PERFORMANCE OF VARIOUS CROPS UNDER ACIDIC SOIL CONDITION IN NORTHERN HILLS AGRO CLIMATIC ZONE OF CHHATTISGARH: A FARMER'S PERSPECTIVE STUDY

M.Sc. (Ag.) Thesis

by

Mirza Altaf Beg

DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
FACULTY OF AGRICULTURE
INDIRA GANDHI KRISHI VISHWAVIDYALAYA
RAIPUR (Chhattisgarh)
2016

PERFORMANCE OF VARIOUS CROPS UNDER ACIDIC SOIL CONDITION IN NORTHERN HILLS AGRO CLIMATIC ZONE OF CHHATTISGARH: A FARMER'S PERSPECTIVE STUDY

Thesis

Submitted to the

Indira Gandhi Krishi Vishwavidyalaya, Raipur

by

Mirza Altaf Beg

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
Master of Science
in
Agricultural Extension

V.V.ID No. 20141520251 ID No. 120114027

JULY, 2016

CERTIFICATE - I

This is to certify that the thesis entitled **"Performance of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh: a farmer's perspective study"** submitted in partial fulfillment of the requirements for the degree of **Master of Science in Agriculture** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, is a record of the bonafide research work carried out by **Mirza Altaf Beg** under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instructions.

No part of the thesis has been submitted for any other degree or diploma or has been published/ published part has been fully acknowledged. All the assistance and help received during the course of the investigation have been duly acknowledged by him.

Date: 20-7-2016

Chairman

(Advisory Committee)

THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE

Chairman (Dr. H. K. Awasthi)

Member (Dr. M. L. Sharma) 20/7/16

Member (Dr. S. Chitale) 20/7/16

Member (Dr. (smt.) S. Shukla) 20/7/2016

CERTIFICATE - II

This is to certify that the thesis entitled **"Performance of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh: a farmer's perspective study"** submitted by **Mirza Altaf Beg** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, in partial fulfilment of the requirements for the degree of **Master of Science in the Department of Agricultural Extension** has been approved by the external examiner and Student's Advisory Committee after oral examination.

Signature External Examiner

(Dr. P.S. Slathia)

Date: 24.8.2016

Major Advisor _____

Head of the Department _____

Faculty Dean _____

Approved/Not approved

Director of Instructions _____

ACKNOWLEDGEMENTS

First of all I would like to thank and praise almighty God (Allah), the most vital, beneficent and merciful, for all his love and blessing conferred up on mankind."A journey is easier when you travel together. Interdependence is especially more valuable than independence." I have been accompanied and supported by many people. It is a pleasant aspect that I got a golden opportunity to express my gratitude to all of them.

I give my cordial thank to my major adviser ***Dr. H. K. Awasthi****, Professor, Department of Agricultural Extension, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) for his valuable and inspiring guidance, interest, research insight, unique supervision, constructive criticism and advices throughout the investigation and preparation of this thesis.*

I have immense pleasure in expressing my appreciation for the members of my advisory committee, Dr. M. L. Sharma, Professor and Head (Agricultural Extension), Dr. S. Chitale, Assistant Professor (Agronomy), and Dr. (Smt.) Sindhu Shukla, Professor, (Agricultural Statistics) for providing proper guidance and encouragement throughout the research work. Without their kind co-operation it would not have been easy to complete this thesis.

I am indebted with deep sense of gratitude for the guidance and cooperation of faculty members of Agricultural Extension Department, Dr. J. D. Sarkar (Professor), Dr. R. S. Sengar (Professor), Dr. D. K. Suryawanshi (Associate Professor), Dr. M. A. Khan (Associate Professor), Shri M. K. Chaturvedi (Assistant Professor) and Shri P. K. Sangode (Assistant Professor).

I am highly obliged to Hon'ble Vice-Chancellor Dr. S. K. Patil, Dr. S. S. Rao, Dean, College of Agriculture, Raipur, Dr J. S. Urkurkar, Director Research Services, Dr. M. P. Thakur, Director Extension Services, Dr. O. P. Kashyap, Dean Student Welfare and Dr. S. S. Shaw, Director of Instructions, IGKV, Raipur for providing necessary facilities to conduct the present investigation.

I have immense pleasure in expressing my whole hearted sense of appreciation to Shri Yuvraj Singh Dhruw (Ph. D. Scholars), Shri Virendra Kumar Painkra (Ph. D. Scholars), Shri Subodh Kumar Pradhan (Ph. D. Scholars), Shri Ashish Gupta (Ph. D. Scholars), Shri Sunil Narbaria (Ph. D. Scholars), Shri

Yogendra Shriwas (Ph. D. Scholars) and Ku. Akansha Pandey (Ph. D. Scholars) for their timely help and advice during the tenure of research work. I also express my thanks to Shri Basant Chandrakar and Smt. Patarangi.

I heartily express my thanks to my friends Bhawna Panda, Preetam Kumar Baghel, Taushif Pathan, Sadab Ahmed, Nutan Singh, Manoj Kumar Painkra, Ram Bihari lahre, Daya Shankar Naik, K. Thirupathaiah, Eshant Kumar Sukdeve, Yashobanta Meher and other friends for their co-operation and time to time encouragements.

I am highly indebted to all the respondents and their families who obliged me by providing necessary information for the present study. Indeed, words are inadequate either in form or spirits to convey my deep sense of gratitude and appreciation to my parents Shri Mirza Imtyaz Beg (Dad), Smt. Sabara Begum (My lovely Mum), Naaz (Sweet Sister), Mirza Ashraf Beg (Big brother), Mirza Istyak Beg (My Sincere brother) and Meraj Khan (my brother-cum-Best friend), Huma Mirza (Sister-in-law) and all family members for their love, sacrifice and blessings for my educational pursuits.

Mirza

Mirza Altaf Beg

Department of Agricultural Extension
College of Agriculture, IGKV
Raipur (C.G.)

TABLE OF CONTENTS

Chapter	Title	Page
	ACKNOWLEDGEMENT	**I**
	TABLE OF CONTENTS	**iii**
	LIST OF TABLES	**Viii**
	LIST OF FIGURES	**X**
	ABBREVIATION	**Xi**
	ABSTRACT	**Xii**
I	**INTRODUCTION**	1
II	**REVIEW OF LITERATURE**	4
	2.1 Socio-economic profile	4
	2.1.1 Age	4
	2.1.2 Education	5
	2.1.3 Family size	6
	2.1.4 Social participation	6
	2.1.5 Occupation	7
	2.1.6 Land holding	7
	2.1.7 Source of Irrigation	8
	2.1.8 Annual income	8
	2.1.9 Farming experience	9
	2.1.10 Existing soil management practices	9
	2.1.11 Cropping pattern	10
	2.1.12 Source of information	10
	2.1.13 Contact with extension personnel	12

2.1.14 Scientific orientation 13

2.1.15 Risk orientation 13

2.1.16 Perception about acidic soil management 14

2.1.17 Awareness of acidic soil management 14

2.2 Performance (productivity) of various crops 15

2.3 Constraints 16

2.4 Suggestion 17

III MATERIALS AND METHODS 19

3.1 Location of the study area 19

3.2 Sample and sampling procedure 20

3.2.1 Selection of district 20

3.2.2 Selection of blocks 20

3.2.3 Selection of villages 20

3.2.4 Selection of respondents 21

3.2.5 Collection of data 21

3.2.6 Statistical methods 21

3.3 Variables of the study 21

3.3.1 Independent variables 21

3.3.2 Dependent variables 22

3.4 Operationalization of independent variables and their measurement 22

Socio-economic profile of respondents 22

3.4.1 Age 22

3.4.2 Education 22

3.4.3 Family size 23

3.1.4 Social participation 23

	3.4.5	Occupation	24
	3.4.6	Land holding	24
	3.4.7	Source of Irrigation	25
	3.4.8	Annual income	25
	3.4.9	Farming experience	26
	3.4.10	Existing soil management practices	26
	3.4.11	Cropping pattern	26
	3.4.12	Source of information	27
	3.4.13	Contact with extension personnel	27
	3.4.14	Scientific orientation	28
	3.4.15	Risk orientation	29
	3.4.16	Perception about acidic soil management	29
	3.4.17	Awareness of acidic soil management	30
3.5	Operationalization of dependent variables and their measurement		30
	3.5.1	Performance (productivity) of various crops under acidic soil condition	31
	3.5.2	Benefit-cost ratio of rice crop cultivation	31
3.6	Constraints faced by farmers in cultivation of various corps under acidic soil condition		31
3.7	Suggestions given by the respondents to overcome the constraints in cultivation of various crops under acidic soil condition		31
3.8	Type of data		31
3.9	Developing the interview schedule		32
	3.9.1	Validity	32
	3.9.2	Reliability	32

3.10 Method of data collection 33

3.11 Statistical analysis 33

IV RESULTS AND DISCUSSION 36

4.1 Independent variables 36

Socio-economic profile of respondents

4.1.1 Age 36

4.1.2 Education 37

4.1.3 Family size 37

4.1.4 Social participation 38

4.1.5 Occupation 38

4.1.6 Land holding 39

4.1.7 Source of Irrigation 40

4.1.8 Annual income 40

4.1.9 Farming experience 43

4.1.10 Existing soil management practices 44

4.1.11 Cropping pattern 44

4.1.12 Source of information 48

4.1.13 Contact with extension personnel 50

4.1.14 Scientific orientation 51

4.1.15 Risk orientation 52

4.1.16 Perception about acidic soil management 52

4.1.17 Awareness of acidic soil management 54

4.2 Performance of various crops under acidic soil condition 57

4.2.1 Existing soil management practices followed by the respondents under acidic soil condition 59

4.2.2 Combination of existing soil management practices and productivity status of various crops grown by the 59

respondents

4.2.3 Comparison of productivity of popular crops among the farmers in two situations (without and with soil management practices) under acidic soil condition 62

4.2.4 Variety wise productivity comparison of popular crops grown by the respondents in two situations 66

4.2.5 Benefit cost ratio of rice crop under different combinations of acidic soil management practices 69

4.3 Correlation analysis of independent variables with productivity of various crops among the respondents 70

4.4 Multiple regression analysis of independent variables with productivity of various crops among the respondents 72

4.5 Constraints and suggestions 75

4.5.1 Constraints faced by the farmers in cultivation of various crops under acidic soil condition 75

4.5.2 Suggestions from the respondents to overcome the constraints in cultivation of various crops under acidic soil condition 77

V SUMMARY, CONCLUSION AND SUGGESTION FOR FUTURE RESEARCH WORKS 79

REFERENCES 86

APPENDIX 94

RESUME 104

LIST OF TABLES

Table	Title	Page
3.1	Distribution of respondents according to their soil testing report	21
4.1	Distribution of respondents according to their age	37
4.2	Distribution of respondents according to their education level	37
4.3	Distribution of respondents according to their size of family	38
4.4	Distribution of respondents according to their social participation	38
4.5	Distribution of respondents according to their occupation	39
4.6	Distribution of respondents according to their land holding	39
4.7	Distribution of respondents according to their availability of irrigation	40
4.8	Distribution of respondents according to their source of irrigation	40
4.9	Distribution of respondents according to their annual income	43
4.10	Distribution of respondents according to their farming experience	43
4.11	Distribution of respondents according to their existing soil management practices	44
4.12	Distribution of respondents according to their use of different soil management practices	44
4.13	Distribution of respondents according to their cropping pattern	47
4.14	Identification of various crops grown in acidic soil condition by the respondents	47
4.15	Distribution of respondents according to their sources of information	48
4.16	Distribution of respondents according to their overall sources of information	50
4.17	Distribution of respondents according to their contact with extension personnel	50
4.18	Distribution of respondents according to their overall contact with extension personnel	51
4.19	Distribution of respondents according to their scientific orientation	52
4.20	Distribution of respondents according to their risk orientation	52
4.21	Distribution of respondents according to their perception about acidic soil management	52
4.22	Distribution of respondents according to their level of perception about acidic soil management	54
4.23	Distribution of respondents according to their awareness of acidic soil management	55

4.24	Distribution of respondents according to their overall level of awareness of acidic soil management	56
4.25	Distribution of respondents according to productivity of various crops, and their area amongst the respondents	57
4.26	Distribution of respondents according to their existing soil management practices under acidic soil condition	59
4.27	Combination of existing soil management practices and productivity status of various crops grown by the respondents	61
4.28	Comparison table of productivity of various crops and their area amongst the both type of respondents (without and with management practices)	64
4.29	Variety wise productivity comparison of popular crops grown by the respondents in two situations	68
4.30	Benefit-cost ratio of rice crop under different combination of existing soil management practices	69
4.31	Coefficient of correlation of independent variables with the performance (productivity) of various crops under acidic soil condition	73
4.32	Multiple regression analysis of independent variables with the performance (productivity) of various crops under acidic soil condition	74
4.33	Constraints faced by the farmers in cultivation of various crops under acidic soil condition	76
4.34	Distribution of respondents as per the suggestion given to overcome the constraints	77

LIST OF FIGURES

Figure	Title	Page
4.1	Distribution of respondents according to their occupation	41
4.2	Distribution of the respondents according to their land holding	42
4.3	Distribution of respondents according to availability of irrigation	42
4.4	Distribution of respondents according to their source of irrigation	45
4.5	Distribution of respondents according to their farming experience	45
4.6	Distribution of respondents according to their existing soil management practices	46
4.7	Distribution of respondents according to their use of different soil management practices	46
4.8	Distribution of respondents according to their cropping pattern	49
4.9	Distribution of respondents according to their source of information	49
4.10	Productivity status of various crops grown in acidic soil condition by the respondents	58
4.11	Comparative productivity status of various crops grown in acidic soil condition by the respondents of with and without soil management practices	65

LIST OF ABBREVIATIONS

%	Per cent
ha	Hectare
i.e.	That is
et al.	And others/ co-workers
Kg	Kilogram
q	Quintal
^{0}	Degree
Fig.	Figure
No.	Number
viz.	Namely
$\bar{X}$	Mean
S.D.	Standard deviation
NS	Non-significant
*	Significant at 0.05 level of probability
**	Significant at 0.01 level of probability
F	Frequency
%	Percentage
AI	Awareness index
R.A.E.O	Rural Agricultural Extension Officer
S.A.D.O	Senior Agricultural Development Officer
A.D.O	Agricultural Development Officer
SMS	Subject Matter Specialist
T.V.	Television
df	Degree of freedom
BCR	Benefit-cost ratio

THESIS ABSTRACT

a) Title of the Thesis	:**"Performance of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh: a farmer's perspective study"**
b) Full Name of the Student	: Mirza Altaf Beg
c) Major Subject	: Agricultural Extension
d) Name and Address of the Major Advisor	: Dr. H. K. Awasthi Professor, Deptt. of Agril. Extension, CoA, IGKV, Raipur 492012
e) Degree to be awarded	:Master of Science in Agriculture

Signature of the Student

Signature of Major Advisor

Date: 20/7/2016

Signature of Head of the Department

20/7/2016

ABSTRACT

The present study was carried out during 2015-16 in the Surajpur and Balrampur districts of Chhattisgarh state. This study aims to assess information on performance (productivity) of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh. This study was conducted in purposively selected 12 villages identified from 4 blocks of Surajpur and Balrampur (two blocks each) districts. The sample was comprised of 120 farmers as respondents. The data collection was done by the use of interview schedule and through personal interview. Data were analyzed with help of suitable statistical methods.

The study showed that majority (67.5%) of the respondents belonged to middle age group (36 to 55 years), illiterate (35%), medium size of family (65.83), involved as a member of any organization (65%) and cent per cent involved in agriculture as major occupation.

Majority of the respondents (73.33%) were marginal farmers. Among these respondents, 53.33 per cent had facility of irrigation, 71.66 per cent earned low annual income (>30000 to Rs. 60000), 60.83 per cent had medium level of farming experience (11 to 20 years), 80.83 per cent were not taking any soil management practices and 87.5 per cent had fair type (rice-wheat-fellow) cropping pattern.

Majority of the respondents (75.83%) had medium level of awareness about acidic soil management, 66.67 per cent had medium level of perception about acidic soil, R.A.E.O, radio, progressive farmers and neighbours were the major sources of information of the respondents utilized for seeking the information about cultivation of crops under acidic soil condition, highest credibility of R.A.E.O and radio were obtained.

Majority of the respondents had contacts with R.A.E.O and also having medium level of overall contact with extension personnel. They had medium level of scientific orientation and risk orientation.

All the respondents were growing rice which occupied maximum 83.5 per cent area. Mostly cultivated crops were rice, wheat and maize identified. As regards to productivity of crops with some soil management practices it is found that performance of tomato crop is best in acidic soil condition followed by maize and rice. These three crops perform better in acidic soil condition.

From the comparison of data between two groups (with and without soil management practices) of respondents, it shows that respondents with soil management practices have shown better performance in productivity of crops in comparison to respondents without any soil management practices. It was seen that in field condition of study area, out of 120 respondents, only 23 respondents follow soil management practices.

In correlation analysis, out of selected seventeen characteristics, six variables viz. land holdings, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel were found to be positive and significantly correlated with productivity of all seven crops (rice, maize, wheat, pigeon pea, chickpea, soybean and tomato) and in multiple regression analysis, out of 17 independent variables, two variables namely existing soil management practices and contact with extension personnel contributed significantly towards productivity of all seven crops (rice, maize, wheat, pigeon pea, chickpea, soybean and tomato) while land holding and annual income contributed significantly towards productivity of four (rice, maize, wheat and tomato) and three (rice, maize and wheat) crops respectively.

Major constraints like high cost of hybrid seed, lack of knowledge about dose of fertilizers and lack of money to invest on additional operation for better utilization of acidic soil were recorded. Major suggestions of the respondents to overcome the constraints were recorded, most of the respondents suggested that support price of crops should be increased, hybrid and improved seeds of various crops should be available at low price and release of canal water at proper time etc.

Place: Raipur

Date: 20/7/2016

(Dr. H. K. Awasthi)

(Chairman Advisory Committee)

शोधग्रंथ सारांश

1.	शोध का शीर्षक	:"कृषक परिप्रेक्ष्य में छत्तीसगढ़ के उत्तरी पहाड़ी कृषि जलवायु क्षेत्र की अम्लीय मृदा में विभिन्न फसलों के प्रदर्शन (उत्पादन) का अध्ययन"
2.	छात्र का पूरा नाम	: मिर्जा अल्ताफ बेग
3.	प्रमुख विषय	: कृषि विस्तार
4.	मुख्य परामर्शदाता का नाम एंव पता	: डॉ. एच. के. अवस्थी प्राध्यापक, कृषि विस्तार विभाग, इ. गाँ. कृ. वि. वि., रायपुर (छ.ग.)
5.	प्राप्त की जाने वाली उपाधि	: एम. एस–सी. (कृषि) कृषि विस्तार

परामर्शदाता का हस्ताक्षर

दिनाँक: 20/7/2016

छात्र का हस्ताक्षर

20/7/16

विभागाध्यक्ष का हस्ताक्षर

सारांश

वर्तमान अनुसंधान **"कृषक परिप्रेक्ष्य में छत्तीसगढ़ के उत्तरी पहाड़ी कृषि जलवायु क्षेत्र की अम्लीय मृदा में विभिन्न फसलों के प्रदर्शन (उत्पादन) का अध्ययन"** वर्ष 2015–16 के दौरान छत्तीसगढ़ के दो जिले कमशः सूरजपुर तथा बलरामपुर में किया गया। इस अध्ययन हेतु उत्तरदाताओं के रूप में 120 कृषकों का चयन किया गया। इस अध्ययन की जानकारी हेतु उत्तरदाताओं से व्यक्तिगत साक्षात्कार विधि द्वारा आंकड़ो का संग्रहण किया गया। आंकड़ो का संग्रहण उपयुक्त सांख्यिकीय विधियों द्वारा जैसे माध्य, मानक विचलन, प्रतिशत, सहसंबध, अनुगमन विश्लेषण एंव टी– टेस्ट कर परिणाम प्राप्त किया गया।

इस अध्ययन से पाया गया कि उनमें से अधिकांश उत्तरदाता लगभग 67.5 प्रतिशत मध्य आयु वर्ग (36 से 55 वर्ष), 35 प्रतिशत लोग अनपढ़, 65.83 प्रतिशत मध्यम परिवार आकार (4 से 7 लोग), 65.83 प्रतिशत लोग किसी संस्था के सदस्य तथा शत् प्रतिशत लोग मुख्य व्यवसाय के रूप में कृषि संलग्न थे।

अधिकांश (73.33 प्रतिशत) उत्तरदाता को सीमांत कृषक के श्रेणी में पाया गया, 53.33 प्रतिशत उत्तरदाताओं के पास सिंचाई के साधन उपलब्ध थे, उनकी परिवार की वार्षिक आय 30,000 से 60,000

रू के बीच पाई गई। 60.83 प्रतिशत उत्तरदाता मध्यम स्तर कृषि अनुभव (11 से 20 वर्ष) के थे, अधिकांश (80.83 प्रतिशत) लोग किसी भी प्रकार की मृदा प्रबंधन का कार्य नही करते थे तथा 87.5 प्रतिशत लोगों के पास धान–गेहूँ–पड़ती फसल पद्धति पाया गया।

अध्ययन क्षेत्र के अधिकांश (75.83 प्रतिशत) उत्तरदाताओं में मध्यम स्तर (18–45 प्रतिशत) की जागरूकता अम्लीय मृदा प्रबंधन के सम्बंध में पाई गई, 66.67 प्रतिशत उत्तरदाताओं में मध्यम अवधारणा अम्लीय मृदा के सम्बंध मे पाया गया, अधिकांश उत्तरदाता अपने अम्लीय मृदा में कृषि क्रियाओं के लिए ग्रामीण कृषि विस्तार अधिकारी, रेडियो तथा उन्नत कृषकों से जानकारी प्राप्त करते हैं, इनकी जानकारी प्राप्त करने का स्तर मध्यम पाया गया। चयनित उत्तरदाताओं में वैज्ञानिक दृष्टिकोण तथा जोखिम उठाने की क्षमता में मध्यम स्तर का पाया गया।

यह पाया गया की सभी उत्तरदाता मुख्य फसल के रूप में धान की खेती करते हैं जो की सबसे अधिक लगभग 83.5 प्रतिशत उपलब्ध भूमि में बताया गया। ज्यादातर खेती की जाने वाली फसलों में धान, गेहूँ तथा मक्का फसल की पहचान की गई। फसलों के उत्पादकता के सम्बंध में देखा जाए तो यह पाया गया की अम्लीय भूमि में कुछ भूमि प्रबंधन क्रियाओं के साथ टमाटर की फसल का प्रदर्शन प्रथम, मक्का का द्वितीय तथा धान का तृतीय स्थान पर रहा।

उत्तरदाताओं के दो समूहों (भूमि प्रबंधन कार्य करने वाले तथा भूमि प्रबंधन कार्य नही करने वाले) के तुलनात्मक अध्ययन से यह स्पष्ट हो गया है कि वे कृषक जो अम्लीय भूमि में भूमि प्रबंधन कार्य करके फसलों का उत्पादन करते हैं, उनकी फसलों की उत्पादकता दूसरे जो कोई भी भूमि प्रबंधन का कार्य नहीं करते की अपेक्षा अधिक पाई गई। यह देखा गया कि चयनित उत्तरदाताओं (120 लोग) में से केवल 23 उत्तरदाता ही अम्लीय भूमि प्रबंधन हेतू प्रबंधन कार्य कर रहे थे।

सह–संबंध विश्लेषण से यह पाया गया की चयन किये गये 17 स्वतंत्र चरों (प्रभावित करने वाले) में से 6 चरों क्रमशः क्षेत्र, सिंचाई के स्त्रोत, वार्षिक आय, मौजूदा मृदा प्रबंधन क्रियाऐं, जानकारी के स्त्रोत तथा प्रसार कार्यकर्ता से संपर्क सकारात्मक महत्व के साथ सभी सातों फसलों के उत्पादकता में योगदान दे रहे थे।

अनुगमन विश्लेषण से यह पाया गया कि चयन किये गये 17 स्वतंत्र चरों (प्रभावित करने वाले) में से 2 चरें क्रमशः मौजूदा मृदा प्रबंधन क्रियाऐं तथा प्रसार कार्यकर्ता से संपर्क सकारात्मक महत्व के साथ सभी सातों फसलों के उत्पादकता मे योगदान दे रहा था, जबकि क्षेत्र सकारात्मक महत्व के साथ चार फसलों (धान, गेहूँ, मक्का तथा टमाटर) एवम वार्षिक आय सकारात्मक महत्व के साथ तीन फसलों (धान, गेहूँ तथा मक्का) के उत्पादकता में योगदान दे रहे थे।

इस अध्ययन में पाया गया कि इस क्षेत्र के लोगों के मध्य प्रमुख बाध्यताएं संकर बीजों का अधिक मुल्य, उर्वरकों के उचित मात्रा की जानकारी का अभाव तथा अम्लीय भूमि के उचित उपयोग हेतु अतिरिक्त भूमि प्रबंधन कार्य करने हेतु धन की कमी है।

अधिकांश उत्तरदाताओं द्वारा सुझाव के रूप में बताया गया कि फसलों के समर्थन मूल्यों में वृद्वि होनी चाहिए, विभिन्न फसलों के संकर तथा उन्नत बीज कम मूल्य में तथा सही समय पर उपलब्ध होने चाहिए एवम सही समय पर नहरों की पानी की उपलब्धता होनी चाहिए।

CHAPTER - I

INTRODUCTION

For decades, soil acidity has been a major constraint to crop production throughout the world. However, in developed nations, the use of lime to counteract acidity in high-input agriculture over the past 50 to 100 years has led to a marked decrease in the area of acid soils under cultivation and to spectacular increase in yields. Estimates of the total area of top soils affected by acidity throughout the world vary from 3.777×10^9 to 3.950×10^9 ha, representing approximately 30% of the total ice-free land area of the world. The largest areas of acid soils are in South America, North America, Asia and Africa. In most regions, the areas of acid soils are still under natural forest or grassland vegetation. The total area affected by subsoil acidity is estimated to be about 2.918×10^9 ha, which means that approximately 75% of the acid soils of the world suffer from subsoil limitations due to acidity (Rengel Z., 2003).

