exotic vegetable growers
- 4.8.Constraints faced by exotic vegetable growers in adoption of scientific crop production technologies
- 4.9.Suggestions given by exotic vegetable growers to overcome the constraints in adoption of scientific crop production technologies

### **4.1 Cognitive level of exotic vegetable growers about scientific crop production technologies**

#### **4.1.1 Cognitive level of broccoli growers about scientific crop production technologies**

From Table 1 it is evident that cent percent of broccoli growers had correct cognitive level regarding type of soil and method of irrigation. The probable reasons might

be that these are the basic agronomic practices. Further, their experience in farming, contact with input dealers and government institutions might have influenced them to have correct cognitive level.

With respect to recommended pH (60.00 %) had incorrect cognitive level, which may be due to lack of understanding about specific pH requirement, lack of tools and resources to monitor soil pH issues.

Regarding type of climate nearly three-fourth (74.00 %) of the broccoli growers had correct cognitive level. This may be due to climate requirements for broccoli are well-documented and widely available through agricultural extension services and online resources. Through experience and trial/error method most growers are likely to understand about basic climate requirements needed for optimal growth and they may also have awareness that ideal climate like temperature, moisture and sun light influence on yield of the crop.

Nearly two-third (64.00 %) of the broccoli growers had incorrect cognitive level regarding nursery bed preparation. The probable reasons may be that majority of the growers were directly purchasing seedlings from nursery units. Exotic farming is still in nascent stage in India and these practices are very new to the farmers. They lack awareness regarding these practices and complexity involved in few practices results in incorrect cognitive level of the farmers.

Further, with respect to seedling rate nearly three-fifth (56.00 %) of the broccoli growers had correct cognitive level because most farmers recognize that planting seedlings too close together can result in poor head development owing to competition for resources. However, spacing the plants too far apart can result in reduced overall yields. Broccoli growers who attend extension programs like training, seminars and workshops may obtain a better grasp of seedling rates, especially if the programs are geared at increasing crop yields.

**Table 1: Cognitive level of broccoli growers about crop production technologies****(n<sub>1</sub>=50)**

Sl. No.	Practices/ Technologies	Cognitive level			
		Correct		Incorrect	
		f	%	f	%
<b>I</b>	<b>General components</b>				
a	Type of soil (sandy and silt loam soil and well-drained soil)	50	100.00	0	0.00
b	Recommended pH (5.8-7.2)	20	40.00	30	60.00
c	Type of climate (cool season crop, optimum temp 10-25°C)	37	74.00	13	26.00
d	Preparation of nursery bed (decomposed FYM or compost @4kg/m <sup>2</sup> , seed treatment with captan or thiram @2.5g/kg, Spacing 2-3cm between seeds and 8-10cm between lines. Depth 1-1.5cm, light irrigation provided)	18	36.00	32	64.00
e	Seedling rate (12000/acre)	28	56.00	22	44.00
<b>II</b>	<b>Recommended hybrid/ variety</b>				
a	Hybrid ( Lucky)	41	82.00	9	18.00
<b>III</b>	<b>Transplanting</b>				
a	Age of seedlings (30-35 days old)	33	66.00	17	34.00
<b>IV</b>	<b>Spacing (45×30cm)</b>	27	54.00	23	46.00
<b>V</b>	<b>Manures and fertilizers</b>				
a	FYM (15-20 t/ha)	22	44.00	28	56.00
b	Chemical fertilizer (N: P: K=120:80:60 kg per ha) and 10 kg boron per ha. Half dose of nitrogen and full dose phosphorous, potassium and boron at the time of transplanting and remaining nitrogen in two splits 30 and 45 days after transplanting.	26	52.00	24	48.00
<b>VI</b>	<b>Water management</b>				

a	Method of irrigation (Micro-irrigation)	50	100.00	0	0.00
b	Frequency of irrigation (2-3 days once )	29	58.00	21	42.00
<b>VII</b>	<b>Intercultural operations</b>				
a	Weed Management (20-25 days after transplanting)	35	70.00	15	30.00
<b>VIII</b>	<b>Pest and disease</b>				
1	Cut worm				
a	Picking and destruct larvae at early stages	27	54.00	23	46.00
b	Rogor @2-3 ml/lit of water	29	58.00	21	42.00
2	Leaf Webber				
a	Picking and destruction of larvae at early stages	27	54.00	23	46.00
b	Cyfluthurin@ 0.5 ml/lit)	22	44.00	28	56.00
<b>3</b>	Aphids ( Neem seed kernel extract can be sprayed at 4 %)	32	64.00	18	36.00
4	Damping off (Seed treatment with captan or thiram @ 2.5 g/kg seeds, Seedling treated with Bavistin@ 1g/lit or Dithane M 45 @ 2 g/lit of water)	29	58.00	21	42.00
<b>IX</b>	<b>Harvesting</b>				
a	Ideal stage (80-90 days after transplanting)	24	48.00	26	52.00
b	Ideal yield(150-240 q/ha)	32	64.00	18	36.00

Regarding broccoli crop hybrid selection more than four- fifth (82.00 %) of the farmers had correct cognitive level the probable reason may be due to the fact that selection of suitable hybrid is very crucial in cultivation of exotic crop from the point of yield and climate. Other reasons may be that the majority of the exotic vegetable growers had 10-20 years of farming experience and also had good contact with input dealers and horticulture department extension personnel.

Regarding, transplanting two-third (66.00 %) of the farmers had correct cognitive level. The probable reason may be that the awareness about better establishment of crop is possible by using correct age planting material in the field and by using this planting

material there may be less transplantation shock. The presence of hi-tech nurseries in the locality might have made them to have correct cognitive level.

With respect to spacing more than half of the respondents (54.00 %) had correct cognitive level. The probable reason for this could be that the farmers who attended training programmes, demonstrations and workshops organised by line departments have learnt the importance of spacing.

Nearly three-fifth (56.00 %) of the broccoli growers had incorrect cognitive level with respect to FYM application this may be due to lack of awareness about FYM and its benefits in maintaining soil health.

Regarding chemical fertilizer application 52 per cent of broccoli growers had correct cognitive level, the probable reason might be that the majority of the growers belongs to medium extension contact, extension participation and mass media exposure category. The good contact with input dealers and line department officials might have influenced them to have correct cognitive level.

Regarding water management, cent per cent of the broccoli growers had correct cognitive level on understanding of irrigation method. This might be due to the fact that the broccoli growers are progressive farmers in nature, that's why they are aware of the modern irrigation methods and its efficiency in better water management. With respect to frequency of irrigation nearly three-fifth (58.00 %) had correct cognitive level. This may be due to the fact that the broccoli crop is water sensitive, requires optimal moisture and also based on climatic condition due to which the growers might have adjusted the irrigation schedules.

With respect to weed management more than two-third (70.00 %) of the growers had correct cognitive level. Intercultural operation is most important that directly influences on quality and quantity of yield, this may be the reason for having correct cognitive level.

With respect to cut worm management, nearly three-fifth (58.00 %) of the growers had correct cognitive level on application of rogor chemical and more than half (54.00 %)

of the growers had correct cognitive level regarding picking and destruction of larvae at early stages. The probable reason for this may be that the application of chemicals will give immediate, better outcomes and destruction of larvae at early stages is cost saving technique.

In case of leaf webber management, more than half (54.00 %) of the growers had correct cognitive level regarding picking and destruction of larvae at early stages. Nearly three-fifth (56.00 %) of the growers had incorrect cognitive level on application of cyfluthurin, this may be due to lack of awareness on symptoms, severity and also on usage of chemical to control the pest.

Regarding aphid's management nearly two-third (64.00 %) had correct cognitive level. This may be due to their familiarity with aphid infestation in other crops they grow and symptoms which are easily noticeable.

In case of damping off disease nearly three-fifth (58.00 %) of the broccoli growers had correct cognitive level. It is a common disease in nursery and early stages of the crop that might have developed enough familiarity with symptoms and management of the disease among the growers.

Further, regarding harvesting more than half (52.00 %) of the growers had incorrect cognitive level with ideal stage of harvesting. This might be because of lack of awareness and less importance on this aspect in extension programmes, as these crop is new to country like India. Nearly two-third (64.00 %) of farmers had correct cognitive level regarding recommended yield, because they had good contact with extension personnel, Department of Horticulture and SAU's. Further, the yield of the crop is an important parameter that develop aspiration among farmers so that they get higher price for their produce at market.

#### **4.1.2 Overall cognitive level of broccoli growers about scientific crop production technologies**

The data in Table 2 revealed that more than one-third (36.00 %) of the broccoli growers had medium cognitive level followed by high (34.00 %) and low (30.00 %) cognitive level about scientific crop production technologies. The probable reasons might be that majority of broccoli growers belonged to medium to high cognitive level regarding

scientific production technologies as these are cash crops that are introduced recently in the country with higher market demand that fetches better price in the market compared to that of traditional crops which aroused interest among the farmers to have good cognitive level among broccoli growers in Bengaluru Rural District. The results are in line with Sai Tejashree (2022)

**Table 2: Overall cognitive level of broccoli growers about scientific crop production technologies**

(n<sub>1</sub>=50)

Cognitive level Category	Broccoli growers (n <sub>1</sub> =50)	
	f	%
Low (<10.41)	15	30.00
Medium (10.41-12.55)	18	36.00
High (>12.55)	17	34.00
Total	50	100
Mean=11.48	SD=2.13	

#### 4.1.3 Cognitive level of lettuce growers about scientific crop production technologies

It is evident from Table 3 that cent percent of lettuce growers had correct cognitive level regarding practices like type of soil and method of irrigation. This may be due to the fact that these parameters are basic and simple practices that one should know before cultivation of any exotic vegetable crop. They have gained significant knowledge regarding these basic practices by contacting input dealers and government institutions.

Nearly three-fifth (56.00 %) of the growers had incorrect cognitive level regarding recommended pH. This may be due to complexities involved in monitoring soil pH and lack of resources.

Nearly three-fourth (74.00 %) of the lettuce growers had correct cognitive level regarding suitable climate. This may be due to the fact that they might have gained

significant knowledge and understanding about suitable climate and they also know it is climate sensitive crop (temperature and humidity).

Regarding nursery bed preparation nearly three-fifth (58.00 %) of the growers had incorrect cognitive level. This may be due to the fact that the majority of the lettuce growers were depending on the nurseries for seedlings and hence they had incorrect cognitive level.

With respect to seedling or seed rate, three-fifth (60.00 %) of the lettuce growers had correct cognitive level. The probable reason may be that the proper seedling rate ensures optimal spacing, reducing competition for resources, promotes uniform growth, making crop management easier and maximizes the yield per unit area.

Regarding varieties more than four-fifth (82.00 %) of lettuce growers had correct cognitive level and the reason for this could be highly progressive nature of farmers, then participation in training programmes, workshops, and seminars arranged by extension agents, private and public agencies which helps growers to update information about the crop.

**Table 3: Cognitive level of lettuce growers about scientific crop production technologies**

(n<sub>2</sub>=50)

Sl. No	Practices/ Technologies	Cognitive level			
		Correct		Incorrect	
		f	%	f	%
<b>I</b>	<b>General component</b>				
a	Type of soil (sandy and silt loam soil and well-drained soil)	50	100.00	0	0.00
b	Recommended pH (5.7-7)	23	46.00	27	54.00
c	Type of climate (cool season crop, optimum temp 15-25°C)	37	74.00	13	26.00
d	Nursery bed 7.5m (l) ×1.2m (w) ×10cm (h) 5 nursery beds prepared for 1 ha 20kg FYM and 15:15:15 complex fertilizer added to soil seeds sown at a distance of 7.5 cm rows.	21	42.00	29	58.00
e	Seedling rate (12000/acre)	30	60.00	20	40.00
<b>II</b>	<b>Recommended varieties</b>				

a	Varieties (Leafy Type-Chinese yellow and snow bolt, Head Type-Great lake)	41	82.00	9	18.00
<b>III</b>	<b>Transplanting</b>				
a	Age of seedlings (35-40 days old)	28	56.00	22	44.00
<b>IV</b>	<b>Spacing (45×30cm)</b>	26	52.00	24	48.00
<b>V</b>	<b>Manures and fertilizers</b>				
a	FYM (25t/ha)	21	42.00	29	58.00
b	Chemical fertilizer (N: P: K=150:100:100 per ha). Half dose of nitrogen and full dose phosphorous and potassium and at the time of transplanting and remaining nitrogen need to be applied after 4 weeks of transplanting.	27	54.00	23	46.00
<b>VI</b>	<b>Water management</b>				
a	Method of irrigation (micro irrigation)	50	100.00	0	0.00
b	Frequency of irrigation(2-3 days interval )	31	62.00	19	38.00
<b>VII</b>	<b>Intercultural operations</b>				
a	Weed Management (20-25 days after transplanting)	38	76.00	12	24.00
<b>VIII</b>	<b>Pest and disease</b>				
1	Cut worm				
a	Picking and destruction of larvae at early stages	28	56.00	22	44.00
b	Rogor @2-3ml/lit of water	27	54.00	23	46.00
2	Leaf Webber				
a	Picking and destruction of larvae in early stages	28	56.00	22	44.00
b	Cyfluthurin@ 0.5ml/lit	24	48.00	26	52.00
3	Aphids (Neem seed kernel extract can be sprayed at 4 %)	31	62.00	19	38.00
4	Damping off Phosphamidon 0.5ml/lit or Dimethoate 1.7ml/lit or quinalphos 2ml/lit and 3 gm copper oxychloride or 2 gm Mancozeb in 1lit of water and spray 2-4 weeks after sowing.	26	52.00	24	48.00
5	Leaf spot 2 ml malathion in 1 lit of water sprayed	33	66.00	17	24.00
<b>IX</b>	<b>Harvesting</b>				
a	Ideal stage (45-70 days after transplanting)	23	46.00	27	54.00
b	Ideal yield (120-150 q/ha)	36	72.00	14	28.00

With respect to transplanting nearly three-fifth (56.00 %) of farmers had correct cognitive level. The probable reason may be by transplanting correct age seedlings that ensures optimal growth, better establishment of the crop in the field.

Regarding spacing, about half (52.00 %) of the growers had correct cognitive level. This may be due to training programs conducted by extension personnel on ideal spacing that has positive impact on yield and plant health. Further, they may be aware that it will reduce the incidence of pest and diseases and competition for nutrients, water and minerals.

With respect to FYM application, nearly three-fifth (58.00 %) of the lettuce growers had incorrect cognitive level. This may be due to overreliance on chemical fertilizers, lack of understanding of benefits of FYM in long term and farmers leaning on immediate results.

More than half (54.00 %) had correct cognitive level about chemical fertilizer application. This may be due to visible result, direct and immediate effect of chemical fertilizers on plant growth. Input companies often provide awareness campaigns to promote the product and these fertilizers are easily quantifiable.

In case of water management, cent per cent of the lettuce growers had correct cognitive level of understanding about micro irrigation method. This might be due to increased awareness on precision water management, reducing the wastage and ensuring optimal soil moisture level to the crop. With respect to frequency of irrigation, majority (62.00 %) of lettuce growers had correct cognitive level. It is due to fact that lettuce growers had proper awareness on precise amount of the water at right time, which will be helpful in reducing water stress and its impact on plant health.

Regarding intercultural operations, more than three-fourth (76.00 %) had correct cognitive level and the probable reason may be that the proper intercultural operation ensures soil loosening thereby helpful in better aeration, enhanced root growth and nutrient uptake. Hence, the growers had correct cognitive level.

With respect to cut worm management nearly three-fifth (56.00 %) of the lettuce growers had correct cognitive level on application of rogor chemical and more than half of the lettuce growers (54.00 %) had correct cognitive level on picking and destruction of larvae at early stages. The probable reason may be farmer's awareness about this pest

through their experience in farming and contact with extension agents as it causes major damage to the crop.

In case of leaf webber management, nearly three-fifth (56.00 %) of the lettuce growers had correct cognitive level regarding picking and destruction of larvae at early stages. This may be due to the fact that the practice is eco-friendly and economical in preventing crop damage. More than half (52.00 %) of the growers had incorrect cognitive level on application of cyfluthurin. It may be due to conflicting advice growers receive on use of chemical from various sources like peers, input dealers and agricultural extension workers that creates confusion regarding optimal application of chemical rate.

Regarding aphid's management nearly two-third (64.00 %) of lettuce growers had correct cognitive level this may be due to their familiarity with aphid infestation and symptoms that are easily noticeable.

In case of damping off disease, more than half (52.00 %) of the lettuce growers had correct cognitive level, which may be due to the fact that the growers with their farming experience may have learnt about the disease and its management from the past occurrence of damping off and through participation in various extension programmes on the management of damping off.

Regarding leaf spot disease, two-third (66.00 %) of the lettuce growers had correct cognitive level. The reason for this may be the lettuce grower's awareness on impact of leaf spot disease which will reduce the quality of lettuce and directly effect on its economic value.

Further, regarding harvesting majority (54.00 %) of the growers had incorrect cognitive level with ideal stage of harvesting as growers prioritize market demand instead of ideal harvesting stage. The ideal stage of identification of crop stage is difficult as it does not exhibit any major visual changes. With respect to yield, majority (72.00 %) of the growers had correct cognitive level. It may be due to good contact with extension agents and input agencies.

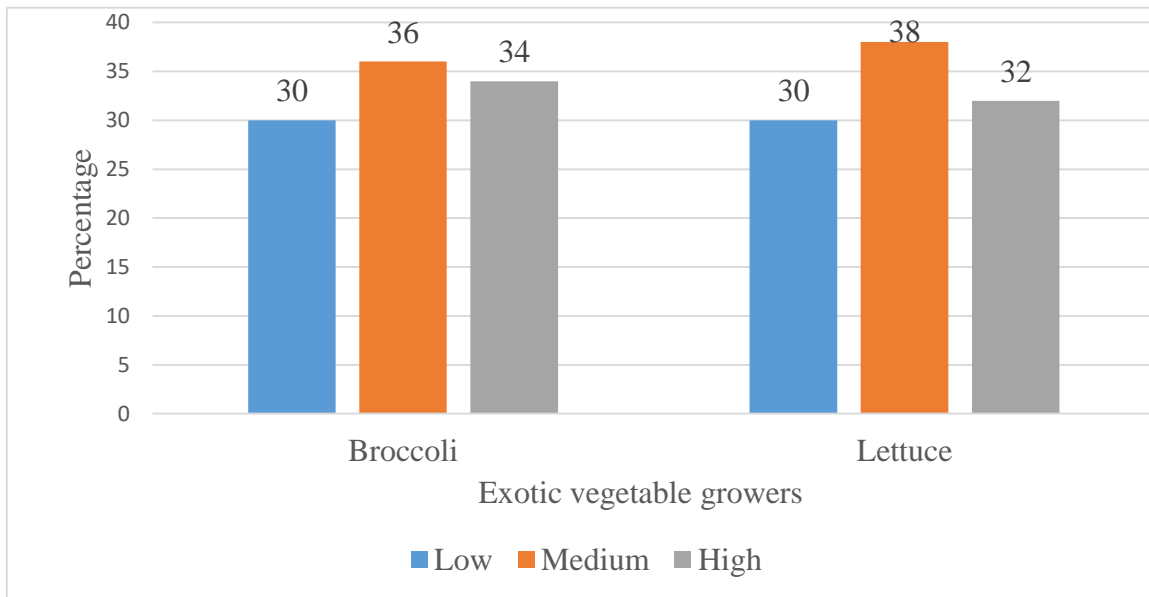
#### 4.1.4 Overall cognitive level of lettuce growers about scientific crop production technologies

Table 4 and Fig 3 indicates that nearly two-fifth (38.00 %) of the lettuce growers belonged to medium cognitive level of understanding, followed by high (32.00 %) and low (30.00 %) cognitive level of understanding. Majority of lettuce growers had medium to high cognitive level about scientific crop production technologies because of the potential of these crops to get higher returns to growers with premium price in market compared to traditional crops, increasing demand for exotic based diets, influence of western food culture and awareness about nutritious and health benefits about these crops. The results are in line with Sai Tejashree (2022).

