

**ASSESSMENT OF CROPPING SYSTEMS FOLLOWED  
BY BIG FARMERS WITH REFERENCE TO  
PRODUCTIVITY IN BALOD DISTRICT OF  
CHHATTISGARH STATE**

**M. Sc. (Ag) Thesis**

**by**

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**Submitted to the**

**Indira Gandhi Krishi Vishwavidyalaya, Raipur**

**by**

**Laleeta Sahu**

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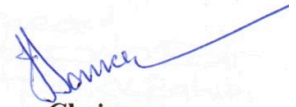
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**OCTOBER , 2015**

## CERTIFICATE – I

This is to certify that the thesis entitled “**Assessment of cropping systems followed by big farmers with reference to productivity in Balod district of Chhattisgarh state**”. Submitted in partial fulfillment of the requirements for the degree of “**Master of Science in Agriculture**” of the Indira Gandhi Krishi Vishwavidyalaya, Raipur, is a record of the bonafide research work carried out by **Laleeta Sahu** under my guidance and supervision. The subject of the thesis has been approved by Student’s Advisory Committee and the Director of Instructions.

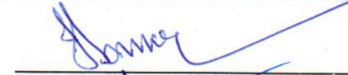
No part of the thesis has been submitted for any other degree or diploma (certificate awarded etc.) or has been published/published part has been fully acknowledged. All the assistance and help received during the course of the investigation have been duly acknowledged by him.

  
Chairman

Date: 09/10/15

### THESIS APPROVED BY THE STUDENT’S ADVISORY COMMITTEE

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Member (Dr. (Smt.) S. Shukla)



## CERTIFICATE – II

This is to certify that the thesis entitled “**Assessment of cropping systems followed by big farmers with reference to productivity in Balod district of Chhattisgarh state**” submitted by **Laleeta Sahu** to the Indra Gandhi Krishi Vishwavidyalaya, Raipur, in partial fulfillment of the requirement for the degree of “**Master of Science in Agriculture**” in the Department of Agricultural Extension has been approved by the External examiner and Student’s Advisory Committee after oral examination.

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Approved/Not approved \_\_\_\_\_

Director of Instructions \_\_\_\_\_

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**Laleeta Sahu**

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## LIST OF NOTATIONS/SYMBOLS

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<i>%</i>	-	Per cent
@	-	At the rate
<i>et al.</i>	-	and others/ and co-workers
<i>Ha</i>	-	Hectare
<i>Hrs</i>	-	Hours
<i>i.e.</i>	-	That is
<i>Kg</i>	-	Kilogram
<i>Km</i>	-	Kilometer
<i>km<sup>2</sup></i>	-	Square kilometer
<i>MT</i>	-	Metric Tonnes
<i>Rs.</i>	-	Rupees
<i>viz.</i>	-	Namely

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## LIST OF ABBREVIATIONS

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Agril.	Agricultural
ADI	Area Diversity Index
C.G.	Chhattisgarh
CLUI	Cultivated Land Utilization Index
DAC	Department of Agriculture and Cooperation
Deptt.	Department
DES	Directorate of Economics and Statistics
etc.	et cetera (and so on)
f	Frequency
FAO	Food and Agricultural Organization
Fig.	Figure
GCA	Gross Cropped Area
GDP	Gross domestic product
Govt.	Government
IGKV	Indira Gandhi Krishi Vishwavidyalaya
MCI	Multiple Cropping Index
MSP	Minimum Support Price
No.	Number
NS	Non – Significant
NSA	Net Sown Area
q	Quintal
R.A.E.O.	Rural Agriculture Extension Officer
REY	Rice Equivalent Yield
Rs.	Rupees
S	Significant
S.D.	Standard Deviation
T.V.	Television

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## THESIS ABSTRACT

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- a) Title of the Thesis : "Assessment of Cropping Systems followed by Big farmers with reference to Productivity in Balod district of Chhattisgarh state"
- b) Full Name of the Student : Laleeta Sahu
- c) Major Subject : Agricultural Extension
- d) Name and Address of the : Dr. J. D. Sarkar, Professor  
Major Advisor College of Agriculture, I.G.K.V., Raipur (C.G.)
- e) Degree to be Awarded : M.Sc.(Ag.) Agricultural Extension

Signature of Major Advisor

Date: 09/10/15

Signature of the Student

Signature of Head of the Department

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## ABSTRACT

This study was focused on assessment of cropping systems with reference to productivity followed by big farmers of Balod district of Chhattisgarh state. In this context, the present study was carried out in Balod, Dondi and Gunderdehi blocks of Balod district (Chhattisgarh) during the year 2014-15. Primary data from 120 respondents, from selected 15 villages were collected through personal interview with the help of pre-tested structured interview schedule. Collected data were tabulated and processed by using appropriate statistical tools.