Soil acidity is determined by the amount of hydrogen (H^+) activity in soil solution and influenced by edaphic, climatic and biological factors. Soils that develop from granite parent materials acidify at a faster rate than soils developed from calcareous parent materials. Sandy soils with relatively few clay particles acidify more rapidly due to their smaller reservoir of alkaline cations and higher leaching potential. High rainfall affects the rate of soil acidification depending on the rate of water percolation through the soil profile. Soil acidification is intensified by the removal of cations through the harvesting of crops and by acid precipitation from polluted air. Organic matter decaying to form carbonic acid and other weak acids also contributes to acidification (Carver and Ownby, 1995). Acid soils limit crop production on 30-40% of the world's arable land and up to 70% of the world's potentially arable land (Haug and Shi, 1991).

Aluminum toxicity is considered the most important growth-limiting factor for plants in acid soils (Carver and Ownby, 1995). The primary response to aluminum stress occurs in the roots (Jayasundra *et al*., 1998). Aluminum-injured roots are stubby and brittle. Root tips and lateral roots thicken and turn brown. The

root system as a whole is affected, with many stubby lateral roots and no fine branching. Such roots are inefficient in absorbing nutrients and water (Foy, 1992).

Acidity and Al toxicity in surface soil can be ameliorated through liming. A liming material is defined as a material whose Ca and Mg compounds are capable of neutralizing soil acidity (Barber, 1984). The bulk of agricultural lime comes from ground limestone and can be calcite ($CaCO_3$), dolomite ($CaCO_3$, $MgCO_3$) or a mixture of the two. Other materials are used to neutralize soil acidity, including marl, slag from iron and steel making, flue dust from cement plants and refuse from sugar beet factories, paper mills, calcium carbide plants, rock wool plants and water softening plants. However, total use of these materials is relatively small and they are generally applied only in areas close to their source. Lime is usually broadcasted on the soil surface and then mixed with the soil during tillage operations. In water, $CaCO_3$ dissolves and hydrolyzes to form OH^- ions that can subsequently react with both H^+ ions formed from hydrolysis of Al^{3+} and exchangeable Al^{3+} (Thomas and Hargrove, 1984).

In India acid soils occur in the high rainfall areas covering about 25 million hectares of land with a pH below 5.5 and 23 million hectares of land with a pH between 5.6 and 6.5. These estimates are calculated by Bhaumik, H.D. and Roy, L. 1964. In India, acid soils occur in Assam, Meghalaya, Arunachal Pradesh, Mizoram, Nagaland, Manipur, Tripura, West Bengal, Bihar Uttar Pradesh, Himachal Pradesh, Jammu and Kashmir, M.P., Maharashtra, Kerala, Karnataka, Tamil Nadu and Andhra Pradesh. Punjab, Haryana, Rajasthan and Gujarat are the only states in India where acid soils do not occur.

The Chhattisgarh state has geographical area of 137.90 lakh ha, 35 per cent of which is net sown area and 63.5 per cent of the total area is under forest. Average annual rainfall is 1325 mm and being a high rainfall zone, the state has more than 20 per cent of the area in acidic soil category. Deficiency of zinc & boron is prevalent. In this area sulphur deficiency has been found in crop area where pulses are grown. About 27 per cent of the area is irrigated. Undulating topography is one aspect for irrigation related constraints and nutrient management. Agriculture and allied sector contributes approximately 20 per cent to the State GSDP. Chhattisgarh accounts for two per cent of India's population

out of which 20 per cent live in urban areas and the remaining 80 per cent resides in rural areas. The population is primarily concentrated in the central plains region. Of the total population of 20.83 million, 43.4 per cent represent scheduled tribes and scheduled castes they live mostly in the nearby forest areas in the north and southern parts of the state. Earlier researches had shown that majority of the farmers and especially tribal farmers are still lagging behind in the adoption of modern technology. It should be a serious concern to the planners, policymakers, agricultural scientist and extension workers. It is therefore necessary to assess the performance of various crops under acidic soil condition and also to know the problems or constraints in adopting modern crop production technologies. Keeping this in view, the present investigation entitled **"Performance of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh: a farmer's perspective study."** was designed with the following specific objectives:-

1. To study the socio-personal and economic profile of farmers,
2. To identify the various crops and cropping pattern, grown by the farmers under acidic soil condition,
3. To assess the performance (productivity) of various crops grown by the farmers in acidic soil condition,
4. To study the farmers' awareness about acidic soil management,
5. To identify the existing practices used by the farmers for management of acidic soil,
6. To study the relationship between independent variables and dependent variable,
7. To find out the various problems faced by the farmers during cultivation of various crops under acidic soil condition and to obtain their suggestions to minimize the problems.

CHAPTER - II

REVIEW OF LITERATURE

Review of literature was undertaken keeping in view the variables for the study. It was rather difficult to find adequate research studies exclusively relating to recommended practices of various crops cultivation. Through review researcher comes to know about the methods, procedures and techniques as well as results of past studies. It provides clues and guidance throughout the research process. Steady efforts were made to compile research findings of the research studies possessing more or less similar characteristics. Therefore, studies related to popular crops were reviewed and presented covering all aspects of the investigation comprehensively under the following headings:

1. To study the socio-personal and economic profile of farmers,
2. To identify the various crops and cropping pattern, grown by the farmers under acidic soil condition,
3. To assess the performance (productivity) of various crops grown by the farmers in acidic soil condition,
4. To study the farmers' awareness about acidic soil management,
5. To identify the existing practices used by the farmers for management of acidic soil,
6. To study the relationship between independent variables and dependent variable,
7. To find out the various problems as faced by the farmers during cultivation of various crops under acidic soil condition and to obtain their suggestions to minimize the problems.

2.1. Socio-economic profile of the farmers

2.1.1 Age

Raghuwanshi (2005) observed that the majority of the respondents i.e. 41.25 per cent belonged to middle age group (36 to 55 years), about 30.00 per cent respondents were of young age group (up to 35 year) and 28.75 per cent respondents were of old age group (55 and above).

Maraddi *et al*. (2007) observed that the variable age had negative and non significant contribution toward adoption level of sustainable sugarcane cultivation practices.

Shori (2011) revealed that the majority of the respondents (68.75%) belonged to middle age group (35 to 55 years), 13.75 per cent respondents were of young age group (below 35 years) and 17.50 per cent respondents were of old age group (more than 55 years).

Deshmukh and Deshmukh (2013) revealed that majority of respondents were found in medium category in age (54%), old category in age (24.66%) and young category in age (21.33%). Where age were found non-significantly associated with constraints level.

2.1.2 Education

Sivanarayana and Reddy (2000) revealed that the majority of the respondents (67.5%) were illiterate and 17.5 per cent of the respondents had primary school level education.

Kavitha and Reddy (2007) revealed that more than half (54.16%) of the farm women were illiterate, while 11.67 per cent farm women were educated up to primary school, 10 per cent were educated up to middle school and 7.50 per cent were educated up to high school and very few of the farm women had college education.

Verma (2009) found that the 43.33 per cent of the respondents were illiterate followed by 37.50 per cent respondents who were found under the categories of up to primary school. Whereas, 12.50 per cent respondents were educated up to middle school and 03.33 per cent had education up to high school, about 01.67 per cent respondents had education up to higher secondary level and only 01.67 per cent respondents were educated up to college and above.

Nirmala *et al*. (2013) found that 36 per cent of the farmers were illiterate, 28 per cent had primary education, 22 per cent possessed secondary education and only 14 per cent of the sample farmers had college level of education.

2.1.3 Family size

Kushwaha (2005) revealed that majority of the farmers (70.00%) had medium size of family, followed by big sized family (20.00%) and small (10.00%).

Raghuwanshi (2005) found that majority of the rice growers (50.63) had medium size of family (6 to 10 members) followed by 26.87 per cent respondents who had large sized family (11 members and above). However, rest of 22.61 per cent respondents had small size of family (up to 5 members).

Geetha and Geetha Devi (2008) revealed that majority (72.5%) of the respondents had medium family size while 17.5 per cent had more than 6 members in their family and 10 per cent respondents had small family size i.e. less than 4 members.

Kumar and Rathod (2013) revealed that most of respondents (60.67%) were categorized under medium sized family i.e. 4 to 9 members followed by 24.66 per cent respondents in the class of large sized family.

2.1.4 Social participation

Bhoite and Girase (1991) revealed that social participation of farmers was non-significantly associated with their adoption behavior in improved dry land technology.

David (2005) revealed that maximum numbers of respondents (41.60%) were having no membership in any social organization followed by 36.80 per cent of the respondents having membership in one organization. Whereas, 13.60 per cent of the respondents were having the membership in more than one organization, while only 8.00 per cent of the respondents belonged to executive/ office bearer category.

Khuspe and Kadam (2012) observed that 57.5 per cent of respondents were having medium level of social participation followed by low level of social participation (20.83%), while 13.33 per cent of respondents were having high level of social participation, where social participation has negative and significant relationship with adoption gap at 0.01 per cent level of probability.

Tidke *et al.* (2012) observed that the respondents accounting upto 76.67 per cent had no participation in any organization while 16.67 per cent and 6.67 per cent respondent were member or office bearer in one and more than one organization, respectively.

Tochhawng *et al.* (2013) reported that nearly half of the respondents had marginal land holding with a farming experience of above 10 years. More than one third of the pig farmers had low extension contact and mass media exposure while nearly half of the respondents had high social participation. More than one-half of the pig farmers had low level of innovativeness and scientific orientation.

2.1.5 Occupation

Pandey (2000) found that the majority of the respondents (43.75%) were practicing only one occupation. Similarly about 37.5 per cent were engaged in two occupations and only limited i.e. 18.75 per cent respondents were doing more than two occupations.

From the research finding of Singh *et al*. (2009) it is evident that all of the farmers (100%) have agriculture as their main occupation.

Shori (2011) indicated that maximum number of the respondents (46.87%) were involved in agriculture + labour work, followed by agriculture (32.50%), agriculture + business (9.37%), agriculture + service (7.50%), agriculture + animal husbandry (3.75%) and none of the respondents were involved in agriculture + animal husbandry + Service.

Dhruw (2014) concluded that the majority of respondents (86.11%) were involved in Agriculture + Labour.

2.1.6 Land holding

Ingle and Wayazada (1989) indicated that size of land holding was significantly related with adoption of agricultural technology in rainfed farming.

Meti and Hanchinal (1994) revealed that land holding was found to be significantly correlated with the adoption with respect to improved cultivation practices of sunflower crop.

Pandey and Kasyap (1993) reported from their socio - economic survey on 100 farmers of Raipur, Balrampur and Bastar districts of Chhattisgarh that the

farmers were not in good economic condition. Hardly 30 per cent of the farmers had more than 5 ha of land.

Singh *et al.* (2012) revealed that 68.8 per cent farmers having land holding size up to 1.0 hectares have adopted the bio-pesticidal preparation more frequently followed by 17.6%, 9.6% and 4% farmers having land holdings of 1.0-2.5 hectares, 2.6-4.0 hectares and 4.0 hectares and above respectively.

2.1.7 Source of irrigation

Pandey (2000) found that the 54.16 per cent respondents had no irrigation facilities whereas 36.66 per cent respondents had irrigation availability up to partial level and only 9.16 per cent respondents had irrigation availability up to significant level for rice cultivation in Chhattisgarh.

Prajapati (2006) revealed that the majority of the wheat growers (70.00%) had no irrigation facilities whereas 30.00 per cent of the respondents availed irrigation facilities.

Asha *et al*. 2010 concluded that irrigation was found positively correlated with annual income 35.0 per cent of the beneficiaries had rich source of irrigation whereas 22.70 per cent of the non-beneficiaries belonged to poor irrigation source.

2.1.8 Annual income

Sharma (1998) reported that the majority of the respondents (41%) belonged to medium income group followed by 37 per cent in low-income group. Agriculture (42.16%) and agriculture labour (31.4%) constituted the major source of earning to the tribal.

Ramesh and Santha (2008) revealed that the respondents with high annual income would have spent more money on farm development through the adoption of organic farming practices.

Swain and Sangramsingh (2009) revealed that income level's effect on level of adoption shows a positive trend in both the situation. It might be due to higher income or higher returns make a farmer rational in his adoption behavior. Innovation in the field of agriculture can well be introduced taking the effect of income.

Gupta *et al*. (2010) concluded that annual income had significant association with the level of participation.

Lakra (2011) observed that majority of farmers (50.62%) were having their annual income in range of Rs. 20,001 to Rs. 40,000 which is considered to be medium income, followed by 21.25 per cent of the respondent having income up to Rs. 20, 000 which come under low level of annual income, while 16.68 per cent of the respondent come under the range of Rs. 40, 001 to 60,000 which is included in to high level of annual income. It has been also observed that only 11.25 per cent respondent earn income more than Rs. 60,000 which is considered very high level of annual income.

Mohanty *et al.* (2013) revealed that the highest proportion (43.34%) of the respondents belonged to medium income group (>30,000- 60,000) followed by low income group (>30,000- 60,000).

2.1.9 Farming Experience

Saxena (2003) observed that majority of the respondents (51.38%) were having 11 to 20 years of tomato farming experience whereas 41.66 per cent of the respondents were having up to 10 years of tomato farming experience and only 6.94 per cent of the respondents were having more than 20 years of tomato farming experience as low and high category of experience were found positively and significantly correlated at 0.01 per cent level of probability with the extent of knowledge about tomato production technology.

Kiran and Shenoy (2010) reported that majority of respondents having medium farming (44%) experience as well as medium level of SRI cultivation experience (64%).

Singh (2011) revealed that farming experiences of farmers with adoption of mungbean production technology were not significant.

Kumar and Rathod (2013) revealed that about 62 per cent respondents found to have medium farming experience (8-13 year) followed by the respondents (25.33%) of high experience. It was also reported that farm experience was significantly correlated with knowledge and adoption at 0.01 level of probability.

2.1.10 Existing soil management practices

Abalu and Dsilva (1979) evaluated the Existing soil management practices in northern Nigeria. The micro level study shows that there is a clear-cut socioeconomic rationale behind the practices adopted by farmers in the area.

Mixed cropping is favored because returns per acre are high and the risk is minimized. Only those technologies that encourage and support the strategies behind the farming practices in this region will have a good chance of being successful.

Shilang *et al.* (2011) revealed that about 59.63% of respondents were not involved in any existing practices especially for reclamation of soil.

2.1.11 Cropping pattern

Mangalabhanu (1977) revealed that a change in the present cropping pattern, which is followed in Kerala, for better utilization of available water and thereby to maximize production.

Rastogi (1979) explored the cropping patterns in selected dry land farming regions of India. It is based on the data collected under the Agro-economic Research Scheme of the Drought-Prone Areas Program at the All India Coordinated Research Project for Dry land Agriculture. The land utilization patterns in these regions are extended to marginal and sub-marginal land, the intensity of cropping remains low, ranging between 84 and 125 per cent. Double cropping is limited to areas with irrigation during the post-monsoon seasons. In rainfed areas, cropping patterns have been essentially developed within the constraints of low and erratic rainfall for a relatively short growing period ranging from 75 to 130 days. It results in very low usage of improved seeds, fertilizers, and plant protection chemicals, irrigation and mechanized technology.

Kalpana *et al.* (2009) revealed that the maximum net income is high under the cropping pattern of maize, cowpea and tomato sequence.

2.1.12 Awareness

Weldemariam *et al*. (2013) concluded that farmers are well aware of the problems of soil erosion and land degradation. Also, the farmers generally believe that erosion can be controlled (95.2 per cent of the respondent farmers).

Sundar and Ramakrishnan (2013) reported that 40 per cent of respondents were both aware and subscribed crop insurance and 27 per cent aware but not subscribed and remaining respondents were not aware about crop insurance schemes.

2.1.13 Perception

Desbiez *et al*. (2004) reported that Indicators that were incorrectly estimated at a frequency greater than 33 per cent included available N and P, soil color, degree of compaction, and infiltration rate. Despite this, farmers' perceptions were correct or nearly-correct over 75 per cent of the time for the majority of indicators evaluated in the study.

Saito (2006) revealed that the most popular criterion used for descriptors of soil types was color and scientific investigations correlated best with farmers' perceptions of soil types classified by color rather than texture.

Sundar and Ramakrishnan (2013) revealed that most of the respondents felt that crop insurance was made only for large farm size farmers or high income farmers. Only few farmers (19%) felt that it suits for all farmers. Because of high premium rate and low compensation paid small and marginal farmers felt that crop insurance is not suited for them. 62 per cent of respondents perceive that current form of crop insurance does not a risk management instrument by sharing financial losses. 61.8 per cent of respondents show their negative sign towards risk sharing of crop insurance and few farmers agrees that crop insurance bare the 0-50 per cent of risks.

Teshome (2014) found that the perceptions of farmers about their land quality were validated by field observations (e.g. on soil types and shape of parcels).

2.1.14 Source of information

Menon *et al.* (1995) reported that utilization pattern of farm information sources significantly influenced by the variable such as educational status, extent of social participation, materials possession, extent of cosmopoliteness, extent of mass media utilization and level of adoption.

Sharma (1998) revealed that sources of information were positively and significantly correlated with the adoption of modern agricultural technology for rice cultivation among the tribal farmers of Surguja district.

Kubde *et al.* (1999) noted that the source of information was significantly correlated with knowledge and adoption of soybean production technology.

Mazher *et al*. (2003) revealed that a significant proportion of small farmers (70.00%) gathered information through their fellow farmers and progressive farmers. Large farmers (20.00%) got information about sugarcane production technologies through the Agriculture Department (extension wing) and the Research Institutes. While 10.00 to 20.00 per cent large farmers gathered information through mass media (radio/television and printed material).

Deshmukh *et al.* (2007) observed that the majority of the respondents fall under medium sources of information (69.09%).

Dubey (2008) showed that majority of the respondents (66.92%) were obtaining the information for dairy farming from veterinary field assistants. The study also revealed that 53.84 per cent of respondents were obtaining the information from veterinary doctors followed by radio (51.53%), TV (44.61%), progressive dairy farmers (40.00%), friends (23.07%) and neighbours (21.53%). It was also found that 10.77, 5.38, 3.84, 3.07 and 2.30 per cent of respondents were receiving information from kissan mela, training, farmer's day, agriculture magazines and news paper, respectively. About 7.69 per cent of the respondents were also receiving information from other sources about improved dairy practices.

Singh *et al*. (2009) revealed that the majority (79.0%) of the Kisan Sahayaks frequently met farmers and radio was the next frequently used source by the farmers (63.0%), followed by input dealers and demonstration (37.0%). Extension officers, scientists, television and leaflets, folders etc. were not used as a source of information frequently. Majority of A.E.O. (81.0%) followed by block officials (53.0%) and input dealers (48.0%) respectively were occasionally used. Other information sources were used as source of information by 35.0 per cent respondents. Only 7.0 per cent said that scientists were the source of information. While all farmers seldom used leaf let, folder, etc, followed by 93.0 per cent scientists, farmers fair / Kisan Gosthi (88.0%), news paper (82.0%), S.D.O (A.E.) (81.0%) respectively.

Singh *et al*. (2012) revealed that source of information utilized by moth bean growers was found to be significantly associated with level of knowledge and extent of adoption.

2.1.15 Contact with extension personnel

Saxena and Singh (2000) observed that the extension contact had positive relationship with their adoption of organic farming practices.

Patel (2008) revealed that less than three-fourth of the respondents (69.33%) had medium level of extension contact followed by 20.00 per cent respondents who had low level of extension contact while only 10.67 per cent respondents had high level of extension contacts. Coefficient of correlation and multiple regression analysis showed that extension contact has negatively significant with the Technological gap in recommended soybean production technology.

Lakra (2011) focused on the distribution of respondents with respect to their frequency of contact with extension personnel separately. The majority (50.00%) of the respondents made contact with Rural Agricultural Extension Officer (RAEO) regularly followed by 28.12 per cent respondents who often contacted RAEO, 18.12 per cent respondents contacted rarely, while only 3.76 per cent of the respondents had never contacted them with regards to Agricultural Development Officer (ADO), the research findings shows that maximum 47.50 per cent respondents had contacted them rarely followed by 38.12 per cent respondents never contacted, 14.38 per cent respondents who often contacted ADO and none of the respondents contacted with ADO regularly.

Kumar *et al.* (2012) found that the majority of the respondents (71%) had medium level of overall contact with extension personnel, 19 per cent of them had low level of overall contact with extension personnel while 10 per cent of them had high level of overall contact with extension personnel.

Kumar and Rathod (2013) observed that extension contact of soybean growers helped them to improve their knowledge, attitude and adoption of soybean technology.

2.1.16 Scientific orientation

Patel *et al*. (2008) showed that 66.00 per cent of the respondents had medium level of scientific orientation followed by 20.67 per cent who had low level of scientific orientation, while 13.33 per cent of respondents had high level of scientific orientation regarding soybean production technology.

Verma (2009) showed that 70.83 per cent of the respondents had medium level of scientific orientation followed by 26.67 per cent respondents who had low level of scientific orientation and 02.50 per cent respondents had high level of scientific orientation regarding organic farming practices.

Shriwas (2011) revealed that the majority of the respondents (84.17%) had medium level of scientific orientation followed by 10.00 per cent who had low level of scientific orientation while 05.83 per cent of respondents had high level of scientific orientation regarding brinjal production technology.

Singh (2011) reported that there is non-significant correlation of scientific motivation with adoption of mung bean production technology in arid zone of Rajasthan.

Deshmukh and Deshmukh (2013) revealed that scientific orientation was found non-significantly associated with constraint level.

Thatchinamoorthy and Selvin (2014) reported that more than 85 per cent of farmers possessed medium level of scientific orientation.

2.1.17 Risk orientation

Singh (2011) observed that coefficient of regression "b" value was not significant for risk orientation. Results indicate that not direct or indirect effect on adoption of mungbean production technology was seen by scientific orientation.

Thatchinamoorthy and Selvin (2014) found that 55 per cent of the SRI farmers had medium level of risk orientation behavior, followed by 27.50 per cent of the SRI farmers with high level of risk orientation behavior and the rest 17.50 per cent of the SRI farmers had low level of risk orientation behavior. In this study the risk orientation behavior of the SRI farmers were found to be in medium to high level.

2.2. Performance (productivity) of various crops under acidic soil condition

Thomas and Ayarza (2000) found that most soils of the cerrados are highly weathered Oxisols (46%), Ultisols (15%), and Entisols (15%), with limitations for crop production in term of low inherent fertility.

Watanabe and Osaki (2002) reported a beneficial effect of Aluminium on the growth of several plant species that were well adapted to temperate or tropical acid soils. In some of these species, Al application enhanced growth and was accompanied by increased nutrient concentrations, especially P concentrations, in the tissues. This Al-induced stimulation of nutrient uptake may occur in general crops.

Bijalwan (2012) revealed that annual (summer and winter) economic yield of agriculture crops under agri-horticulture system was 1106 kg ha^{-1} $year^{-1}$ on northern site with a reduction of 34.56% compared to the sole agriculture crops (1720 kg·$ha^{-1}$$year^{-1}$). The grain yield was recorded 621 kg·ha^{-1} $year^{-1}$ and 485 kg·ha^{-1} ·$year^{-1}$ in summer and winter season respectively.

Sharma *et al.* (2013) found that the three tillage practices were replaced with three levels of nitrogen (N) and potassium (K) to rice (33, 66, and 100% of recommended) and 66% of recommended N, P and K to wheat. Phosphorus was totally omitted for the rice crop. The recommended N and K for rice was 90 and 40 kg ha^{-1}, whereas the recommendations for N, P, and K for wheat were 120, 90 and 30 kg ha^{-1}.