**Table 4: Overall cognitive level of lettuce growers about scientific production technologies**

**n<sub>2</sub>=50**

Cognitive level Category	Lettuce growers (n <sub>2</sub> =50)	
	No.	%
Low (<10.17)	15	30.00
Medium (10.17-12.27)	19	38.00
High (>12.27)	16	32.00
Total	50	100
Mean= 11.22	SD=2.10	



**Fig 3: Overall cognitive level of broccoli and lettuce growers about crop production technologies**

#### **4.2 Extent of adoption of scientific crop production technologies by exotic vegetable growers**

##### **4.2.1 Extent of adoption of crop production technologies by broccoli growers**

It is evident from Table 5 that cent per cent of the broccoli growers had cultivated in recommended type of soil. The probable reason might be that the availability of particular type of soil that are optimal for broccoli growth in the study area. Majority (56.00 %) of the broccoli growers are not practising any scientific technologies to maintain recommended pH as they don't have knowledge on these aspects and limited resources to monitor and manage soil pH. About 42.00 per cent of broccoli growers did not adopt nursery bed preparation. This might be due to limited access to quality seeds, high cost involved in nursery preparation and lack of time among farmers to look after various operations in nursery bed preparation. Further, availability of quality seedling from nurseries at reasonable price may forced the farmers to go for transplanting instead of nursery bed preparation.

More than half (52.00 %) of the respondents are fully practicing the required seed rate per acre of land, followed by partial adoption (48.00 %). The probable reasons for this might be the farmer's awareness on optimal plant density in the field, and also on following proper seedling rate that will help in reducing competition for nutrients, water, fertilizers which results in enhanced yield and quality of produce. Majority (64.00 %) of the growers had fully adopted recommended broccoli hybrids, followed by partial adoption (36.00 %). The probable reasons for this might be awareness about superior yield performance hybrids and also timely availability of hybrids in the locality.

Nearly half of the broccoli growers i.e., 48.00 per cent of the growers had transplanted the seedlings, followed by partial adoption (44.00 %) and no adoption (8.00 %). This might be due to good contact with nursery owner, less distance to nursery from their locality and timely availability of proper age seedling at nursery. Further, transplanting of seedlings at right time will ensure better establishment in the field and this will also reduce stress due to transplantation.

An examination of Table 5 shows that more than half of the broccoli growers (58.00 %) had partially adopted recommended spacing, followed by full adoption (42.00 %). The probable reason might be that small scale farmers who possess less land will try to adjust more plants per unit area which leads to partial adoption of recommended spacing.

With respect to application of manures and fertilizers, more than half (54.00 %) of the broccoli growers had partial adoption, followed by full adoption (36.00 %), and no adoption (10.00 %). The probable reasons for this might be that farmers expect immediate results in plant growth and yield, but manures take time for their decomposition, and it shows a slower effect on plants. Further, chemical fertilizers are more easily and readily available to the farmers compared to FYM.

In case of chemical fertilizers, more than two-third (70.00 %) of broccoli growers had partial adoption, followed by full adoption (30.00 %). The probable reason might be that farmers apply chemical fertilizers based on their knowledge or by taking advice from input dealers rather than the scientific recommendations. Further, farmers often use a

combination of organic and chemical fertilizers in order to balance the cost, which might be another reason for this kind of result.

**Table 5: Extent of adoption of scientific crop production technologies by broccoli growers. (n<sub>1</sub>=50)**

Sl. No	Practices/ Technologies	Extent of adoption					
		Full adoption		Partial adoption		No adoption	
		f	%	f	%	f	%
<b>I</b>	<b>General components</b>						
a	Type of soil (sandy and silt loam soil and well-drained soil)	50	100.00	0	0.00	0	0.00
b	Recommended pH (5.8-7.2)	22	44.00	0	0.00	28	56.00
c	Type of climate (cool season crop, optimum temp 10-25°C)	26	52.00	24	48.00	0	0.00
d	Preparation of nursery bed (decomposed FYM or compost @4kg/m <sup>2</sup> , seed treatment with captan or thiram @2.5g/kg, Spacing 2-3 cm between seeds and 8-10 cm between lines. Depth 1-1.5cm, light irrigation provided)	11	22.00	18	36.00	21	42.00
e	Seedling rate (12000/acre)	26	52.00	24	48.00	0	0.00
<b>II</b>	<b>Recommended varieties</b>						
a	Hybrid (Lucky)	32	64.00	14	28.00	4	8.00
<b>III</b>	<b>Transplanting</b>						
a	Age of seedlings (30-35 days old)	24	48.00	22	44.00	4	8.00
<b>IV</b>	<b>Spacing (45×30cm)</b>	21	42.00	29	58.00	0	0.00
<b>V</b>	<b>Manures and fertilizers</b>						
a	FYM (15-20 t/ha)	18	36.00	27	54.00	5	10.00
b	Chemical fertilizer (N: P: K=120:80:60) per ha and 10 kg boron per ha. Half dose of nitrogen and full dose phosphorous, potassium and boron at the time of transplanting and remaining nitrogen in	15	30.00	35	70.00	0	0.00

	two splits 30 and 45 days after transplanting.						
<b>VI</b>	<b>Water management</b>						
a	Method of irrigation (Micro irrigation)	46	92.00	0	0.00	4	8.00
b	Frequency of irrigation (2-3 days interval)	21	42.00	29	58.00	0	0.00
<b>VII</b>	<b>Intercultural operations</b>						
a	Weed Management (20-25 days after transplanting)	27	54.00	18	36.00	5	10.00
<b>VIII</b>	<b>Pest and disease</b>						
1	Cut worm						
a	Picking and destruction of larvae in early stage	19	38.00	0	0.00	31	62.00
b	Rogor @2-3 ml/lit of water	27	54.00	22	44.00	1	2.00
2	Leaf Webber						
a	Picking and destruction of larvae in early stage	19	38.00	0	0.00	31	62.00
b	cyfluthurin@ 0.5 ml/lit	16	32.00	31	62.00	3	6.00
3	Aphids (Neem seed kernel extract can be sprayed at 4 %)	22	44.00	24	48.00	4	8.00
4	Damping off (Seed treatment with captan or thiram @ 2.5g/kg seeds, Seedling treated with Bavistin@ 1g/l or Dithane M 45 @ 2g/lit of water)	21	42.00	28	56.00	1	2.00
<b>IX</b>	<b>Harvesting</b>						
a	Ideal stage (70-90 days after transplanting)	15	30.00	35	70.00	0	0.00
b	Ideal yield (150-240 q/ha)	23	46.00	27	54.00	0	0.00

f- frequency %- percentage

Majority (92.00 %) of broccoli growers fully adopted micro irrigation, as growers often experience the water scarcity due to the depletion in the groundwater levels; and growers are aware of the fact that by using micro-irrigation, water can be utilized effectively, and uniform water distribution ensures higher yield and good quality produce.

Further, the growers are aware and have availed the government subsidies for micro-irrigation and national schemes like Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) that might have influenced them to adopt different irrigation methods.

Regarding frequency of irrigation, majority *i.e.*, 58.00 per cent of broccoli growers had partially adopted recommended intervals of days for irrigation and 42.00 per cent of them fully adopted. The probable reasons for this might be that the climate and rainfall influence the irrigation schedule of the crop based on which farmers adjust their irrigation schedules.

With respect to weed management, more than half (54.00 %) of the respondents had fully adopted weed management practices, followed by partially adoption (36.00 %) and no adoption (10.00 %). The probable reason may be that farmers are well-versed with the effects of the weeds on crops, thus they are very cautious in controlling weeds by adopting the weed management practices. Further, even at the higher prices of weedicides they purchase and use it, as it reduces the dependency on labours for weeding and crop competition with the weeds for nutrients.

It is evident from the Table 5 that chemical and larval destruction by picking is practiced by broccoli growers to manage the cut worms. More than half of the (54.00 %) broccoli growers had fully adopted the recommended chemical and its dosage. Further, 44.00 per cent of the grower's partially adopted the chemical management dosage. While only, 2.00 per cent of the growers did not adopt it. Whereas, majority *i.e.*, 62.00 per cent of the growers had not adopted the cultural method *i.e.*, cut worm larval destruction by picking. This might be due to the fact that manual picking and destruction of larvae is labour, time and cost intensive process. Further, cut worms are difficult to identify as they hide in soil and farmers often prefer chemical method to control. Thus, farmers have adopted recommended chemical with the trade name rogor, which is very effective against larvae and worms and it ensures the significant reduction in the incidence and ensures crop productivity. Further, availability of chemicals in the agrochemical shop and their ease of application with the help of basic equipment might have resulted in full adoption.

With respect to leaf webber, 62.00 per cent of the broccoli growers had partially adopted recommended chemical, followed by full adoption (32.00 %) and only 6.00 per cent of the growers had not adopted the use of chemical. The probable reason for this might be the lack of understanding about proper dosage of chemical and growers are aware of the fact that overuse of chemical may lead to pesticide resistance in target pests.

Majority of (62.00 %) the growers had not adopted picking and destruction of leaf webber larvae at early stages, followed by full adoption (38.00 %). This might be due to the fact that leaf webber often hide in their webs making it difficult for farmers to identify them. Further, manual picking and destruction is laborious, time consuming and cost intensive process.

Among the broccoli growers nearly half of the respondents i.e., 48.00 per cent had partially adopted the aphid management. Whereas, 44.00 and 8.00 per cent of the broccoli growers had fully adopted and not adopted the aphid management practices, respectively. This may be due to the fact that the farmers have adopted Neem Seed Kernel Extract (NSKE) application, which works gradually and hinders the aphid growth and reproduction rather than killing the pest instantly. Thus, the mixed opinion has arrived.

Regarding the management of damping off disease, more than half of the growers (56.00 %) had partially adopted disease management practices, followed by fully adopted (42.00 %) and not adopted (2.00 %). The probable reason for this might be that farmers procure the seedlings from the renowned nurseries which produces the disease-free seedlings. Thus, most of the farmers have partially adopted the disease management practices to avoid the damping off disease in the field condition by treating the seedlings with bavistin solution

With respect to the adoption of ideal harvesting stage, majority (70.00 %) of the growers had partially adopted ideal stage of harvesting, followed by full adopted (30.00 %). The probable reasons for this could be that lack of complete understanding or awareness on exact stage of harvesting. Further, market demands might have encouraged the farmers to harvest the crop earlier than the ideal stage to fetch good prices for their produce.

More than half (54.00 %) of the broccoli growers were partially getting the recommended yield, followed by 46.00 per cent of them getting full yield. The probable reason may be that majority of the growers getting partial yield because of change in weather condition, irregular rainfall pattern, variation in temperature and soil quality. Further, lack of knowledge on important practices influences yield viz., pest and diseases management and spacing which resulting in partial adoption.

**Table 6: Overall extent of adoption of recommended scientific technologies by broccoli growers**

**n<sub>1</sub>=50**

Adoption Category	Broccoli growers (n <sub>1</sub> =50)	
	f	%
Low (<44.33)	14	28.00
Medium (44.33 - 46.79)	19	38.00
High (>46.79)	17	34.00
<b>Total</b>	50	100.00
<b>Mean=45.56</b>	<b>SD=2.46</b>	

#### **4.2.2 Overall adoption of broccoli growers about scientific crop production technologies.**

From Table 6 indicates that about, 38.00 per cent of broccoli growers had medium adoption followed by high adoption (34.00 %) and low adoption (28.00 %). The probable reasons for the above findings might be growers had adopted important technologies or practices such as method of irrigation (micro-irrigation), recommended hybrid, weed management and optimum seedling rate that are easy, simple and relatively advantageous in terms of yield and economic importance. Nevertheless, majority of them partially adopted some of the scientific crop production technologies like application of manures and fertilizers, ideal spacing, pest and disease management, ideal stage of harvesting and

yield. Further, majority of them not adopted few technologies like cultural method of pest control, nursery bed preparation and scientific technologies to maintain soil pH because of the complexities involved in adoption of these practices and availability of other alternatives might resulted in medium to high adoption rates.

#### **4.2.3 Extent of adoption of scientific crop production technologies by lettuce growers**

From Table 7, it is clear that cent percent of lettuce growers had cultivated in recommended type of soil, because of the availability of suitable soil in this region. Further, sandy loamy soils provide ideal growth conditions for lettuce as these soils provide optimal drainage, water retention, and root aeration for lettuce plants. About 56.00 per cent of the lettuce growers had not adopted scientific technologies to maintain soil pH followed by full adoption (44.00 %). This might be due to lack of awareness about soil pH and its effect on the crop growth and yield parameters.

The data displayed in table 7 indicates that more than two-fifth (44.00 %) of the lettuce growers had partially adopted nursery bed preparation, followed by no adoption (36.00 %) and full adoption (20.00 %). The probable reason might be that preparing nursery bed involves various steps from preparation of land by adding organic matter, maintaining proper drainage and irrigation involves cost, labour and effort. Farmers often with limited resources feel burden to adopt and hence purchase seedling directly from nursery resulting in more partial adoption.

Majority (58.00 %) of the lettuce growers had partially adopted recommended seedling rate followed by full adoption (42.00 %). Lack of awareness among growers about the optimal plant density that influence on yield and quality of the produce, might be the reason for above results.

Most of the lettuce growers had full adopted recommended varieties (58.00 %) followed by partial adoption (42.00 %). The probable reasons for this was due to gained confidence on the recommended varieties by attending various training programmes and demonstration about the varieties timely availability of the varieties.

With respect to transplanting, more than two-fifth (46.00 %) of the lettuce growers had full adoption, followed by partial adoption (44.00 %) and no adoption (12.00 %). This may be due to the fact that transplanting the seedlings at the appropriate age avoids transplant shock and helps in proper establishment of the crop by maintaining optimum crop growth. Further, transplanting at the right stage will be helpful to reduced crop failure and to escape from the seasonal pest and diseases. Two-third (66.00%) of the lettuce growers had partially adopted the recommended spacing, followed by full adoption (34.00%). This is due to the fact that growers are aware about good yields that are ensured by the recommended spacing. Further, the quantum of air and sunlight through the plants restricts the incidence of pest and diseases, which in turn reduces the cost of production and gives good returns by increased yield.

In case of manures, more than two-third (68.00 %) had partially adopted followed by full adoption (28.00 %), and no adoption (28.00 %). The probable reason for this might be that the availability, preparation, transportation of manures are time and labour intensive and farmers often seek quick results and the benefits from FYM are not immediate in terms of crop growth and yield. Thus, this might have led to the partial adoption.

Majority (82.00 %) of the lettuce growers had partially adopted the recommended dose of the chemical fertilizers, followed by full adoption (18.00 %). The probable reason for this might be application of chemical fertilizers without soil test-based recommendations and growers often follow mixed approach of using both organic and chemical fertilizers and hence partial adoption is seen predominantly.

Majority (96.00 %) of the growers have fully adopted the micro-irrigation systems and only 4.00 per cent of the growers have not adopted. This might be due to the fact that the lettuce growers are aware of the benefits of using micro irrigation systems as it directly supplies water to the root zone by reducing evaporation and runoff. Further, financial support from government through various subsidy schemes might have influenced the growers.

Regarding frequency of irrigation, more than three-fourth (76.00 %) of the respondents partially adopted followed by full adoption (24.00 %). The reasons might be

that growers in Bengaluru region rely on borewells for irrigation, based on different season and climate the rainfall pattern varies, result in change in water level which influenced the growers to follow the irrigation schedules based on crop requirement.

**Table 7: Extent of adoption of scientific crop production technologies by lettuce growers**

(n<sub>2</sub>=50)

Sl. No.	Practices/ Technologies	Extent of adoption					
		Full adoption		Partial adoption		No adoption	
		f	%	f	%	f	%
<b>I</b>	<b>General components</b>						
a	Type of soil (sandy and silt loam soil and well-drained soil)	50	100.00	0	0.00	0	0.00
b	Recommended pH (5.7-7)	23	46.00	0	0.00	27	54.00
c	Type of climate (cool season crop, optimum temp 15-25°C)	29	58.00	21	42.00	0	0.00
d	Nursery bed 7.5m(l)×1.2m(w)×10cm(h), 5 nursery beds prepared for 1 ha 20kg FYM & 15:15:15 complex fertilizer added to soil seeds sown at a distance of 7.5 cm rows	10	20.00	22	44.00	18	36.00
e	Seedling rate (12000/acre)	21	42.00	29	58.00	0	0.00
<b>II</b>	<b>Recommended varieties</b>						
a	Varieties (Leafy Type-Chinese yellow and snow bolt, Head Type-Great lake)	29	58.00	18	36.00	3	6.00
<b>III</b>	<b>Transplanting</b>						
a	Age of seedlings (35-40 days old)	23	46.00	21	42.00	6	12.00
<b>IV</b>	<b>Spacing (45×30cm)</b>	17	34.00	33	66.00	0	0.00
<b>V</b>	<b>Manures and fertilizers</b>						
a	FYM (25t/ha)	14	28.00	34	68.00	2	4.00
b	Chemical fertilizer (N: P: K=150:100:100 per Ha). Half dose of nitrogen and full dose phosphorous and potassium and at the time of	9	18.00	41	82.00	0	0.00

	transplanting and remaining nitrogen need to be applied after 4 weeks of transplanting.						
<b>VI</b>	<b>Water management</b>						
a	Method of irrigation (micro irrigation)	48	96.00	2	4.00	0	0.00
b	Frequency of irrigation (2-3 days interval)	12	24.00	38	76.00	0	0.00
<b>VII</b>	<b>Intercultural operations</b>						
a	Weed Management (20-25 days after transplanting)	34	68.00	14	28.00	2	4.00
<b>VIII</b>	<b>Pest and disease</b>						
1	Cut worm						
a	picking and destruction of larvae at early stages	18	36.00	0	0.00	32	64.00
b	Rogor @2-3ml/lit of water)	21	42.00	27	54.00	2	4.00
2	Leaf Webber						
a	picking and destruction of larvae at early stage	18	36.00	0	0.00	32	64.00
b	Cyfluthurin@ 0.5ml/lit	21	42.00	26	52.00	3	6.00
3	Aphids (Neem seed kernel extract can be sprayed at 4 %)	24	48.00	23	46.00	3	6.00
4	Damping off Phosphamidon 0.5ml/lit or Dimethoate 1.7ml/lit or quinalphos 2ml/lit and 3 gm copper oxychloride or 2 gm Mancozeb in 1 lit of water and spray 2-4 weeks after sowing.	12	24.00	35	70.00	3	6.00
5	Leaf spot 2ml malathion in 1 lit of water sprayed	27	54.00	23	46.00	0	0.00
<b>IX</b>	<b>Harvesting</b>						
a	Ideal stage (45-70 days after transplanting)	18	36.00	32	64.00	0	0.00
b	Ideal yield(120-150 q/ha)	17	34.00	33	66.00	0	0.00

f- frequency %- percentage

With respect to weed management more than two-third (68.00 %) of the lettuce growers have fully adopted, followed by partial adoption (28.00 %) and not adopted (4.00

%). The probable reason might be that growers are well aware and have experienced the adverse effects of not following weed management practices on crop growth and yield. Further, they are aware that weed increases the competition for resources like water, fertilizers, nutrients and hence have controlled weeds for better output.