The findings of this study revealed that most of the big farmers who followed various cropping systems were found high school educated and belonged to nuclear family type. As regards to involvement in occupations, Maximum number of the respondents were involved in agriculture + animal husbandry. Maximum number of the respondents had 4 to 6 ha of land holdings, the data regarding soil types indicated that of the total, maximum number of

respondents had matasi soil (*Inceptisols*), and majority of the respondents were having irrigation facility.

According to socio-psychological characteristics, attitude of respondents towards modern agricultural technologies, the majority of the respondents had moderately favourable attitude. Most of the respondents had medium level use of information sources, and majority of the respondents were found in the medium level of contact with extension agencies.

The majority of the respondents had follow the Rice-Wheat cropping system and most of the respondents had intensity of cropping of more than 100 per cent. The data on area under existing cropping systems shows that total 252.60 ha area was used by the big farmers for different cropping systems, out of which the cropping system Rice-Wheat occupied area as majority.

The data on popular varieties of different crops present in existing cropping systems in the study area, MTU-1010 was found as the most popular variety of rice, Kanchan for wheat, J.L.-3 for lentil, N.R.C.-37 for soybean, Kartika for linseed, Chandan for maize, J.G.-74 for chickpea, Vardan for rapeseed-mustard, respectively. From the above findings, it can be concluded that farmers were mostly using high yielding varieties for rice and other existing crops. The REY (Rice Equivalent Yield) was found according to MSP (Minimum Support Price) of rice. The data regarding system productivity indicated that the cropping system of Maize-Mustard had highest REY ( $61.39 \text{ q ha}^{-1}$ ), and highest productivity (yield q/ha) was productivity of sugarcane (300 q/ha).

In correlation analysis, it was found that variables soil types, cropping intensity and existing cropping patterns were found to be positive and significantly correlated at 0.05 level of probability. While education and irrigation facilities were found to be positive and significantly correlated at 0.01 level of probability. Similarly, in the case of multiple regression analysis, out of selected 11 independent variables soil types showed positive and significant contribution at 0.05 level of probability, irrigation facilities and sources of information had positive and significant contribution at 0.01 level of probability. However, all the selected 11 variables in the model show 57.60 per cent contribution in the system productivity/ REY (Rice Equivalent Yield).

So far as the problems faced by the big farmers with reference to system productivity (REY), the big farmers were concerned, it was found that majority of the respondents faced problem of high cost of HYV seeds as the major technological constraints, family problem as the major personal constraints, others does not follow improved agril. techniques as the major social constraints, more than enough investment as the major economic constraints, cooperation society is far away as the major institutional constraints etc.

To overcome the above , majority of the respondents suggested that improved technology should be available at cheaper rates, regularly training programme should be imparted in local spoken language, resistant varieties should be easily available well in time on reasonable rates, seed, fertilizer and plant protection chemicals should be supplied at proper time, awareness should be developed among other farmers for adoption of improved technology and visit of farmers on research stations should be organized.

From the above findings, it can be concluded that there is a need to increase the system productivity with reference to other cropping patterns, through proper utilization of sources of information, extension contacts, exhibition, kisan mela and training programme should be conducted in different aspects of cropping systems with reference to productivity by the concerned agencies.

## शोधग्रंथ सारांश

अ) शोध ग्रंथ का शीर्षक : छत्तीसगढ़ के बालोद जिले के बड़े किसानों द्वारा अनुसरित फसल पध्दतियों के उत्पादकता के संबंध में मूल्यांकन करना

ब) छात्र का पूरा नाम : ललीता साहू

उ) प्रमुख विषय : कृषि विस्तार

द) मुख्य परामर्शदाता का नाम एवं पता : डॉ. जे. डी. सरकार, प्राध्यापक, कृषि विस्तार विभाग, इं. गा. कृ. वि. वि., रायपुर (छ.ग.)