Rahman *et al.* (2013) revealed that the result indicated that most of the yield components viz., spikes/m^2, 100-grain weight and grain yield of wheat were significantly improved by liming for both the years and locations. There were variations in lime response among the wheat varieties. The index of relative adaptability (IRA %) for yield of BARI Gom-26 and Bijoy was more than 100 per cent for both the years. The results indicated that these two wheat varieties are relatively tolerant to low pH and could be adapted in acidic soil of Sylhet.

Shaktawat *et al.* (2013) revealed that among various crops demonstrated and tested on the basis of equivalent yield, pigeon pea crop gave highest yield and net return compared to other crops. Among the different varieties tested JS - 9752, T – 9, JM – 721, ICPH - 2671, HQPM – 1 and JJ – 1022 variety of soybean, black gram, green gram, pigeon pea, maize and jowar were significantly superior compared with other varieties tested.

Kumar *et al.* (2014) revealed that increasing levels of lime (in the furrow) from 0 to 0.6 t ha^{-1} significantly increased growth, yield attributes and yield. The

quality parameters of rice-bean were also influenced significantly by the application of lime. Maximum gross return (39,098 Rs. ha^{-1}), net return (27,281 Rs. ha^{-1}), benefit: cost (B: C) ratio (2.29), production efficiency, and economic efficiency were also realized with the application of lime at 0.6 t ha^{-1}.

2.3. Constraints

Singh *et al.* (2004) revealed that one of the major constraints faced by the respondents was non availability of budget (finance) on time. About 60 per cent respondents felt regarding non-availability of input like quality seeds, fertilizers, bio-fertilizers, etc. The other problems faced by the scientists were lack of faith in Government organizations by the villagers, low risk bearing capacity of the farmers, lack of devoted staff and sufficient staff at the center.

Kumar (2004) studied on tomato growers in Belgaum district of Karnataka reported that majority of the farmers (75.83%) faced the problem of lack of technical knowledge and guidance about improved cultivation practices as well as post-harvest technology. Whereas, 65.00 per cent of them faced the problem of high fluctuation in market price, followed by transportation cost (62.53%), labour shortage and high wages (55.83%) and lack of irrigation facilities and power shortage (46.66%).

Singh *et al.* (2007) revealed that the major constraints taken into account were technological, socioeconomic and agro -ecological which limit the adoption of modern package of practices for its cultivation and ultimately the yield. The incidence of pests and diseases on plants (97.52% respondents), non-availability of quality seed material (96.23% respondents) and non-availability of sulphur based phosphatic fertilizer for balanced nutrition (94.35% respondents) were identified as major constraints which cause setback in the expected production.

Singh *et al.* (2011) revealed that the ground water of north-eastern and southern parts of Rajasthan is having with problems of high content of carbonate, bicarbonate and sodium ions. Unavailability of good quality water for irrigation, numbers of farmers are using such problematic water for irrigation resulting in accumulation of ions and making soil unfit for cultivation.

Jat *et al.* (2012) indicated that out of input constraints explained, on the whole "unavailability of fertilizers in the local market at the time of sowing" (2.50

MS) was most perceived constraint and hence it was ranked first. The second most perceived constraint was "unavailability of improved seed at the time of sowing" (2.34 MS) followed by "lack of irrigation water" (2.24 MS) and "subsidy is not given on different agricultural inputs" (2.17 MS) were perceived as third and fourth most perceived constraints, respectively. The constraints "unavailability of recommended chemicals for seed treatment" (2.16 MS), "unavailability of labour" (2.10 MS) and "non-availability of recommended weedicides" (2.04 MS) were perceived as fifth, sixth and seventh most perceived constraints.

2.4. Suggestions

Onim (1992) revealed that small landholdings limited the farmer's choice to cultivate improved forages as most available land was used for subsistence food crops and suggested the use of more intensive technologies.

Gallagher (2003) reported that paddy growing farmers in Vadodara district of Gujarat must have regular contact among farmers and agriculture officers & scientist (20%) and skilled labours (70%).

Kushwaha (2005) revealed that the majority of the farmers (54.16%) suggested that the proper irrigation facilities should be provided. About (40.00%) farmers suggested that fertilizer, plant protection, chemicals and other input material should be supplied at proper time. While, 37.50 and 33.33 per cent farmers reported that regular training programme should be imparted in the village about recommended improved technology and seed of resistant high yielding varieties should be available in time on reasonable rates, respectively. However, 32-50 per cent farmers suggested that extension personnel should convey the desired information at right time, while 16.66 per cent farmers suggested that short-term credit facilities should be available in the village.

Thanh and Singh (2006) revealed that the it is imperative to call for attention from government, policy makers, and planners to design effective rice export policy/strategy that would ensure to overcome the constraints faced by the farmers for promoting rice production and export.

Rajan *et al.* (2013) suggested in general, the farmer's knowledge increases with the increase in their education level, experience, attitude towards fish farming, scientific orientation, use of information sources, training exposure.

CHAPTER-III

MATERIALS AND METHODS

The chapter covers precise method and procedure followed during the course of research work as well as preparation of manuscript. The blueprint used in carrying out investigation has been outlined in this chapter. The bifurcation of research methodology adopted is given under following heads:

3.1 Location of the study area

3.2 Sample and sampling procedure

3.3 Variables of the study

3.3.1 Independent variables

3.3.2 Dependent variables

3.4 Operationalization of independent variables and their measurement

3.5 Operationalization of dependent variables and their measurement

3.6 Constraints faced by farmers in cultivation of various crops under acidic soil condition

3.7. Suggestions given by respondents to minimizing the constraints

3.8. Type of data

3.9. Developing the interview schedule

3.9.1 Validity

3.9.2 Reliability

3.10 Method of data collection

3.11 Statistical analysis

3.1 Location of the study area

The study was conducted in Surajpur and Balrampur district of Chhattisgarh state during the year 2015-16. Chhattisgarh state has 27 districts i.e., Bijapur, Sukma, Dantewada, (Dakshin Bastar), Bastar (Jagdalpur), Kondagaon, Narayanpur, Kanker (Uttar Bastar), Kawardha, Rajnandgaon, Balod, Durg, Bemetara, Dhamtari, Gariyaband, Raipur, Baloda Bazar, Mahasamund, Bilaspur, Mungeli, Korba, Janjgir-Champa, Jashpur, Raigarh, Koriya, Surajpur,

Surguja (Ambikapur) and Balrampur. Out of these, Surajpur and Balrampur districts were purposively selected for this study.

Surajpur is located at latitude 23.22°N and longitude 82.85°E. It has an average elevation of 528 meters (1,732 ft). It is the Administrative Head Quarter of the Surajpur District, located at distance of 256 km north from the state capital Raipur. Majority of the population are tribal. Surajpur reflects the rich traditional values and cultural legacies of the bygone days that have percolated to the modern era.

Balrampur is located at latitude 23° 60' 67" N and longitude 83° 62' 03" E. The Balrampur district occupies the north part of Chhattisgarh state. The district is bound on north and northeast of its parent district, i.e. Surguja district. The total area of the district is approximately 3806.08 sq. kms. Most part of the district consists of hills. The district is rich in forest.

3.2 Sample and sampling procedure

3.2.1. Selection of district

The study was conducted during the year 2015-16 in the Surajpur and Balrampur districts of Chhattisgarh state. The Chhattisgarh state consists of 27 districts out of which Surajpur and Balrampur districts were selected purposively because of both districts have maximum percentage area of acidic soil.

3.2.2. Selection of blocks

For this study, from each selected districts 2 blocks were selected purposively based on the soil testing report. In this way total 4 blocks (2×2=4) were selected for the study.

In Surajpur district, out of total 6 blocks, 2 blocks namely; Surajpur and Pratapur were selected purposively according to soil testing report.

In Balrampur district, out of total 6 blocks, 2 blocks namely; Balrampur and Shankarnagar were selected purposively according to soil testing report.

3.2.3. Selection of villages

For this study, a list of villages of each selected block was prepared on the basis of soil testing reports with the help of Biotechnology laboratory of Surguja district. From each selected block, 3 villages were selected purposively

based on the soil testing report. In this way total 12 villages (4×3=12) were selected for the study.

In Surajpur district, villages namely; Salka, Silphili and Pandonagar were purposively selected in Surajpur block. Mani, Tatidadh and Semra villages were purposively selected in Pratapur block.

In Balrampur district, villages namely; Jhaleria, Patelpara and Bindul were purposively selected in Balrampur block. Muslikala, lodhi and Belkana villages were purposively selected in Shankargarh block.

3.2.4. Selection of respondents

A list of farmers were prepared on the basis of soil testing report and on the basis of soil acidity ranges between 5 to 6.5 pH, 10 farmers were selected randomly. In this way total 120 respondents this way total (12×10=120) were selected for the study.

Table 3.1: Distribution of selected respondents according to their soil testing report

S.N	pH range	pH category	Respondents	
			Number	Percentage (%)
1	5.1 – 5.5	Strongly acid	17	14.17
2	5.6 – 6.0	Moderately acid	78	65.00
3	6.1 – 6.5	Slightly acid	25	20.83
		Total	**120**	**100**

3.2.5. Collection of data

The data were collected by personal interview with the help of well prepared, structured and pre-tested interview schedule.

3.2.6. Statistical methods

Collected data were processed and tabulated by using appropriate statistical scales and methods like frequency, mean, per cent, correlation coefficient, multiple regression analysis and t-Test.

3.3. Variables of the study

3.3.1. Independent variables

- Age
- Existing soil management practices of respondents for management of acidic soil

- Education
- Family size
- Social participation
- Occupation
- Land holding
- Source of irrigation
- Annual income
- Farming experience
- Cropping pattern
- Awareness of acidic soil management
- Perception about acidic soil
- Source of information
- Contact with extension personnel
- Scientific orientation
- Risk orientation

3.3.2. Dependent variables

- Performance (productivity) of various crops under acidic soil condition.

3.4. Operationalization of independent variables and their measurement

3.4.1 Age

It refers to a period of human life, measured by years from birth, usually marked by a certain stage or degree of mental or physical development and involving legal responsibility and capacity. The age of the respondents as informed by them during personal interview was recorded. Variable was measured with the procedure followed by Raghuwanshi (2005) and it was categorized as follows:

Categories	Score
Young (<35 years)	1
Middle (36-55 years)	2
Old (>55 years)	3

3.4.2. Education

Education is the act or process of imparting or acquiring knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life. Level of formal education obtained by the respondent may influence their social status, attitude and adoption. Variable

was measured with the procedure followed by Supe (2007) and it was categorized as follows:

Categories	Score
o Illiterate	0
o Primary	1
o Middle	2
o High School	3
o Higher Secondary	4
o Under Graduate	5
o Post Graduate	6

3.4.3. Family size

Family is a basic social unit consisting of parents and their children, considered as a group, whether dwelling together of not. On the basis of number of members in the family of the respondents, the following categories were made:

Categories	Score
o Small (1 to 3 members)	1
o Medium (4 to 7 members)	2
o Large (Above 7 members)	3

3.4.4. Social participation

The social participation of the respondents may influence their adoption behavior. Through social participation, respondents may get an opportunity for more learning/ exposure towards new ideas and may be motivated for adoption. The term social participation in this study refers to the degree of involvement of the respondents in formal/informal organizations as member or executive/office bearer or both. Social participation scale developed by Nirban (2004), was used with some modification for the measurement of social participation of the respondents. A social participation score was computed for

each respondent on the basis of their membership(s) and position in various formal/informal organizations. The scoring was done in following manner:

Categories	Score
o No social participation	0
o Member of any organization	1
o Office bearer of any organization	2

3.4.5. Occupation

Occupation is a person's usual or principal work or business or activity in which a person is engaged, especially as a means of earning a living; vocation. Variable was measured with some modification of the procedure followed by Hadole and Tawade (Bhairamkar *et al.* 2011). The occupation held by the respondents such as Agriculture, wage earner (agricultural labour + other labour), animal husbandry, services and business were included in the study. The kinds of the occupation practiced by the respondents were categorized for analysis in the following manner:

Categories	Score
o Agriculture	5
o Wage earner (Agricultural labour + Other labour)	1
o Animal husbandry	3
o Business	6
o Service	4

3.4.6. Land holding

It refers to a tract of land possessed by an individual respondent for the purpose of obtaining agricultural production. It was measured by the actual number in hectare land owned and cultivated by them at the time of interview. Variable was measured with the procedure followed by Verma (2009) and it was categorized as follows:

Categories	Score
o Marginal (up to 1 ha)	1
o Small (1.1 to 2 ha)	2
o Medium (2.1 to 4 ha)	3
o Large (above 4 ha)	4

3.4.7. Source of irrigation

Irrigation is the method in which water is supplied to plants at regular intervals for agriculture. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Variable was measured with some modification of the procedure followed by Raghuwanshi (2005). Information regarding the type of the source used by the respondents for providing irrigation to the crops was collected. Different sources of irrigation such as canal, tube well, pond, well and farm pond were identified and categorized as follows:

Categories	Score
o No Source	0
o Canal	5
o Tube well	4
o Pond	2
o Well	3
o Farm pond	1

3.4.8. Annual income

Income is the monetary payment received for goods or services, or from other sources, as rents or investments. In this study, total annual income from all the available sources of the respondents were obtained and categorized as per criteria developed by Mohanty (2013) in the following manner:

Categories	Score
o Poor (up to Rs. 30,000)	0
o Low (>30,000 to Rs.60,000)	5

o Medium (>60,000 to Rs. 100,000)	4
o High (>100,000 to Rs. 500,000)	2
o Very high (>500,000)	3

3.4.9. Farming experience

Farming may be defined as a tract of land, usually with a house, barn, silo, etc., on which crops and often livestock are raised for livelihood. The experiences of respondents were categorized on the basis of years spend in the farming under acidic soil condition. The respondents were categorized as follows:

F. E. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Less experienced (Up to 10 years)	0
o Medium experienced (11 to 20 years)	1
o High experienced (Above 20 years)	2

3.4.10. Existing soil management practices of respondents for management of acidic soil

Existing soil management practices of respondents for management of acidic soil were categorized on the basis of number of practices followed by them. The respondents were categorized as follows:

Categories	Score
o No management practice	0
o Taking one management practice	1
o Taking two management practices	2
o Taking more than two management practices	3

3.4.11. Cropping pattern

It refers to the yearly sequence and spatial arrangements of crops and fallow on a given area by the respondent farmer. In other words, it denotes the crops grown by the respondents in kharif, rabi and summer season, as well as annual and perennial crops on his/her land. Variable was measured with slightly

modification of the procedure followed by Nirban (Bhairamkar *et al.* 2011) One score for growingthe crops in each of three seasons, while four score for annual crops grown and five score for perennial crops grown by the respondent. The cropping pattern can be grouped into the categories namely 'poor', 'fair' and 'good' by using the formula mean and standard deviation.

C. P. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Poor [taking crop(s) only in one season]	1
o Fair (taking crops in two seasons)	2
o Good (taking crops in three seaons)	3

3.4.12. Awareness of acidic soil management

Knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience. Awareness scale developed by Ingale and Deshpande (Bhairamkar *et al.* 2011) was used for the measurement of awareness of respondents. The statements of the original scale were suitably modified to measure the awareness of respondents. The scale has nine items. The response categories three point continuum scale Full, Partial and Nil with score of 2, 1 and 0 respectively.

Awareness index was worked out to assess the level of awareness of each respondent with the help of following equation:

$$A.I. = \frac{O}{S} \times 100$$

Where,

AI = Awareness index of respondent

O = Total obtained score by respondent

S = Total obtainable score

On the basis of Awareness index farmers were categorized as below:

Categories	Score
o Nil	0
o Low (< 17.00%)	1

o Medium (18.00 to 45.00 %)	2
o High (> 45.00%)	3

3.4.13. Perception about acidic soil

Perception is the way in which something is regarded, understood, or interpreted. Perception scale developed by Hardikar (1998) was used for the measurement of perception of women beneficiaries about usefulness of development programme. The statements of the original scale were suitably modified to measure the perception of respondents. The scale had eleven items. Out of these eleven items, number 1, 2, 3, 4, 5, 8, 9, 10, and 11 were positive items and number 6 and 7 were negative item. The score for positive item were 5, 4, 3, 2 and 1 and for negative item scores were 1, 2, 3, 4 and 5 for the response categories strongly agree, agree, undecided, disagree and strongly disagree, respectively. The sum of scores of all the eleven statements was worked out. The respondents were categorized into the following groups:

P. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Low level (up to 25 Score)	1
o Medium (26 to 32 Score)	2
o High level (above 32 Score)	3

3.4.14. Source of information

It referred to the frequency of contact or exposure of the respondent to different sources for obtaining information on agriculture and occupation related technology. The extent of use of information sources was measured by taking into consideration all the possible sources available to the respondents. Each respondent was asked to indicate that how frequently he/she get information about the technology from each of the listed sources. The scoring procedure used was 3 for ‘regular’, 2 for ‘occasional’ and 1 for ‘never’ consulting the source. Respondents can be categorized into three categories namely, ‘low’, ‘medium’ and ‘high’ by using mean and standard deviation. To determine the extent of utilization of each

information source, the responses of the farmers were recorded and presented in frequency and percentage.

Afterwards the respondents were categorized for analysis on the basis of using number of information sources as follows:

S. O. I. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Low utilization (up to 5 sources)	1
o Medium utilization (6-9 sources)	2
o High utilization (above 9 sources)	3

3.4.15. Contact with extension personnel

This is operationally defined as the "frequency with which a respondent comes in contact with extension personnel i.e. RAEOs, SADOs, SMS, Agriculture scientists. The extent of contact was measured by four point continum scale viz., never, rarely, always and regularly with a score 0, 1, 2 and 3 respectively. This variable was measured using the procedure followed by Bhairamkar (2009) with some modification. On the basis of overall obtainable score, the respondents were grouped into four categories as following manner:

E. C. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Never	0
o rarely (up to 2 score)	1
o Often (3 to 4 score)	2
o Regularly (above 4 score)	3

3.4.16. Scientific orientation

It refers to the degree to which an individual is inclined to use scientific method in farming and decision-making. The scientific orientation scale developed by Supe (2007) was used for the measurement of scientific orientation of respondents. The statement of the original scale was suitably modified to measure the scientific orientation of respondents. The scale had six items. Out of these six items, number 1, 2, 3, 4 and 5 were positive items and

number 6 was negative item. The score for positive items were 5, 4, 3, 2 and 1 and for negative item scores were 1, 2, 3, 4, 5 for the response categories strongly agree, agree, undecided, disagree and strongly disagree, respectively. The sum of scores of all the six statement was worked out. The respondents were categorized into following groups:

S. O. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Low level of scientific orientation (up to 21 score)	1
o Medium level of scientific orientation (22 to 25 score)	2
o High level of scientific orientation (Above 25 score)	3

3.4.17. Risk orientation

It was operationalized as the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the problem in cultivation of various crops under acidic soil condition. The risk orientation scale developed by Supe (2007) was used with slight modifications in this study. The scale had six statements. Out of these four statements, number 1, 2, 3 and 4 were positive statements and number 5 and 6 were negative statements. The score for positive statements were 5, 4, 3, 2 and 1 and for negative statements scores were 1, 2, 3, 4, 5 for the response categories strongly agree, agree, undecided, disagree and strongly disagree, respectively. The sum of scores of all the six statements was worked out. The respondents were categorized into following groups:

R. O. I. = Mean ($\bar{X}$) ± S.D. (Standard Deviation)

Categories	Score
o Low level risk orientation (less than 15 score)	1
o Medium level risk orientation (16 to 21 score)	2
o High level of risk orientation (Above 21 score)	3

3.5. Operationalization of dependent variables and their measurement

3.5.1. Performance (productivity) of various crops under acidic soil condition

The average productivity (q/ha) of each popular crops, as reported by respondents of the study area was recorded and presented in range and average form. For analysis, actual yield of the crops were utilized.

3.5.2. Benefit cost ratio of rice crop

A benefit-cost ratio (B:C ratio) is an indicator, used in the formal discipline of cost-benefit analysis, that attempts to summarize the overall value for money of a project or proposal. Data related to cost of cultivation of major crop was collected through the interview schedule and collected data was analyzed with the help of scale of benefit cost ratio developed by the department of Agricultural Economics, IGKV, Raipur with some modification. Assessment of benefit cost ratio was calculated by using following formula:

$$\mathbf{B:C\ ratio} = \frac{\mathbf{Net\ income}}{\mathbf{Cost\ of\ cultivation}}$$

3.6. Constraints faced by farmers in cultivation of various crops under acidic soil condition

Simple ranking technique was applied to measure the constraints faced by the respondents in cultivation of various crops under acidic soil condition. Each farmer was asked to mention his constraints in cultivation of various crops under acidic soil condition in order of degree of difficulties. The response was calculated and presented on the basis of frequency and percentage.

3.7. Suggestions given by respondents to minimizing the constraints

Farmers were asked to give their valuable suggestions to overcome the constraints faced by them in cultivation of various crops under acidic soil condition. The suggestions offered were summarized on the basis of number and per cent of respondents who reported for the respective suggestions.

3.8. Type of data

The following types of the data were obtained from the respondent in view of the objectives of the study:

1. Data pertaining to socio-economic profile of the respondents

2. Data regarding the Awareness of the farmers about the cultivation of various crops under acidic soil condition,

3. Data regarding the performance (productivity) of various crops grown by the farmers under acidic soil condition,

4. Data regarding the constraints faced by farmers in cultivation of various crops under acidic soil condition and obtain their suggestion to overcome the constraints faced by them.

3.9. Developing the interview schedule

The interview schedule was designed on the basis of objectives and independent and dependent variables in the present investigation. To facilitate the respondents, the interview schedule was framed in "Hindi". Each question was thoroughly examined and discussed with the experts before finalizing the interview schedule. Adequate precautions and care were taken into consideration to formulate the questions in a manner that they were well understood by the respondents and would find it easier to respond.

The prepared interview schedule was used in the study area for collecting the data. On the basis of experience gained in pre-testing, the necessary modifications and suggestions were incorporated before giving a final touch to interview schedule.

3.9.1. Validity

Validity refers to "the degree to which the data collection instruments measures what it is supposed to measure rather than something else". The validity of interview schedule used for this study was maximized by taking following steps:

1.The interview schedule was thoroughly discussed with the concerned scientists and member of advisory committee and their suggestions were incorporated.

2. Pre-testing of interview schedule provided an additional check for improving the instrument.

3. The relevancy of each question in terms of objectives of study, their logical order and wordings of each question was checked carefully.

3.9.2. Reliability

Reliability of an interview schedule refers to "its consistency or stability in obtaining information from respondents". The test-retest method of estimating reliability of an interview schedule was followed in this study. Thirty respondents of the study area were randomly selected and interviewed and they were re-interviewed after 2 to 3 weeks by using the same interview schedule followed at the time of first interview. Since same responses were observed, the reliability of the interview schedule was ensured.

3.10. Method of data collection

Respondents were interviewed through personal interview. Prior to interview, respondents were taken into confidence by revealing the actual purpose of the study and also full care was taken to develop good rapport with them. They were assured that the information given by them would be kept confidential. The interview was conducted in the most formal and friendly atmosphere without any complications.

3.11. Statistical analysis

The data collected during the course of investigation was tabulated into the coding sheet and then appropriate analysis of data was made according to objectives as suggested by Cochran and Cox (1957). The statistics techniques were applied in the form of frequency, percentage, mean, standard deviation, coefficient of correlation, multiple regressions and t-Test.

3.11.1. Frequency and percentage

Frequency and percentage were used for making simple comparison.

3.11.2. Mean and standard deviation

(i) Mean

Mean of sample was calculated by using the following formula:

$$\bar{X} = \frac{\Sigma X}{N}$$

Where,

$\bar{X}$= Mean of the respondents

ΣX = Sum of the respondents values

N = Total number of respondents

(ii) Standard deviation

Standard deviation was calculated by using following formula:

$$S.D. = \sqrt{\frac{\Sigma [X - \bar{X}]^2}{(N-1)}}$$

Where,

SD = Standard deviation

x = Deviation obtained from mean

N = Number of observations

3.11.3. Pearson's Coefficient of correlation

The technique used to find out the relationship between two variables. The formula was used as follows:

$$R = \frac{N(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[N(\Sigma x^2) - (\Sigma x)^2][N(\Sigma y^2) - (\Sigma y)^2]}}$$

Where,

r = Correlation coefficient

x = Score of independent variable

y = Score of dependent variable

N = Number of observation

3.11.4. Multiple regressions

This technique was used to know the partial and complete influence of independent variables. For the present study linear model of regression equation was used which is as follows:

$Y1 = a + b1x1 + b2x2 + \ldots\ldots\ldots\ldots + bnxn$

Where,

Y1 = Dependent variable

x1…xn = Independent variables

a = Constant value

b1…bn = Regression coefficient for independent variables.