It is noticed that chemical method and cultural methods are followed by lettuce growers for cut worm management. Fifty-four per cent of the lettuce growers had partial adoption of recommended chemical to manage cutworms followed by full adoption (42.00 %) and not adopted (4.00 %). The probable reason for this might be that lettuce growers apply chemical only when it is absolutely needed and they use different chemicals to avoid pest and they are aware of the fact that by overuse of chemical it develops resistance in pest. In case of larvae picking and destruction at early stage more than three-fifth (62.00 %) of the growers had not adopted, followed by full adoption (38.00 %). This might be due to fact that manually picking and destruction of larvae is time, labour intensive process and farmers are often busy with their daily chores. Therefore, farmers often prefer chemical method of control. Further, cut worms are difficult to identify as they hide in soil.

With respect to leaf webber fifty-two per cent of the lettuce growers had partially adopted recommended chemical, followed by full adoption (42.00 %) and no adoption (6.00 %). The probable reason for this might be most of the lettuce growers are having medium experience in farming and they know that by using same chemical it reduces the chemical effectiveness.

Nearly two-third (64.00 %) of the growers had not adopted picking and destruction of larvae at early stages, followed by full adoption (36.00 %). This might be due to the fact that leaf webber often hide in their webs making it difficult for farmers to identify them and they also face issues with labour availability so they often use chemicals to treat leaf webber larvae.

In case of aphid management 48.00 per cent of the lettuce growers had full adoption followed by (44.00 %) partial adoption and (8.00 %) not adopted. This may be due to that the fact that lettuce growers are progressive farmers they are aware of the fact that the application of Neem Seed Kernel Extract (NSKE) works slowly, eco-friendly in nature and

affects aphid growth and reproduction. Further they are aware of its long term benefits on soil health which may result in full adoption.

Regarding damping off disease management about 70.00 per cent had partially adopted seedling/seed treatment with chemicals followed by full adoption (24.00 %) and no adoption (6.00 %). The probable reason for this might be that lettuce is new crop among the growers, therefore lack of understanding on the diseases and the early symptoms might confuse with the issues like nutrient deficiency. Thus majority have adopted partially.

More than half (54.00 %) of the lettuce growers fully practicing leaf spot disease management followed by partial adoption (46.00 %). The probable reasons for this might be that as leaf spot disease has visual distinct spot on leaves which makes the farmers to identify easily and they know its effect on crop. Hence, they have adopted technologies for better management of disease.

The finding from Table 7 on ideal stage of harvesting indicates that, nearly two-third (64.00 %) of the lettuce growers partially adopted ideal stage of harvesting followed by full adoption (36.00 %). The probable reason may be that lack of awareness on characteristics of ideal harvesting stage like leaf colour, texture and labour also influence the time of harvesting. Further to meet market demand they may harvest either early or late *i.e.*, if demand is more they harvest earlier than ideal stage and vice versa.

About 66.00 per cent of the lettuce growers getting partial yield than the recommended and 34.00 per cent of them are getting ideal yield. The probable reason may be that lettuce is highly susceptible to various pests and diseases like (pin worms, cutworms and aphids), early harvest may not fetch more price for the produce and delayed harvest may affect quality and quantity of produce. Hence, they are getting partial yield.

#### **4.2.4 Overall adoption of lettuce growers about scientific crop production technologies.**

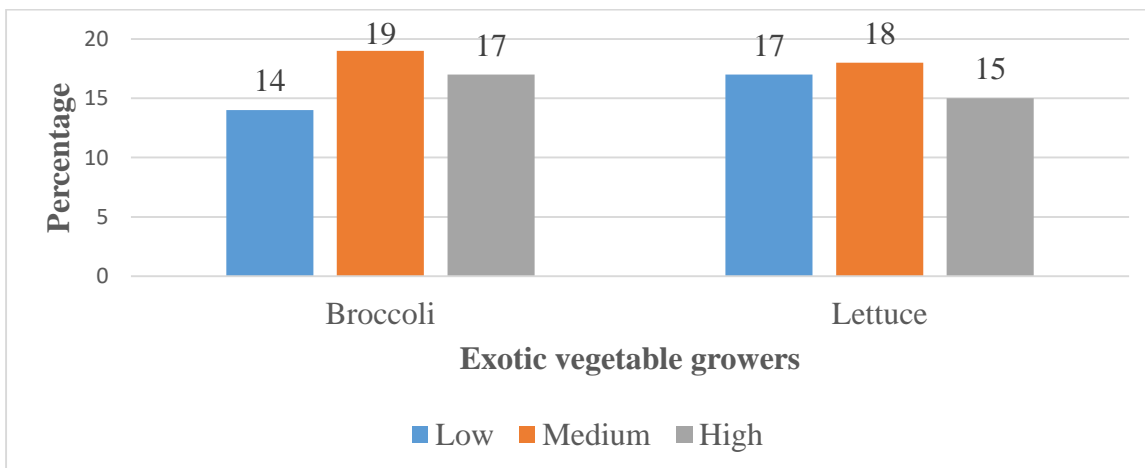
In case of lettuce growers, more than one-third (36.00 %) had medium adoption followed by low (34.00 %) adoption and high (30.00 %) adoption as noticed in Table 8 and Fig 5. The probable reason may be the growers have adopted most of the simple practices like varieties, method of irrigation, weed management etc., that influence on their yield and

economic status. Further, they had partial adoption on various practices like pest and disease management, ideal stage of harvesting, manures and fertilizer application and seedling rate. On the other hand, majority not adopted cultural method of cut worm and leaf webber management, nursery bed preparation and scientific technologies to maintain soil pH, as it involves complexity there is need for formal and informal sources of education, training and support on these aspects.

**Table 8: Overall extent of adoption of recommended scientific technologies by lettuce growers**

**n<sub>2</sub>=50**

Adoption Category	Broccoli growers (n <sub>1</sub> =50)	
	f	%
Low (<44.23)	17	34.00
Medium (44.23 - 46.57)	18	36.00
High (>46.57)	15	30.00
<b>Total</b>	<b>50</b>	<b>100.00</b>
<b>Mean=45.4</b>	<b>SD=2.35</b>	



**Fig 5: Overall adoption level of broccoli and lettuce growers about scientific crop production technologies**

### **4.3 Personal, socio-economic and psychological characteristics of broccoli growers.**

It is essential to analyse the characteristics of exotic vegetable growers to understand the clear picture about their personal, socio-economic and psychological background. Relevant information on the profile characteristics was collected, analysed and discussed in Table 9.

#### **4.3.1 Age**

It is evident from Table 9 that, more than two-fifth (42.00 %) of broccoli growers belonged to young followed by middle (36.00 %) and old (22.00 %) age groups. In case of lettuce growers two-fifth (40.00 %) belonged to middle aged group followed by young (32.00 %) and old (28.00 %) aged groups. A critical observation of the above findings indicates that significant per cent of the growers are of middle age. The probable reason might be that broccoli and lettuce exotic vegetable crops are short duration and profitable crops which creates interest among the middle and young aged farmers to cultivate the crops and earn more money in short time. Another reason could be because middle and young growers are well-versed in the use of mass media platforms, where they are exposed to numerous new technologies and are willing to take risks and commercialize their farm for profit. The results are in line with Harisha (2017).

#### **4.3.2 Education**

It can be observed from Table 9 that, among broccoli growers nearly one-third (32.00 %) belonged to high school followed by PUC (22.00 %), middle school (18.00 %), primary school (16.00 %), graduate (6.00 %) and illiterate (6.00 %). In case of lettuce growers about nearly one-third (30.00 %) belonged to high school followed by middle school (22.00 %), primary (20.00 %), PUC (16.00 %), illiterate (8.00 %) and graduate (4.00 %) category. It is clear from the above results that most of the exotic vegetable growers were educated up to high school this might be because that in survey area the schools present were up to 10<sup>th</sup> and for higher education they have to move to the taluk or districts and hence they discontinued their education and involved in agriculture and allied activities. Another possible explanation is that the pattern is driven by a preference for

rapid revenue versus long-term educational investments. The results are in conformity with Kudari (2014).

#### **4.3.3 Farming experience**

The glance from Table 9 depicts that, more than two-fifth (44.00 %) of the broccoli growers had medium farming experience followed by high (30.00 %) and low (26.00 %). With respect to lettuce growers 40.00 per cent had medium farming experience followed by low (38.00 %) and high (22.00 %). It is evident from above data that majority of exotic vegetable growers belonged to medium farming experience, this may be due to the fact that the majority of the growers belongs to young and middle aged group and possess high school education. farmers in rural areas have been actively engaged in a variety of commercial farming operations. It suggests that highly experienced individuals have received additional knowledge through their experiences. Farmers with more farming expertise can perceive things more easily and effectively. The results are in line with Padma (2013).

#### **4.3.4 Family size**

From Table 9 it is clear that, nearly three-fifth (58.00 %) of the broccoli growers belonged to medium family size followed by large (28.00 %) and small (14.00 %) family size. In case of lettuce growers' half (50.00 %) of the growers belonged to medium family size followed by large (34.00 %) and small (16.00 %) family size. Due to modernisation the families at village level are splitting up and becoming nuclear families with small and medium sized family members. With more members find it harder to invest, and those with fewer members may not have enough money. So a medium family size is optimal for growth. The findings of the present study are in conformity with the findings of Patil (2014).

#### **4.3.5 Annual income**

It is evident from Table 9 that, two-fifth (40.00 %) of the broccoli growers belonged to medium level followed by low (32.00 %) and high (28.00 %) level of annual income. With respect to lettuce growers more than one-third (36.00 %) belonged to medium and an

equal percent of the growers belongs to low and high i.e. (32.00 %) category. The probable reasons may be that exotic crop is one of the important horticultural crop, had more potential for market demand and export but factors like size of land holding, limited access to advanced technology and stable profit may result in most of the growers to fall under medium annual income category. The present study results are in line with the findings of Shrikrishana (2015).

#### **4.3.6 Land holding**

It can be inferred from Table 9 that, 38.00 per cent of the broccoli growers had small holdings followed by big (34.00 %) and marginal (28.00 %) land holdings respectively. With respect to lettuce growers about majority (40.00 %) of them had small holdings followed by big (36.00 %) and marginal (24.00 %) land holding.

The probable reasons might be that the fragmentation of ancestral property among the family members and the increased urbanization around the Bangalore has made the farmers to quit the farming and to take up commercial activities by involving in the real estate. Thus the farmers holding the lands are cultivating high value crops, Whereas, small and marginal land holders growing remunerative and short duration crops like broccoli and lettuce. The findings are in accordance with the study reported by Mamathalakshmi (2010) and Yashaswini (2013).

#### **4.3.7 Extension contact**

It is observed from Table 9 that, exactly half (50.00%) of broccoli growers had medium level of extension contact followed by high (32.00%) and low (18.00%) levels of extension contact. With respect to lettuce growers nearly half (48.00%) of the respondents had medium level of extension contact followed by low (28.00%) and high (24.00%). The probable reason may be that majority of the exotic vegetable crop growers were middle aged and had medium to high cosmopolitan nature. These characteristics might have influenced them to possess good contact with kvk scientists, agricultural department officers and input dealers. This result is in line with the results of Hanchinal (1999).

#### **4.3.8 Extension participation**

It can be clearly noted from Table 9 that, with regard broccoli growers nearly two-fifth (38.00 %) belonged to medium followed by high (32.00 %) and low (30.00 %). Among the lettuce growers more than two-fifth (42.00 %) belonged to medium followed by high (30.00 %) and low (28.00 %) level of extension participation. The probable reasons might be because of active participation in various extension activities may help them to gain scientific cultivation practices information. The findings are in line with Mahatab (2010).

#### **4.3.9 Mass media exposure**

A bird eye view of Table 9 depicts that, nearly half (46.00 %) of broccoli growers belonged to medium followed by high (34.00 %) and low (20.00 %) level of mass media exposure. With regards to lettuce grower's two-fifth (40.00 %) belonged to medium followed by high (34.00 %) and low (26.00 %) level of mass media exposure. The probable reasons for that might be farmers now a days are more accessible to mass media to get the information easily. They use the mass media to get useful information as well as for entertainment purpose. The results are in conformity with the findings of the study conducted by Vedamurthy (2002) and Mahatab (2010).

#### **4.3.10 Risk orientation**

A glimpse of Table 9 shows that, among broccoli growers more than two-fifth (42.00 %) had medium followed by high (34.00 %) and low (24.00 %) levels of risk orientation. In case of lettuce growers nearly half (46.00 %) of the respondents had medium followed by high (32.00 %) and low (22.00 %) levels of risk orientation. The probable reasons for this could be that the exotic vegetable growers were innovative and ready to practice new technologies to get good income and profit. Farmers' personal, psychological, social, and economic circumstances influence their risk orientation, which explains why some people have medium to high levels of risk orientation. The results are in conformity with the findings of with Harisha (2017).

#### **4.3.11 Achievement motivation**

It is evident from Table 9 that, half of the broccoli grower's had medium achievement motivation (50.00 %) followed by high (32.00 %) and low (18.00 %) level of achievement motivation. With respect to lettuce growers nearly half (48.00 %) belonged to medium followed by low (32.00 %) and high (20.00 %) level of achievement motivation. The probable reason for this could be achievement motivation is the fundamental quality that drives and supports a person to do anything. In order to achieve the desired results, achievement motivation aids a person in making decisions and carrying out tasks in certain ways. It helps an individual in accomplishment of desired results. This is helpful in achieving desired profit and yield. The findings are in accordance with the studies conducted by Veena (2017).

#### **4.3.12 Innovative proneness**

A glimpse from Table 9 shows that, nearly half (46.00 %) of the broccoli growers belonged to medium innovative proneness followed by high (30.00 %) and low (24.00 %). With regard to lettuce growers more than two-fifth (42.00 %) belongs to medium followed by high (30.00 %) and low (28.00 %) level of innovative proneness. The probable reason for this might be that they have positive attitude towards adoption of any new practices and programmes. The exotic vegetable crop growers were regularly taking part in training programs organised by IIHR, interacting with KVK scientists and line department extension personnel for getting information on scientific cultivation practices. As a result, their level of expertise and understanding has grown, and they may now be connected to or associated with scientific practice. Similar findings were reported by Lavanya (2010) and Raksha (2012).

#### **4.3.13 Cosmopolitaness**

It is evident from Table 9 that, thirty-eight per cent of broccoli growers had medium followed by high (36.00 %) and low (26.00 %) level of cosmopolitaness. With regard to lettuce growers nearly one-third (36.00 %) belonged to medium cosmopolitaness followed by high (34.00 %) and low (30.00 %) level of cosmopolitaness. The probable reason for this may be that the growers were actively involved in various farming operations and are

having good farming experience because of this they are having frequent contact with the input dealers and department officials to get updated information on farming. The results of the study are in conformity with that of Naveen (2016).

**Table 9: Personal, socio-economic and psychological characteristics of farmers practicing exotic vegetables**

Sl. No.	Characteristic	Criteria	Broccoli growers n <sub>1</sub> =50		Lettuce growers n <sub>2</sub> =50	
			f	%	f	%
1	Age	Young (<35years)	21	42.00	16	32.00
		Middle (35-50 years)	18	36.00	20	40.00
		Old age (>50 years)	11	22.00	14	28.00
2	Education	Illiterate	3	6.00	4	8.00
		Primary school	8	16.00	10	20.00
		Middle school	9	18.00	11	22.00
		High school	16	32.00	15	30.00
		Pre-university	11	22.00	8	16.00
		Graduate	3	6.00	2	4.00
3	Farming experience	Low (<10 years)	13	26.00	19	38.00
		Medium (10-20 years)	22	44.00	20	40.00
		High (>20 years)	15	30.00	11	22.00
4	Family size	Small (1-3 members)	7	14.00	8	16.00
		Medium (4-6 members)	29	58.00	25	50.00
		Large (>6 members)	14	28.00	17	34.00
5	Annual income  Mean=356150 S.D.=184201.6	Low (< 264049.2)	16	32.00	16	32.00
		Medium (264049.2- 448250.8)	20	40.00	18	36.00
		High >(448250.8)	14	28.00	16	32.00
6	Land holding	Marginal (Below 2.5 acres)	14	28.00	12	24.00
		Small (2.5 to 5.0 acres)	19	38.00	20	40.00
		Big (Above 5.0 acres)	17	34.00	18	36.00
7	Extension contact  Mean=10.75 S.D.=1.63	Low < (9.94)	9	18.00	14	28.00
		Medium (9.94 -11.56)	25	50.00	24	48.00
		High>(11.56)	16	32.00	12	24.00

<b>8</b>	<b>Extension participation</b>  <b>Mean=14.54</b> <b>S.D.=1.89</b>	Low < (13.59)	15	30.00	14	28.00
		Medium (13.59 – 15.49)	19	38.00	21	42.00
		High >(15.49)	16	32.00	15	30.00
<b>9</b>	<b>Mass media exposure</b>  <b>Mean=3.12</b> <b>S.D.=1.01</b>	Low < (2.62)	10	20.00	13	26.00
		Medium (2.62 -3.62)	23	46.00	20	40.00
		High >(3.62)	17	34.00	17	34.00
<b>10</b>	<b>Risk orientation</b>  <b>Mean=3.1</b> <b>S.D.=0.78</b>	Low < (2.71)	12	24.00	11	22.00
		Medium (2.71-3.49)	21	42.00	23	46.00
		High >(3.49)	17	34.00	16	32.00
<b>11</b>	<b>Achievement motivation</b>  <b>Mean=11.45</b> <b>S.D.=1.54</b>	Low < (10.68)	9	18.00	16	32.00
		Medium (10.68-12.22)	25	50.00	24	48.00
		High >(12.22)	16	32.00	10	20.00
<b>12</b>	<b>Innovative proneness</b>  <b>Mean=12.13</b> <b>S.D.=1.24</b>	Low < (11.51)	12	24.00	14	28.00
		Medium (11.51-12.75)	23	46.00	21	42.00
		High >(12.75)	15	30.00	15	30.00
<b>13</b>	<b>Cosmopolitaness</b>  <b>Mean=6.17</b> <b>S.D.=1.43</b>	Low < (5.46)	13	26.00	15	30.00
		Medium (5.46-6.88)	19	38.00	18	36.00
		High >(6.88)	18	36.00	17	34.00
<b>14</b>	<b>Scientific orientation</b>  <b>Mean=8.74</b> <b>S.D.=1.64</b>	Low < (7.92)	14	28.00	10	20.00
		Medium (7.92-9.56)	21	42.00	25	50.00
		High >(9.56)	15	30.00	15	30.00

#### **4.3.14 Scientific orientation**

It is evident from Table 9 that, more than two-fifth of the broccoli growers (42.00%) of the growers belonged to medium followed by high (30.00%) and low (28.00%) scientific orientation. In case of lettuce growers half (50.00%) belonged to medium followed by high (30.00%) and low (20.00%) level of scientific orientation. The probable reasons for that could be farmers tried to acquire knowledge on new agricultural practices and adopt the same in order to improve their economic status. The results of the present study are in conformity with the findings of Chandrani (2008).