इ) उपाधि जिससे सम्मानित किया जाना है : कृषि विस्तार में स्नातकोत्तर (कृषि)

मुख्य परामर्शदाता के हस्ताक्षर

छात्र के हस्ताक्षर

दिनांक 09/10/15

विभागाध्यक्ष के हस्ताक्षर

## सारांश

यह अध्ययन बालोद जिले के बड़े किसानों द्वारा अनुसरित फसल पध्दतियों के उत्पादकता के संबंध में मूल्यांकन करने पर केंद्रित था। इस संबंध में वर्तमान अध्ययन वर्ष 2014-15 में छत्तीसगढ़ के बालोद जिले के बालोद, डौण्डी और गुण्डरदेही विकासखण्डों में किया गया था। चयनित 15 गांवों से 120 उत्तरदाताओं से प्राथमिक आंकड़े साक्षात्कार अनुसूची के माध्यम से एकत्र किए गये तथा आंकड़ों को उचित सांख्यिकीय विधियों की सहायता से सारणीबद्ध किया गया।

इस अध्ययन के परिणाम हमें यह बताते हैं कि विभिन्न फसल पध्दतियों का पालन करने वाले बड़े किसान उच्च माध्यमिक स्तर तक शिक्षित थे तथा एकल परिवार से संबंध रखते थे। अधिकतम उत्तरदाताओं का मुख्य व्यवसाय कृषि, पशुपालन था तथा अधिकतम उत्तरदाताओं के जोत का आकार 4 से 6 हेक्टेयर के मध्य पाया गया। अधिकतम उत्तरदाताओं की भूमि में मिट्टी का प्रकार मट्टासी पाया गया तथा अधिकतम उत्तरदाताओं के पास सिंचाई के साधन उपलब्ध थे।

सामाजिक एवं मनोवैज्ञानिक विशेषताओं के अनुसार, आधुनिक कृषि तकनीकों की दिशा में उत्तरदाताओं का रवैया मध्यम स्तर का पाया गया। उत्तरदाताओं में से अधिकांश ने जानकारी के सूत्रों के मध्यम स्तर का उपयोग किया। उत्तरदाताओं के बहुमत विस्तार शाखाओं के साथ संपर्क के मध्यम स्तर में पाये गये।

अधिकांश उत्तरदाताओं ने धान-गेहूँ की फसल पध्दति का अनुसरण किया था तथा फसल की तीव्रता 100 फीसदी से अधिक थी। बड़े किसानों द्वारा अनुसरित फसल पध्दतियों के अंतर्गत कुल 252<sup>१</sup>60 हेक्टेयर क्षेत्र पर फसल उत्पादन किया गया जिसमें से धान, गेहूँ की फसल पध्दति का बहुतायत से पालन किया गया। इस अध्ययन के क्षेत्र में अनुसरित फसल पध्दतियों के अंतर्गत उपस्थित विभिन्न फसलों में से धान में एम टी यू 1010, गेहूँ में कंचन, अलसी में जी एल-3, मसूर में एन आर सी-37, सोयाबीन में कार्तिका, मक्का में चंदन, चना में जे जी-74 तथा तोरिया सरसों में वरदान सबसे लोकप्रिय किस्मों के रूप में पाये गये। उपरोक्त सभी बातों से यह कहा जा सकता है कि अधिकतर बड़े किसानों द्वारा धान एवं अन्य फसलों के लिए अधिक उपज देने वाली किस्मों का उपयोग किया गया। फसल पध्दति की उत्पादकता का विश्लेषण न्यूनतम समर्थन मूल्य के अनुसार किया गया। सभी अनुसरित फसल पध्दतियों में मक्का-सरसों की फसल पध्दति की उत्पादकता-क्विंटल प्रति हेक्टेयर सबसे अधिक थी। सभी फसलों में गन्ने की उत्पादकता-क्विंटल प्रति हेक्टेयर सबसे अधिक पायी गयी।