3.11.5. Benefit cost ratio (BCR)

Benefit-cost ratio was used to know about the benefit from the per rupee investment in the cultivation of crop by the respondents. Benefit-cost ratio was calculated in the following manner:

$$\mathbf{B:C\ ratio} = \frac{\mathbf{Net\ income}}{\mathbf{Cost\ of\ cultivation}}$$

B:C = Benefit-cost ratio Net income = Gross income – Cost of cultivation

3.11.6. t-Test (tow sample assuming unpaired observation and unequal variances)

This test was used to find out the level of significance between two unpaired observation's mean. For the present study t-Test (assuming unpaired and unequal variance) equation was used which is as follows:

$$t = \frac{\overline{X} - \overline{Y}}{\sqrt{\left(\frac{S_x^2}{n_1} + \frac{S_y^2}{n_2}\right)}}$$

Where, $\overline{X}$ = mean of first observation, $\overline{Y}$ = mean of second observation

S_y^2 = variance of second observation, S_x^2= variance of first observation

n_1 = no. of observation first, n_2 = no. of observation second

CHAPTER-IV

RESULTS AND DISCUSSION

This chapter deals with the results obtained on various aspects of the study and supported with suitable discussion on findings. The data were collected through the interview schedule on the basis of objectives of the study. The data collected were classified, tabulated, analyzed, presented, interpreted and discussed systematically.

The findings of the study are presented and discussed under the following heads:

4.1. Independent variables

4.1.1. Socio-economic profile of respondents

4.2. Dependent variable

4.2.1. Performance (productivity) of various crops under acidic soil condition

4.3. Correlation analysis of independent variables with the performance (productivity) of various crops under acidic soil condition

4.4. Multiple regression analysis of independent variables with the performance (productivity) of various crops under acidic soil condition

4.5. Constraints faced by the farmers in the cultivation of various crops under acidic soil condition

4.6. Suggestions offered by the farmers in the cultivation of various crops under acidic soil condition

4.1. Independent variables

4.1.1 Age of the respondents

The findings on age of the respondents are presented in table 4.1. The data revealed that majority of the respondents (67.50%) belonged to the middle age group (Between 36 to 55 years) followed by young age group of the respondents (17.50%) i.e. up to the age of 35 years. While in the older age group, the percentage of respondents was only 15.

Table 4.1: Distribution of respondents according to their age group (n=120)

S. N	Age group	Frequency	Percentage
1	Young (Up to 35 years)	21	17.50
2	Middle (36 -55 years)	81	67.50
3	Old (Above 55 years)	18	15.00

This finding indicated that the majority of the respondents in the study area belonged to the middle age group followed by young age group and older age group. Similar findings were reported by Shori (2011), Raghuwanshi (2005).

4.1.2 Education of the respondents

In case of education, the data revealed that the most of selected respondents (35%) were illiterate. However, 30.83 per cent of selected respondents had primary level of education, followed by middle education 16.66 per cent and high school passed (11.66%). The respondents with higher secondary education were in 3.33 per cent, 1.66 per cent respondents were under graduate and only 0.83 per cent respondents were post graduate. The finding revealed that the most of the respondents in the study area had illiterate (table 4.2). Similar findings were also observed by Kavitha and Reddy (2007) and Sivanarayana and Reddy (2000).

Table 4.2: Distribution of respondents according to their education level (n=120)

S.No.	Education status	Frequency	Percentage (%)
1	Illiterate	42	35.00
2	Primary	37	30.83
3	Middle	20	16.66
4	High School	14	11.66
5	Higher Secondary	04	3.33
6	Under Graduate	02	1.66
7	Post Graduate	01	0.83

4.1.3. Family Size

Data pertaining to their size of the family in the table 4.3 indicated that 65.83 per cent of the respondents had medium size of family i.e. 4 to 7 members followed by lagre size of family (22.5%) i.e. above 7 members and small size of family (10.83%) i.e. 1 to 3 members. This finding indicates that the majority of the respondents belonged to the medium size of family. Similar findings were also reported by Kumar and Rathod (2013) and Geetha and Geetha Devi (2008).

Table 4.3: Distribution of respondents according to their family size (n=120)

S.N.	Size	Frequency	Percentage
1	Small (1 to 3 members)	13	10.83
2	Medium (4 to 7 members)	79	65.83
3	Large (Above 7 members)	27	22.50

$\bar{X}$= 5.23 S.D. = 1.69

4.1.4. Social participation

Data pertaining to their participation in different organizations is given in table 4.4. The table indicated that the majority of the respondents (65.00%) were member of any organization followed by respondents with no social participation (32.5%) and resporndents with office bearer of organization (2.5%). Similar findings were reported by David (2005) and Tidke (2012).

Table 4.4: Distribution of respondents according to their social participation (n=120)

S.N.	Social participation	Frequency	Percentage
1	No social participation	39	32.50
2	Member of any organization	78	65.00
3	Office bearer of any organization	03	2.50

4.1.5. Occupation

Data pertaining to their involvement in different occupation is given in the table 4.5 and fig. 4.1. The result indicated that cent percent (100%) respondents were involved in agriculture occupation. It was found that 75.83 per cent of the respondents were involved in agriculture + wage earner, followed by respondents involved in only agriculture (9.17%), respondents involved in

agriculture + business (8.33%), respondents involved in agriculture + wage earner + business (3.33%), respondents involved in agriculture + animal husbandry (2.5%) and respondents involved in agriculture + service (0.83%). It can be concluded that majority of respondents were involved in agriculture + wage earner (96.66%). Similar findings were also reported by Dhruw (2014) and Shori (2011) in their study.

Table 4.5: Distribution of respondents according to their occupation (n=120)

S.N.	Occupation	Frequency	Percentage (%)
1	Only Agriculture	11	9.17
2	Agriculture + Wage earner	91	75.83
3	Agriculture + Business (shops, petty trading, shoe repairing etc)	10	8.33
4	Agriculture + Wage earner + Business	04	3.33
5	Agriculture + Animal husbandry	03	2.50
6	Agriculture + Service	01	0.83
	Total	**120**	**100%**

4.1.6. Land holding

Data pertaining to distribution of the respondents according to their land holding are presented in the table 4.6 and fig. 4.2. The data regarding land holding indicated that 73.33 per cent of the respondents were marginal farmers (up to 1 ha of land holding) followed by small farmers (25.83%) i.e. 1.1 to 2 ha of land holding, medium farmers (0.83%) i.e. 2.1 to 4 ha of land holdings. while 0 per cent of the respondents had above 4 ha of land holding (big farmers). It can be concluded from the data that majority of the respondents had up to 1 ha (marginal farmers) of land holding. Similar finding was also reported by Singh *et al.* (2012).

Table 4.6: Distribution of respondents according to their land holding (n=120)

S.N.	Land holding	Frequency	Percentage
1	Marginal (up to 1 ha)	88	73.33
2	Small (1.1 to 2 ha)	31	25.83
3	Medium (2.1 to 4 ha)	01	0.83
4	Large (above 4 ha)	00	0.00

4.1.7. Source of irrigation

Data pertaining to irrigation facilities are mentioned in the table 4.7 and 4.8 (fig. 4.3 & 4.4). It is clear from these tables that the 46.67 per cent of respondents had no source of irrigation facilities and remaining 53.33 per cent of respondents had irrigation facilities. Respondents who had different source of irrigation, about 46.87 per cent of respondents used canal, 18.75 per cent of respondents used pond, 17.19 per cent of the respondents used tube well, 12.5 per cent of the respondents used well as source of irrigation and 4.69 per cent of the respondents used farm pond. Similar finding was also reported by Pandey (2000).

Table 4.7: Distribution of respondents according to availability of irrigation (n=120)

Category	Frequency	Percentage (%)
Not available	56	46.67
Available	64	53.33
Total	**120**	**100**

Table 4.8: Distribution of respondents according to their source of irrigation (n=64)

Category	Frequency	Percentage (%)
Canal	30	46.87
Tube well	11	17.19
Pond	12	18.75
Well	08	12.50
Farm pond	03	4.69

4.1.8. Annual income

It is very difficult to assess the average annual income of each individual, as they are not maintaining any records. The attempt was made to collect the annual income of the respondents through discussion and interpretation from different angles. The distribution of the respondents according to their annual

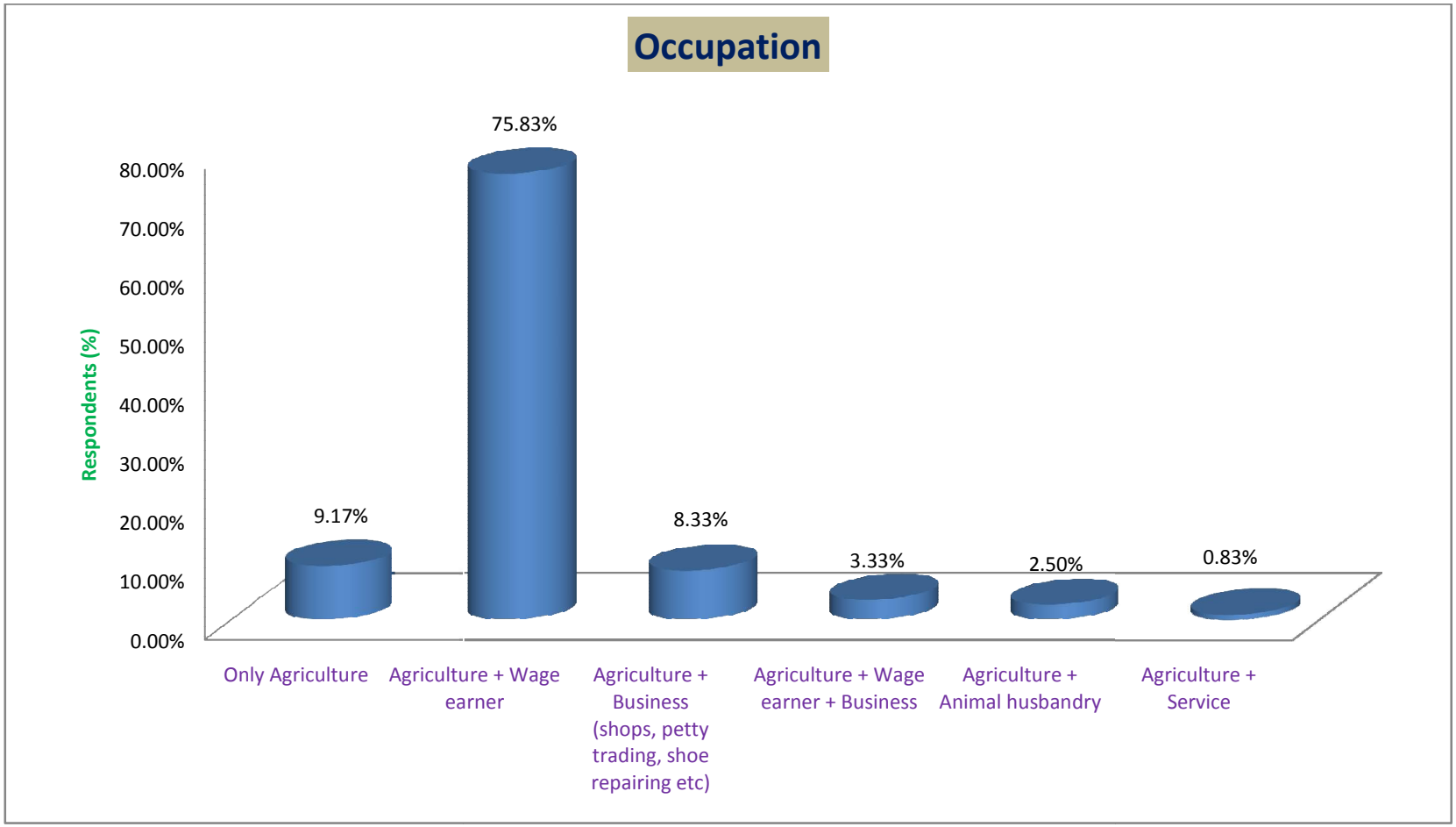

Fig. 4.1 Distribution of the respondents according to their occupation

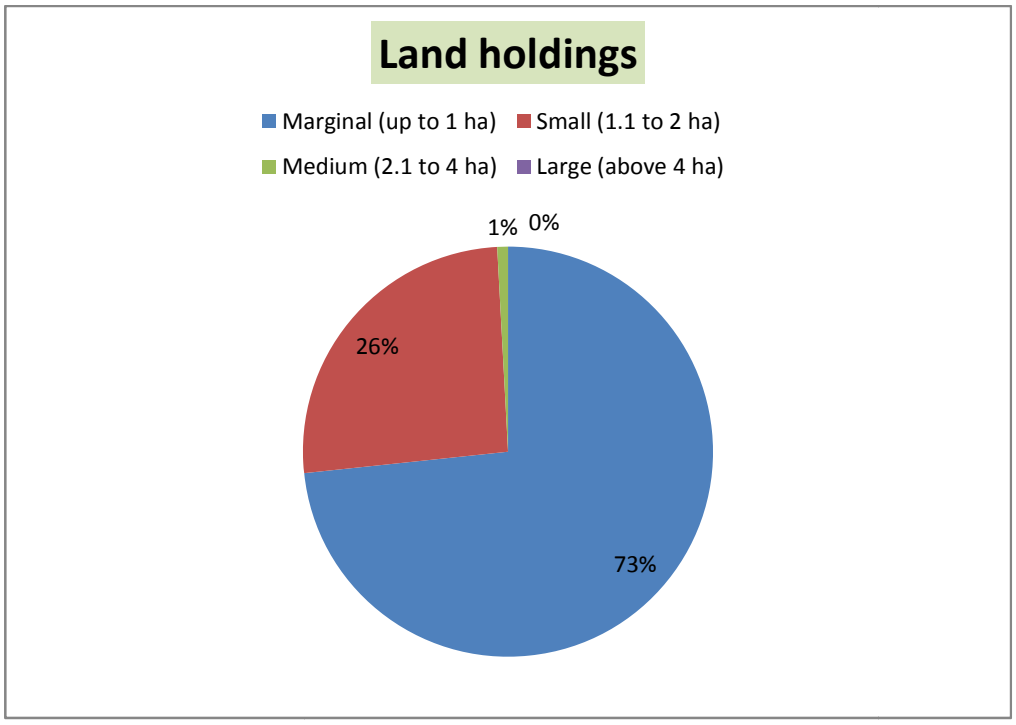

Fig. 4.2 Distribution of the respondents according to their land holding

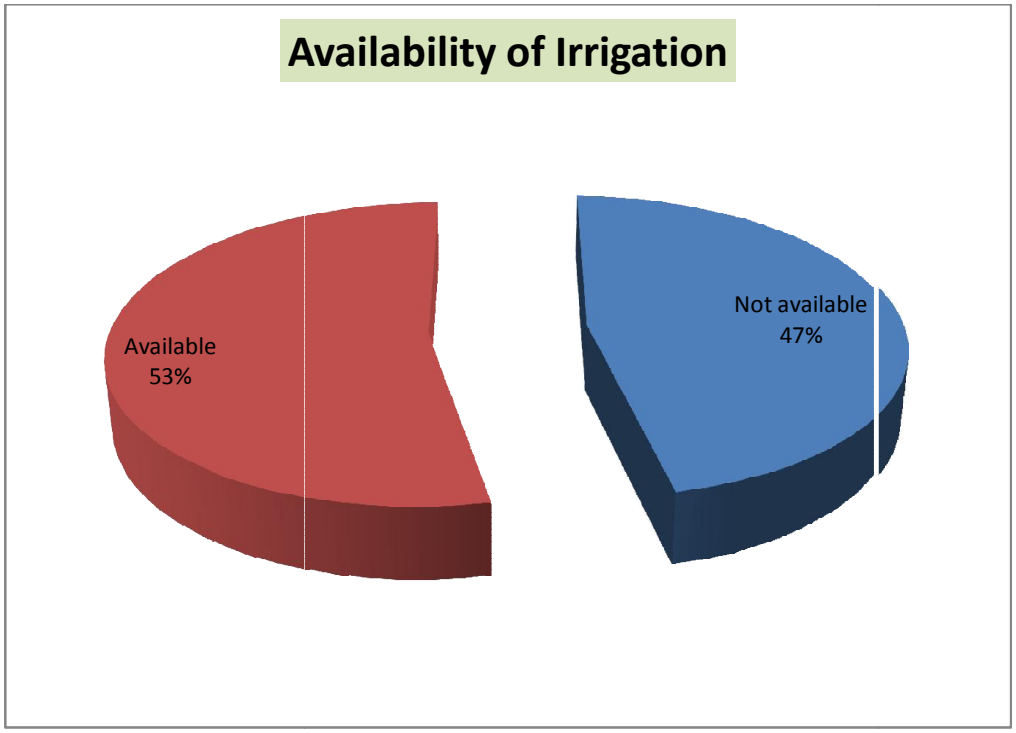

Fig. 4.3 Distribution of the respondents according to availability of irrigation

income is presented in table 4.9. It was found that most of the respondents had low annual income (71.66%) i.e. Rs. 30,000 to Rs. 60,000, followed by respondents with poor annual income (24.16%) i.e. upto Rs. 30,000. Whereas, 3.33 per cent of the respondents obtained medium annual income i.e. Rs.60,000 to 100,000 followed by respondents with high annual income (0.83%) i.e. Rs. 100,000 to 500,000 and no respondents (0%) had annual income very high (above Rs. 500,000). It can be concluded from data that majority of the respondents had low annual income i.e. rage from Rs. 30,000 to Rs. 60,000. Similar finding was also reported by Mohanty *et al.* (2013).

Table 4.9: Distribution of respondents according to their annual income (n=120)

S.N.	Annual income in Rs.	Frequency	Percentage
1	Poor (up to Rs. 30,000)	29	24.16
2	Low (>30,000 to Rs.60,000)	86	71.66
3	Medium (>60,000 to Rs. 100,000)	04	3.33
4	High (>100,000 to Rs. 500,000)	01	0.83
5	Very high (>500,000)	00	0.00

4.1.9. Farming experience

Data pertaining to farming experience presented in table 4.10 and fig. 4.5. It was found that majority of respondents (60.83%) had medium farming experience (11 to 20 years) followed by high farming experience (30%) i.e. above 20 years and only 9.17 respondents had low farming experience i.e. upto 10 years. Similar finding was also reported by Saxena (2003).

Table 4.10: Distribution of respondents according to their farming experience (n=120)

S.N.	Farming experience	Frequency	Percentage
1	Low experienced (Up to 10 years)	11	09.17
2	Medium experienced (11 to 20 years)	73	60.83
3	High experienced (Above 20 years)	36	30.00
$\bar{X}$= 15.97			S.D.= 6.12

4.1.10. Soil management practices of respondents for management of acidic soil

Data pertaining to existing soil management practices of respondents for management of acidic soil presented in tables 4.11 and 4.12 (fig. 4.6 & 4.7). It was found that the majority of respondents (80.83%) followed no farming practices for acidic soil management and remaining 23 respondents (19.17%) followed existing soil management practices. The respondents who practiced different soil management practices, about 47.83 per cent farmers followed more than two management practices, 30.43 per cent of respondents followed only two management practices and 21.74 percent respondents followed only one management practice. Similar finding was also reported by Shilang *et al.* (2011).

Table 4.11: Distribution of respondents according to their soil management practices (n=120)

Categories	Frequency	Percentage (%)
Not taking any soil management practices	97	80.83
Taking existing soil management practices	23	19.17
Total	**120**	**100**

Table 4.12: Distribution of respondents according to their use of different soil management practices (n=23)

Categories	Frequency	Percentage (%)
Taking one management practice	05	21.74
Taking two management practices	07	30.43
Taking more than two management practices	11	47.83
Total	**23**	**100**

4.1.11. Cropping pattern

Data pertaining to cropping pattern presented in table 4.13 and fig. 4.8. The result indicated that the majority of respondents (87.5%) had double cropping pattern (Rice-Wheat-Fellow) followed by multiple cropping pattern (10%) i.e. Rice-Wheat-Maize and only 2.5 per cent of respondents had mono cropping

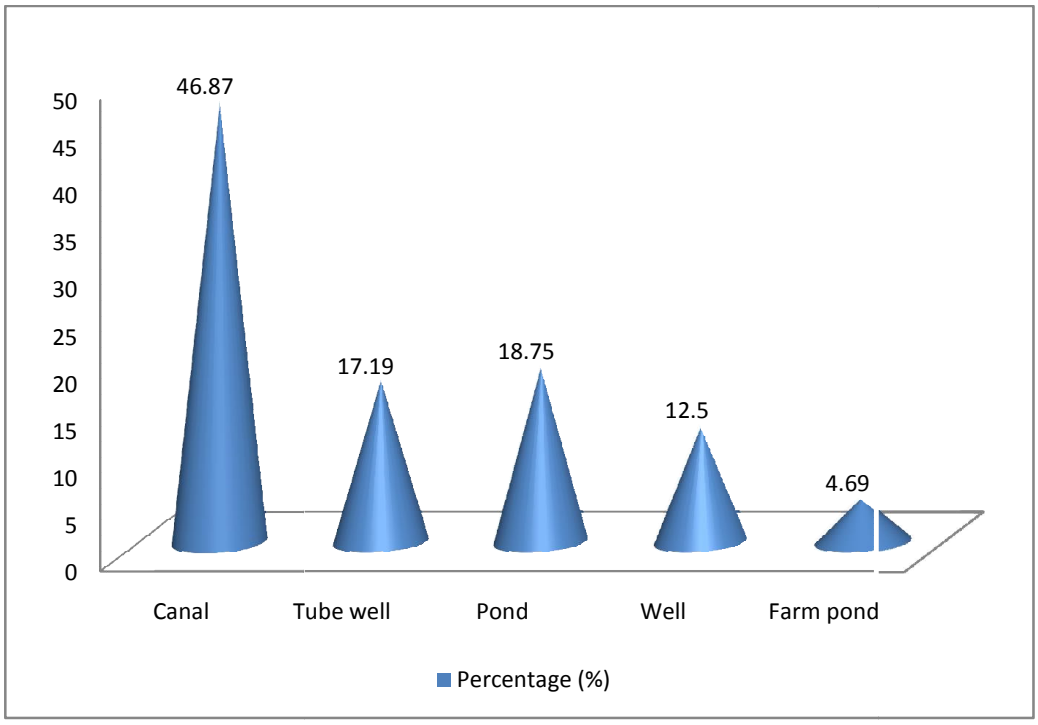

Fig. 4.4. Distribution of the respondents according to their different source of irrigation

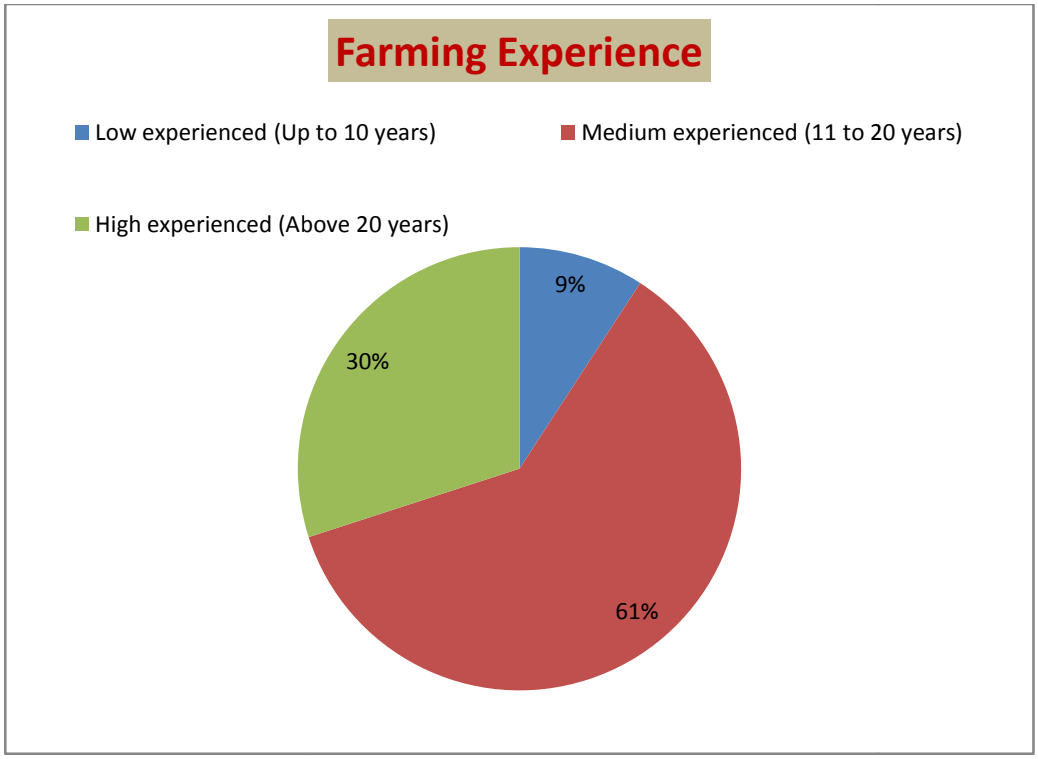

Fig. 4.5 Distribution of the respondents according to their farming experience

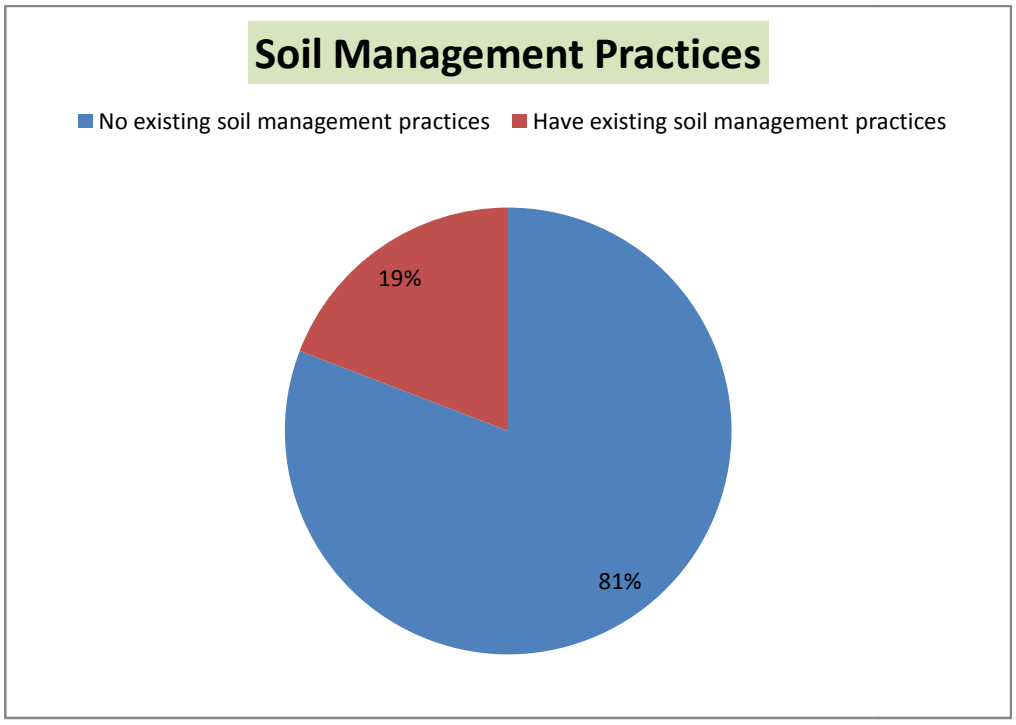

Fig. 4.6 Distribution of the respondents according to their soil management practices