#### **4.4 Association between personal, socio-economic and psychological characteristics of exotic vegetables growers with their cognitive level**

The chi-square test ( $\chi^2$ ) was used to assess the association between the personal, socio-economic and psychological characteristics of exotic vegetable growers and their degree of cognitive comprehension, further the results were examined for statistical significance and presented in the Table 10.

Among the broccoli grower's, two variables *viz.*, education and cosmopolitaness had a positively significant association with cognitive level of the exotic vegetable growers at one per cent level of significance. Whereas, extension contact, extension participation, risk orientation, innovative proneness and scientific orientation were positively significant at five per cent level of significance. However, variables like age, farming experience, family size, annual income, land holding and mass media exposure and achievement motivation had a non-significant association with the cognitive level of exotic vegetable growers.

In case of the lettuce grower's education and risk orientation had a positive and significant association with the cognitive level of exotic vegetable growers, at one per cent level of significance. Further, extension contact, extension participation, innovative proneness and scientific orientation were positively significant at five per cent level of significance. However, variables like age, farming experience, family size, annual income, land holding and mass media exposure, achievement motivation and cosmopolitaness had non-significant association with cognitive level of the farmers.

**Table 10: Association between personal, socio-economical and psychological characteristics and cognitive level of exotic vegetable growers**

(n=100)

Sl. No	Independent variables	Chi-square ( $\chi^2$ )	
		Broccoli growers n <sub>1</sub> =50	Lettuce growers n <sub>2</sub> =50
1	Age	2.365 <sup>NS</sup>	2.526 <sup>NS</sup>
2	Education	19.050 <sup>**</sup>	10.665 <sup>**</sup>
3	Farming experience	3.700 <sup>NS</sup>	2.463 <sup>NS</sup>
4	Family size	2.789 <sup>NS</sup>	4.608 <sup>NS</sup>
5	Annual income	4.679 <sup>NS</sup>	8.505 <sup>NS</sup>
6	Extension contact	10.872 <sup>*</sup>	10.758 <sup>*</sup>
7	Extension participation	12.335 <sup>*</sup>	11.270 <sup>*</sup>
8	Land holding	2.584 <sup>NS</sup>	6.233 <sup>NS</sup>
9	Mass media exposure	1.041 <sup>NS</sup>	3.738 <sup>NS</sup>
10	Risk orientation	9.820 <sup>*</sup>	13.558 <sup>**</sup>
11	Achievement motivation	5.515 <sup>NS</sup>	0.838 <sup>NS</sup>
12	Innovative proneness	12.391 <sup>*</sup>	10.758 <sup>*</sup>
13	Cosmopolitaness	13.006 <sup>**</sup>	5.609 <sup>NS</sup>
14	Scientific orientation	12.39 <sup>*</sup>	10758 <sup>*</sup>

\* Significant at 5% level; \*\*Significant at 1% level; NS-Non-significant

Education was found to be significantly associated with cognitive level of exotic vegetable growers. Education enables an individual's ability to think comprehensively. The majority of the exotic vegetables growers are having a minimum level of schooling *i.e.*, upto high school which is enough to create the curiosity among them regarding the monetary benefits attainable after the adoption of new technologies like exotic vegetables. Thus, gaining knowledge on scientific cultivation practices, pest and disease management, market trend and linkages for exotic vegetables makes farmers to have a significant association with cognitive level.

Extension contact and Extension participation are having significant association with the cognitive level of exotic vegetable growers. The most likely explanation is that growers actively participate in extension programmes and activities conducted by the Department of Horticulture, Krishi Vigyan Kendra (KVK), Raitha Samparka Kendra (RSK), Indian Institute of Horticultural Research (IIHR). As these above-mentioned institutes not only provide critical information to the growers about new technologies, production practices and market trends. They also make farmers to adopt them and gain the benefits of these technologies. This rapport helps the growers to maintain a cordial relation with the extension workers. Further, regular communication and frequent contact with extension agents makes to exchange information and talk about different facets. The farmer's subsequent interaction with the extension workers and participation in various extension events, such as group meetings on newly released technologies, farmers field schools, field days, krishimela and demonstrations makes them to acquire knowledge on new farming techniques and by implementing them in their fields enables farmers to gain monetary benefits and increase cognitive level.

Risk orientation had significant association with the cognitive level of exotic vegetable grower. The probable reasons might be that even in the frequent crop failures, uneven distributed rainfall, changing climate, repeated incidence of pest and disease, market price fluctuations and middlemen's exploitation, farmers cultivate crops with the risk and a hope of getting good yield and returns. So, in the process of gaining knowledge they are exposed to various risks. Thus, the cognitive level is directly associated with the risk orientation of the farmers.

Innovative proneness had significant association with the cognitive level of exotic vegetable growers. The probable reasons for this might be that only few studies are carried out on the production aspects of these exotic vegetables in the country. Even then, the market demand has made farmers to gain interest and grow exotic vegetables by enhancing their cognitive level. Therefore, may be innovative proneness is having a significant relationship with the cognitive level.

Farmers are growing these exotic vegetable crops in a very inimitable manner and their knowledge regarding the crop management is incredible. These vegetables are new in

all the ways, right from cultivation to the consumption. Even then the farmers in consultation with the Scientists are growing these crops in a very scientific manner in their pieces/patches of land to captivate the market demand. Hence the cognitive level of the exotic vegetables growers and their scientific orientation is associated.

#### **4.5 Association between personal, socio-economic and psychological characteristics of exotic vegetable growers with their adoption behavior**

The chi-square test ( $\chi^2$ ) was used to explore the association between the adoption behavior and personal, socio-economic and psychological characteristics of exotic vegetable growers, it is presented in Table 11.

Among broccoli grower's, education had positive and significant association with adoption behavior of exotic vegetable growers at one per cent level of significance. Whereas, extension contact, extension participation, risk orientation, innovative proneness and scientific orientation were positively significant with the adoption behavior of exotic vegetable growers at five per cent level of significance. However, variables like age, farming experience, family size, annual income, land holding and mass media exposure, achievement motivation and cosmopolitaness had non-significant association with the adoption level of exotic vegetable growers.

In case of the lettuce grower's, one per cent level of significance only education had a positive and significant association with adoption behavior of exotic vegetable growers. Whereas, extension contact, extension participation, risk orientation, achievement motivation and scientific orientation were positively significant at five per cent level of significance. However, variables like age, farming experience, family size, annual income, land holding, mass media exposure, innovative proneness and cosmopolitaness had a non-significant association with the adoption level of exotic vegetable growers.

Education was found to be significantly associated with the adoption level of exotic vegetable growers. The most likely explanation for this could be that educated farmers may have better access to information sources which provides knowledge on the advantages of cultivating exotic crops. Further, educated farmers are better positioned to identify market

demands for exotic vegetables and to respond for it by cultivating them. Thus, may be education is significantly associated with the adoption behavior.

Extension contact had significant association with the adoption behavior of exotic vegetables growers. The probable reasons might be that extension agents from various institutions and departments might have demonstrated how to grow exotic vegetables (broccoli and lettuce). Further, the frequent contact with extension agent for the subsidy schemes might have created awareness on the easy and hurdles production techniques, reduced cost of production and increased monetary benefits might have made farmers to grow exotic crops.

**Table 11: Association between personal, socio-economical and psychological characteristics of exotic vegetable growers with their adoption behavior**

**n=100**

Sl. No	Independent variables	Chi-square ( $\chi^2$ )	
		Broccoli growers n <sub>1</sub> =50	Lettuce growers n <sub>2</sub> =50
1	Age	2.464 <sup>NS</sup>	5.912 <sup>NS</sup>
2	Education	22.635**	13.324**
3	Farming experience	5.600 <sup>NS</sup>	2.428 <sup>NS</sup>
4	Family size	3.198 <sup>NS</sup>	2.491 <sup>NS</sup>
5	Annual income	1.399 <sup>NS</sup>	5.617 <sup>NS</sup>
6	Extension contact	9.939*	9.482*
7	Extension participation	11.270*	10.849*
8	Land holding	3.398 <sup>NS</sup>	3.506 <sup>NS</sup>
9	Mass media exposure	8.700 <sup>NS</sup>	8.626 <sup>NS</sup>
10	Risk orientation	11.270*	10.849*
11	Achievement motivation	3.130 <sup>NS</sup>	12.867*
12	Innovative proneness	10.872*	9.320 <sup>NS</sup>
13	Cosmopolitaness	2.284 <sup>NS</sup>	2.262 <sup>NS</sup>
14	Scientific orientation	12.336*	11.73*

\* Significant at 5% level; \*\*Significant at 1% level; NS-Non-significant

Extension participation had significant association with the adoption behavior of exotic vegetables growers. The probable reasons might be that as the farmers involve in various extension activities like training, demonstrations, krishimela and field visit conducted by different institutions like KVK, RSK, SAU and IIHR, provides insights into the innovative technologies and practices. As a result, farmers who are actively involving in the various extension activities are very keen to adopt new technologies. Thus, the extension participation is influencing directly on the adoption behavior of the farmers.

Risk orientation had significant association with the adoption level of exotic vegetable growers. The probable reasons for this might be that farmers with previous experience of growing traditional crop and they know the in and out of the traditional crops for long time. Further, convincing to cultivate a new variety of old crop itself is a challenging task for the extension workers of various institutions. In such a scenario farmer himself cultivating these exotic vegetables by identifying its demand and advantages is risky. Thus, may be risk orientation is significant with the adoption behavior.

Farmers with strong achievement motivation might be more receptive to experimenting with innovative techniques, and their desire to succeed, drive to innovate, excitement to boost output, and acquire recognition in the farming community by using the best and innovative technologies. Thus, achievement motivation had significant association with the adoption behavior of exotic vegetable growers.

Innovative proneness had significant association with the adoption level of exotic vegetable growers. The probable reasons for this might be that farmers who are open to adopt new ideas, are prepared to take calculated risks, and seek solutions. Farmers who are innovative identifies the potentiality of the technology they adopt and recognizes the market opportunities and economic benefits associated with adoption of that technology.

Scientific orientation and adoption behavior of exotic vegetable growers were significantly associated. The probable reasons for this might be that majority farmers more likely to rely on expert's advice and evidence-based practices scientific research findings, which are proven effective through field trials or by experimentation. While making

decisions in adopting new crops and to overcome the challenges in use of new technology they rely on scientific findings so it is positively associated with adoption behavior.

#### **4.6 Marketing behavior of exotic vegetable growers**

##### **4.6.1 Marketing behavior of broccoli growers**

From data presented in Table 12, it is evident that 76.00 per cent of the broccoli growers about collects price information from wholesalers followed by online platform (24.00 %), personally visiting market (20.00 %), government agency (18.00 %) and others (12.00 %). The probable reason for getting price information from wholesalers was because they directly visit farmers field and build trust by interacting with growers, which made them to believe that the information provided was reliable, accurate and timely.

About 62.00 per cent of the broccoli growers sell their produce to wholesalers followed by co-operative marketing (30.00 %), selling directly to consumers (20.00 %), local market at village level (12.00 %) and online platforms (8.00 %). The probable reason may be that direct selling helps the farmers to sale fresh produce at higher rate which enable them to get good income and it saves their transportation cost, storage costs, and reduces middlemen involvement.

Cent per cent of broccoli growers sell their produce immediately after harvest if prices are favourable. The probable reason for this might be that exotic vegetables are highly perishable; freshness of the produce cannot be maintained for long time. To minimize risk associated with spoilage and to get better price in the market they sell produce immediately after harvest. Further in order to meet immediate expenses like labour, seeds, fertilizers they sell immediately.

With respect to mode of transportation 78.00 per cent of broccoli growers uses truck for transportation of produce followed by auto (28.00 %) and tractor (27.00 %). Most of the growers sell produce directly from the field to wholesalers, but if they need to transport the produce they use trucks. The probable reason for this might be that trucks can handle large quantities of the load compared to other small vehicles (auto and cars) and it is economical and efficient, and produce can be transported to many markets.

**Table 12: Marketing practices followed by the broccoli growers****(n<sub>1</sub>=50)**

Sl. No	Statements	Broccoli growers n <sub>1</sub> =50	
		f	%
<b>1</b>	<b>Source of price information</b>		
a	Government agencies	09	18.00
b	Personally visiting market	10	20.00
c	Wholesaler	38	76.00
d	Online platform	12	24.00
e	Others	06	12.00
<b>2</b>	<b>Selling</b>		
a)	Local market at the village level	06	12.00
b)	Selling directly to consumers	10	20.00
c)	Wholesalers	31	62.00
d)	Online platforms	4	8.00
e)	Co-operative marketing	15	30.00
<b>3</b>	<b>Time of selling the produce</b>		
a	Sale after the harvest	50	100.00
<b>4</b>	<b>Mode of transportation</b>		
a	Tractor	14	28.00
b	Auto	13	26.00
c	Trucks	39	78.00
<b>5</b>	<b>Storage</b>		
a	Not followed	50	100.00

Multiple responses are taken; f= frequency, %=percentage

None of the broccoli growers store the produce, as these crops are highly perishable, having a very short shelf life and lack of cold chain facilities on the spot might have influenced the farmers not to store the produce.

**Table 13: Marketing practices followed by the lettuce growers****(n<sub>2</sub>=50)**

Sl. No	Statements	Lettuce growers n <sub>2</sub> =50	
		f	%
<b>1</b>	<b>Source of price information</b>		
a	Government agencies	10	20.00
b	Personally visiting market	7	14.00
c	Wholesaler	33	66.00
d	Online platform	9	18.00
e	Others	8	16.00
<b>2</b>	<b>Selling</b>		
a)	Local market at the village level	4	8.00
b)	Sell directly to consumers	12	24.00
c)	Wholesalers	34	68.00
d)	Online platforms	3	6.00
e)	Co-operative marketing	9	18.00
<b>3</b>	<b>Time of selling the produce</b>		
a	Sale after the harvest if prices are favorable	50	100.00
<b>4</b>	<b>Mode of transportation</b>		
a	Tractor	14	28.00
b	Auto	12	24.00
c	Trucks	41	82.00
<b>5</b>	<b>Storage</b>		
a	Not followed	50	100.00

Multiple responses are taken; f= frequency, %=percentage

It is evident from Table 13 that, 66.00 per cent of lettuce growers collect information related to prices from wholesalers, followed by government agencies (20.00

%), online platforms (18.00 %), others (16.00 %), and by personally visiting the market (14.00 %). The reason for this might be due that the lettuce growers may perceive that the wholesalers are aware of the prices prevailing in the local and urban markets, as they always interact with various intermediaries, because of this nature they might have gained the trust of the farmers through interaction and rapport building. The growers believe that information given by wholesalers is accurate, timely and up-to-date on various aspects, so the majority rely on wholesalers for the price information.

More than two-third of the lettuce growers (68.00 %) sell their produce to wholesalers followed by selling directly to consumers (24.00 %), co-operative marketing (18.00 %), local market at village level (8.00 %) and online platforms (6.00 %). The probable reason for this might be lettuce crop is highly perishable and has a short shelf life after harvest. Hence, the growers sell their produce fast to prevent spoiling and majority of them sell their produce to wholesalers because they are knowledgeable on quality of the produce based on that prices are fixed and the payment for the produce will be made immediately to the growers.

Cent per cent of lettuce growers sell their produce immediately after harvest. The probable reason might be that lettuce is a highly perishable crop, it must be processed or distributed immediately. By practicing this, the growers may get good price, hence they are following.

More than four-fifth (82.00 %) of the lettuce growers uses truck in case of transportation of produce followed by tractor (28.00 %) and auto (24.00 %). The probable reason for this might be that in trucks the produce can be transported without any damage and delay compared to other modes of transportation. The tractor and auto were used to transport the third and fourth harvested crop.

None of the lettuce growers store the produce, the probable reason might be that lettuce has extremely short shelf life, highly perishable and degrading soon after harvest. This makes storing not only inconvenient, but also impracticable, as these vegetables can quickly lose their freshness, texture, flavour, and nutritional content. Another reason might be changing humidity, temperature fluctuations, and physical handling all increase the

likelihood of spoiling. Storing them can cause quick degradation, resulting in waste and a loss of market value.

## **4.7 Economic performance of exotic vegetable growers**

### **4.7.1 Cost of cultivation of broccoli and lettuce**

Table 14 indicates the cost incurred on variable and fixed factors in cultivation of exotic vegetables per acre.

**Working cost:** The average working costs for broccoli cultivation per acre was Rs. 45,675.09. In that the largest portion of working costs was spent on seedlings (Rs. 11,630) followed by labour charge (Rs. 11,431), manures (Rs. 5,930), plant protection (Rs. 3,919), land preparation (Rs. 3,730), Interest on Working capital @7% (Rs. 2,988.09), fertilizers (Rs. 2,602), micro nutrients (Rs. 2,331), irrigation charge (Rs.614) and miscellaneous cost Rs. 500/-.

In case of lettuce it is evident from Table 14 that average working costs for lettuce cultivation per acre was Rs. 47,306.84. The amount spent on seedlings was highest (Rs. 13,100) followed by on labour charge (Rs. 11,460), manures (Rs. 6,090), plant protection (Rs. 3,925), land preparation (Rs. 3,650), Interest on Working capital @7% (Rs. 3,094.84), fertilizers (Rs. 2,485), micro nutrients (Rs. 2,385), irrigation charge (Rs. 617) and miscellaneous cost Rs. 500/-.

**Fixed cost:** Fixed cost incurred for broccoli cultivation per acre was around Rs. 12,468.96. The rental value of land was the most significant component, costs around Rs. 10,000 followed by Interest on fixed capital@12% (Rs. 1,335.96), depreciation costs (Rs. 983) and land revenue (Rs. 150).

In case of lettuce growers fixed cost incurred for cultivation of the crop per acre costs around Rs. 9,075.36. The rental value of land was the most significant component, costs around Rs. 7,000 followed by Interest on fixed capital @12% (Rs. 972.36), depreciation costs (Rs. 983) and land revenue (Rs. 150).

**Cost of cultivation:** The average cost of cultivation of broccoli was Rs. 58,144.05 per acre. In case of lettuce average cost of cultivation was found to be Rs. 56,382.2. In both the cases variable cost found to be more compared to fixed cost.