सहसंबंध विश्लेषण यह बताता है कि 11 चयनित चरों में से 3 चर 0.05 के स्तर पर सकारात्मक सहसंबद्ध पाये गये। वे 3 चर इस प्रकार हैं - मिट्टी का प्रकार, फसल की तीव्रता एवं वर्तमान समय में उपस्थित फसल पध्दति। इसी प्रकार 0.01 के स्तर पर 2 चर शिक्षा एवं सिंचाई के साधन सकारात्मक रूप से सहसंबद्ध पाये गये।

मल्टीपल रिग्रेशन विश्लेषण से यह पता चलता है कि 11 चयनित चरों में से 3 चर जिनमें से 2 चर मिट्टी का प्रकार एवं सिंचाई के साधन 0.05 के स्तर पर सकारात्मक एवं महत्वपूर्ण पाये गये और 1 चर जानकारी के सूत्रों का 0.01 के स्तर पर महत्वपूर्ण योगदान पाया गया।

अधिकांश उत्तरदाता जिन परेशानियों का सबसे अधिक सामना करते थे वे सभी घटते हुए क्रम में इस प्रकार प्रस्तुत किए गए हैं - मुख्य तकनीकी बाधा के रूप में अधिकतम उपज देने वाली किस्मों के बीजों का अधिकतम मूल्य, व्यक्तिगत बाधा के रूप में पारिवारिक समस्या, सामाजिक बाधा के रूप में दूसरों के द्वारा उन्नत कृषि तकनीकों का पालन नहीं करना, आर्थिक बाधा के रूप में आवश्यकता से अधिक आर्थिक निवेश एवं संस्थागत बाधा के रूप में सहकारी समिति की दूरी अधिकतम होना आदि मुख्य थे।

उपरोक्त बाधाओं के निराकरण के लिए उत्तरदाताओं द्वारा दिए गए सुझाव घटते हुए क्रम में इस प्रकार प्रस्तुत किए गए हैं - प्रतिरोधी किस्मों के बीजों की उचित दरों पर नियमित उपलब्धता, बीजों, उर्वरकों एवं पौध संरक्षणों की सही समय पर आसानी से

उपलब्धता, प्रशिक्षण कार्यक्रमों का स्थानीय भाषा में संचालन, कृषि रसायनों की सही समय पर उपलब्धता, एवं बेहतर कृषि तकनीकी के किसानों के द्वारा अंगीकरण को प्रोत्साहन दिया जाना आदि मुख्य सुझाव थे।

अंततः उपरोक्त सभी बातों से यह कहा जा सकता है कि बड़े किसानों द्वारा अनुसरित फसल पध्दतियों के संबंध में उत्पादकता को प्रोत्साहन देने के लिए विस्तार संपर्क, कृषि संबंधी प्रदर्शनियों, किसान मेलों और प्रशिक्षण कार्यक्रमों के साधनों के समुचित उपयोग के माध्यम से प्रयास करने की आवश्यकता है।

## CHAPTER-I INTRODUCTION

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The cropping system study is useful to understand the overall sustainability of agricultural system. A cropping system is defined as the crops and crop sequences, their management techniques used on a particular field over a period of years. Despite the focus on industrialization, agriculture remains a dominant sector of the Indian economy both in terms of contribution to gross domestic product (GDP) as well as a source of employment to millions across the country. Agriculture plays a vital role in the Indian economy. The total Share of Agriculture & Allied Sectors (Including agriculture, livestock, forestry and fishery sub sectors) in terms of percentage of GDP is 13.9 percent during 2013-14 at 2004-05 prices. [As per the estimates released by Central Statistics Office]. As per the land use statistics 2011-12, the total geographical area of the country is 328.7 million hectares, of which 140.8 million hectares is the reported net sown area and 195.2 million hectares is the gross cropped area with a cropping intensity of 138.7%. The net irrigated area is 65.3 million hectares. As per the 4th Advance Estimates of Production of food grains for 2013-14, total food grain production is estimated to be 264.77 million tonnes (MT). In 2013-14, India achieved a record food grain production of 264 MT, beating the previous year's (2012-13) 257 MT, according to data provided by Department of Economics and Statistics (DES). Also, agricultural profitability has increased over the last decade with record increases in MSPs (minimum support prices) for agricultural produce for all covered crops. The Agriculture and Allied Sector contributed approximately 13.9% of India's GDP (at constant 2004-05 prices) during 2013-14. (Annual report 2013-14).