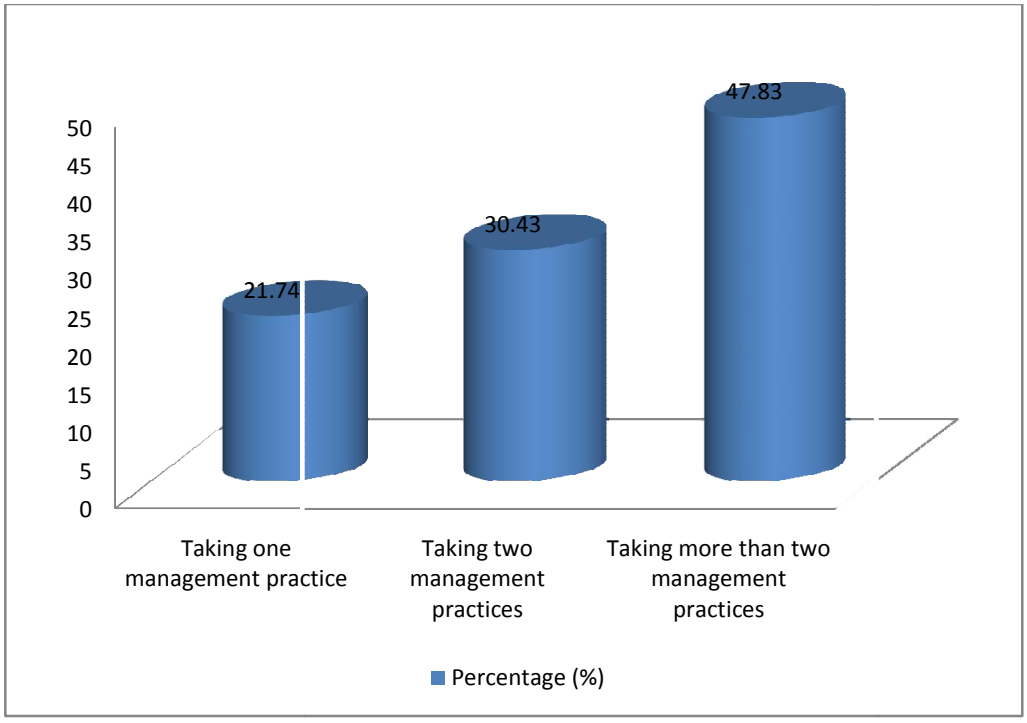

Fig. 4.7 Distribution of the respondents according to their use of different soil management practices

pattern (Rice-Fellow). While overall cropping intensity of the respondents were 155.3%. Similar finding was also reported by Manglabhanu (1977).

Table 4.13: Distribution of respondents according to their cropping pattern (n=120)

S. N	Category	Cropping pattern	Frequency	%	Avg. cropping intensity (%)
1	Mono cropping	Rice- Fellow	03	2.50	100.00
2	Double cropping	Rice- Wheat- Fellow	105	87.50	153.76
3	Multiple cropping	Rice- Wheat- Maize	12	10.00	212.10
Overall Cropping intensity					**155.3%**

$\bar{X}$= 2.37 S.D.= 0.98

Data pertaining to identification of various crops grown in acidic soil condition by the respondents of study area presented in table 4.14. The result indicated that the majority of respondents (100%) were involved in rice cultivation followed by 80.83 per cent of respondents were involved in wheat cultivation, 33.33 per cent of respondents were involved in maize cultivation, 24.17 per cent of respondents were involved in chickpea cultivation, 20 per cent of respondents were involved in pigeon pea cultivation, 15.83 per cent of respondents were involved in tomato cultivation and only 10 per cent of respondents were involved in soybean cultivation.

Table 4.14: Identification of various crops grown in acidic soil condition by the respondents of study area (n= 120)

S.N.	Crops	Respondents		Area (ha)	
		F	%	Area	%
1	Rice	120	100	90.6	83.50
2	Wheat	97	80.83	43.0	39.63
3	Maize	40	33.33	13.9	12.90
4	Chick pea	29	24.17	7.9	07.28
5	Pigeon pea	24	20.00	4.8	04.42
6	Tomato	19	15.83	8.8	08.11
7	Soybean	12	10.00	4.2	03.87

4.1.12. Source of information regarding acidic soil management

The data pertaining to utilization of the information sources for seeking the information about utilization of acidic soil for cultivation of crops are presented in the table 4.15 and fig. 4.9. The finding revealed that majority of the respondents (92.5%) found information about utilization of acidic soil for cultivation of crops from R.A.E.O. The study also revealed that, 84.17 per cent of the respondents obtained the information from radio followed by information from progressive farmers (73.33%), neighbours (49.17%), newspaper (35.83%). While 32.5 per cent of the respondents obtained the information utilization of acidic soil for cultivation of crops from friends, A.D.O (30.83%), demonstration (23.33%), kisan mela (22.5%), relatives (18.33%), T.V. (17.5%), scientist (15%), village leader (11.67%), training (10.83%) and only 0.83 per cent of respondent seeking the information from agriculture magazines. Similar finding was also reported by Kushwaha (2005).

Table 4.15: Distribution of respondents according to their Source of information (n=120)

S.N.	Source of information	Frequency	Percentage	Rank
1	Friends	39	32.50	VI
2	Relatives	22	18.33	X
3	R.A.E.Os	111	92.50	I
4	Radio	101	84.17	II
5	Kisan mela	27	22.50	IX
6	Neighbours	59	49.17	IV
7	A.D.Os	37	30.83	VII
8	Scientist	18	15.00	XII
9	Newspaper	43	35.83	V
10	Agricultural Magazine	01	0.83	XV
11	Progressive farmers	88	73.33	III
12	T.V.	21	17.50	XI
13	Village leader	14	11.67	XIII
14	Demonstration	28	23.33	VIII
15	Training	13	10.83	XIV

**Data based on multiple response*

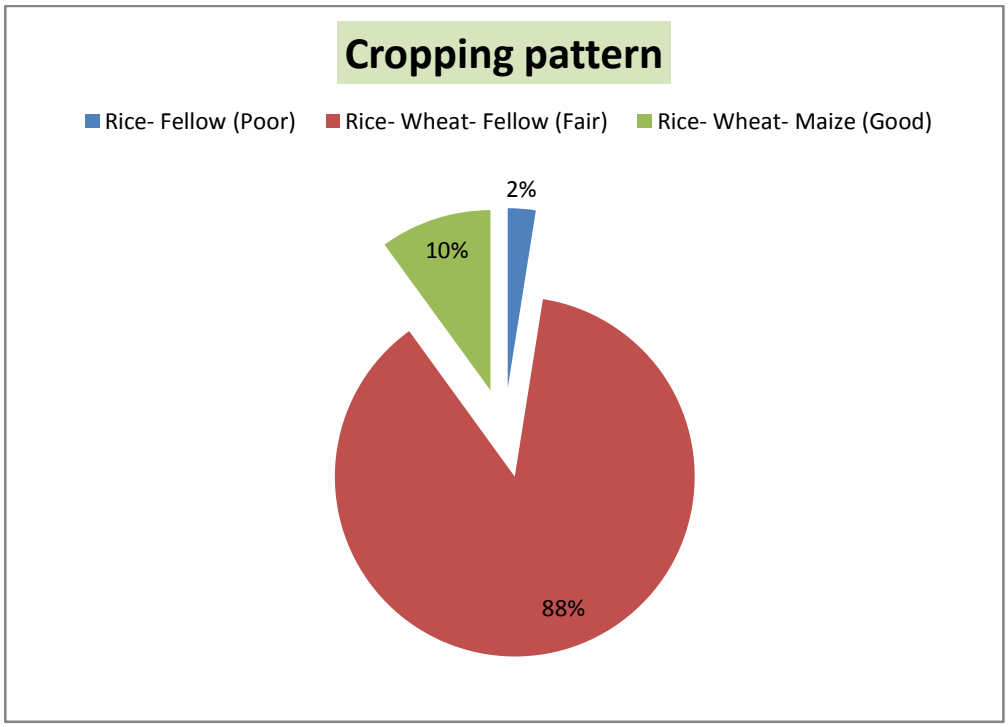

Fig. 4.8 Distribution of the respondents according to their cropping pattern

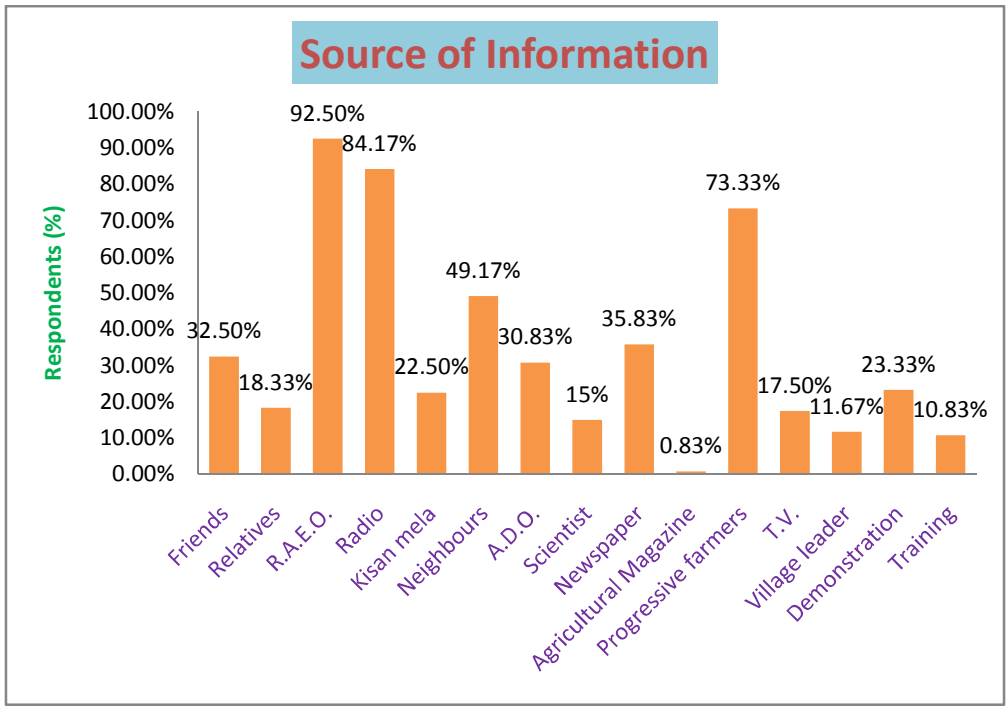

Fig. 4.9 Distribution of the respondents according to their source of information

The findings of table 4.16 and fig. 4.11 shows that majority of the respondents (53.33%) had medium level of information followed by low level of information (28.33%) and only 18.33 per cent of the respondents had high level of information. Similar finding was also reported by Shriwas (2011).

Table 4.16: Distribution of respondents according to their overall sources of information (n=120)

S.N.	Categories	Frequency	Percentage
1	Low (up to 5 source)	34	28.33
2	Medium (6 to 9 source)	64	53.33
3	High (above 9)	22	18.33
$\bar{X}$= 7.32			S.D.= 2.47

4.1.13. Contact with extension personnel

Data pertaining to contact with extension personnel is presented in table 4.17. It was found that 64.17 per cent of the respondents had contact with R.A.E.O followed by rarely contact (32.5%) and 3.33 per cent of the respondents had regular contact with R.A.E.O. None of the respondents had never contact with R.A.E.O.

In case of A.D.O, 50.83 per cent of the respondents had rarely contact with A.D.O followed by never contact (45%) and 4.17 per cent of the respondents had often contact with A.D.O, none of the respondents had regular contact with A.D.O.

In case of S.A.D.O, 72.5 per cent of the respondents had never contact with S.A.D.O followed by contact (26.67%) and 0.83 per cent of the respondents had often contact with S.A.D.O, none of the respondents had regularly contact with S.A.D.O.

In case of S.M.S., 81.67 per cent of the respondents had never contact with S.M.S. followed by rarely contact (18.33%) and none of the respondents had regular and often contact with S.M.S.

Table 4.17: Distribution of respondents according to their contact with extension personnel (n=120)

S.N	Extension	Extent of contact

.	Personnel	Never		rarely		Often		Regular	
		f	%	f	%	f	%	F	%
1	R.A.E.O	00	0.00	39	32.5	77	64.17	04	3.33
2	A.D.O	54	45.00	61	50.83	05	4.17	00	0.00
3	S.A.D.O	87	72.50	32	26.67	01	0.83	00	0.00
5	SMS	98	81.67	22	18.33	00	0.00	00	0.00

In case of overall contact with extension personnel (RAEO, ADO, SADO, Agricultural scientists and SMS) the data are presented in table 4.18. The data revealed that majority of respondents (58.33%) had medium level of overall contact with extension personnel followed by low level of contact (25.83%). Whereas, 9.16 per cent of respondents had high level of contact with extension personnel and only 6.66 per cent of the respondents had no contact with extension personnel. Similar finding was also reported by Kumar et al. (2012).

Table 4.18: Distribution of respondents according to their overall contact with extension personnel (n=120)

S.N.	Categories	Frequency	Percentage
1	Nil	08	6.66
2	Low (up to 2 score)	31	25.83
3	Medium (3 to 4 score)	70	58.33
4	High (above 4 score)	11	9.16
$\bar{X}$= 3.06			S.D.= 1.51

4.1.14. Scientific orientation

The table 4.19 shows that majority of the respondents (69.17%) had medium level of scientific orientation followed by low level of orientation (25.83%), while 3.33 per cent respondents had high level of scientific orientation.

It can be concluded that majority of the respondents came under the medium level of scientific orientation category. The results are in close agreement with the finding of Thatchinamoorthy and Selvin (2014), who reported that more than 85 per cent of farmers possessed medium level of scientific orientation.

Table 4.19: Distribution of respondents according to their scientific orientation (n=120)

S.N.	Level of scientific orientation	Frequency	Percentage
1	Low level of scientific orientation (up to 21 score)	33	27.50
2	Medium level of scientific orientation (22 to 25 score)	83	69.17
3	High level of scientific orientation (Above 25 score)	04	3.33
$\bar{X}$= 23.1			S.D.= 1.80

4.1.15. Risk orientation

Data pertaining to risk orientation of respondents are presents in table 4.20. It was found that majority of the respondents (62.5%) had medium level of risk orientation followed low level of risk orientation (23.33%) and 14.17 per cent of the respondent had high level of risk orientation. The results are in good agreement with the findings of Devarani and Bandhyopadhyay (2012) and Thatchinamoorthy and Selvin (2014) who found that half of the respondents have medium level of risk orientation.

Table 4.20: Distribution of respondents according to their risk orientation (n=120)

S.N.	Level of risk orientation	Frequency	Percentage
1	Low level risk orientation (less than 15 score)	28	23.33
2	Medium level risk orientation (16 to 21 score)	75	62.50
3	High level risk orientation (Above 21 score)	17	14.17
$\bar{X}$= 18.4			S.D.= 3.11

4.1.16. Perception about acidic soil

Data pertaining to perception of acidic soil of respondents are presented in table 4.21. The table shows response of respondents with different eleven statements in the form of frequency and percentage (%).

Table 4.21: Distribution of respondents according to their perception about acidic soil (n=120)

S.N	Perception	SA	A	UD	DA	SDA
1	It is beneficial for farmers to test soil	**6**	**17**	**97**	**0**	**0**

	in soil test laboratory before doing cultivation of crops in acidic soil.	**(5)**	**(14.17)**	**(80.83)**	**(0)**	**(0)**
2	Before selecting any crop for cultivation in acidic soil advice should be taken from any agricultural worker (R.A.E.OS, A.D.OS, S.A.D.OSS and SMS etc).	**9 (7.5)**	**109 (90.83)**	**2 (1.67)**	**0 (0)**	**0 (0)**
3	In acidic soil only recommended crops and their varieties should be cultivated under acidic soil.	**2 (1.67)**	**8 (6.67)**	**110 (91.67)**	**0 (0)**	**0 (0)**
4	For management of acidic soil different types of recommended practices are used which increases soil fertility and productivity.	**0 (0)**	**17 (14.17)**	**103 (85.83)**	**0 (0)**	**0 (0)**
5	Use of recommended dose of fertilizer is beneficial for acidic soil.	**4 (3.33)**	**17 (14.17)**	**99 (82.5)**	**0 (0)**	**0 (0)**
6	There is lack of information regarding management of acidic soil.	**12 (10)**	**79 (65.83)**	**13 (10.83)**	**10 (8.33)**	**4 (3,33)**
7	Management of acidic soil is expensive.	**43 (35.83)**	**36 (30)**	**13 (10.83)**	**19 (15.83)**	**9 (7.5)**
8	More subsidies should be provided by government for reclamation of acidic soil.	**117 (97.5)**	**3 (2.5)**	**0 (0)**	**0 (0)**	**0 (0)**
9	It is better to use tolerant varieties as compare to reclamation of acidic soil.	**0 (0)**	**8 (6.67)**	**106 (88.33)**	**4 (3.33)**	**2 (1.67)**
10	Seed treatment before sowing in acidic soil is helpful in minimizing the occurrence of plant diseases.	**12 (10)**	**23 (19.17)**	**85 (70.83)**	**0 (0)**	**0 (0)**
11	Timely soil testing should be done from agriculture department with the help of soil testing laboratory.	**20 (16.67)**	**78 (65)**	**22 (18.33)**	**0 (0)**	**0 (0)**

Note: Figure in parenthesis was percent to the total.

Table 4.22 shows that majority of the respondents (66.67%) had medium level of perception followed by low level of perception (20%) and only only 13.34 per cent of the respondents had high level of perception. Similar finding was also reported by Sundar and ramakrishnan (2013).

Table 4.22: Distribution of respondents according to their level of perception about acidic soil (n=120)

S.N.	Level of perception	Frequency	Percentage
1	Low level (up to 28 Score)	24	20.00
2	Medium (29 to 36 Score)	80	66.67
3	High level (above 36 Score)	16	13.34
$\bar{X}$= 31.77			S.D.= 4.32

4.1.17. Awareness of acidic soil management

Data pertaining to awareness of acidic soil management are presents in table 4.23. The data revealed that the majority of the respondents (78.33%) were partial aware about acidic soil management followed by respondents with complete awareness (20.83%) and only 0.83 per cent of respondents were not aware about acidic soil management.

The result related to second statement of the table 4.23 i.e. components which are use in management of acidic soil, the majority of the respondents (79.17%) were partial aware followed by respondents with complete awareness (12.5) and 8.33 per cent of farmers were not aware.

The result related to third statement of the table 4.23 i.e. suitable crops which are recommended for cultivation under acidic soil condition, the majority of the respondents (68.33%) were not aware followed by respondents with partial awareness (31.67%) and no respondent (0%) comes under complete level of awareness.

The result related to fourth statement of the table 4.23 i.e. seed treatment before sowing of seed, the majority of the respondents (87.5%) were not aware

followed by respondents with partial awareness (12.5%) and no respondent (0%) comes under complete level of awareness.

The result related to fifth statement of the table 4.23 i.e. recommended fertilizers name for cultivation of crops under acidic soil condition, the majority of the respondents (65.83%) were not aware followed by respondents with partial awareness (28.33%) and no respondents (0%) comes under complete level of awareness.

The result related to sixth statement of the table 4.23 i.e. recommended fertilizers dose for cultivation of crops under acidic soil condition, the majority of the respondents (90%) were not aware followed by respondents with partial awareness (9.17%) and only one respondent (0.83%) was complete aware.

The result related to seventh statement of the table 4.23 i.e. soil test (report), majority of the respondents (82.5%) were partial aware about acidic soil management followed by respondents with complete awareness (17.5%) and no respondent (0%) comes under category of nil.

The result related to eighth statement of the table 4.23 i.e. use of lime as acidic soil reclamation practices, majority of the respondents (80%) were partial aware about acidic soil management followed by respondents with complete awareness (19.67%) and only one (0.83%) respondent was comes under category of nil.

The result related to ninth statement of the table 4.23 i.e. manures which are beneficial for acidic soil management practices, the majority of the respondents (82.5%) were not aware followed by respondents with partial awareness (17.5%) and no respondent (0%) was comes under the category of complete level of awareness.

Table 4.23: Distribution of respondents according to their awareness of acidic soil management (n=120)

S.N	Particulars	Level of Awareness		
		Complete	Partial	Nil
1	Do you know about acidic soil management	25 (20.83)	94 (78.33)	1 (0.83)

2	Do you know about the components which are used in management of acidic soil	15 (12.50)	95 (79.17)	10 (8.33)
3	Do you know about suitable crops which are recommended for cultivation under acidic soil condition	0 (0.00)	38 (31.67)	82 (68.33)
4	Do you know about seed treatment before sowing of seed (special reference to acidic soil condition)	0 (0)	15 (12.5)	105 (87.5)
5	Do you know about recommended fertilizers name for cultivation of crops under acidic soil condition	0 (0.00)	34 (28.33)	79 (65.83)
6	Do you know about recommended fertilizers dose for cultivation of crops under acidic soil condition	1 (0.83)	11 (9.17)	108 (90)
7	Do you know about soil test (report)	21 (17.50)	99 (82.50)	0 (0.00)
8	Do you know about use of lime as acidic soil reclamation practices	23 (19.67)	96 (80)	1 (0.83)
9	Do you know about manures which are beneficial for acidic soil management practices	0 (0.00)	21 (17.50)	99 (82.50)

Note: Figure in parenthesis was percent to the total.

From the table 4.24 and fig 4.9 the data clearly revealed that the majority of the respondents (75.83%) had medium level of overall awareness followed by high level of overall awareness (16.67%) and only 7.5 per cent had low level of overall awareness. Similar finding was reported by Weldimariam (2013).

Table 4.24: Distribution of respondents according to their level of overall awareness about acidic soil management (n=120)

S.N.	Level of Awareness	Frequency	Percentage
1	Low (< 17.00%)	09	07.50
2	Medium (18.00 to 45.00 %)	91	75.83

3	High (> 45.00%)	20	16.67
$\bar{X}$= 31.2			S.D.= 14.04

4.2. Performance of various crops and their area amongst the respondents under acidic soil condition

Table 4.25 shows that all the respondents (100%) cultivated rice crop, while the wheat growers were 80.83 per cent followed by maize grower (33.33%). It was found that chick pea was grown by the 24.17 per cent respondents, while, pigeon pea, tomato and soybean were grown by 20, 15.83 and 10 per cent respondents respectively. In case of coverage of the area under different crops, table 4.25 shows that rice occupied maximum area (83.5%), followed by wheat (39.63%), maize (12.9%), tomato (8.11%), chick pea (7.28%), pigeon pea (4.42%) and soybean (3.87%).