**Table 14: Cost of cultivation of exotic crops per acre in Rs**

(n=100)

Sl. No	Particulars	Broccoli n <sub>1</sub> =50	Lettuce n <sub>2</sub> =50
<b>A</b>	<b>Variable cost</b>		
1	Land preparation	3730	3650
2	For seed or seedling	11630	13100
3	Irrigation charge	614	617
4	Manures	5930	6090
5	Fertilizers	2602	2485
6	Plant Protection	3919	3925
7)	Micro Nutrients	2331	2385
8)	Labour charge	11431	11460
9)	Miscellaneous cost	500	500
10)	Interest on Working capital @7%	2988.09	3094.84
	<b>Total Variable Cost</b>	<b>45675.09</b>	<b>47306.84</b>
<b>B</b>	<b>Fixed cost</b>		
1	Rental value of land	10000	7000
2	Land revenue	150	150
3	Depreciation on farm implements	983	953
4	Interest on fixed capital	1335.96	972.36
	<b>Total Fixed cost</b>	<b>12468.96</b>	<b>9075.36</b>
	<b>Total cost (A+B)</b>	<b>58144.05</b>	<b>56382.2</b>

## Returns from exotic vegetable cultivation

It is depicted from Table 15 that returns from sale of broccoli and lettuce was found to be 1.69 lakhs and 1.76 lakhs. Returns from lettuce is higher than broccoli due to its more market demand during the period.

**Yield and gross returns:** The gross return comprises of revenue without deducting the cost and net income is income obtained after deducting cost, as shown in table 15. The average broccoli yield per acre was 4765 kg and average price of broccoli per kg was Rs. 35.64. The per acre average gross returns from broccoli cultivation was found to be Rs. 1.69 lakhs.

**Table 15: Returns from cultivation of exotic vegetable crop per acre**

(n=100)

<b>Particulars</b>	<b>Broccoli n<sub>1</sub>=50</b>	<b>Lettuce n<sub>2</sub>=50</b>
Yield (kg/acre)	4765	4630
Price (per kg in Rs)	35.64	Rs. 38.00
Gross returns in Rs	1,69,824.6	Rs. 1,76,320
Total cost in Rs	Rs. 58,144.05	Rs. 56,382.2
Net return in Rs	Rs. 1,11,680.6	Rs. 1,19,937.8
Benefit cost ratio	2.92	3.13

In case of lettuce, the average yield per acre was 4630 kg and average price for lettuce per kg was Rs. 38.00 The per acre average gross returns from lettuce cultivation was Rs. 1.76 lakhs.

**Net returns:** The analysis of net returns from broccoli cultivation revealed that the net return was positive that is Rs. 1,11,680.6 per acre

In case of lettuce the net returns from cultivation revealed that the net return was positive that is Rs. 1,19,937.8 per acre

**Benefit to cost ratio (B:C):** The benefit cost ratio from broccoli and lettuce cultivation over total cost was found to be 2.92 and 3.13 respectively.

**Table 16 Economic performance of exotic vegetable growers**

(n=100)

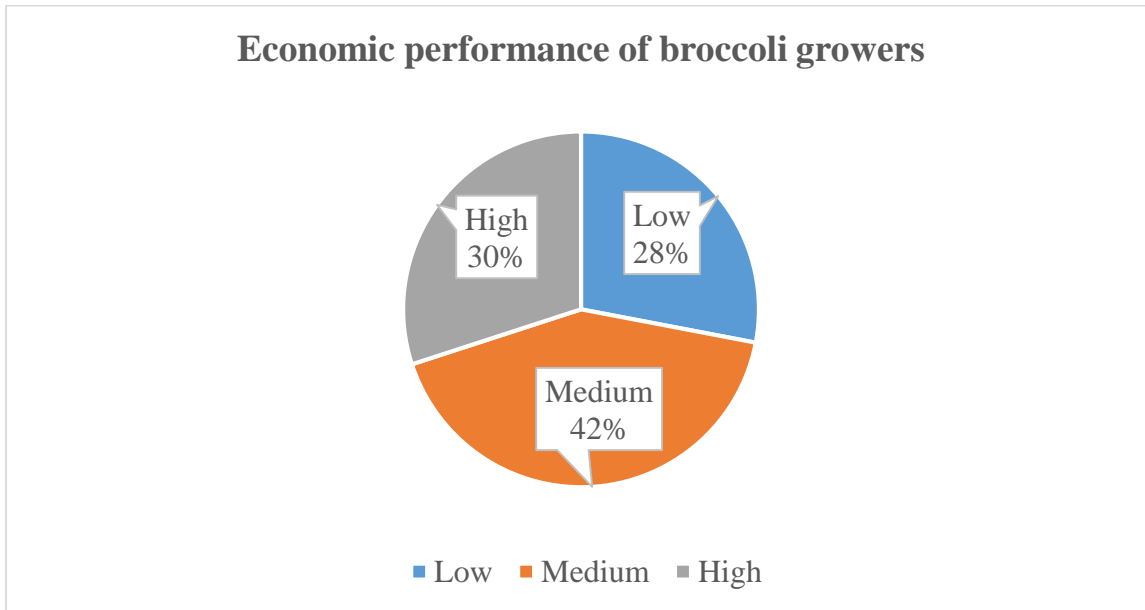
Economic performance	Broccoli growers n <sub>1</sub> =50		Lettuce growers n <sub>2</sub> =50	
	f	%	f	%
Low (< 263.65)	14	28.00	15	30.00
Medium (263.65-316.41)	21	42.00	19	38.00
High (> 316.41)	15	30.00	16	32.00
<b>Mean=290.03</b>	<b>SD=52.76</b>			

It can be observed from Table 16 and Fig 5&6 that majority of the broccoli growers (42.00 %) were found to be in medium level of economic performance. Whereas, 30.00 per cent and 28.00 per cent of the respondents were found to be in high and low level of economic performance, respectively. In case of lettuce growers, majority of them belonged to medium (38.00 %) economic performance followed by high (32.00 %) and low (30.00 %) economic performance.

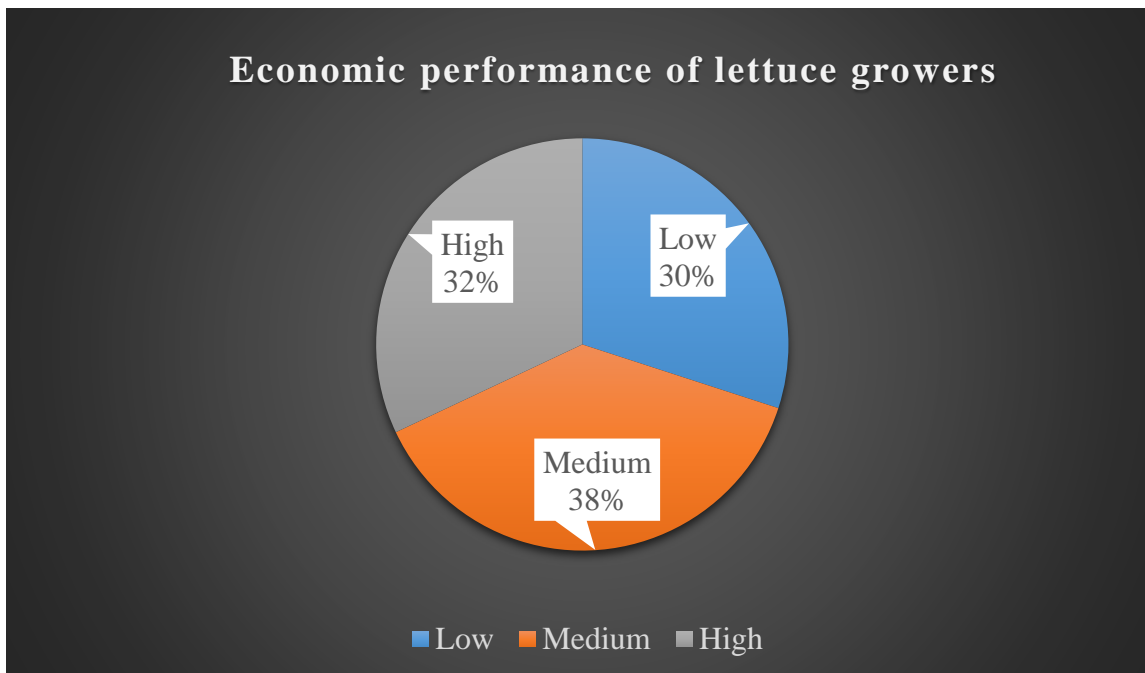
The probable reason for the majority of respondents having medium to high economic performance that Bengaluru, being one of the important metropolitan cities, has an increasing population of different age groups, some of them preferring health-conscious food and a few who prefer fast foods. There is an increase in demand for these exotic vegetables like broccoli and lettuce, and they supply these exotic vegetables to local markets, restaurants, and export markets, and a few of the growers have also entered into contracts with Big Basket and Reliance Fresh, ensuring good prices for their goods.

The majority of growers have medium risk-bearing ability; innovativeness, extension participation, extension contact, and scientific orientation might have

contributed to their medium to high economic success. Another explanation might be their modest financial capabilities, small scale investments on resources such as excellent seeds, fertilizers, and irrigation equipment; labor and markets; and the willingness to take cautious risks.



**Fig 5: Economic performance of broccoli growers**



**Fig 6: Economic performance of lettuce growers**

#### 4.8 Constraints faced by broccoli and lettuce growers in adoption of crop production technologies

The broccoli and lettuce growers have faced a lot of issues while adopting crop production technologies which including post-harvest marketing, production constraints which results in declining the productivity hence we need to have knowledge on constraints faced by the farmers and need to take efforts in order to mitigate it.

##### 4.8.1 Constraints faced by broccoli growers

It is evident from Table 17, market price fluctuation was the major constraint faced by broccoli growers (Rank I), followed by non-availability of timely skilled labour high (Rank II), exotic vegetable are highly perishable (Rank III), pest and disease management (Rank IV), exotic vegetables requires specific climatic condition (Rank V), lack of improved varieties (Rank VI), lack of infrastructure (Rank VII), high initial investment (Rank VIII), lack of proper market (Rank IX) and cost of cultivation is high (Rank X) were the constraints faced by broccoli grower.

**Table 17: Constraints faced by broccoli growers**

(n<sub>1</sub>=50)

Sl. No.	Statement	Broccoli growers response (n <sub>1</sub> =50)						Rank
		More severe		Severe		Less severe		
		f	Per cent	f	Per cent	f	Per cent	
1	Cost of cultivation is high	7	14.00	22	44.00	21	42.00	X
2	Lack of proper market	14	28.00	17	34.00	19	38.00	IX
3	Market price fluctuations	33	66.00	10	20.00	7	14.00	I
4	Exotic vegetables are highly perishable	11	22.00	28	56.00	11	22.00	III
5	Exotic vegetables require specific climatic condition and soil	13	26.00	24	48.00	13	26.00	V
6	Lack of improved varieties	8	16.00	28	56.00	14	28.00	VI
7	High initial investment	8	16.00	24	48.00	18	36.00	VIII
8	Lack of infrastructure	5	10.00	28	56.00	16	32.00	VII
9	Non availability of timely skilled labour	13	26.00	28	56.00	9	18.00	II
10	Pest and disease occurrence	12	24.00	26	52.00	12	24.00	IV

#### 4.8.2 Constraints faced by lettuce growers

A bird eye view of Table 18 depicts that, market price fluctuation was the major constraint faced by lettuce growers (Rank I), followed by exotic vegetables are highly perishable (Rank II), non-availability of timely skilled labour (Rank III), requires specific climate condition and soil (Rank IV), pest and disease management (Rank V), lack of infrastructure (Rank VI), lack of improved varieties (Rank VII), high initial investment (Rank VIII), lack of proper market (Rank IX) and cost of cultivation is high (Rank X).

**Table 18: Constraints faced by lettuce growers**

(n<sub>2</sub>=50)

Sl. No.	Statement	Lettuce growers response (n <sub>2</sub> =50)						Rank
		More severe		Severe		Less severe		
		f	%	f	%	f	%	
1	Cost of cultivation is high	6	12.00	21	42.00	23	46.00	X
2	Lack of proper market	8	16.00	20	40.00	22	44.00	IX
3	Market price fluctuations	37	74.00	8	16.00	5	10.00	I
4	Exotic vegetables are highly perishable	13	26.00	28	56.00	9	18.00	II
5	Exotic vegetables require specific climatic condition and soil	16	32.00	22	44.00	12	24.00	IV
6	Lack of improved varieties	10	20.00	22	44.00	18	36.00	VII
7	High initial investment	6	12.00	24	48.00	20	40.00	VIII
8	Lack of infrastructure	7	14.00	26	52.00	17	34.00	VI
9	Non availability of timely skilled labour	13	26.00	27	54.00	10	20.00	III
10	Pest and disease occurrence	9	18.00	27	54.00	14	28.00	V

To overcome the constraints faced by exotic vegetable growers establishing direct link with buyers and sellers, proper training and educating labourers about new farming practices, post-harvest handling and storage facilities, growing these crops under controlled conditions, timely and efficient information on plant protection measures, supply of quality inputs and extension and advisory services need to provide.

#### 4.9 Suggestions given by exotic vegetable growers to overcome the constraints in adoption of crop production technologies

Suggestions to overcome any constraint faced by exotic vegetable growers which helps in addressing the problem at a faster rate and also to the core. Hence, suggestions were taken from the farmers about difficulties in adoption the effects of their problems.

##### 4.9.1 Suggestions given by broccoli growers to overcome the constraints

Table 19 reflects the suggestions given by broccoli growers to overcome constraints faced by them. Majority of the farmers suggested that contract farming (Rank I) need to adopted, followed by quality and timely inputs availability (Rank II), crop rotation to promote and sustain soil nutrient quality (rank III), government support policies (Rank IV), production of more resistant varieties (Rank V) and integrated pest and disease management strategies (Rank VI).

**Table 19: Suggestions as expressed by broccoli growing farmers**

(n<sub>1</sub>=50)

Sl. No.	Farmer's suggestions	Broccoli growers' response (n <sub>1</sub> =50)								Rank
		More important		Important		Less important		Not important		
		f	%	f	%	f	%	f	%	
1	Government support policies	16	32.00	22	44.00	5	10.00	7	14.00	IV
2	IPM strategies	4	8.00	21	42.00	15	30.00	10	20.00	VI
3	Encouraging contract farming policy	36	72.00	7	14.00	4	8.00	3	6.00	I

4	Crop rotation practices need to be followed	15	30.00	25	50.00	6	12.00	4	8.00	III
5	Production of more resistant varieties	8	16.00	29	58.00	8	16.00	5	10.00	V
6	Quality and timely inputs availability	32	64.00	9	18.00	5	10.00	4	8.00	II

#### 4.9.2 Suggestions given by lettuce growers to overcome the constraints

**Table 20: Suggestions as expressed by lettuce growing farmers**

(n<sub>2</sub>=50)

Sl. No.	Farmer's suggestions	Lettuce growers' response (n <sub>2</sub> =50)								Rank
		More important		Important		Less important		Not important		
		f	%	f	%	f	%	f	%	
1	Government support policies	11	22.00	24	48.00	7	14.00	8	16.00	V
2	IPM strategies	3	6.00	21	42.00	16	32.00	10	20.00	VI
3	Encouraging contract farming policy	34	68.00	9	18.00	4	8.00	3	6.00	I
4	Crop rotation practices need to be followed	17	34.00	23	46.00	5	10.00	5	10.00	II
5	Production of more resistant varieties	10	20.00	25	50.00	9	18.00	6	12.00	IV
6	Quality and timely inputs availability	26	52.00	13	26.00	7	14.00	4	8.00	III

Table 20 reflects the suggestions given by lettuce growers to overcome constraints faced by them. Majority of the farmers suggested contract farming (Rank I) need to adopted, followed by crop rotation to promote and sustain soil nutrient quality (Rank II), quality and timely inputs availability (rank III), production of more resistant varieties (Rank IV), government support policies (Rank V) and integrated pest and disease management strategies (Rank VI).

The probable reasons for this might be through contract farming price stability can be achieved, reduced market and price risks. If farmers involved in contract farming with companies as they provide training, inputs and technical assistance that is helpful for the farmers to adopt new practices and thereby income level can be improved.

Timely quality input availability and crop rotation helpful in improving the quality and quantity of yield, reduces loses, efficient crop management, soil health improvement by maintaining soil organic matter, better water management.

Production of more resistant varieties helpful to overcome pest and disease related issues, reduced crop damage and thereby improvement in yield which influences income of farmer.

Government support policy like subsidies and incentives, crop insurance, loan facilities, infrastructure facilities helpful for farmers to overcome their risk and uncertainty associated with growing crop like crop failure, pest and disease, money lender interest issues.

Integrated pest and disease management strategies helpful in preventing crop losses, disease prevention, reduced usage of inputs like chemicals and minimal environmental pollution and health risks.

### **Implications and recommendations from the study**

- ❖ SAU should focus on conducting in-depth research on exotic vegetable crops and thereby plays a vital role in promoting research and development in the field of exotic vegetables.

- ❖ Most of the growers not aware of various practices viz., nursery bed preparation, recommended pH, FYM application, plant protection measures to manage pest and disease, frequency of irrigation in winter, ideal stage of harvesting. Hence, efforts should be made in this line to create the awareness about these technologies through appropriate extension strategies because these are the important components in exotic vegetable cultivation in future days to come. These technologies are important which measure the variability within the field and helps in taking an appropriate decision.
- ❖ Majority of exotic vegetable growers adopted technologies like type of soil, method of irrigation, weed management, recommended varieties and suitable climate. However, some of the exotic farming practices like applying recommended dose of fertilizers, ideal stage of harvesting, pest and disease management and spacing were partially adopted. Hence, Department of Horticulture and KVK's, extension professionals should educate the farmers about importance of critical practices and technologies which are crucial for enhancing the crop productivity per unit area.
- ❖ Awareness programs on frequent usage of mobile apps that provide information on weather events, market information and scientific technologies should be intensified. Further, awareness on identifying pests and diseases at early stages through various mobile applications reduce risk.
- ❖ Market fluctuation was the major constraint faced by exotic vegetable growers. Government need to promote contract farming with companies as they provide training, inputs and technical guidance that is helpful for the farmers to adopt new practices and thereby income level can be improved.
- ❖ Government support policy like subsidies and incentives, crop insurance, loan facilities, infrastructure facilities are helpful for farmers to overcome their risk and uncertainty associated with crop failure, pest and disease incidence, money lender interest issues.
- ❖ Institutions should provide timely and quality inputs like seed material, fertilizers, disease and pest tolerant and resistant varieties which may enhance yield of the crop.

### **Future line of research**

- ✓ The study was carried out in Bengaluru rural district of Karnataka. Hence, it needs to be replicated on large scale covering the remaining other potential broccoli and lettuce growing areas.
- ✓ The study was restricted to broccoli and lettuce, the findings of this study could not be generalised to other exotic crops. Hence, similar study on other crops may be taken up.
- ✓ As the study was restricted to two taluks, the findings of this study could not be generalized to other areas. Therefore, it is suggested to conduct a similar investigation in different broccoli and lettuce growing areas.
- ✓ This study was conducted within the time and resource limitations of a student researcher. However, there is further scope for survey and action research in this field.