Chhattisgarh state is the 10<sup>th</sup> largest state in India, with an area of 135.190 km<sup>2</sup> (52000 m<sup>2</sup>) with a population of 25.5 million. Chhattisgarh state consists of 27 districts. According to a government estimate, net sown area of the state is 4.828 million ha and the gross sown area is 5.788 million ha. ("Agriculture in Chhattisgarh", Retrieved on 22 July, 2011). Agriculture in Chhattisgarh is marked

by rain fed farming, low value, low yield dominant cropping pattern and a large share of dependent population. Canals are the main source of irrigation in the state and they are dependent on rainfall only. Though a substantial portion of the population is dependent on agriculture, the major crops produced in the state being paddy, kodo-kutki, maize, wheat, gram, lathyrus, niger, linseed, mustard, soybean and ground nut, nearly 80% of State's gross cropped area is covered by one crop i.e. Paddy. As per data compiled by NABARD in their State Focus Paper 2014-15 and Indira Gandhi Krishi Vishwavidhyalaya, Raipur in Krishi Darshika 2014, on cropping pattern and cropping intensity for the State of Chhattisgarh the cropping intensity is only 137%, which means that only 37% area is doubled cropped as virtually mono cropping. Cropping pattern of the state shows production in Kharif is 73.50% and in Rabi, it is 26.50 %. Kharif production is mainly depends upon rain fall. Entire economy of the state mainly depends on single crop produced in the state i.e. in Kharif. (Annual report 2013-14)

The efficiency of such a system can be measured by its performance through indices. For the assessment of cropping systems with reference of productivity some indicators are used to quantify the performance or sustainability of the agricultural practice such as Cropping Intensity (CI) and System Productivity or Rice Equivalent Yield (REY). In view of the above facts, the present investigation entitled **“Assessment of cropping systems followed by Big farmers with reference to Productivity in Balod district of Chhattisgarh state”** was carried out with following objectives:

1. To study the socio-personal, socio-economic and communicational characteristics of the farmers,
2. To study about the existing cropping systems among big farmers of Balod district of Chhattisgarh state,
3. To assess the productivity of existing cropping systems,
4. To find out the constraints faced by farmers with reference to productivity of different cropping systems, and
5. To obtain the suggestions from the big farmers for increasing the productivity and income.

**Significance of the study:**

Present study tries to assess the cropping systems with reference to productivity. The analysis of socio-personal, socio-economic, socio-psychological and communicational factors may substantiate the assessment of cropping systems to a considerable extent. The assessment of cropping systems may help to give directions to the field level workers to manipulate the appropriate factors so as to increase the productivity level of crops. An attempt has also been made to study the problems faced by the big farmers who followed various types of cropping systems, there by the efforts can be made to eliminate those problems in order to increase their productivity level of crop production technology.

The results of the study are expected to be useful to the extension personnel and the administrators to know the attitude towards modern agricultural technologies preferred by the big farmers who followed various cropping systems and also the results could be used to help to understand their attitude level by organizing other extension activities. In Chhattisgarh state, the productivity with reference to cropping systems is not up to the desirable level. The low level of productivity is reflected due to improper arrangement of cropping systems, but even then no systematic efforts, have been made to assess the attitude of the big farmers according to particular cropping system with reference of productivity. Therefore, this study was designed to bring in light the causes responsible for improper arrangement of cropping systems followed by big farmers of Balod district.

The findings of this study will serve as a guideline for research and extension workers to work in line of farmer's perspective for improving the productivity and change the attitude of the farmers towards modern agricultural technologies in more significant way. The study will also be helpful to the planners, administrators and those who are directly or indirectly associated with assessment of cropping systems. Hence, an effort has been made by planning a special study by which the cropping systems followed by the big farmers has been assessed with reference to productivity in Balod district of Chhattisgarh state.