In case of the productivity of different crops grown by the respondents, table 4.25 and fig. 4.10 indicates that respondents obtained 132.79 q/ha average productivity from tomato. Similarly, the average productivity from important crops like maize, rice, wheat, soybean, chick pea and pigeon pea were 22.77, 20.87, 12.69, 7.75, 6.32 and 4.59 q/ha respectively.

Table 4.25: Distribution of respondents according to productivity of various crops, and their area amongst the respondents (n=120)

S.N.	Crops	Respondents*		Area (ha)*		Average Productivity (q/ha)
		F	%	Area	%	
1	Rice	120	100	90.6	83.50	**20.87**
2	Wheat	97	80.83	43.0	39.63	**12.69**
3	Maize	40	33.33	13.9	12.90	**22.77**
4	Chick pea	29	24.17	7.9	07.28	**6.32**
5	Pigeon pea	24	20.00	4.8	04.42	**4.59**
6	Tomato	19	15.83	8.8	08.11	**132.79**
7	Soybean	12	10.00	4.2	03.87	**7.75**

** Data based on multiple responses*

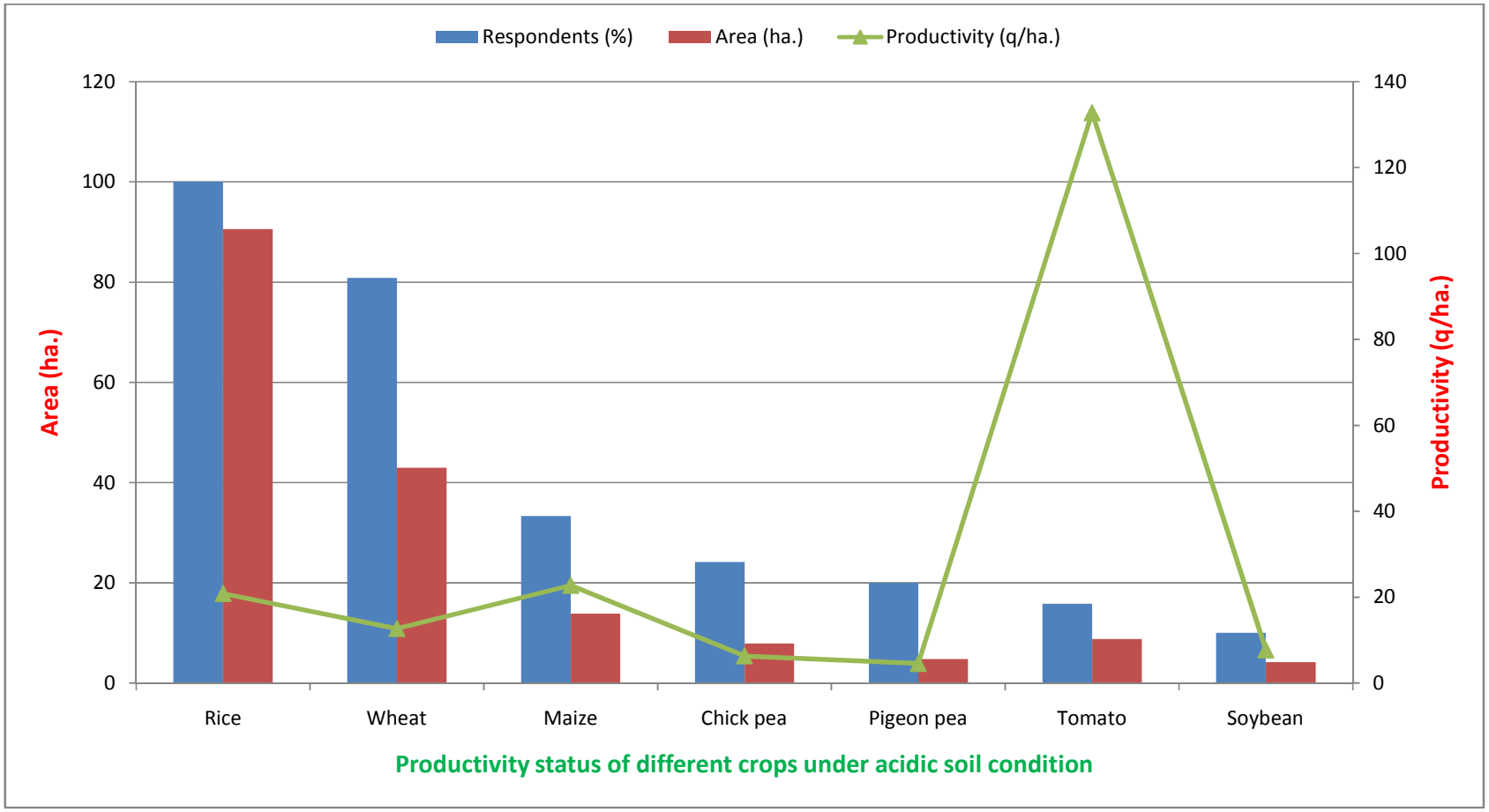

Fig. 4.10 Overall productivity status of various crops grown in acidic soil condition by the respondents

4.2.1 Existing soil management practices followed by the respondents under acidic soil condition (n= 120)

Data pertaining to existing soil management of the respondents presented in the table 4.26. The data revealed that majority (80.83%) of the respondents did not follow any acidic soil management practices, wheareas, only 19.17 per cent of the respondents followed the acidic soil management practices.

Table 4.26: Distribution of respondents according to their acidc soil management practices (n= 120)

S.N.	Soil management practices	Frequency	Percentage (%)
1	Taking soil management practices	23	19.17
2	Not taking any soil management practices	97	80.83
	Total	**120**	**100**

The data in the table 4.26.1 shows that majority of the respondents (100%) used lime followed by manures (59.56%), fertilizers of basic nature (52.17%). While, 39.13 per cent respondents used suitable crops which perform better under acidic soil condition.

Table 4.26.1: Distribution of respondents according to their existing soil management practices under acidic soil condition (n= 23)

SN	Practice	Frequency	Percentage (%)
1	Use of lime	23	100
2	Use of fertilizers (Basic nature)	12	52.17
3	Taking suitable crops	09	39.13
4	Use of manures*	16	59.56

***** = *Maintain soil pH through buffering activity,* *#Data based on multiple responses*

4.2.2. Combination of existing soil management practices and productivity status of various crops grown by the respondents

Data pertaining to different combinations of existing soil management practices and their productivities with different crops are presented in the table 4.27. It was found that majority of respondents (47.83%) comes under lime + manures combination of soil management practices followed by the combination of

lime + fertilizers (30.43%) and only 21.74 per cent of respondents came under lime + fertilizers + manures combination of soil management practices.

In case of rice crop, the data (table 4.27) revealed that maximum productivity (25.23 q/ha) found under the combination of lime + fertilizers + manures followed by lime + fertilizers (23.07 q/ha) and lime + manures combination (22.47 q/ha) of soil management practices.

In case of wheat crop, the data (table 4.27) revealed that maximum productivity (15.88 q/ha) found in the combination of lime + fertilizers + manures, followed by lime + fertilizers (14.93 q/ha) and lime + manures combination (14.57 q/ha) of soil management practices.

In case of maize crop, the data (table 4.27) revealed that maximum productivity (26.44 q/ha) found in the combination of lime + fertilizers + manures, followed by lime + fertilizers (24.03 q/ha) and lime + manures combination (22.96 q/ha) of soil management practices.

In case of chickpea crop, the data (table 4.27) revealed that maximum productivity (9.87 q/ha) found in the combination of lime + fertilizers + manures, followed by lime + fertilizers (7.96 q/ha) and lime + manures combination (6.41 q/ha) of soil management practices.

In case of pigeon pea crop, the data (table 4.27) revealed that maximum productivity (6.36 q/ha) found in the combination of lime + fertilizers + manures, followed by lime + fertilizers (5.93 q/ha) and lime + manures combination (4.69 q/ha) of soil management practices.

In case of tomato crop, the data (table 4.27) revealed that maximum productivity (156.36 q/ha) found in the combination of lime + fertilizers + manures, followed by lime + fertilizers (140.53 q/ha) and lime + manures combination (135.49 q/ha) of soil management practices.

In case of soybean crop the data (table 4.27) revealed that maximum productivity (9.65 q/ha) found in the combination of lime + fertilizers + manures followed by lime + fertilizers (8.09 q/ha) and lime + manures combination (7.7 q/ha) of soil management practices.

Table 4.27 revealed that the productivity of all seven crops was found best under lime + fertilizers + manures combination of soil management practices.

Table 4.27: Combination of existing soil management practices and productivity status of various crops grown by the respondents (n=23)

Combination	Frequency	%	Productivity status of crops						
			Rice* q/ha	Wheat q/ha	Maize* q/ha	Chickpea q/ha	Pigeon pea q/ha	Tomato* q/ha	Soybean q/ha
Lime + Fertilizer	07	30.43	23.07	14.93	24.03	7.96	5.93	140.53	8.09
Lime + Manure	11	47.83	22.47	14.57	22.96	6.41	4.69	135.49	7.70
Lime + Fertilizer + Manure	05	21.74	25.23	15.88	26.44	9.87	6.36	156.36	9.65

***** = *Suitable crop which perform better in slightly acidic condition with some management practices.*

% = Percentage,

4.2.3. Comparison of productivity of various crops among the farmers in two situations (without and with soil management practices) under acidic soil condition

In case of rice crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28 & fig.4.11) revealed that number of farmers i.e. 97 (80.83%) with area 67.3 hectares (62.02%) had average productivity about **18.48 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 23 (19.16%) with area 23.3 hectares (21.47%) had average productivity about **23.26 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of rice under both condition (without and with soil management practices). The value (11.7) shows that both categories were significantly differ from each other.

In case of wheat crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28 & fig.4.11) revealed that number of farmers i.e. 74 (76.29%) with area 31.9 hectares (29.4%) had average productivity about **11.93 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 23 (23.71%) with area 11.1 hectares (10.23%) had average productivity about **15.13 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of wheat under both condition (without and with soil management practices). The value (10.08) shows that both categories were significantly differ from each other.

In case of maize crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28 & fig.4.11) revealed that number of farmers i.e. 24 (60%) with area 6.9 hectares (6.35%) had average productivity about **20.79 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 16 (40%) with area 7 hectares (6.45%) had average productivity about **24.75 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of maize

under both condition (without and with soil management practices). The value (11.24) shows that both categories were significantly differ from each other.

In case of chickpea crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28 & fig.4.11) revealed that number of farmers i.e. 18 (62.07%) with area 4.9 hectares (4.51%) had average productivity about **5.23 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 11 (37.93%) with area 3 hectares (2.76%) had average productivity about **7.41 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of chickpea under both condition (without and with soil management practices). The value (9.65) shows that both categories were significantly differ from each other.

In case of pigeon pea crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28 & fig.4.11) revealed that number of farmers i.e. 16 (66.67%) with area 2.5 hectares (2.3%) had average productivity about **3.86 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 8 (33.33%) with area 2.3 hectares (2.12%) had average productivity about **5.33 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of pigeon pea under both condition (without and with soil management practices). The value (8.52) shows that both categories were significantly differ from each other.

In case of tomato crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28) revealed that number of farmers i.e. 7 (36.84%) with area 3.4 hectares (3.13%) had average productivity about **120.08 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 12 (63.16%) with area 5.4 hectares (4.97%) had average productivity about **145.5 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of tomato under both condition (without and with soil management practices). The value (5.95) shows that both categories were significantly differ from each other. In case

Table 4.28: Comparison table of productivity of popular crops and their area amongst the both type of respondents (without and with soil management practices)

SN	Crops name		Without any management practices					With management practices					t- Test #
			Respondents		Area (ha.)		Mean productivity	Respondents		Area (ha.)		Mean Productivity	t-Stat Value
			F	%	Area	%	(q/ha.)	F	%	Area	%	(q/ha.)	
1	Rice	(n= 120)	97	80.83	67.3	62.02	**18.48**	23	19.16	23.3	21.47	**23.26**	**11.7***
2	Wheat	(n= 97)	74	76.29	31.9	29.4	**11.93**	23	23.71	11.1	10.23	**15.13**	**10.08***
3	Maize	(n= 40)	24	60.00	6.9	6.35	**20.79**	16	40.00	7	6.45	**24.75**	**11.24***
4	Chick pea	(n= 29)	18	62.07	4.9	4.51	**5.23**	11	37.93	3	2.76	**7.41**	**9.65***
5	Pigeon pea	(n= 24)	16	66.67	2.5	2.3	**3.86**	8	33.33	2.3	2.12	**5.33**	**8.52***
6	Tomato	(n= 19)	7	36.84	3.4	3.13	**120.08**	12	63.16	5.4	4.97	**145.5**	**5.95***
7	Soybean	(n= 12)	7	58.33	1.7	1.56	**6.71**	5	41.67	2.5	2.3	**8.8**	**5.7***

 # = t-Test: Two-Sample Assuming Unequal Variances and Unequal observations.

*** = Significance at 0.01 (1%) df**

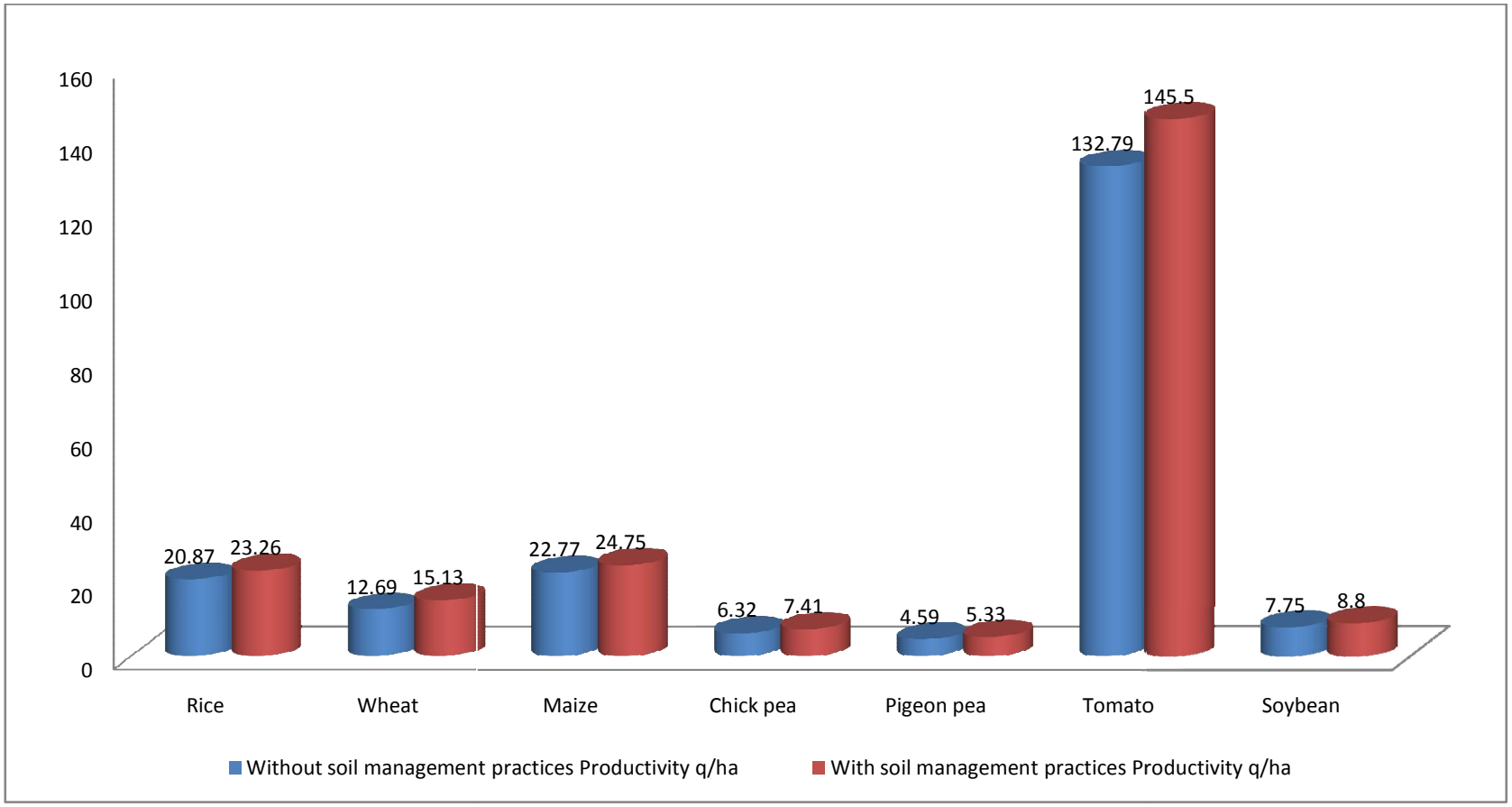

Fig. 4.11 Comparative productivity status of various crops grown in acidic soil condition by the respondents of with and without soil management practices

of soybean crop, under category in which farmers did not practiced any additional soil management practices, the data (table 4.28) revealed that number of farmers i.e. 7 (58.33%) with area 1.7 hectares (1.56%) had average productivity about **6.71 q/ha**. While under category in which farmers practiced additional soil management practices, number of farmers i.e. 5 (41.67%) with area 2.5 hectares (2.3%) had average productivity about **8.8 q/ha**.

The t-Test (two sample assuming unpaired observation and unequal variance) applied to find out about significance level of productivity of soybean under both condition (without and with soil management practices). The value (5.7) shows that both categories were significantly differing from each other.

4.2.4 Variety wise productivity comparison of popular crops grown by the farmers in two situations (without and with soil management practices) under acidic soil condition

Data pertaining to varieties wise productivity comparison of popular crops between two situations grown by the respondents in acidic soil condition are presented in table 4.29.

In case of varieties of rice crop, all respondents (120) were cultivated rice. Under the category in which farmers did not practiced any additional soil management practices, the data (table 4.29) revealed that majority of respondents i.e. 44 (36.66%) cultivated MTU-1010 variety with average productivity about **21.51 q/ha** while under category in which farmers practiced additional soil management practices, majority of farmers i.e. 14 (11.67%) cultivated MTU-1010 variety with average productivity about **25.29 q/ha**. Under the category in which farmers did not follow any acidic soil management practices, about 12.5 per cent respondents were grown MTU-1001 variety with the productivity **20.1 q/ha,** whereas, under second category of respondents same variety performed with the productivity **23.94 q/hac**. About 9.16 per cent respondents were grown IR 64 variety with the productivity 18.44 q/ha under the category in which farmers did not follow any acidic soil management practices whereas under second category of respondents same variety performed with the productivity **21.1 q/hac**. About 8.33 per cent respondents were grown Vishnubhog variety with the productivity **16.12 q/ha** under the category in which farmers did not follow any acidic soil

management practices whereas under second category no one respondent was cultivated Vishnubhog variety of rice. About 6.67 per cent respondents were grown IR 36 variety with the productivity **18.32 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category of respondents same variety performed with the productivity **22.71 q/hac**. About 5 per cent respondents were grown Jau phool variety with the productivity **15.43 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category no one respondent cultivated Jau phool variety of rice. About 2.5 per cent respondents were grown Safri variety with the productivity **19.33 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category no one respondent cultivated Safri variety of rice.

In case of varieties of wheat crop, about 97 respondents were cultivated wheat. Under the category in which farmers did not practiced any additional soil management practices, the data (table 4.29) revealed that majority of respondents i.e. 47 (48.45%) cultivated Sarbati variety with average productivity about **12.30 q/ha** while under category in which farmers practiced additional soil management practices, majority of farmers i.e. 19 (19.59%) cultivated Sarbati variety with average productivity about **13.98 q/ha**. Under the category in which farmers did not follow any acidic soil management practices, about 19.59 per cent respondents were grown HD- 2278 variety with the productivity **13.02 q/ha,** whereas, under second category of respondents same variety performed with the productivity **16.23 q/hac**. About 6.19 per cent respondents were grown LOK-1 variety with the productivity **11.56 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category no one respondent cultivated LOK-1 variety of wheat. About 2.06 per cent respondents were grown Sujata variety with the productivity **10.45 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category no one respondent cultivated sujata variety of wheat.

In case of varieties of maize crop, about 40 respondents were cultivated maize. Under the category in which farmers did not practiced any additional soil management practices, the data (table 4.29) revealed that majority of respondents

Table 4.29: Variety wise productivity comparison of popular crops grown by the farmers in two situations (without and with soil management practices) under acidic soil condition

Crop	Varieties name	Without any soil management practices			With soil management practices		
		Respondents		Mean productivity	Respondents		Mean productivity
		F	%	(q/ha.)	F	%	(q/ha.)
Rice	MTU-1010	44	36.66	**21.51**	14	11.67	**25.29**
(n=120)	MTU-1001	15	12.50	**20.10**	3	2.50	**23.94**
	IR 64	11	9.16	**18.44**	4	3.33	**21.10**
	Vishnubhog	10	8.33	**16.12**	0	0.00	**0.00**
	IR 36	8	6.67	**18.32**	2	1.67	**22.71**
	Jau phool	6	5.00	**15.43**	0	0.00	**0.00**
	Safri	3	2.5	**19.33**	0	0.00	**0.00**
Average				**18.48**			**23.26**
Wheat	Sarbati	47	48.45	**12.30**	19	19.59	**13.98**
(n=97)	HD- 2278	19	19.59	**13.02**	4	4.12	**16.23**
	LOK-1	6	6.19	**11.56**	0	0.00	**0.00**
	Sujata	2	2.06	**10.45**	0	0.00	**0.00**
Average				**11.93**			**15.13**
Maize	Pioneer	16	40.00	**22.29**	12	30.00	**26.14**
(n=40)	Hi-starch	5	12.50	**20.47**	4	10.00	**23.36**
	Penakal	3	7.70	**19.59**	0	0.00	**0.00**
Average				**20.79**			**24.75**

i.e. 16 (40%) cultivated Pioneer variety with average productivity about **22.29 q/ha** while under category in which farmers practiced additional soil management practices, majority of farmers i.e. 12 (30%) cultivated Pioneer variety with average productivity about **26.14 q/ha**. Under the category in which farmers did not follow any acidic soil management practices, about 12.5 per cent respondents cultivated Hi-starch variety with the productivity **20.47 q/ha** whereas under second category of respondents same variety performed with the productivity **23.36 q/hac**. About 7.7 per cent respondents were grown Penakal variety with the productivity **19.59 q/ha** under the category in which farmers did not follow any acidic soil management practices whereas under second category no one respondent was cultivated Penakal variety of maize.

4.2.5 Benefit cost ratio of rice crop under different three combinations of acidic soil management practices

Table 4.30 represents benefit cost ratio of rice crop cultivation under three different combinations of existing soil management practices. It was found that maximum benefit cost ratio (1.47) of rice crop cultivation observed under the combination of lime + fertilizers (basic nature) followed by combination of lime + fertilizers + manure with 1.35 (B:C ratio) whereas lime + manure combination of acidic soil management practices shows only 1.33 benefit cost ratio (B:C ratio).

Table 4.30 Benefit cost ratio of rice crop under different three combinations of acidic soil management practices

Particulars	Lime + Fertilizers	Lime + Manure	Lime + Fertilizers + Manure
Cost of cultivation (Rs/ hac)	12768	14832	15332
Gross return (Rs/ hac)	31546	34547	35998
Net income (Rs/ hac)	18778	19715	20666
B:C ratio	**1.47**	**1.33**	**1.35**

4.3 Correlation analysis of independent variables with performance (productivity) of various crops under acidic soil condition

In case of rice crop, the data (table 4.31) revealed that source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, source of irrigation, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of rice crop under acidic soil condition. While rest variables were non-significantly correlated with the performance (productivity) of rice crop under acidic soil condition.

It means that productivity of rice crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of maize crop, the data (table 4.31) revealed that source of irrigation, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of maize crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of maize crop under acidic soil condition.

It means that productivity of maize crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of wheat crop, the data (Table 4.31) revealed that source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, source of irrigation, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of wheat crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of wheat crop under acidic soil condition.

It means that productivity of wheat crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of pigeon pea crop, the data (Table 4.31) revealed that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of pigeon pea crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of pigeon pea crop under acidic soil condition.

It means that productivity of pigeon pea crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of chickpea crop, the data (Table 4.31) revealed that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of chickpea crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of chickpea crop under acidic soil condition.

It means that productivity of chickpea crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of soybean crop, the data (Table 4.31) revealed that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of soybean crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of soybean crop under acidic soil condition.

It means that productivity of soybean crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

In case of tomato crop, the data (table 4.31) revealed that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of tomato crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of tomato crop under acidic soil condition.

It means that productivity of tomato crop increases by increasing in land holding, source of irrigation, annual income, existing soil management practices, source of information and contact with extension personnel.