**Plate 2 Interaction with exotic vegetable growers**

# **SUMMARY**

## V SUMMARY

India's varied climate guarantees that every type of fresh vegetable is available. Many changes have been brought about by globalization in developing countries, including a change in lifestyle and living conditions, the development of large food chains that introduce foreign cuisines into eating habits, and a transformation in food tastes, particularly among the younger population. The rapid development of a variety of exotic vegetables in the everyday diet is being aided by people's growing awareness of the value of these vegetables as sources of dietary fiber, antioxidants, and nutraceuticals. Globally, the demand for exotic vegetables is expanding quickly. India has a great deal of opportunity to compete in the developing exotic vegetable export and local markets. Profitability and a greater return on vegetable farming can be achieved by growing exotic vegetables. Broccoli, purple broccoli, lettuce, coloured capsicum, baby corn, asparagus, parsley, leek, cherry tomato, celery, thyme, Chinese cabbage, red cabbage, zucchini, and so on are the examples of exotic vegetables that are used in current cuisines. These exotic vegetables are fetching a higher price than our traditional vegetables in the market.

### **Salient findings**

- 1) More than one-third (36.00 %) of the broccoli growers belonged to medium level cognitive level followed by high (34.00 %) and low (30.00 %) categories. With respect to adoption level, nearly two-fifth belonged to medium (38.00 %) followed by high (34.00 %) and low (28.00 %) adoption categories.
- 2) Nearly two-fifth (38.00 %) of lettuce growers belonged to medium cognitive level of understanding followed by high (32.00 %) and low (30.00 %) belonged to cognitive level of understanding. In case of adoption more than one-third (36.00 %) had medium adoption level followed by low (34.00 %) and high (30.00 %) adoption categories.
- 3) Cognitive level of broccoli growers about crop production technologies, cent per cent of the growers had correct cognitive level about type of soil and method of irrigation. Whereas, majority of the growers had correct cognitive level about recommended hybrid (82.00 %), type of climate (74.00 %), weed management (70.00 %), age of seedling (66.00 %), equal percentage of ideal yield and aphid management (64.00 %), equal percentage of

cut worm management through chemical method and damping off disease management (58.00 %) and seedling rate (56.00 %). Whereas, majority of the farmers had incorrect cognitive level of understanding regarding nursery bed preparation (64.00 %), recommended  $p^H$  (60.00 %), equal percentage of FYM and leaf webber management through chemical method (56.00 %), ideal stage of harvesting (52.00 %), chemical fertilizers (48.00 %) and equal percentage of spacing and picking and destruction of cut worm and leaf webber larvae in early stage (46.00 %).

4) Cognitive level of lettuce growers about crop production technologies, cent per cent of the growers had correct cognitive level about type of soil and method of irrigation. Whereas, majority of the growers had correct cognitive level about varieties (82.00 %), weed management (76.00 %), type of climate (74.00 %), ideal yield (72.00 %), aphid management (62.00%), seedling rate (60.00%), equal percentage of cut worm management through cultural method and age of seedling (56.00%), Whereas, majority of the farmers had incorrect cognitive level of understanding on various aspects equal percentage of growers lack cognitive level on nursery bed preparation and FYM (58.00%), equal percentage of recommended  $p^H$  and ideal stage of harvesting (54.00%), leaf webber management through chemical method (52.00 %) and equal percentage of damping off disease management and spacing (48.00 %).

5) Extent of adoption of cultivation practices by broccoli growers indicates that, cent per cent had fully adopted type of soil. Whereas 92.00 per cent adopted method of irrigation followed by recommended hybrid (64.00 %), weed management (54.00 %), seedling rate (52.00 %). More than three-fourth (78.00 %) of the growers had partially adopted frequency of irrigation followed by equal percentage of chemical fertilizer application and ideal stage of harvesting (70.00 %), leaf webber management through chemical method (62.00 %), equal percentage of spacing and frequency of irrigation (58.00 %), damping off disease (56.00 %), equal percentage of FYM and ideal yield (54.00%). Nearly three-fifth (56.00 %) not adopted scientific technologies to maintain recommended  $p^H$  followed by picking and destruction of larvae in early stages (62.00 %), and nursery bed preparation (42.00 %).

6) Extent of adoption of lettuce cultivation practices indicates that cent per cent had fully adopted type of soil followed by method of irrigation (96.00 %), weed management (68.00 %), recommended varieties (58.00 %). More than four-fifth (82.00 %) partially adopted chemical fertilizer application followed by frequency of irrigation (76.00 %), damping off disease management (70.00 %), FYM (68.00 %), equal percentage of spacing and ideal yield (66.00 %), ideal stage of harvesting (64.00 %) and seedling rate (58.00 %). Nearly two-third (64.00 %) of the growers not adopted cultural practice to manage cut worms and leaf webber followed by scientific technologies to maintain recommended pH (54.00 %) and adopted nursery bed preparation (36.00 %).

7) More than two-fifth (42.00 %) of the broccoli growers belonged to young age category. Nearly one-third (32.00 %) belonged to high school education. More than two-fifth (44.00 %) belonged to medium farming experience. Nearly three-fifth (58.00 %) medium family size. Two-fifth (40.00 %) belonged to medium annual income. Nearly two-fifth (38.00 %) possess small land holding. Majority of the growers belonged to medium extension contact (50.00 %), extension participation (38.00 %), mass media exposure (46.00 %), risk orientation (42.00 %), achievement motivation (50.00 %), innovative proneness (46.00 %), cosmopolitaness (38.00 %) and scientific orientation (42.00 %).

8) Two-fifth (40.00 %) of the lettuce growers belonged to middle age category. Nearly one-third (30.00 %) belonged to high school education. Fourty per cent belonged to medium farming experience. Half (50.00 %) of the growers belonged to medium family size. Two-fifth (40.00 %) of the growers possess small land holding. Majority of growers belonged to medium annual income (36.00 %), extension contact (48.00 %), extension participation (42.00 %), mass media exposure (40.00 %), risk orientation (46.00 %), achievement motivation (48.00 %), innovative proneness (42.00 %), cosmopolitaness (36.00 %) and scientific orientation (50.00 %).

9) The association between personal, socio-economic and psychological characteristics with cognitive level of broccoli growers found that characteristics like education, cosmopolitaness had positive and significant association with cognitive level of understanding at one per cent level of significance. Whereas characteristics like extension contact, extension participation, risk orientation, innovative proneness and scientific

orientation had positive and significant association with cognitive level of understanding at five per cent level of significance.

10) The association between personal, socio-economic and psychological characteristics with cognitive level of lettuce growers found that characteristic like education and risk orientation had positive and significant association with cognitive level of understanding at one per cent level of significance. Whereas extension contact, extension participation, innovative proneness and scientific orientation had positive and significant association with cognitive level of understanding at five per cent level of significance.

11) The association between personal, socio-economic and psychological characteristics with adoption level of broccoli grower's characteristics like education had positive and significant association with adoption level of understanding at one per cent level of significance. Whereas characteristics like extension contact, extension participation, risk orientation, innovative proneness and scientific orientation had positive and significant association with adoption level of understanding at five per cent level of significance.

12) Among lettuce grower's characteristics like education had positive and significant association with adoption level of understanding at one per cent level of significance. Whereas extension contact, extension participation, risk orientation, achievement motivation and scientific orientation had positive and significant association with adoption level at five per cent level of significance.

13) Marketing behaviour of broccoli growers more than three-fourth (76.00 %) collects price information from wholesalers. More-than three-fifth (62.00 %) sell their produce to wholesalers. Cent per cent of broccoli growers sell their produce immediately after harvest if prices are favourable. Nearly four-fifth (78.00 %) uses truck in case of transportation of produce. None of the broccoli growers store the produce.

14) Marketing behaviour of lettuce growers two-third (66.00 %) collects information related to prices from wholesalers. More than two-third (68.00 %) sell their produce to wholesalers. Cent per cent of lettuce growers sell their produce immediately after harvest if prices are favourable. than four-fifth (82.00 %) uses truck in case of transportation of produce. None of the lettuce growers store the produce.

15) More than two-fifth (42.00%) of the broccoli growers belonged to medium followed by high (30.00%) and low (28.00%) economic performance categories.

16) Nearly two-fifth (38.00 %) of the lettuce growers belonged to medium followed by high (32.00 %) and low (30.00 %) economic performance categories.

17) Majority of the broccoli growers expressed that market fluctuation was the major constraint (Rank I), followed by non-availability of timely skilled labour (Rank II), exotic vegetables are highly perishable (Rank III), pest and disease occurrence (Rank IV).

18) Majority of the lettuce growers expressed that market fluctuation was the major constraint (Rank I), followed by exotic vegetables are highly perishable (Rank II), non-availability of timely skilled labour (Rank III), requires specific climate condition and soil (Rank IV).

19) Majority of the broccoli growers suggested that contract farming (Rank I) need to be adopted, followed by quality and timely inputs availability (Rank II), crop rotation to promote and sustain soil nutrient quality (Rank III).

20) Majority of the lettuce growers suggested contract farming (Rank I) need to be adopted, followed by crop rotation to promote and sustain soil nutrient quality (Rank II), quality and timely inputs availability (Rank III).

## **REFERENCES**

## VI REFERENCES

- AHUJA, R., SINGH, S. P., SANGWAN, S. S. AND GAUTAM, G., 2016, Entrepreneurial behaviour of dairy farmers in Haryana. *Haryana Vet.*, **55** (1): 6-11.
- AJAYKUMAR, M. AND MURAGOD, P. P., 2021, A study on analysis of cost of cultivation, usage of production technology and constraints faced by tomato growers. *Pharm. Innov. J.*, **10** (10): 1433-1438.
- AKKAMAHADEVI NAIK., 2016, Knowledge and adoption of organic farming practices in red gram in dryland areas of Karnataka. *M.Sc. (Agri.) Thesis* (Unpub.), Prof. Jayashankar Telangana State Agri. Univ., Hyderabad.
- AMARNATH, J. AND TAMIL VENDHAN, K., 2017, An economic analysis of cut flower marketing in Tamil Nadu. *Econ. Aff.*, **62** (4): 621-631.
- ANONYMOUS, 2017, Horticulture statistics at a glance. Ministry of Agriculture and Farmers Welfare, New Delhi.
- ANONYMOUS, 2022, Karnataka state horticulture development report.
- ASHOK, K, S. AND ASKI, S. G., 2016, Profile characteristics of cabbage growers in North Karnataka: *Agric. Upd.*, **11** (3): 293-297.
- ASHOKKUMAR BANSILAL, 2015, A study on knowledge and adoption of recommended cultivation practices of black gram growers in north eastern region of Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Raichur.
- BADMUS, M. A. AND YEKINNI, O. T., 2011, Economic analysis of exotic vegetable production among urban Fadama women farmers in Akinyele Local Government Area Oyo State, Nigeria. *Int. J. Agric. Econ. Rural Dev.*, **4** (1): 19-24.
- BAGHERI A. AND SHABANALIFAMI H., 2016, Potato growers' risk perception: A case study in Ardabil province of Iran. *J. Agric. Sci. Tech.*, **18** (2): 55-65.

- BAIRENENI, N. AND NAGNUR, S., 2022, Consumption pattern of exotic vegetable consumers: A comparative study between Dharwad and Hyderabad of Karnataka and Telangana states of India. *Pharm. Innov. J.*, **11** (2): 793-797.
- BANDU, P. M., 2021, Technological gap in adoption of chilli production practices. *M. Sc. (Agri.) Thesis* (Unpub.), College of Agriculture, Latur Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani.
- BARLA, G. W., PANIGRAHI, R. S., MADHU, M., PRUSTY, A. K., ROUT, D. S. AND ROUT, S., 2020, Knowledge level of tribal farmers of Koraput district of Odisha on cultivation of off-season vegetables. *Multilogic. Sci.*, **10** (35): 1354-1357.
- BHARATH, H. G., 2022, Comparative analysis of adoption level and economic performance of chrysanthemum growers in Tumakuru district of Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- BHATTACHARJEE, U., SAHA, A., TIWARI, P. K., DHAKRE, D. S. AND GUPTA, R. K., 2021, Achievement motivation of organic farmers of Birbhum district of West Bengal. *Indian J. Ext. Edu.*, **57** (1): 38-42.
- BHIRDE, B. A., 2015, Technological gap in ginger production. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.
- BINDU, N., 2018, Economic performance and entrepreneurial behaviour of flower growers in Tumkur district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- BISHNOI, D. K., BHATIA, J. K. AND PRAKASH, S., 2017, Protected cultivation of capsicum in Haryana. *Ind. J. Econ. Dev.*, **13** (2): 72-76.
- BORAH, D., 2016, Awareness of tribal womenfolk regarding different provisions of MGNREGA: a study in Longjap gram panchayats under Kathiatoli development block of Nagaon district, Assam, India. *Int. J. Innov. Res. Dev.*, **5** (14): 201-205.
- CHANDRAN, V. AND PODIKUNJU, B., 2021, Constraints experienced by homestead vegetable growers in Kollam district. *Indian. J. Ext. Educ.*, **57** (1): 32-37.

- CHANDRANI SAHA, 2008, A study on sustainability of farming system and livelihood security among rural households in Tripura. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- CHAUDHARY, P. J., 2018, Impact of Krishi Vigyan Kendra, Vejalpur of Panchmahal district of Gujarat state. *M. Sc. (Agri.) Thesis* (Unpub.), Anand. Agric. Univ., Gujarat.
- CHAUHAN, C. D., BHATT, M. R., PARMAR, V. S. AND CHAREL, J. M., 2017, Knowledge of the farmers about low-cost greenhouse technology. *Int. J. Curr. Microbiol. Appl. Sci.*, **6** (5): 97-102.
- CHAUHAN, M. N., 2015, Constraints faced by tribal farmers in adoption of export-oriented okra production expertise in Tapi district of South Gujarat. *Int. J. Adv. Res. Innov. Ideas Educ.*, **1** (5): 741-746.
- CHENDAKE, A. D. AND CHAUHAN P. M., 2015, Marketing strategy of greenhouse vegetable and flower growers in Sabarkantha district of Gujarat, India. *J. Agric. Res.*, **53** (2): 277- 285.
- CHOUDHARY, A. K., 2016, Scaling-up of protected cultivation in Himachal Pradesh, India. *Cur. Sci.*, **111** (2): 272-277.
- DARADE, R. E., 2017, Technological gap in maize cultivation in Buldana district. *M. Sc. (Agri.) Thesis* (Unpub.), Dr. Panjabrao Deshmukh Krishi Vidyapeeth., Akola.
- DAS, R., HANGLEM, A., DAS, T. AND PRADHAN, K., 2015, Analysing the constraints associated with the adoption of scientific vegetable cultivation practices. *Intl. J. Sci. Res.*, **4** (5): 753-755.
- DHIMAN, M. R., SUMAN, R. S., SUNITA, S. M., AGARWAL, S. K. AND KUMAR, R., 2016, Analyzing the knowledge level of liliun growers of Lahaul valley of Himachal Pradesh, India. *Pl. Arch.*, **16** (2): 675-678.
- DHURWEY, C. K., CHOUDHRY, V. K., BANTE, R. AND SHREY, R., 2015, Constraints perceived by farmers in production and marketing of major cole

- vegetable crops in Bemetara district of Chhattisgarh state. *Int. Res. J. Agric. Econ. Stat.*, **6** (1): 193-196.
- DODDAMANI, D., 2014, A study on knowledge and adoption of recommended cultivation practices among thompson seedless grape growers in Bijapur district of Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- GANESHPRASAD, T. S., 2010, A study on knowledge, adoption and economic performance of sugarcane farmers of Cauvery, Tungabhadra and Ghataprabha command areas of Karnataka. *Ph. D. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- GAUTTAM, S., THAKKAR, K. A. AND SUTHAR, S., 2014, Motivational sources and knowledge of farmers in adoption of drip irrigation system. *Guj. J. Ext. Edu.*, **25** (2): 175-177.
- GREENA, A. V., 2015, Precision farming in Kamabainallur sub-basin under TNIAMWARM: An impact analysis. *M. Sc. (Agri.) Thesis* (Unpub.), Tamil Nadu. Agric. Univ., Coimbatore.
- GURJAR, R. S., GOUR, C. L., DEEPAK DWIVEDI, D. D. AND BADODIYA, S. K., 2017, Entrepreneurial behavior of potato growers and constraints faced by farmers in production and marketing of potato and their suggestion. *Pl. Arch.*, **17** (1): 427-432.
- HANCHINAL, S. N., 1999, Privatization of Extension Service: Attitude and preference of farmers and extension personnel. *Ph. D. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.
- HANJABAM, S., 2014, Analysis of the profile characteristics and attitude of the farmers, extent of adoption and constraints in taking up precision farming in Kerala. *Int. J. Hum. Soc. Sci.*, **1** (2): 258-289.

- HARISH, L., 2010, A study on knowledge, adoption and economic performance of crossandra growers in Chickballapura and Chitradurga districts of Karnataka state. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- HARISHA, N., 2017, A study on vegetable production under protected cultivation in Kolar district of Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Raichur.
- HARISHA, N., TULSIRAM, J., METI, S. K., CHANDARGI, D. M. AND JOSHI, A. T., 2020, Extent of adoption of tomato cultivation practices among farmers under shade nets in Kolar district of Karnataka. *Indian J. Ext. Edu.*, **55** (1): 28-33.
- HARSHAL, E., PREMOD, N. AND CHAUDARI, M., 2006, Precision agriculture - A new form of agriculture to maximize crop production and minimize the environmental damage. *Agric. Update.*, **1** (2): 24-25.
- HEWETT, E. W., 2012, High-value horticulture in developing countries: barriers and opportunities. *CAB Reviews.* **7** (54):1-16.
- HIREMATH, N. S., 2000, Participation of rural youth in farm and non-farm activities in Dharwad taluk. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agri. Sci., Dharwad.
- IYIADE, A.F., 2013, Comparative economic analysis of indigenous and exotic vegetables in Ibadan metropolis, Oyo State, Nigeria. *Pac. J. Sci. Tech.*, **14** (1): 246-250.
- JAISWAL, V., SINGH, K.C., KURMI, J. AND SINGH, S., 2020, Entrepreneurial behavior of vegetable growers at Gangeo block of Rewa District (MP). *J. Pharmacogn. Phytochem.*, **9** (3): 1688-1690.
- JAYASANKAR, R., SNEHA, V. AND MUTHU KUMAR, R., 2020, Technological and cultivational knowledge of the PMKSY beneficiaries about grape cultivation with drip irrigation in Tamil Nadu. *Pl. Arch.*, **1** (20): 1589-1592.
- JAYSWAL, P. S., PARMAR, V. S. AND JOSHI, N. S., 2019, Constraints faced by the farmers in adoption of improved cultivation practices of gram. *Guj. J. Ext. Edu.*, **54** (2):118-121.