**Scope of the study:**

The research study would attempt to assess the Impact of cropping systems with reference to productivity. The findings of this study provide valuable information to all public and private extension agents, researchers and policy makers to achieve their efforts for cropping system approaches. The results of the study pertaining to the constraints and suggestions would help to taken out appropriate remedial measures by the extension agencies.

**Limitation of the study:**

1. The present study faced the limitations of the time and the resources to be encountered by the researcher.
2. The items included in the study for detailed investigation are also limited because it is not possible to cover all the segments in such a short time.
3. Although every efforts were made to make the best use of standardized tools and techniques of data collection, yet their accuracy may not guaranteed.

## **CHAPTER - II**

### **REVIEW OF LITERATURE**

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In research, a body of literature is a collection of published information and data relevant to a research question. A review of the literature is an essential part of your academic research project. The review is a careful examination of a body of literature pointing toward the answer to our research question. Literature reviewed typically includes scholarly journals, scholarly books, authoritative databases and primary sources. Sometimes it includes news papers, magazines, other books, films, and audio and video tapes, and other secondary sources. In view of the above facts, efforts were made to collect the research findings on the subject possessing similar characteristics.

The researcher has to review the concerning literature at every stage. It is not a one shot exercise but a continuous process, while going through the literature, the researcher get acquainted with the subject-matter, techniques and materials and guide his efforts in desirable direction. 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. Attempts have been made in this chapter to review the relevant literature available on assessment of cropping systems with reference to productivity in India and abroad.

A brief account of related studies has been furnished under the following heads:

#### 2.1 Independent variables

##### 2.1.1 Education

##### 2.1.2 Type of family

##### 2.1.3 Occupation

2.1.4 Land holding and soil types

2.1.5 Irrigation facilities

2.1.6 Sources of information

2.1.7 Extension contacts

2.1.8 Attitude towards modern agricultural technologies

2.1.9 Existing cropping patterns

2.1.10 Cropping intensity

2.2 System productivity (REY- Rice Equivalent Yield)

2.3 Problems faced by the respondents in following different cropping systems

2.4 Suggestions given by the respondents to overcome the problems faced by them in following different cropping systems

## **2.1 Independent variables**

### **2.1.1 Education**

Chandra (2001) revealed that, nearly 50.00 per cent of hybrid paddy growers had low education followed by medium (28.7%) and high (25.4%) education level.

Chaudhary (2003) stated that, the majority of the respondents (39.28%) were found to be educated up to middle school level, followed by 29.76 per cent of the respondents who were illiterate. A negligible per cent of respondents (1.78%) were observed to have college level education.

Nilkanthrao and Rajput (2003) concluded that, majority of the farmers were having the education up to college level.

Ruyosu and Kharub (2003) reported that, majority of the farmers belonged to primary level of education group.

Shrivastava (2005) observed that, majority of the rice growers (50.63%) were educated up to high school and higher secondary followed by 16.87 per cent of the respondents were found up to middle school, whereas 15.63 per cent of the respondents were educated up to college and above level, while 12.50 per cent and

4.37 per cent of the respondents were came under primary school and illiterate categories, respectively.

Nagadev and Venkataramaiah (2007) found that, about 16.67 per cent sample respondents were illiterates, while 83.33 per cent of sample respondents were literates in different groups.

Shashidara *et al.* (2007) revealed that, education has non-significant association with adoption, while remaining independent variables exhibited positive association.

Dhruw (2008) found that, most of the maize growers (35.83%) were educated up to primary school level followed by 25.00 per cent respondents were found under the category of middle school level, whereas 20.83 per cent respondents were illiterate. 13.34 per cent of the respondents had educated up to high school and higher secondary level and only 5.00 per cent respondents had educated up to college level and above.

Mao *et al.* (2008) concluded that, most families heads were able to read and had studied in the primary school, while a few of them had studied in the secondary school and only a family had studied in high school education.

Patel (2008) found that, most of the soybean growers (28.00%) were education up to primary school level followed by 22.66 per cent of the respondents who were illiterate, whereas 21.34 per cent respondents who had education up to middle school level. About 17.34 per cent respondents who had education up to high and higher secondary school level and only 10.66 per cent of the respondents had educated up to college level and above.