4.4 Multiple regression analysis of independent variables with performance (productivity) of various crops under acidic soil condition

The results of multiple regression analysis are presented in the table 4.32. The results of multiple regression analysis reveals that, two variables viz. existing soil management practices and contact with extension personnel were significantly contributed towards the productivity of all seven crops (rice, maize, wheat, pigeon pea, chickpea and tomato). While land holding was significantly contributed towards productivity of four crops (rice, maize, wheat and tomato) followed by annual income which was significantly contributed towards productivity of three corps (rice, maize and wheat).

The variables age, education, family size, social participation, occupation, farming experience, cropping pattern, awareness of acidic soil management, scientific orientation and risk orientation had no significant contribution in the productivity of any of seven crops (rice, maize, wheat, pigeon pea, chickpea and tomato).

Table 4.31: Coefficient of correlation of independent variables with performance (productivity) of various crops under acidic soil condition.

SN	Independent Variables	Coefficient of correlation "r" value						
		Rice (n= 120)	Maize (n= 40)	Wheat (n= 97)	Pigeon pea (n= 24)	Chickpea (n= 29)	Soybean (n= 12)	Tomato (n= 19)
1	Age	.045	.075	-.023	-.157	-.001	.095	.251
2	Education	.054	.093	.096	.197	.002	.132	.106
3	Family size	.141	.305	.066	.143	.074	.348	.191
4	Social participation	.166	.044	.127	.206	.021	.315	.002
5	Occupation	.168	.220	.136	.203	.035	.300	.204
6	Land holding	.295**	.440**	.445**	.413*	.379*	.593*	.488*
7	Source of Irrigation	.248**	.359*	.369**	.409*	.385*	.579*	.527*
8	Annual income	.239**	.488**	.410**	.472*	.470*	.581*	.480*
9	Farming experience	.001	.109	.038	.393	.015	.334	.275
10	Existing soil management practices	.790**	.811**	.780**	.778**	.869**	.830**	.842**
11	Cropping pattern	.170	.178	.119	.003	.179	.211	.064
12	Awareness of acidic soil management	.010	.175	.193	.338	.230	.223	.060
13	Perception about acidic soil management	.146	.217	.127	.224	.129	.206	.218
14	Source of information	.205*	.401*	.227*	.478*	.370*	.648*	.472*
15	Contact with extension personnel	.191*	.340*	.225*	.440*	.392*	.587*	.499*
16	Scientific orientation	.144	.216	.126	.220	.123	.412	.207
17	Risk orientation	.153	.104	.073	.351	.303	.339	.250

Particulars	Rice		Maize		Wheat		Pigeon pea		Chickpea		Soybean		Tomato	
df	118		38		95		22		27		10		17	
Level	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01
"r" table value	0.179	0.234	0.312	0.403	0.200	0.260	0.404	0.515	0.367	0.471	0.576	0.708	0.456	0.575

Table 4.32: Multiple regression analysis of independent variables with performance (productivity) of various crops under acidic soil condition.

Independent Variables	Rice (n= 120)		Maize (n= 40)		Wheat (n= 97)		P. pea (n= 24)		C. pea(n= 29)		Tomato (n= 19)		Soybean (n= 12)	
	"t"	"b"	"t"	"b"	"t"	"b"	"t"	"b"	"t"	"b"	"t"	"b"	"t"	"b"
X1	.411	.181	.059	.045	.657	.155	.423	.204	.680	.461	.405	.407	.445	.263
X2	.109	-.022	-.660	-.416	-.330	-.143	.327	.229	.305	.525	-.049	-.113	.176	.107
X3	1.336	.510	.336	.361	-.276	-.053	-.295	-.393	.358	.368	.239	.458	-.442	-.246
X4	.679	.339	.341	.292	.435	.135	-.107	-.099	.371	.154	.028	.884	-.283	-.174
X5	.447	.198	-.392	-0.46	0.31	0.13	.384	.229	-.263	-.356	-.42	-.85	.288	.316
X6	1.997	.835*	2.133	1.52*	2.008	1.694*	.976	.482	.123	.079	2.503	1.495*	.805	.528
X7	-.056	-.007	.430	.168	.431	.036	-.378	-.123	-.122	-.184	-.430	-.452	.095	.017
X8	1.981	.772*	2.078	1.46*	1.991	1.35*	.872	.741	.541	.447	.596	.764	.498	0.68
X9	.544	.352	.485	.563	.508	.366	.521	.249	.495	.429	.671	.710	.485	.691
X10	2.303	1.86*	2.445	1.73*	2.298	1.966*	2.147	1.76*	2.274	1.38*	2.366	1.275*	2.452	1.29*
X11	-.348	-.210	.137	.281	-.258	-.144	-.115	-.131	-.044	-.063	-.235	-.206	-0.39	-0.28
X12	-.185	-.159	-.235	-.053	.459	.034	-.092	-.010	.407	.103	-.145	-.399	.467	.305
X13	-.407	-.113	-.320	-.151	-.417	-.051	-.387	-.058	-.323	-.106	-.023	-.26	-.194	-.407
X14	.477	.528	.541	.683*	-.481	-.353	.495	.227	-.510	-.352	-.541	-.291	-.674	-.343
X15	1.989	.751*	2.713	1.8**	2.101	1.703*	2.499	1.65*	2.109	1.33*	2.532	1.621*	2.511	1.387*
X16	.223	.165	-.243	-.240	.267	.072	-.205	-.116	-.130	-.089	.145	.377	-.118	-.027
X17	.329	.189	.420	.198	-.202	-.061	.316	.223	.161	.027	-.462	-.373	.149	.110
R^2	.711		.725		.672		.839		.887		.956		0.70	
F value of R	17.07		4.22		11.06		2.770		6.834		4.308		2.891	

Particulars	Rice		Maize		Wheat		Pigeon pea		Chickpea		Tomato		Soybean	
df	118		38		95		22		27		17		10	
Level	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.05	0.05	0.01	0.05	0.01	0.05	0.01
"t" table value	1.980	2.618	2.024	2.711	1.985	2.628	2.073	2.818	2.051	2.770	2.109	2.898	2.228	3.169

4.5. Constraints and Suggestions

4.5.1. Constraints faced by the farmers in cultivation of various crops under acidic soil condition

Multiple responses were taken to ascertain the constraints faced by the farmers in cultivation of various crops under acidic soil condition. The constraints perceived by the respondents were grouped into five categories i.e. technological constraints, personnel constraints, social constraints, economical constraints, and institutional constraints and data regarding these constraints are presented in table 4.33.

In case of technological constraints, the data shows that majority of the respondents (85.83%) faced high cost of hybrid seed that was major constraint followed by lack of knowledge about dose of fertilizers (80.83%). The other technological constraints were high cost of fertilizers (79.17%), non availability of improved seed at proper time (77.50%), release of canal water not available at proper time (76.67%), implements were costly for land preparation (71.67%), lack of knowledge about proper seed rate (65.00%), frequent attack of insects, pest and diseases (59.17%), lack of knowledge about proper land preparation (57.50%), high cost of pesticide (53.33%) and non availability of fertilizers at proper time (31.67%).

In case of personal constraints, 65 per cent of the respondents had small size of land that was was major constraint followed by lack of education (35%) and conflict among the family members about taking decisions (27.5%).

Similarly, others (29.17%) were not adopted new practices and 17.5 per cent respondents had lack of motivation and guidance about better utilization of acidic soil.

In case of economical constraints, 80.00 per cent lack of money to invest on additional operation for better utilization of acidic soil and 40.83 per cent respondents had less amount of minimum support price.

In case of institutional constraints, 55.83 per cent of the respondents reported that poor coordination between farmers and extension workers, and distance of krishi upaj mandi (23.33%).

Table 4.33: Constraints faced by the farmers in cultivation of various crops under acidic soil condition. (n=120)

Constraints	Frequency*	Percentage
Technological constraints		
➢ Lack of knowledge about proper land preparation	69	57.50
➢ Implements is costly for land preparation	86	71.67
➢ Non availability of improved seed at proper time	93	77.50
➢ High cost of hybrid seed	103	85.83
➢ Frequent attack of insects, pest and diseases	71	59.17
➢ Lack of knowledge about proper seed rate	78	65.00
➢ High cost of fertilizers	95	79.17
➢ Lack of knowledge about dose of fertilizers	97	80.83
➢ Non availability of fertilizers at proper time	38	31.67
➢ Release of canal water not available at proper time	92	76.67
➢ High cost of pesticide	64	53.33
Personal constrains		
➢ Conflict among the family members about taking decisions	33	27.50
➢ Small size of land	78	65.00
➢ Lack of education	42	35.00
Social constraints		
➢ Others not adopted new practices	35	29.17
➢ Lack of motivation and guidance about better utilization of acidic soil.	21	17.50
Economical constraints		
➢ Lack of money to invest on additional operation for better utilization of acidic soil	96	80.00
➢ Less amount of minimum support price	49	40.83
Institutional constraints		

➢ Poor coordination between farmers and extension workers	67	55.83
➢ Distance of krishi upaj mandi	28	23.33

*Data are based on multiple responses

4.5.2. Suggestions from the respondents to overcome the constraints in cultivation of various crops under acidic soil condition

data pertaining to suggestions from the respondents to overcome the constraints in cultivation of various crops under acidic soil condition are presented in the table 4.34. It was found that 81.67 per cent of the respondents suggested to increase support price of crops, whereas other suggestions were to availability of hybrid and improved seeds of various crops at low prices (78.33%), release of canal water at proper time (74.17%), to provide more subsidies for seed, fertilizers and lime by the government (72.5%), availability of pesticide at low prices (65%), conduction of extension activities i.e. kisan mela, demonstration, exhibition, training, visits etc. in villages at proper time (60%), timely available of fertilizer (54.17%), contact of R.A.E.Os with the farmers for delivery of right information at right time (50.83%), availability of agricultural equipments at low prices (44.17%) and availabity of resistant variety for various insects, pest and diseases should be available at proper time (16.67%).

Table 4.34: Distribution of respondents as per the suggestions given to overcome the constraints

Suggestions	Frequency*	Percentage
➢ Extension activities i.e. kisan mela, demonstration, exhibition, training, visits etc. should be conducted in village at proper time.	72	60.00
➢ Hybrid and improved seeds of various crops should be available at low price	94	78.33
➢ Release of canal water at proper time	89	74.17
➢ Timely available of fertilizer	65	54.17
➢ Resistant varieties for various insects, pest and diseases should be available at proper	20	16.67

time		
➢ Agricultural equipment should be available in low price	53	44.17
➢ Pesticide should be available in low price	78	65.00
➢ Support price of crops should be increased	98	81.67
➢ R.A.E.OSs should be convey right information at right time	61	50.83
➢ More subsidies should be provided for seed, fertilizers and lime by the government.	87	72.50

*Data are based on multiple Reponses

CHAPTER-V
SUMMARY, CONCLUSION AND SUGGESTION

The Chhattisgarh state has geographical area of 137.90 lakh ha, out of which net sown areas are 35 per cent and 63.5 per cent areas are under forest. Average annual rainfall is 1325 mm and because of high rainfall zone, more than 20 per cent of the areas are under acidic soil category. Deficiency of zinc & boron is prevalent in the soil. Sulphur deficiency has been found in the area where pulses crops are grown. About 27 per cent of the area is irrigated. Undulating topography is one aspect for irrigation related constraints and nutrient management.

Now days, there are so many research conducted and technologies generated on acidic soil management for cultivation of various crops from the site of its development to points of its utilization. With a view to develop an extension strategy for increasing production per unit area of various crops under acidic soil condition, the present study entitled **"Performance of various crops under acidic soil condition in northern hills agro climatic zone of Chhattisgarh: a farmer's perspective study."** was designed with the following specific objectives:-

1. To study the socio-personal and economic profile of farmers,
2. To identify the various crops and cropping pattern, grown by the farmers under acidic soil condition,
3. To assess the performance (productivity) of various crops grown by the farmers in acidic soil condition,
4. To study the farmers' awareness about acidic soil management,
5. To identify the existing practices used by the farmers for management of acidic soil,
6. To study the relationship between independent variables and dependent variable,

7. To find out the various problems as faced by the farmers during cultivation of various crops under acidic soil condition and to obtain their suggestions to minimize the problems.

The study was conducted during the year 2015-16 in the Surajpur and Balrampur districts of Chhattisgarh state. The Chhattisgarh state consists of 27 districts out of which Surajpur and Balrampur districts were selected purposively because of both district has maximum percentage area of acidic soil. In Surajpur district, out of total 6 blocks 2 blocks namely; Surajpur and Pratapur were selected purposively according to soil testing report and in Balrampur district, out of total 6 blocks 2 blocks namely; Balrampur and Shankarnagar were selected purposively according to soil testing report. Three villages (3x4=12) were selected purposively from each selected block. From each selected village, 10 farmers were selected purposively according to soil testing report. In this way a total of 30 farmers from each block were selected. Thus the total 120 respondents from four blocks were selected purposively for the study.

The data were collected personally through pre-tested interview schedule. Collected data were tabulated and processed by using appropriate statistical tools and methods.

The major findings of the study are summarized under following subheadings:-

Independent variables

The study revealed that majority (67.5%) of the respondents belonged to the middle age group (between 36 to 55 years), illiterate (35%), medium size of family (65.83%) i.e. 4 to 7 members, members of any organization (65.83%), involved in agriculture + wage earner occupation (75.83%).

In the study area, respondents had marginal land holding (73.33%) i.e. upto 1 ha, no source of irrigation (46.67%), low annual income (71.66%) i.e. >Rs. 30,000 to 100,000. Majority of the respondents had medium farming experience (60.83%) i.e. 11 to 20 years and did not follow any soil management practices for acidic soil management (80.83%).

The study indicated that 87.5 per cent of the respondents had fair (rice-wheat) type of cropping pattern with155.1 per cent overall cropping intensity of the selected (120) respondents were recorded.

It was found that 75.83 per cent of the respondents had medium level of awareness, medium level of perception (66.67%) about acidic soil management. Majority (92.5%) of the respondents were contacted by the R.A.E.O for the seeking of the information related to acidic soil management, medium level of utilization of source of information (53.33%), about 64.17 per cent respondents were often contacts with Rural Agriculture Extension Officer (RAEO). In case of rarely contact with extension personnel, maximum (50.83%) of the respondents had contact with agricultural development officer (ADO), only 3.33 percent of respondents were regularly contacted by R.A.E.O and about 58.33 per cent of the respondents had medium level of overall contact with extension personnel.

In the study area, respondents had medium level of scientific orientation (69.17%) and risk orientation.

Dependent variable

The findings of the productivity of various crops grown by the respondents under acidic soil condition revealed that the highest average productivity (132.79 q/ha) was obtained from tomato, followed by maize (22.77 q/ha). It was found that average productivity of other crops like rice, wheat, chickpea, pigeon pea and soybean were 20.87, 12.69, 6.32, 4.59, and 7.75 q/ha respectively.

From the comparison of various crops productivity between two groups of the respondents (with management and without management practices), it was found that there was highly significant different (in case of productivity of crop) between two groups of the respondents under acidic soil condition.

From the different combinations of existing soil management practices of the respondents with productivity status of crops, it was reported that maximum productivity of all the seven crops grown by the respondents were found in the combination of Lime + Fertilizers (basic nature) + Manure followed by combination of Lime + Fertilizers (basic nature). In case of benefit cost ratio (B:C) of rice cultivation, it was found that maximum B:C ratio (1.47) was found in combination of lime + fertilizers (basic nature).

In case of performance (productivity) of various crops under acidic soil condition, the average productivity of tomato is maximu followed by maize, rice, wheat, soybean, chickpea and pigeon pea.

Correlation analysis

Correlation coefficient between the selected characteristics of the respondents with productivity of seven crops grown by the respondents was also worked out.

In case of rice crop prouctivity, it was found from the data that source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, source of irrigation, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of rice crop under acidic soil condition. While rest variables were non-significantly correlated with the performance (productivity) of rice crop under acidic soil condition.

In case of maize crop productivity, it was found from the data that source of irrigation, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of maize crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of maize crop under acidic soil condition.

In case of wheat crop productivity, it was found from the data that source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, land holding, source of irrigation, annual income and existing soil management practices were significantly correlated at 0.01 level of significance with the performance (productivity) of wheat crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of wheat crop under acidic soil condition.

In case of pigeon pea crop productivity, it was found from the data that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at

0.01 level of significance with the performance (productivity) of pigeon pea crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of pigeon pea crop under acidic soil condition.

In case of chickpea crop productivity, it was found from the data that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of chickpea crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of chickpea crop under acidic soil condition.

In case of soybean crop productivity, it was found from the data that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of soybean crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of soybean crop under acidic soil condition.

In case of tomato crop productivity, it was found from the data that land holding, source of irrigation, annual income, source of information and contact with extension personnel were significantly correlated at 0.05 level of significance. Whereas, only existing soil management practice was significantly correlated at 0.01 level of significance with the performance (productivity) of tomato crop under acidic soil condition. While rest variables were non-significantly correlated with performance (productivity) of tomato crop under acidic soil condition.

Multiple regression analysis

From the results of multiple regression analysis it was found that, two variables viz. existing soil management practices and contact with extension personnel significantly contributed towards the productivity of all seven crops (rice, maize, wheat, pigeon pea, chickpea and tomato). While land holding significantly contributed towards productivity of four crops (rice, maize, wheat and tomato) followed by annual income which significantly contributed towards productivity of three corps (rice, maize and wheat).

The variables age, education, family size, social participation, occupation, farming experience, cropping pattern, awareness of acidic soil management, scientific orientation and risk orientation had no significant contribution in the productivity of any of seven crops (rice, maize, wheat, pigeon pea, chickpea and tomato).

Conclusion

From the above findings, it can be concluded that the overall productivity of the various crops under acidic soil condition was low. Hence, extension efforts should be made to increase the level of awareness and knowledge about the management of acidic soil for better productivity of crops. In case of productivity of crops with some soil management practices, it can be concluded that performance of tomato crop was best in acidic soil condition followed by maize and rice. These three crops performed better in acidic soil condition. Its productivity can be improved by additional soil management practices.

From the comparison between two groups (with and without soil management practices) of respondents, it was found that respondents with soil management practices had better performance in the productivity of crops as compare to respondents without any soil management practices. It was seen that in the field condition of study area, out of 120 respondents, only 23 respondents followed soil management practices. As a remedy to this problem, there urgent need to increase the adoption of recommended production technology through proper utilization of sources of information, extension contacts, exhibition, kisan mela and training programme.

From the results of correlation and multiple regression analysis, it can be concluded that level of land holdings, annul income, farming experience, existing soil management practices, contact with extension personnel and source of information of respondents regarding various crops production under acidic soil condition with different soil management aspects need to be increased that which can enhance the productivity of crop. Majority of respondents were illiterate hence there is anurgent need to improve their education and knowledge level through providing education and training, skill, demonstrations, field trips and proper technical guidance. The skill demonstrations on use of various practices of the acidic soil management may be helpful in convincing and

changing theattitude of the respondents.

Suggestions for future research works:

On the basis of results and experience gained after the completion of the investigation the following points are suggested for further studies:

1. The similar study should also be conducted with more number of respondents in other parts of the state.
2. The study was conducted only in four blocks of Surajpur and Balrampur (2 blocks each) districts of Chhattisgarh state. Hence, a detail study is required in order to generalize the recommendations for all the districts of northern hills agro-climatic zones of Chhattisgarh for better production of various crops under acidic soil condition. Policies should be made by state/central government to enhancing the acidic soil management practices in the state.
3. A separate study should be framed to determine the productivity of any particular crop under different combination of acidic soil management practices.
4. A detail study is required on adoption, non-adoption and reversion pattern of newly released high yielding v arieties of various crops specially under acidicsoil conditions.

REFERENCES

Abalu, G. O. I. and D'Silva, B. 1979. Socio-economic Analysis of Existing Farming Systems and Practices in Northern Nigeria, p19 – 23.

Anonymous. 1977. "Project Report for Command Area Development", Department of Agriculture, Govt. of Kerala, p.3-4.

Anonymous. 2007-2013. Production & Productivity Report. Agriculture Department of Chhattisgarh, www.agridept.cg.gov.in/agriculture.

Asha *et al*. 2010, Knowledge and adoption of cultivation and storage practices of paddy. Assam Journal of Extension Education, 19: 293-298.

Ayarza, M. and Thomas, R. J. 2000. Management and Conservation of Acid Soils in the Savannahs of Latin America: Lessons from the Agricultural Development of the Brazillian Cerrados. *IAEA in Austria ISSN 1011-4289.*

Bhairamkar, *et al.* 2011. Quantification of variables and various scales in Extension Education. Jain Brothers, 1st edition, New Delhi- 110 005, ISBN: 978-81-8360-161-0.

Bhoite, H. S. and Girase, K. A. 1991. Relationship between farmers socio-personal traits and adoption of improved dry land technology. Indian Journal of Extension Education 10: 115-118.

Bijalwan, A. 2012. Structure, Composition and Diversity of Horticulture Trees and Agricultural Crops Productivity under Traditional Agri-Horticulture System in Mid Hill Situation of Garhwal Himalaya, India. American Journal of Plant Sciences, Vol. 3, 480-488.

Carver, B. F. and Ownby, J. D. 1995. Acid soil tolerance in wheat. Advance Agronomy, 54: 117–173.

Cochran, W. G. and Cox, 1957. Analysis of Covariance: Its Nature and Uses. Special Issue on the Analysis of Covariance (Sep., 1957), Vol. 13, No. 3, pp. 261-281, DOI: 10.2307/2527916.

David, R. 2005. Impact of Home Science Training Program Organize at Krishi Vigyan Kendra, Bilaspur (c.g.). M.Sc. (Ag.) thesis, IGAU, Raipur.

Deshmukh, A. N. and Deshmukh, S. J. 2013. Constraints in Production and Marketing of Soybean. *Agriculture Update,* 8(1&2):64-66.

Deshmukh, P. R., Kadam, R. P. and Sindhe, V. N. 2007. Knowledge and adoption of agricultural technologics in Marathwada. Indian Research Journal of Extension Education, 7(1): 40-42.

Devarani, D. and Bandhyopadhyay 2012. A study on adoption of drip irrigation system in Maharashtra State. *Internat. J. agric. Sci. Vol.2* No.2: 335-337.

Dhruw, Y. S. 2014. Constraint Analysis In Adoption Of Summer Rice Production Technology In Dhamtari District of Chhattisgarh. M.Sc. (Ag.) Thesis, IGKV, Raipur.

Dubey, Y. K. 2008. Current scenario and constraints analysis in adoption of improved dairy practices followed by the dairy farmers in the vicinity of Raipur city. M.Sc. (Ag.) Thesis, IGKV, Raipur (C.G.).

Foy, C. D. 1992. Soil Chemical Factors Limiting Plant Root Growth, Vol. 19. New York: Springer-Verlag, pp. 97–149.

Gallagher, K. 2003. Common Questions, Answers and Suggestions on Farmer Field Schools. International Learning Workshop on Farmer Filed Schools (FFS): Emerging Issues and Challenges. Yogyakarta, Indonesia.

Geetha, G. S. and Devi, G. 2008. Technology adoption and training needs of sericulture farmers- a case study in NGO. Indian Journal of Agricultural Sciences, 42(3): 157-163.

Gupta, B. S., Chauhan, J., Thomas, M. and Kakran, M. S. 2010. Extent of Participation of Beneficiaries in the Different Micro-Agro Eco Systems of Ghorbae Watershed Area in Shahdol District, Madhya Pradesh. Indian Research Journal of Extension Education, 10 (2), 113-115.

Haug, A. and Shi, B. 1991. Biochemical Basis of Aluminium Tolerance in Plant Cells. Kluwer Academic Publishers,pp. 839–850.

Ingle, P. O. and Wayazada, M. R. (1989). Adoption of Agriculture technology in rainfed farming project. Maharashtra Journal of Extension Education, 8: 189.

Jat, J. R., Sangram S. S., Lal, H. and Choudhary L. R. 2012, Constraints Faced by Tomato Growers in Use of Improved Tomato Production Technology Rajasthan Journal of Extension Education, 20 : 159-163.

Jayasundra, *et al.* 1998. Responses of cool season grain legumes to soil abiotic stresses. Indian society of soil Science, 15 (3): 45-49.

Kavitha, L. and Reddy, M. S. 2007. Personal and socio–economic characteristics of farm women. Journal of Research ANGRAU 35(1): 79-80.

Khuspe, S.B. and Kadam, R.P. 2012. Adoption Gap in Recommended Production Practices of Chickpea. Agriculture Update 7(3&4): 301-303.

Kiran, S. and Shenoy, N. 2010. Constraints in adoption of system of rice intensification in Warangal district of Andhra Pradesh. Journal Research ANGRU 38(1&2)77-85.

Kubde, V. R., Takale, V. S. and Bhople R.S. 1999. Knowledge and adoption of soybean production technology by farmers. Maharashtra Journal of Extension Education, 18: 185-188.