- JETHI, R., ROY, M. L., MUKHERJEE, A., CHANDRA, N. AND JOSHI, P., 2019, Knowledge level of vegetable growing farmers in hills of Uttarakhand: A comparative study. *J. of Multidiscip. Adv. Res.*, **8** (2): 1-8.
- JHA, K. K. AND DAS, R., 2019, Adoption of recommended production technology by chilli growers in Tripura. *Indian. J. Ext. Edu.*, **55** (3): 117-122.
- KARANGAMI, R. S., 2017, Adoption of recommended rice cultivation practices by the farmers from Palghar district. *M. Sc. (Agri.) Thesis*, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.
- KARAT, SHILPA. AND BABY, SMITHA., 2020, Entrepreneurial behaviour of polyhouse farmers in Kerala. *Int. J. Agric. Sci. Res.*, **10** (2): 29-40.
- KARTHIKEYAN, S., BHUVANESWARI, K., KENNEDY, J. S., SUGANTHI, A., ASHOK, K. R. AND SHANMUGASUNDARAM, R., 2020, Constraints faced by cabbage farmers of the Nilgiris district in the adoption of IPM technology. *J. Entomol. Zool. Stud.*, **8** (1): 1007-1010.
- KASINATH, B. L., LAL, S. V., KUMAR, S., KAPOOR, P., BASANTIA, D., MEENA, B.L., KUMAR, M., PAUL, T., AHMED, S. Z. AND KUNDU, A., 2018, Knowledge level of North Andaman farmers towards scientific vegetable cultivation practices-A case study. *Pl. Arch.*, **18** (2): 2443-2447.
- KAUR, K., KAUR, P. AND SINGH, K., 2017, Adoption status of various sowing practices of protected cultivation of vegetables in Punjab, India. *Int. J. Curr. Microbiol. Appl. Sci.*, **6** (12): 801-812.
- KHATING, S. M., KAPSE, P. S. AND KAUSADIKAR, H. K., 2018, Correlates of knowledge and adoption of recommended cultivation practices of onion among the growers. *Int. J. Curr. Microbiol. Appl. Sci.*, Special Issue-6: 2487-2491.
- KOLGANE, B.T., SURAMWAD, S. R. AND DOUND, R. V., 2018, Study the entrepreneurial behaviour of pomegranate growing farmers in Solapur district of Maharashtra state. *J. Pharmacogn. Phytochem.*, **7** (1): 2956-2958.

- KOWSHALYA, K. S., 2016, Impact of Integrated Farming System Demonstration (IFSD) programme on livelihood and nutritional security of farmers of Mandya district. *Ph. D. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- KUDARI, B. M., 2014, A study on perception of precision farming by the farmers. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.
- KUMAR, P. P., 2019, A study on the knowledge and adoption of the recommended production technologies by the red gram growers of Prakasam district of Andhra Pradesh. *M. Sc. (Agri.) Thesis* (Unpub.), Acharya N.G. Ranga Agric. Univ., Guntur.
- KUMAR, P., CHAUHAN, R. S., GROVER, R. K., 2016, Economics analysis of tomato cultivation under poly house and open field conditions in Haryana, *Ind. J. Appl. Nat. Sci.*, **8** (2):846-848.
- KUMAR, S., ROY, M. L. AND MUKHERJEE, A., 2018, Marketing behaviour of vegetable growers in Uttarakhand hills.
- KUMARA, N., FAROOQUEE, A. N. AND SASIDHAR, P. V. K., 2015, Entrepreneurial behaviour of vegetable growers in Karnataka-India. *Indian. J. Econ. Dev.* **12** (2): 47-54
- KUMARI, K., 2015, A study on impact of front-line demonstration on area and productivity of wheat growers in Jabalpur district. *M. Sc. (Agri.) Thesis* (Unpub.), Jawaharlal Nehru Krishi Vishwa Vidyalaya., Jabalpur.
- LAKSHMINARAYANA, M. T., 1997, Adoption of sustainable sugarcane farming practices - An analysis, *Ph. D. (Agri.) thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- LAVANYA, B. T., 2010, Assessment of farming system efficiently in Theni district of Tamil Nadu. *M.Sc. Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- LAXMI, B. B., 2012, An analysis of adoption level and economic performance of Bt cotton growers in Gadag district of Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.

- LOHARE, R., 2017, A study on knowledge and adoption of chickpea production technology among the farmers in Tirla block of Dhar district. *M. Sc. (Agri.) Thesis* (Unpub.), Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya., Gwalior
- MAHADEVAPPA, M., 2015, Constraints in production and marketing of organic vegetable growers in Belagavi district of Karnataka. *Int. J. Curr. Res.*, **7** (12): 24816- 24819.
- MAHATAB ALI, K.M., 2010, A study on knowledge and adoption of aerobic rice growers in Eastern dry zone of Karnataka state. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- MALLA, A. K., 2019, A study on knowledge level of KVK trained vegetable growers. *Asian. J. Agric. Ext. Econ. Socio.*, **30** (3): 1-6.
- MAMATHALAKSHMI, N., 2010, Performance evaluation of chrysanthemum growers in Mandya district of Karnataka. *M.Sc.(Agri.) Thesis* (Unpub.), Univ. Agri. Sci., Bangalore.
- MANSURI, F., 2020, Extent of adoption of chickpea production technology in Vidisha district. *M. Sc. (Agri.) Thesis* (Unpub.), Jawaharlal Nehru Krishi Vishwa Vidyalaya., Jabalpur.
- MARATHA, P., 2015, A study on marketing behaviour of vegetable growers in Morar block of Gwalior district. *M. Sc. (Agri.) Thesis* (Unpub.), Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya., Gwalior.
- MISHRA, K., MISHRA, O. P., KUMAR, L. AND SINGH, S. K., 2018, Utilization pattern of mobile phone technology (Smart Phone) among the farmers of Nagaur district in Rajasthan. *Ind. Res. J. Ext. Edu.*, **17** (4): 117-121.
- MORE, S. H., KADAM, J. R., DESHMUKH, S. K. AND ZAGADE, P. M., 2021, Constraints faced by the vegetable growers in marketing of vegetables and suggestions to overcome these constraints. *Int. J. Adv. Agric. Sci. Tech.*, **8** (1): 29-32.

- MOULIK, T. K. AND RAO, C. C., 1973, Self-rating scale of farmers; Measurement in Extension research.
- MUKHERJEE, A., SINGH, P., BURMAN, R. R., SHUBHA, K. AND ROY, M. L., 2019, Development of test to measure knowledge level of farmer's producer organization members about improved hill agricultural practices. *J. Comm. Mobil. Sustain. Dev.*, **14** (1): 57-64.
- MUTTEPPA CHIGADOLLI, 2018, A study on knowledge and extent of adoption of improved cultivation practices by turmeric growers of Belagavi district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- NAIK, K. S. AND DESHMUKH, P. R., 2016, Knowledge and adoption of recommended package of practices of banana growers. *Agric. Upd.*, **11** (1): 41-44.
- NASRIN, M., BORUA, S., BORUA, R. AND DEKA, B., 2017, Knowledge level of farmers on recommended cultivation practices of off-season vegetable crops under low-cost polyhouse technology in Assam. *Asian. J. Agric. Ext. Econ. Socio.*, **21** (4): 1-6.
- NATWADIA, R., 2021, Knowledge and adoption of drip system of irrigation of vegetable growers in the adopted villages of SKNAU, Jobner. *M. Sc. (Agri.) Thesis* (Unpub.), Sri Karan Narendra Agric. Univ., Jobner.
- NAVEEN KUMAR, S., 2016, A study on knowledge and adoption of post -harvest technologies by turmeric growers of Bagalkot district. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.
- NAYAK, U. S., DAS, S. R. AND SHIAL, G., 2020, Perception and adoption level of improved off-season tomato cultivation practice among farm women of Odisha. *Int. J. Bio-Resour. Stress Manag.*, **11** (3): 297-303.
- NITHIYA, S., 2014, TN-IAMWARM project: Socio-economic impact of precision farming in sugarcane. *M. Sc. (Agri.) Thesis* (Unpub.), Tamil Nadu. Agric. Univ., Coimbatore.

- OLADELE, O. I., 2011, Contribution of indigenous vegetables and fruits to poverty alleviation in Oyo State, Nigeria. *J. Hum. Ecol.*, **34** (1): 1-6.
- OMORUYI, C., 2016, Economic analysis of cabbage production in Plateau state, Nigeria. *Ph. D. (Agri.) Thesis* (Unpub.), Ahamadu Bello Univ., Zaria.
- PACHIYAPPAN, P., KUMAR, P., REDDY, K.V., KUMAR, K. N. R., KONDURU, S., PARAMESH, V., RAJANNA, G. A., SHANKARAPPA, S. K., JAGANATHAN, D. AND IMMANUEL, S., 2022, Protected cultivation of horticultural crops as a livelihood opportunity in Western India: An economic assessment. *Sustainability.*, **14** (12): 7430.
- PADMA, S. R., 2013, Perspectives of stakeholders on precision farming by the farmers. *Ph. D. (Agri.) Thesis* (Unpub.), Tamil Nadu. Agric. Univ., Coimbatore.
- PALANIAPPAN, V. AND RADHAKRISHNAN, B., 2020, Factors influencing consumers' purchasing behaviour on exotic vegetables in Coimbatore city. *Asian J. Agric. Ext. Econ. Sociol.*, **38** (12): 122-133.
- PARMAR, N. R., 2015, Comprehensive awareness among the farmers about the application of bio-fertilizers in Anand district. *M. Sc. (Agri.) Thesis* (Unpub.), Anand. Agric. Univ., Gujarat.
- PARUSHNI, M. G., 2017, A study on technological gap of ginger cultivation in Shivamogga district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Hort. Sci., Shivamogga.
- PARVEEN KUMAR, N., CHAUHAN, R. S., MEHTA, V. P. AND BHATIA, J. K., 2018, A review on economic aspect of protected cultivation in India. *Res. Trends Hort. Sci.*, **7** (3): 43-59.
- PASHA, M., AHMED, T. AND PRASAD, R. K. P., 2016, Critical analysis of adoption pattern of pomegranate growers in Koppal district. *Int. J. Sci. Nature*, **7** (1): 94-96.
- PATEL, G. R., PATEL, N. K. AND PATEL, G. D., 2015, Adoption of new production technology of tomato in Navsari district of south Gujarat. *J. Sci.*, **5** (12): 1305-1308.

- PATHADE, S. S., SAWANT, M. N., SADASHIVE S. M., PORDHIYA, K. I. AND RAMESH, N., 2017, Study of socio-economic and psychological characteristics of self-help group Members. *Indian. Res. J. Ext. Edu.*, **53** (4): 129-131.
- PATIL, P. P., 2014, Technological gap in turmeric production technology in Sangli district. *M.Sc. (Agri.) Thesis* (Unpub.), Mahatma Phule Krishi Vidyapeeth., Rahuri.
- PATIL, R., 2017, Economic analysis of marketing channel of grapes in Maharashtra. *Int. Res. J. Agric. Eco. Stat.*, **8** (1): 21-25.
- PATIL, S. P. AND NAGNUR, S., 2016, Participation of farm women involved in chilli cultivation. *Int. J. Home Sci. Ext. Commun. Manage.*, **3** (1): 1-7.
- PATIL, V.F., 1990, a critical Analysis of gap and constraints in the adoption of improved rice cultivation practices in Konkan region, Maharashtra. *Ph. D. (Agri.) Thesis* (Unpub.), Uni. Agric. Sci. Dharwad.
- PAWAR, P. B., HADOLE, S. M. AND UGALE, T. B., 2019, Adoption of recommended production technology by tomato growers in Nashik district of Maharashtra. *Guj. J. Ext. Edu.*, **5** (1): 136-139.
- POTALE, S. D., 2016, Knowledge and adoption of floriculture technology by the polyhouse owners. *M. Sc. (Agri.) Thesis* (Unpub.), Mahatma Phule Krishi Vidyapeeth., Rahuri.
- PRAKASH, P., KUMAR, P., KAR, A., KISHORE, P., SINGH, A. K. AND IMMANUEL, S., 2021, Protected cultivation in Maharashtra: determinants of adoption, constraints, and impact. *Agric. Econ. Res. Rev.*, **34** (2): 217-228
- PRAMOD, GUPTA, S., SHARMA, K. C., BADHALA, B. S. AND SHARMA, R. N., 2022, Knowledge and association of solar pump users regarding vegetable production technology in Jaipur Rajasthan. *Indian J. Ext. Educ.*, **58** (3): 29-32.
- PRASAD, H. V. AND VENKATARAMULU, P. S. M., 2018, Study on farmer level of knowledge toward vegetable cultivation. *J. Res.*, **46** (2): 75-82.

- PRAVEEN, K., CHAUHAN, R. S. AND GROVER, R. K., 2015, Comparative economics of cucumber cultivation under polyhouses and open field conditions in Haryana. *Indian J. Econ. Dev.*, **3** (7): 1-4.
- RAGHUWANSHI, N., YADAV, J. P., GHOSLYA, A. K., KUMAR, V. AND BIJARNIA, S. R., 2020, Knowledge of solar energy technology by the farmers of Jaipur district in Rajasthan. *Int. J. Cur. Microbiol. App. Sci.*, **9** (3): 660-663.
- RAJASREE, R., SHARMA, F. L. AND UPADHYAY, B., 2019, Association between the characteristics of vegetable growers and level of adoption of eco-friendly technologies in vegetable cultivation. *Indian. Res. J. Ext. Edu.*, **19** (4): 15-84.
- RAJESH, C. M., 2020, Performance of horticulture crop growers under protected cultivation in Chikkaballapura district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- RAKSHA, R., RITA GOEL, R.G. AND LALI YADAV, L.Y., 2012, Constraints faced by rural women in procurement and utilization of credit facilities in Hisar district. *J. Res. ANGRAU.*, **40** (4): 29-35.
- RAO, C.C. AND SASANKA, V.M., 2015, Exotic Veggies: A practical utility of innovation-lured by the easy returns. *Int. J. Appl. Res.*, **1** (12): 1038-1041.
- RAO, K. V. R., AGRAWAL, V., CHOURASIA, L., KESHRI, R., AND PATEL, G. P., 2013, Performance evaluation of capsicum crop in open field and under covered cultivation. *Int. J. Agric. Sci.*, **9** (2): 602-604.
- RAVI, D. AND PATIL, B. L., 2019, Constraints experienced and suggestions by farming community in adaptation to climate change in Karnataka: An economic analysis. *Int. J. Curr. Microbiol. App. Sci.*, **8** (2): 376-383.
- RAWAL, J., 2017, A study on extension needs of vegetable growers in Kumaon Region of Uttarakhand. *M.Sc. (Agri.) Thesis* (Unpub.), G.B. Pant Univ. Agric. Technol., Pant Nagar.

- REDDY, I. V., 2017, Adoption gap in chilli production technology. *M. Sc. (Agri.) Thesis* (Unpub.), Dr. Panjab Rao Deshmukh Krishi Vidyapeeth., Akola.
- RITURAJ, B., BORUA, S., DEKA, C. R. AND BORAH D., 2015, Entrepreneurial behaviour of tribal winter vegetable growers in Jorhat district of Assam. *Indian. Res. J. Ext. Edu.*, **15** (1): 65-69.
- ROHIT, J., DUBEY, S. K., SINGH, P., SINGH, B. K. AND KUMBHARE, N. V., 2017, An assessment of constraints faced by the farmers in peri-urban vegetable cultivation. *Int. J. Curr. Microbiol. Appl. Sci.*, **6** (10): 2245-2251.
- RULI, S. S., GOUDAPPA, S. B., REDDY, B. S. and SHASHIDHARA, K. K., 2022, Adoption level of farmers on protected cultivation technologies in Kalyana Karnataka region of Karnataka. *Pharma. Innov. J.*, **11** (6): 1077-1081.
- SAHANA, S. AND GAYATHRI, G. N., 2022, Socio-economic profile of fruits and vegetable growers: An after the fact research. *Asian. J. Agric. Ext., Econ. Soc.*, **40** (11): 175-184.
- SAI TEJASHREE, G., 2022, Cognitive and adoption behaviour of horticulture crop growers towards precision farming technologies in Eastern Dry Zone of Karnataka. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- SATPATHY, A., LENKA, S. AND PRUSTY, A. K., 2021, A study on the constraints faced by the vegetable growers and suggestions to overcome in east Singhbhum district of Jharkhand. *Environ. Ecol.*, **39** (4): 1319-1323.
- SEHGAL, B., 2019, Knowledge of farmers regarding polyhouses. *J. Pharmacogn. Phytochem.*, **8** (3): 3805-3808.
- SHANABHOGA, M. B., 2016, Impact of public and private agriculture extension on production and income of pomegranate growers. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bengaluru.

- SHANKARAIHAH, C. AND CROUCH, B. R., 1997, Patterns of adaptation of factors associated with economic success in wool Industry, Department of Agriculture, University of Queensland, Brisbane, Australia.
- SHASHIDHAR, D. N., 2004, A study on influencing factors and constraints in drip irrigation by horticulture farmers of Bijapur district of Karnataka. *M.Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad, Karnataka.
- SHIRUR, M., 2015, A study on mushroom entrepreneurship and consumer behaviour in Karnataka. *Ph. D. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- SHITU, A. G., 2014, Comparative analysis on precision farming technologies in selected crops of North Eastern Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Raichur.
- SHRIKRISHANA, K. R., 2015, Technological gap in pigeon pea production technology. *M. Sc. (Agri.) Thesis* (Unpub.), Vasanttrao Naik Marathwada Krishi Vidyapeeth, Parbhani.
- SIDDAYYA, S. AND REDDY, S. V., 2015, An intervention approach to enhance vegetable production through growers' association in Karnataka. *Indian. J. Econ. Dev.*, **11** (3): 685-692.
- SINGH, B. 2019, Impact of front-line demonstrations on knowledge and adoption of improved chickpea production technology among farmers in KVK Sheopur (M.P.). *M.Sc. (Agri.) Thesis* (Unpub.), Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya., Indore.
- SINGH, D., YADAV, R. N., SINGH, D. K., PRAKASH S. AND KUMARI, S., 2017, Study on personal socio-agro-economic, psychological and communicational characteristics of the vegetable growers in western Uttar Pradesh. India. *Int. J. Curr. Microbiol. App. Sci.*, **6** (7): 2255-2262.

- SINGH, R. P., 2013, Horticultural (high value agricultural) crops diversification in eastern India: II – Employment opportunities and income generation strategies. *Int. J. Innov. Hortic.* **2**(1): 28-43.
- SIVASHANKAR, N., AND SHASHIDHAR, K. K., 2016, Adoption behaviour of jasmine cultivation in Bellary district of Karnataka State. *Indian. Res. J. Ext. Educ.*, **11** (21): 23-26.
- SOMVANSHI, R. M., DESHMUKH, A. N., MOKHALE, S. U. AND GODASE, S. K., 2016, Entrepreneurial behaviour of vegetable growers. *Agric. Upd.*, **11** (3): 239-241.
- SRIDEVI, K. AND SEKAR, V., 2014, Marketing behaviour of coffee growers. *J. Ext. Educ.*, **26** (2): 5229-5235.
- SRINIVAS, M. V., VENKATAREDDY, Y. B. AND LAKSHMAN, R. B. S., 2014, A study on marketing practices followed by tomato growers and source of market information. *Int. J. Mark. Hum. Resour. Manag.*, **5** (4): 01-05.
- SRINIVAS, M. V., REDDY, B. L. AND REDDY, Y. V., 2016, Marketing behaviour of vegetable growers. *Agric. Upd.*, **11** (4): 434-437.
- SUMAN, R. S., 2019, Socio-economic and psychological characteristics of vegetable growers. *Int. J. Recent. Sci. Res.*, **10** (1): 30544-30547.
- SUMANA, N. A., 2017, Entrepreneurial behaviour and marketing practices of grape growers in Chikkaballapura district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- SUNDRESHA, B. R., 2018, A study on knowledge and adoption of improved cultivation practices by ginger growers in Hassan district. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Bangalore.
- SUPE, S.V., 1969, Factors related to different degrees of rationality in decision making among farmers in Buldhana district. *Ph. D. (Agri.) Thesis* (Unpub.), Indian Agricultural Research Institute, New Delhi.