Kumar, A. and Rathod, M.K. 2013. Adoption behaviour of Farmers about Recommended Technology of Soybean. Agriculture Update 8(1&2): 134-137.

Kumar, D., Shrivastava, K. K., Shrivastava, P. and Shori, R. K. 2012. Profile of farmers and their attitude towards mass information sources. Journal of Plant Development Sciences 4 (4): 605-611.

Kumar, R., Chatterjee, D., Kumawat, N., Pandey, A., Roy, A. and Kumar M. 2014. Productivity, quality and soil health as influenced by lime in rice-bean cultivars in foothills of northeastern India. The Crop Journal, CJ 5, DOI: 10.1016/j.cj.2014.06.001.

Kumar, S., Singh, R. and Singh, A. 2014. Assessment of Gaps in Pulse Production in Hamirpur District of Himanchal Pradesh. Indian Research Journal of Extension Education 14(2): 20-24.

Kushwaha, D. P. 2005. Study on adoption pattern of rice cultivars among farmers in northern hill agro-climatic zone of Chhattisgarh. M. Sc. (Ag.) Thesis, IGKV, Raipur.

Lakra, P. K. 2011. A study on extent of adoption of hybrid rice production technology by the tribal farmers of Surguja district of Chhattisgarh. M.Sc. (Ag.) Thesis, IGKV, Raipur (C.G.).

Mangalabhanu, M. 1977. "Project Report for Command Area Development", Department of Agriculture, Govt. of Kerala, pp.3-4.

Maraddi, G. N. and Verma, N.S. 2007. Adoption of cotton production technologies by the farmers of Malaprabha command area of Karnataka. Karnataka Journal of Agriculture Science, 16(1): 137-140.

Mazher, Abbas., Sher, Mohammad., Nabi, Iftikhar and Muhammad, Kashif 2003. Farmers information sources, their awareness and adoption of recommended sugarcane production technologies in the Central Punjab (Pakistan). Pakistan Journal of Agricultural Science, 40 (3/4): 202-206.

Menon, A. G. G., Karippai, S. R. and Bhaskaran, C.O. 1995. Credibility and utilization pattern of farm information sources by small farmers. J. Extn. Edu. T.N.A.U. 6(1): 1071-1074.

Meti, S. K. and Hanchinal (1994). A study on adoption pattern in the cultivation practices of sunflower crop among the farmers. Maharashtra Journal of Extension Education, 13: 155-159.

Mohanty, A. K., Lepch, B and Kumar, A. 2013. Constraints analysis in adoption of vegetable production technologies for livelihood perspective of tribal farmers in north Sikkim. Indian research journal of Extension education, 13 (2): 51-56.

Nirmala, B., Vasudev, N. and Suhasini, K. 2013. Farmer's perceptions on hybrid rice technology: A case study of Jharkhand. Indian Research Journal of Extension Education 13 (3): 103-105.

Onim, J. F. M. 1992. Dual-purpose goat research in western Kenya. In: Kategile, J.A., Mubi, S. (editors), Future of livestock industries in East and Southern Africa, Proceedings of a Workshop held at Kadoma Ranch

Hotel, Zimbabwe, 20-23 July, 1992. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia, p. 227.

Pandey, P. K. (2000). Constraints analysis in adoption of rice production technology in the Kota tribal block of Bilaspur district in Madhya Pradesh. M.Sc. (Ag.) Thesis, IGKVV, Raipur.

Pandey, R. L. and Kashyap, O. P. 1993. Studies on socio-economic strata and Lathyrus consumption in rural Madhya Pradesh. In Proc: *Lathyrus sativus* and human *Lathyrism*, Progress and prospects, 2nd Int. College. *Lathyrus / Lathyrism*, Dhaka 10-12 Dec, University of Dhaka, pp 47-50.

Patel, M. K. 2008. A Study on Technological Gap in Recommended Soybean Production Technology among the Farmers of Kabirdham District of Chhattisgarh State. M.Sc.(Ag.) Thesis, IGKV, Raipur (C.G.).

Patel, M. K. 2008. A Study on Technological Gap in Recommended Soybean Production Technology among the Farmers of Kabirdham District of Chhattisgarh State, M.Sc. (Ag.) Thesis, IGKV, Raipur (C.G.).

Prajapati, I. B. 2006. A study on socio-economic factors responsible for technological gap of recommended wheat technology among tribal farmers of Sidhi district (M.P.). M.Sc. (Ag.) Thesis, JNKVV, Jabalpur.

Raghuwanshi, H. S. 2005. Adoption behaviour of rice growers regarding control measures of various insect pests of rice crop in Dhamtari district of Chhattisgarh state. M.Sc. (Ag.) Thesis, IGKV, Raipur, p.87.

Rahman, M. A. Barma, N. C. D. Sarker, M. H. Sarker, M. M. R. and Nazrul, M. M. I. 2013. Adaptability of Wheat Varieties In Strongly Acidic Soils of Sylhet. Bangladesh Journal of Agricultural Research, 38(1): 97-104.

Rajan, P., Dubey, M. K., Singh, S. R. K. and Khan, M. A. 2013. Factors Affecting Knowledge of Fish Farmers Regarding Fish Production Technology. Indian Research Journal of Extension Education, 13 (2): 60-65.

Ramesh, P. and Santha, G. 2008. Extent of adoption and relationship between the characteristics of organic farmers and their adoption level. Mysore Journal of Agricultural Science, 42(3): 526-529.

Rastogi, A. 1979. The Cropping Patterns in Selected Dry Land Farming Regions of India. All India Coordinated Research Project for Dry land Agriculture, Akola, Maharashtra.

Rengel, Z. 2003. Handbook of Soil Acidity. CRC Press, 1 edition, New York, NY 10016, p. 1-2.

Saito *et al.* 2006. Farmers' knowledge of soils in relation to cropping practices: A case study of farmers in upland rice based slash-and-burn systems of northern Laos. *ELSIVIER*, Science Direct, Geoderma 136: 64–74.

Saxena, B. 2003. Study on Knowledge and Adoption Level of Tomato Production Technology among the Farmers of Jashpur District in Chhattisgarh. M.Sc.(Ag.)Thesis, IGKV Raipur (C.G.).

Saxena, K. K. and Singh, R. L. 2000. Adoption of organic farming practices by farmers of Malwa region. Maharashtra Journal of Extension Education, XIX.

Shaktawat, R. P. S., Singh, D. and Singh, H. P. 2013. Performance of different varieties of crops under Malwa Plateau situation of Mandsaur district. The Crop Journal, Vol. 3, 2249-555X.

Sharma, R. (1998). Identification and use of ITK‟s in relation to adoption of recommended agricultural practices by tribal farmers of Sarguja District in M.P. M.Sc. (Ag) Thesis, submitted to IGKVV, Raipur (M.P.) : 115.

Sharma, S. Chander, G. Verma, T. S. and Verma, S. 2013. Soil Potassium Fractions In Rice-Wheat Cropping System After Twelve Years Of Lantana Residue Incorporation In A Northwest Himalayan Acid Alfisol. Journal of Plant Nutrition, Vol. 36:1809–1820.

Sharma, S., Rao, P. K. and Sharma, R. 2013. Role of Women in Decision-Making Related to Farm : A Study of Jammu District of J&K

State. International Journal of Scientific and Research Publications, 3(1): 1-4.

Shori, R. 2011. Attitude of farmers regarding of control measurement practices of various weeds of rice crop in Dhamatri district of Chhattisgarh state. M.Sc. (Ag.) Thesis, IGKV, Raipur.

Shori, R. K. 2011. Attitude of Farmers Regarding Adoption of Control Measure Practices of Various Weeds of Rice Crop in Dhamtari District of Chhattisgarh State. M.Sc. (Ag.) Thesis, IGKV, Raipur.

Shriwas, Y. 2011. A study on knowledge and adoption of recommended brinjal production technology among the farmers of Durg district of Chhattisgarh state, M.Sc.(Ag.) Thesis, IGKV, Raipur (C.G.).

Singh, B. 2011. Factors Influencing the Adoption of Mung Bean Production Technology in Arid Zone Of Rajasthan. Rajasthan Journal of Extension Education 19:173-177.

Singh, D. K., Singh, A. K., Yadav, V. P., Singh, R. B., Baghel, R. S. and Singh, M. 2009. Association of socio-economic status with economic motivation of the farmers. Indian Research Journal of Extension Education 9(2):53-56.

Singh, I., Singh, K. K. and Gautam, U. S. 2012. Constraints in Adoption of Soybean Production Technology. Indian Research Journal of Extension Education Special issue (Vol. II): 169-171.

Singh, L., Singh, N. and Singh, A. 2004. Communication behaviour of KVK officials: A case study. Indian Research Journal of Extension Education, 4 (1&2): 106-108.

Singh, R., Kumar, A. and Chand, R. 2007. Accelerating adoption of zero tillage technology. Indian Research Journal of Extension Education 7 (1): 6-10.

Sivanarayana, G., Prasad, S. V. and Reddy, S. J. 2000. Constraints in the adoption of improved sheep and goat practices by the small and marginal farmers of diversified farming. Journal of Research ANGRAU, 28(3): 44-47.

Sundar, J. and Ramakrishnan, L. 2013. A Study on Farmers' Awareness, Perception and Willing To Join and Pay for Crop Insurance. International Journal of Business and Management Invention, 2: 48-54.

Swain, S. K. and Sangramsingh, S. P. 2009. Impact of Socio-Economic Variables on Technology Adoption Behaviour of Small Farmers in Coastal Orissa. Journal of Extension Education 1&2:85-89.

Thanh, N. C. and Singh, B. 2006. Constraints faced by the farmers in rice production and export. Omonrice 14: 97-110.

Thatchinamoorthy, C. and Selvin, R. 2014. A study on profile of system of rice intensification (SRI) paddy growers in Tirunelveli district of Tamilnadu. International Journal of Current Research 6 (4): 6064-6066.

Tidke, G. R., Rathod, M. K. and Mandve, R. P. 2012. Knowledge and adoption of farmers about the management of pod borer complex in pigeon pea. International Journal of Extension Education Vol. 8: 71-76.

Tochhawng, L. and Rewani, S. K. 2013. Constraint Analysis of Backyard Pig Farming in Tribal Areas of Mizoram. Indian Research Journal of Extention Education 13 (2): 123-125.

Verma, S. 2009. A study on knowledge and adoption of organic farming practices in paddy cultivation among the tribal farmers of Kanker district (C.G.). M.Sc. (Ag.) Thesis, IGKV, Raipur.

Watanabe, T., Jansen, S. and Osaki, M. 2006. Al–Fe interactions and growth enhancement in Melastoma malabathricum and Miscanthus sinensis dominating acid sulphate soils. Plant Cell and Environment, Vol. 29, 2124–2132.

Weldemariam, *et al.* 2013. Farmers' perceptions' and participation on Mechanical soil and water conservation techniques in Kembata Tembaro Zone: the Case of Kachabirra *Woreda,* Ethiopia, International Journal of Advanced Structures and Geotechnical Engineering, *ISSN 2319-5347, Vol. 02*, No. 04.

कृषि विस्तार विभाग

कृषि महाविद्यालय, इं.गां.कृ.वि.वि. रायपुर (छ. ग.)

शोध साक्षात्कार प्रश्नावली

"कृषक परिप्रेक्ष्य में छत्तीसगढ़ के उत्तरी पहाड़ी कृषि जलवायु क्षेत्र की अम्लीय मृदा में विभिन्न फसलों का प्रदर्शन (उत्पादन) का अध्ययन"

परामर्शदाता	शोधकर्ता का नाम
डॉ. एच. के. अवस्थी	**मिर्जा अल्ताफ बेग**
कृषि विस्तार विभाग	एम.एस–सी. (कृषि) अंतिम वर्ष
प्रश्नावली क्र.	कृषि विस्तार विभाग, इं.गां.कृ.वि.वि., रायपुर (छ.ग.)

1. कृषक का नाम :..... 2. जातिः .....

2. पिता का नाम :..... 4. ग्रामः .....

5. विकासखण्ड ..... 6. जिलाः .....

7. राज्य ..... 8. उम्रः व्यस्क 35 वर्श तक / मध्यम 36–55 वर्श तक / वृद्ध 55 से अधिक

9. परिवार का आकार – छोटा परिवार 1–3 सदस्य/मध्यम परिवार 4–7/बडा परिवार 7 से अधिक

10. परिवार के सदस्यो ं की संख्या ..... 11. मो बाईल न0ः .....

12. शिक्षा का स्तर–

i)	अशिक्षित	
ii)	प्रायमरी	
iii)	मिडिल	
iv)	हाई स्कूल	
v)	हायर सेकेण्डरी	
vi)	स्नातक व अधिक	

13. क्या आप किसी ग्रामीण संस्था अथवा संगठन में सदस्य/पद पर है । (हाँ /नहीं)

यदि हाँ तो निम्नलिखित जानकारी दीजिएः

क्र. सं.	संस्थायें	भागीदारी (हाँ /नहीं)	सदस्य	पदाधिकारी	कब से कब तक (वर्ष)
1	ग्राम पंचायत				
2	सांस्कृतिक मंच				
3	युवा मण्डल				
4	किसान क्लब				
5	सहकारी समिति				
6	स्कूल				
7	अन्य				
	1.....				

14. आपका मुख्य व्यवसाय कौन सा है और विभिन्न व्यवसायों से होने वाली कुल वार्षिक आय कितनी है?

क्र	व्यवसाय	व्यवसाय का प्रकार		वार्षिक आय रूपए
		मुख्य	सहायक	
1	कृषि			
2	कृषि मजदूरी			
3	अन्य मजदूरी			
4	पशुपालन			
5	नौकरी			
6	व्यवसाय			
7	अन्य 1..... 2..... 3.....			
	योग			

15. कृपया अपनी भूमि संबंधी जानकारी दीजिए –

कुल जमीन (भूमि) .....(एकड़) पड़ती भूमि .....(एकड़)

कृषि योग्य भूमि .....(एकड़)

1. सिंचित भूमि.....(एकड़) 2. असिंचित भूमि.....(एकड़)

16. आपके पास सिंचाई के स्त्रोत कौन से हैं?

1 स्वयं का नलकूप / 2 शासकीय नलकूप / 3 नहर / 4 तालाब / 5 डबरी / 6 कुंआ / 7 अन्य

17. आप कितने वर्षों से खेती कर रहे हैं : ..... वर्ष

18. आप एक वर्ष में कितनी फसल लेते हैं : 1.खरीफ ..... 2.रबी..... 3.ग्रीष्म.....

19. क्या आपने अम्लीय मृदा सुधार से संबंधित प्रशिक्षण कार्यक्रम में कभी भाग लिया है । (हाँ / नहीं)

यदि हाँ तो कृपया निम्नलिखित जानकारी दीजिए ।

क्र. सं.	संस्था का नाम	प्रशिक्षण का स्थान
1	सरकारी संस्था	
2	सहकारी संस्था	
3	एन. जी. ओ.	
4	निजी संस्था	

यदि नहीं तो क्या कारण है ।

1..... 2.....

3..... 4.....

20 क्या आप अम्लीय भूमि सुधार हेतु उपाय (कार्य) करते हैं । (हाँ / नहीं)

यदि हाँ तो जानकारी देवें

1. चूना : .....
   .
2. फसल : .....
3. उर्वरक:.....

21. सस्यक्रम पिछले वर्ष :

फसल	किस्म	क्षेत्र (एकड़)		मृदा संशोधक	बीजोपचार	उर्ववरक प्रयोग										प्रति एकड़ उत्पादन (क्विं.)	उत्पादन व्यय / एकड़	फसल विक्रय रू / क्विं.
		सिंचित	असिंचित	Y/N	Y/N	यूरिया	कि.ग्रा.	डी.ए.पी	कि.ग्रा.	एम.ओ.पी.	कि.ग्रा.	ईफको	कि.ग्रा.	अन्य	कि.ग्रा.			
खरिफ 1..... 2.....																		
योग																		
रबी 1..... 2.....																		
योग																		
ग्रीष्म 1..... 2.....																		
योग																		
कुल योग																		

22. आपको फसल उत्पादन हेतु अम्लीय भूमि प्रबंधन के बारे में कितनी जानकारी है । विवरण देवें–

क्र.	विवरण			जानकारी का स्तर		
		हाँ	नहीं	पूर्ण	आंशिक	निरंक
1	अम्लीय भूमि प्रबंधन के बारे में जानते हैं?					
2	क्या आप अम्लीय भूमि प्रबंधन हे तु प्रयो ग होने वाले अवयवों के नाम जानते हैं?					
3	आपको अम्लीय भूमि हेतु उपयुक्त फसलों का जानकारी है?					
4	अम्लीय भूमि में बुआई के पूर्व बीजोपचार करने हेतु बीजोपचारको के नाम जानते हैं?					
5	आपाको अम्लीय भूमि हेतु प्रयोग में लाये जाने वाली उर्वरकों का जानकारी हैं?					
6	आपको विभिन्न उर्वरकों के अनुशंसित मात्रा की जानकारी है?					
7	आपको मृदा परिक्षण के बारे मे जानकारी है?					
8	अम्लीय भूमि सुधारक हेतु चूना के प्रयोग की जानकारी है?					
9	अम्लीय भूमि प्रबंधन हेतु प्रयोग किये जाने वाले खाद की जानकारी है?					

23. अम्लीय मृदा में खेती को अपनाने से संबंधित आपकी अवधारणा क्या है? निम्नलिखित कथनों से आप किस स्तर तक सहमत है ।

क्र.	अवधारणा	पूर्णतः सहमत	सहमत	कुछ कह नहीं सकते	असहमत	पूर्णतः असहमत
1	अम्लीय भूमि में खेती करने के पूर्व उसका परिक्षण मृदा प्रयोगशाला में करवाना लाभदायक रहता है।					

2	अम्लीय भूमि में फसल चयन करने के पूर्व किसी कृषि सलाहकार की सलाह लेनी चाहिए।					
3	अम्लीय भूमि मे केवल अनुशंसित फसल किस्मों को लगाना चाहिए					
4	अम्लीय भूमि सुधार हेतु विभिन्न अनुशंसित विधियो के प्रयोग से मृदा उर्वरता एवं उत्पादकता में वृद्धि होती है ।					
5	अम्लीय भुमि में अनुशंसित उर्वरकों की मात्रा का प्रयोग करना लाभदायक होता है।					
6	अम्लीय भूमि सुधार हेतु जानकारीयो का अभाव है।					
7	अम्लीय भूमि सुधार एक खर्चीला कार्य है।					
8	अम्लीय भूमि सुधार हेतु सरकार को सहायिकी (सबसीडी) देना चाहिए।					
9	सहनशील किस्मों का उपयोग भूमि सुधार की अपेक्षा अधिक किफायती तरीका है ।					
10	अम्लीय भूमि बुआई पूर्व बिजोपचार करने से पौध रोग को कम किया जा सकता है।					
11	समय समय पर कृषि विभाग तथा मृदा परिक्षण प्रयो गशाला द्वारा मृदा परिक्षण किया जाना आवश्यक है।					

24. आपको अम्लीय मृदा में खेती संबंधी जानकारी किन स्रोतों से प्राप्त होती हैं?

क्र.	स्त्रोत	अक्सर	कभी–कभी	कभी नहीं
1	मित्र			
2	रिश्तेदार			
3	पडोसी			
4	उन्न्त किसान			
5	पंच/सरपंच			
6	ग्रा.कृ.वि. अधि.			
7	कृ.वि. अधि.			
8	कृषि वैज्ञानिक			
9	समाचार पत्र			
10	कृषि पत्रिका			
11	रेडियो			
12	टी. वी.			
13	किसान मेला			
14	प्रदर्शन			
15	प्रशिक्षण			

25. क्या आप अम्लीय मृदा सुधार की तकनीक की जानकारी हेतु अपने गांव के आस–पास के शहर /ब्लाक से संपर्क रखते हैं ? हाँ /नहीं

यदि हाँ तो, कृपया शहर जाने का अंतराल बताइयें–

1. बहुत कम (माह में एक बार) ( )
2. कभी–कभी (सप्ताह में दो बार) ( )
3. प्रतिदिन ( )

26 अम्लीय भूमि में खेती हेतु आप अपने वैज्ञानीक अभिमुखता के बारे में बतायें

क्र	कथन	प्रतिक्रिया				
		पूर्णतः सहमत	सहमत	कुछ कह नहीं सकते	असहमत	पूर्णतः असहमत

01	अम्लीय भूमि प्रबंधन कार्य कृषक को बिना किसी भूमि प्रबंधन कार्य की अपेक्षा अधिक लाभ प्रदान करता है।					
02	वह कृषक जिसे अधिक कृषि कार्य अनुभव हो उसे अम्लीय भूमि मे खेती करने हेतु भूमि प्रबंधन का कार्य करना चाहिए।					
03	वैज्ञानिक विधियों से अम्लीय भूमि में खेती कार्य सिखनें में कृषक को अधिक समय लगता है। यह उसके प्रयास व परिश्रम पर निर्भर करता है।					
04	एक अच्छा कृषक अम्लीय भूमि में नयी विधियों का प्रयोग अधिक लाभ अर्जित करने हेतु करता है।					
05	एक कृषक के जिवन स्तर को उठाने हेतु परंपरागत खेती के विधियों में बदलाव लाना तथा अम्लीय भूमि में प्रबंधन कार्य को अपनाना आवश्यक है।					
06	कृषकों के पूर्वजों द्वारा अम्लीय भूमि में खेती करने का परम्परागत तरीका हि अब तक अम्लीय भूमि में खेती करने का सर्वश्रेष्ठ तरीका है।					

27. क्या आप अम्लीय भूमि सुधार की तकनीक से संबंधित जानकारी के लिये कृषि विस्तार कार्यकर्ताओं/अधिकारियों से संपर्क करते हैं । (हाँ/नहीं)

यदि हाँ तो कृपया निम्न जानकारी दीजिए –

क्र.	कृषि विस्तार कार्यकर्ता	संपर्क का अंतराल			
		कभी नही	कभी कभी	ज्यादातर	नियमित
01	ग्रामीण कृषि विस्तार अधिकारी				
02	कृषि विकास अधिकारी				
03	वरिष्ठ कृषि विकास अधिकारी				
04	कृषि वैज्ञानिक				
05	विषय वस्तु विषेषज्ञ				

28. कृपया आप फसल उत्पादन के लिए अम्लीय भूमि सुधार हेतु विभिन्न अनुशंषित विधियों को अपनाने संबंधित जोखिम उठाने की क्षमता के बारे में जानकारी प्रदान करें ।

क्र.	जोखिम उठाने की क्षमता	पूर्णतः सहमत	सहमत	कुछ कह नहीं सकते	असहमत	असहमत पूर्णतः
1	वह कृषक जो कि फसल उत्पादन के लिए भूमि सुधार हेतु जोखिम उठाता है। वह अपने कृषि व्यवसाय में ज्यादा सफल होता है ।					
2	कृषको को जोखिमउठाकर भूमि सु धार करना चाहिए ताकि वह ज्यादा आर्थिक लाभ अर्जित कर सकें ।					
3	कृषकों को ऐसे समय पर जोखिम उठाना चाहिए जब कि कृषि कार्य में सफल होने की संभावना रहती है ।					

4	यदि कृषको ने पूर्व में अम्लीय भूमि सुधार हेतु कार्य नहीं किया है तो उन्हें भूमि सुधार करने का जोखिम उठाना चाहिए ।					
5	किसानों को नई तकनीक तब तक नहीं अपनाना चाहिये जब तक की अन्य कृषक उसे सफलतापूर्वक न अपनावे।					
6	नई तकनीक अपनाना सदैव जोखिम पूर्ण रहता है ।					

29 अम्लीय भूमि में खेती करने में होने वाली कठिनाई एवं समस्याआ को बताईये–

1. .....
2. .....
3. .....
4. .....
5. .....

30 अम्लीय भूमि में खेती करने में आने वाली कठिनाई एवं समस्याओ ं को दूर करने हेतु अपने सुझाव व्यक्त करें–

1. .....
2. .....
3. .....
4. .....
5. .....

RESUME

Name : Mirza Altaf Beg

Date of birth : 01-01-1991

Present Address : Room no. 17 Shivam (Dau Jagdev Sao) Boys Hostel

Phones : 9691650006

Fax : -

E. mail : altafmirza69@gmail.com

Permanent address : Mominpura ward-40, Ambikapur, Surguja (C.G) 497001

Academic Qualification:

Degree	Year	University/Institute
HSC (10^{th})	2006	CBSE, New Delhi
HSSC (12^{th})	2008	CGBSE, Raipur
DCA (Diploma)	2010	IT Career, New Delhi
B.Sc. Agriculture	2014	IGKV, Raipur
M.Sc. Agricultural Extension	2016	IGKV, Raipur

Professional Experience (If any):

Membership of Professional Societies (If any): Advances in Life Sciences

Awards / Recognitions (If any):

Publications (If any): 3

Mirza-
Signature