- SUSHMA, K. C., 2007, An analysis of enterprenuring development in women through EDP training, *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agric. Sci., Dharwad.
- SYED, H., M. AND NAYAN, R., 2016, Adoption behaviour of brinjal (*Solanummelongena L*) growers in Nawada block of Nawada district of Bihar. *Int. J. Engine Techno. Manage Appl. Sci.*, **9** (4): 44-48.
- THAKUR, B. S., SHARMA, R. AND KOTA, C., 2020, A study on extent of adoption of recommended Chilli (*Capsicum annum L.*) production technology among the farmers of Patharia in Madhya Pradesh. *Int. J. Agric. Invent.*, **5** (2): 255-261.
- TRIVEDI, G., 1963, Measurement analysis of socio-economic status in rural families. *Ph. D. (Agri.) Thesis*, (Unpub.), Indian Agricultural Research Institute, New Delhi.
- UMRETIYA, K., 2015, A comparative study on adoption of improved chickpea varieties in Indore district of Madhya Pradesh. *M. Sc. (Agri.), Thesis* (Unpub.), R.V.S.K.V.V., Indore.
- VEDAMURTHY, H. S., 2002, A study on Arecanut management practices in Shimoga district in Karnataka. *M. Sc. (Agri.) Thesis* (Unpub.), Univ. Agri. Sci., Dharwad.
- VEENA, C. M., 2017, Yield gap analysis of rice in Kabini command area of Karnataka. *M. Sc. (Agri.), Thesis* (Unpub.), Univ. Agric. Sci., Bengaluru.
- VERMA, H. L. AND SHARMA, S. K., 2020, Adoption of drip irrigation system by the farmers in Bikaner district of Rajasthan. *Int. J. Cur. Microbiol. App. Sci.*, **9** (3): 2231-2335
- VINAYAK N. N., 2014, A study on knowledge adoption and economic performance of arecanut growers in North Canara district of Karnataka. *M. Sc. (Agri.), Thesis* (Unpub.), Univ. Agri. Sci., Bangalore.
- WANKHADE, S. A., 2018, Knowledge and adoption of protected cultivation technology by capsicum growers in Maharashtra. *M. Sc. (Agri.), Thesis* (Unpub.), Mahatma Phule Krishi Vidyapeeth., Rahuri.

- WONGNAA, C. A., AKURIBA, M. A., EBENEZER, A., DANQUAH, K. S. AND OFOSU, D. A., 2019, Profitability and constraints to urban exotic vegetable production systems in the Kumasi metropolis of Ghana: a recipe for job creation. *J. Glob. Entrep. Res.*, **9** (4): 1-19.
- YADAV, S., 2021, Assessment of knowledge level on soil health management practices among the vegetable growers of Amber Tehsil in Jaipur district of Rajasthan. *M. Sc. (Agri.) Thesis (Unpub.)*, Sri Karan Narendra Agric. Univ., Jobner.
- YADAV, S., PRAJAPATI, R. R. AND PRAJAPATI, M. R., 2014, Knowledge and adoption of tomato growers about improved tomato production technology. *Guj. J. Ext. Educ.*, **25** (2): 172-174.
- YASHASWINI, M.A., 2013, Effectiveness of Front Line Demonstrations of Krishi Vigyana Kendra on FLD Farmers of Mandya District. *M. Sc. (Agri.) Thesis (Unpub.)*, Univ. Agric. Sci., Bangalore.
- YASHODHARA, B., 2015, A comparative analysis of livelihood status in irrigated and rainfed farming situations in central dry zone of Karnataka. *Ph. D. (Agri.) Thesis (Unpub.)*, Univ. Agric. Sci., Bangalore.

# **APPENDICES**

**UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE**  
**DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION**

**INTERVIEW SCHEDULE**

**“COGNITIVE LEVEL AND ADOPTION BEHAVIOR OF EXOTIC  
VEGETABLE GROWERS IN BENGALURU RURAL DISTRICT  
OF KARNATAKA”**

**PART-I**

Respondent No: \_\_\_\_\_

**I. General information about the respondents**

1. Name of the respondent: \_\_\_\_\_

2. Village : \_\_\_\_\_

3. Taluk : \_\_\_\_\_

4. District: **Bengaluru Rural District**

**II. Personal information about the respondents**

5. Age (Completed Years) : \_\_\_\_\_

6. Education Level : \_\_\_\_\_

i. Illiterate

ii. Primary school

iii. Middle school

iv. High school

v. Pre-university

vi. Graduate

7. Family size: (No. of members) : \_\_\_\_\_

Sl. No.	Category	Male	Female
1	Adult		
2	Children		
3	Total		

8. Annual income from all sources: Rs. \_\_\_

9. Farming experience: \_\_\_\_\_ years

10. Land holding (Acres): \_\_\_\_\_

- i. Dry land
- ii. Wet land
- iii. Garden land

### 11. Extension Agency contact

Frequency often you contact extension personnel in your area

Sl.No	Extension personnel	Frequency of contact				
		Once in a				Never (0)
		Week (4)	Fortnight (3)	Month (2)	While (1)	
1.	ADA					
2.	AO					
3.	AAO					
4.	University scientist (KVK scientist/others)					
5.	AHO					
6.	Veterinary officer					
7.	Others (specify)					

### 12. Extension participation

Indicate the extent to which you have participated in the following extension activities during the last one year

Sl. No.	Extension activities	Particulars		
		Regularly (2)	Occasionally (1)	Never (0)
1.	Krishimela			
2.	Demonstration			
3.	Training program			

4.	Group discussion			
5.	Agricultural Exhibition			
6.	Educational tour			
7.	Campaign			
8.	Field visit			
9.	Farmers field school			
10.	Exposure tour			
11.	Farm and home visit			
12.	Any other (Specify)			

### 13. Achievement motivation

Please express your feelings about these statements by indicating the degree of your agreement or disagreement with Strongly Agree (SA), Agree (A) or Disagree (DA)

Sl. No.	Statements	Response category		
		SA (3)	A (2)	DA (1)
1	Work should come first even if one cannot get proper rest in order to achieve one's goals			
2	It is better to be content with whatever little one has, than to be always struggling for more			
3	No matter what I have done I always want to do more			
4	I would like to try hard at something really difficult even if it provides that I cannot do it			
5	The way things are now-a-days discourage one to work hard			
6	One should succeed in occupation even if one has to neglect this family			

### 14. Risk bearing ability

Please state your response for the following statements with Agree (A) or Disagree (DA)

Sl.No	Statements	Response category	
		A (1)	DA (0)
1	A farmer should grow more number of crops to avoid greater risks involved in growing one or two crops		
2	A farmer who is willing to take greater risks than the average farmer usually has better financial condition		

3	It is good for a farmer to take risks when he knows his change of success is fairly high		
4	It is better for a farmer not to try new farming methods unless other farmers have used them (-)		
5	Trying on entirely new method in farming by a farmer involves risks but it is worth trying		

## 15. Cosmopolitaness

a. Please indicate the number of times you visit the nearest town.

1. Two or more times in a week (5)
2. Once in a week (4)
3. Once in fifteen days (3)
4. Once in a month (2)
5. Seldom (1)
6. Never (0)

b. Generally what would be the main purpose of your visit

1. All visits relating to agriculture (5)
2. Some visits relating to agriculture (4)
3. Personal/Domestic (3)
4. Entertainment (2)
5. Others (1)
6. No response (0)

## 16. Innovativeness

Please indicate your agreement or disagreement for the following with Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA) and Strongly Disagree (SDA)

Sl. No.	Statements	Response category				
		SA (5)	A (4)	UD (3)	DA (2)	SDA (1)
1	I am very much interested in adopting whatever new practices that are helpful in better farming					

2	Since, we are not sure of the new practices, I would like to wait till others adopt					
3	Since new practices are not profitable, I am not interested in any of them.					
4	I try to keep myself well informed about the improved practices and try to adopt as soon as possible.					
5	New practices are not easily adoptable and hence I do not adopt.					

### 17. Mass media participation

Sl.No.	Source	Participation		
		Regular (2)	Occasional (1)	Never (0)
1	Reading newspaper			
2	Reading farm magazines			
3	Listening to radio			
a	Listening to krishi programmes			
b	Listening hints to farmers			
4	Watching television			
a	Watching agricultural programmes			

### 18. Scientific orientation

Please indicate your response strongly agreement/ agreement/disagreement for the following statements

Sl.No	Statements	Response category		
		SA (2)	A (1)	DA (0)
1	A farmer who is willing to take great risk than average farmer usually does better financially			
2	It is better for a farmer not to try new farming methods unless most others have used them with success (-)			
3	New method of farming gives better result to a farmer than old method			
4	Even a farmer with lot of experience should use new method of farming			
5	Though it takes time for farmers to learn new farming methods it is worth the efforts.			

6	In order to have our lands productive and ecofriendly, the present system of farming needs to be modified			
7	A good farmer experiments with new idea in farming			
8	The way our forefathers were practicing is still is the best way follow today (-)			

## PART II

### I. Cognitive and adoption behavior of broccoli growers

Sl. No.	Technologies	Recommendation	Knowledge		Adoption			
			CK	ICK	FA	PA	NA	Reason
1.	In which type of soil, you are growing broccoli?	Sandy and silt loam soil are most suited. It prefers well drained upland soil.						
2.	What is the recommended range of pH suitable for growing broccoli?	pH of 5.8-7.2						
3.	Which type of climate is suitable for cultivation of broccoli?	Cool season crop Sensitive to high and low temperature Optimum temperature range 10-25°C						
4.	How will you prepare the nursery bed?	<ul style="list-style-type: none"> <li>• Decomposed FYM or compost @4 Kg/m<sup>2</sup>.</li> <li>• Seeds treatment - captan or thiram @2.5g/Kg.</li> <li>• Spacing 2-3 cm between seeds and 8-10 cm between lines. The depth of sowing is 1-1.5 cm.</li> </ul> Light irrigation is provided after sowing the seeds						
5.	Seed rate/ Seedling per acre	12,000 Seedlings per acre						
6.	<b>Varieties</b> Do you know recommended varieties / hybrids of Broccoli? Which variety/ hybrid you use?	Pusa KTS-1 Solan Green Head Fiesta Lucky Pushpa						

7.	<b>Transplanting</b>	The seeds are ready for transplanting 30-35 days' age seedling.						
8.	<b>Spacing</b>	Transplanting should be done in the afternoon at a distance of 45×30 cm.						
9.	<b>Irrigation</b>  Which type of irrigation do you follow?	Micro irrigation  Frequent but light irrigation is essential throughout crop growth. Irrigation given at 2-3 days interval						
10.	Fertilizer application  <b>FYM Application</b>  What is the recommended quantity of FYM for broccoli crop?	15-20 tonnes per hectare						
11.	<b>Chemical fertilizers</b>  What is the recommended dose of fertilizer for broccoli? (as basal and top dressing)	120:80:60 NPK/ha 10 Kg boron  Half dose of nitrogen and full dose of phosphorous, potash and boron should be given at the time of transplanting and remaining nitrogen should be given at the time of transplanting and remaining nitrogen should be given in two splits doses i.e.30 and 45 days after transplanting as top dressing.						
12.	Intercultural operations  Weed Management							

13.	Plant protection  Which are the pests noticed in the field/crop?  How would you manage the following important Pests?	Cut worm Leaf Webber Aphids						
i)	Cutworm	a) Picking and destruction of larvae at the early stage of the crop. b) Spraying of the heavily infested crop with Rogor @2-3ml/lit of water.						
ii)	Leaf Webber	a) Picking and destruction of larvae at the early stages. b) Crop should be sprayed with Cyfluthrin @ 0.5ml/ lit of water.						
iii)	Aphids	Neem seed kernel extract can be sprayed at 4 percent.						
14.	<b>Disease Management</b> Which are the diseases noticed in the field/crop? How do you manage damping off?	Damping off  i. Seed treatment with captan or thiram @ 2.5g/Kg seeds Seedling should be treated with Bavistin@ 1g/lit or Dithane M 45 @ 2g/lit of water						
15.	<b>Harvesting</b> a) What is the ideal stage for harvesting broccoli?  b) What is the recommended yield of Broccoli per acre? How many pickings you do?  How much yield you obtained per acre?	80-90 days of transplanting.  150-240 q/ha						

**CK-Correct knowledge, IK-Incorrect knowledge FA-full adoption PA-Partial adoption, NA-No adoption**

## II. Cognitive and adoption behavior of lettuce growers

Sl. No.	Technologies	Recommendation	Knowledge		Adoption			
			CK	ICK	FA	PA	NA	Reason
1.	In which type of soil, you are growing lettuce?	Sandy and silt loam soil are most suited. It prefers well drained upland soil.						
2.	What is the recommended range of pH suitable for growing lettuce?	pH of 5.7-7						
3.	Which type of climate is suitable for cultivation of lettuce?	Cool season crop Optimum temperature range 15-25°C						
4.	How will you prepare the nursery bed?	<ul style="list-style-type: none"> <li>• 7.5m(l)×1.2m(w)×10cm (h)- 5 nursery beds prepared for 1 ha</li> <li>• 20 kg FYM and 15:15:15 complex fertilizer added to soil</li> <li>• Seeds sown at a distance of 7.5 cm rows</li> </ul>						
5.	Seed rate/ Seedling per acre	12,000-13000 seedlings per acre. 250 gm (seeds)/ha						
6.	Varieties Do you know recommended varieties / hybrids of Lettuce? Which variety/hybrid you use?	Leaf type - (Chinese yellow and snow bolt) Head type- (Great lake)						
7.	Transplanting	35-40 days old seedling						

8.	spacing	<ul style="list-style-type: none"> <li>Transplanting should be done in the afternoon at a distance of 45×30 cm</li> </ul>						
9.	Irrigation Which type of irrigation do you follow? Do you have knowledge about drip/sprinkler irrigation? (Yes/No)	Micro irrigation						
	Frequency of irrigation	Frequent but light irrigation is essential throughout crop growth. 2-3 days interval						
10.	Fertilizer application FYM Application What is the recommended quantity of FYM for lettuce crop?	25 tonnes per hectare						
11.	Chemical fertilizers What is the recommended dose of fertilizer for Lettuce?	150:100:100 NPK/ha						
12.	Intercultural operations Weed Management	Shallow hoeing to remove weeds and avoid injury to roots after 20-25 days of transplanting.						
13.	Plant protection Which are the pests noticed in the field/crop? How would you manage the following important pests?	Cut worm, Leaf Webber, Aphids						

i)	Cutworm	a) Picking and destruction of larvae at the early stage of the crop.						
		b) Spraying of the heavily infested crop with Rogor @2-3ml/lit of water						
ii)	Leaf Webber	a) Picking and destruction of larvae at the early stages.						
		b) Crop should be sprayed with Cyfluthrin @ 0.5ml/lit of water						
iii)	Aphids	Neem seed kernel extract can be sprayed at 4 percent						
14.	Disease Management  Which are the diseases noticed in the field/crop? How do you manage damping off?	Damping off Leaf spot Phosphamidon 0.5ml/lit (or) Dimethoate 1.7ml/lit (or) quinalphos 2ml/lit and 3gm copper oxychloride (or) 2gm mancozeb in 1lit of water and spray 2-4 weeks after sowing.						
15.	Harvesting a) What is the ideal stage for harvesting lettuce?	The crop become ready for harvesting after 45-70 days of after sowing the seeds.						
	b) What is the recommended yield of Lettuce per acre?	120-150 q/ha						

### III. Economic performance of exotic vegetable growers

#### Cost of cultivation of exotic crop per acre in Rs

Sl.No	Particulars	Broccoli	Lettuce
A	Variable cost		
	Land preparation		
	For seed or seedling		
	Irrigation charge		

	Manures		
	Fertilizers		
	Plant Protection		
	Micro Nutrients		
	Hired Labour		
	Family Labour		
	Machine Labour		
	Miscellaneous		
	Interest on Working capital		
	Total Variable Cost		
B	Fixed cost		
	Rental value of own land		
	Rent paid for leased in land		
	Depreciation on farm implements and Buildings		
	Interest on fixed capital		
	Total Fixed cost		
	Total cost (A+B)		

## 2. Returns from cultivation of exotic vegetable crop per acre

Particulars	Broccoli	Lettuce
Yield (qtls/ha)		
Price (Rs/qtls)		
Gross returns		
Total cost		
Net return		
Benefit cost ratio		

## **PART-III**

### **Marketing behaviour of Exotic vegetable growers**

#### **1. From which source do you collect the price information?**

- a) News paper
- b) Radio
- c) Government agency (KVK, RSK, Agril Universities, USDA, ICAR)
- d) Personally visiting market
- e) Others who visit the markets
- f) Wholesalers
- g) If any other specify

#### **2. Where do you sell the produce?**

- a) Local market at the village level
- b) Sell directly to consumer
- c) APMC
- d) Wholesalers
- e) Online platforms
- f) Co-operative marketing
- g) If any other (please specify)

#### **3. Time of selling the produce?**

- a) Sale after the harvest if the prices are favourable
- b) Store for some time and selling the produce
- c) If any other (please specify)

#### **5. Are you storing the produce? Yes/No If yes, indicate which storage method you are following.**

- a) Vacuum cooling systems
- b) Cold storage facilities
- d) Dry storage facilities
- e) Traditional storage structures
- f) if any other (please specify)

## PART-IV

### CONSTRAINTS FACED BY THE BROCCOLI AND LETTUCE GROWERS IN ADOPTION OF CROP PRODUCTION TECHNOLOGIES

Sl.No.	Constraints	Response		
		More severe (2)	Severe (1)	Less severe (0)
1.	Cost of cultivation is high			
2.	Non availability of quality seeds at right time			
3.	Lack of proper market			
4.	Market fluctuations			
5.	Exotic vegetables are highly perishable			
6.	Exotic vegetables require specific climatic condition and soil			
7.	Lack of improved varieties			
8.	High initial investment			
9.	Lack of infrastructure			
10.	Non availability of labour			
11.	Pest and disease management			

### SUGGESTIONS FOR OVERCOMING THE CONSTRAINTS FACED BY BROCCOLI AND LETTUCE GROWERS

Sl. No	Suggestion	More important (4)	Important (3)	Less important (2)	Not important (1)
1	Govt support policies				
2	IPM strategies				
3	Encouraging Contract farming				
4	Crop rotation followed				
5	Production of more Resistant varieties				
6	Quality and timely inputs availability				