Kumar (2010) found that, maximum of the wheat growers (28.33%) were educated up to primary school level and 25.00 per cent were educated up to middle school level, followed by 16.67 per cent of the respondents who were illiterate. Whereas, 13.34 per cent respondents had education up to high school level, 8.33 per cent of the respondents each were educated up to higher secondary level and college and above.

Singh *et al.* (2013) revealed that, 26.15%, 22.30% and 16.15% of the respondents had primary level, middle level and matric or above level education, respectively. However, rest of the respondents (35.38%) was illiterate. The educational level of the study area was higher than that of national level and it might be due to the better educational facilities available in the area.

### **2.1.2 Type of Family**

Manker *et al.* (2000) obtained that, majority of the respondent were from joint family type (71.87%) followed by individual type of family (28.33%).

Pandey (2000) observed that, family type was associated with adoption of rice production technology.

Shrivastava and Lakhera (2003) observed that, type of family failed to establish any significantly relationship with the knowledge, adoption and diffusion of mushroom production technology.

Singh *et al.* (2003) observed that, majority of DCS to their family type reveals that 57.39 per cent members belonged to nuclear family and 42.61 per cent belonged to joint family.

Savitha (2004) observed that, 54.00 per cent of the respondents belonged to nuclear family, followed by joint family (46.00%).

Prakash *et al.* (2004) reported that, among 26 variables three variables i.e. family type, knowledge gap and constraints were found highly significant and positively correlated with extent of technological gap.

David (2005) observed that, the trend of living in nuclear family among farmers was 63.20 per cent.

Singh *et al.* (2007) observed that, most of the farmers were living in joint family system in both adopter (54%) & non adopter (51%), category of accelerating adoption of zero tillage system.

Narmatha (2009) revealed that, nuclear family was seen among 92.00 per cent of the respondents.

Borgohain and Akand (2011) observed that, irrespective of blocks, majority of the respondents were belonged to nuclear family.

Chand *et al.* (2011) observed that, the nearly 2/3rd of the respondents were belonged to nuclear family while remaining to joint family.

Hai *et al.* (2011) revealed that, maximum respondents (53.50%) were having joint type of family.

Rathod *et al.* (2011) revealed that, the type of family, majority of farm women lived in joint family (65%) while 35 per cent lived in nuclear family.

Upadhyay and Desai (2011) revealed that, majority (68.33%) of the respondents were from joint family.

Koundal (2012) reported that, majority of the respondents were belonged to nuclear family. It shows that Gujjar community is also supporting nuclear family system.

Lad *et al.* (2012) observed that, most of the farm women were from nuclear family, followed by joint family.

### **2.1.3 Occupation**

Kumar (2000) observed that, higher percentages of farmers were practicing farming as their main occupations.

Mandal (2000) stated that, the percentage of agriculture labour and service has decreased at present and the percentage of non-agricultural labour, non-government service has increased.

Pandey (2000) found that, majority of the respondents (43.75%) practicing only one occupation. Similarly about 37.50 per cent were engaged in two occupation and only limited *i.e.* 18.73 per cent were engaged in more than two occupation in relation to adoption of rice production technology.

Sharma *et al.* (2000) found that, occupation has the significant correlation with the adoption level of crop production technologies.

Farooqui and Godse (2003) found that, the major population of the area was dependent on agriculture. They were having their own land or they were working on other field as labor.

Pandey *et al.* (2004) revealed that, the respondents were in agriculture occupation with increasing of cosmopolitans and family need, about 31.88 and 23.75 per cent respondent were engaged in forestry and animal husbandry, respectively.

Shrivastava (2005) found that, most of the rice growers (26.87%) had involved in farming + business followed by 25.00 per cent respondents who involved in farming + services, whereas 22.50 per cent of the respondents were involved in farming. About 12.50 per cent of the respondents were employed in farming + Animal husbandry. A few respondents (7.50%) had their farming +labour, whereas only 5.63 per cent of the respondents were employed in farming + Animal husbandry + services. Prajapati (2006) revealed that the majority of the wheat growers

(61.67%) practiced only farming as the source of income, whereas 38.33 per cent farmers had other sources of income along with farming.

Mohiuddin *et al* (2007) revealed that, agriculture was the main occupation of the selected farmers and 15% & 17% farmers have no secondary occupation in Patiya and Satkania respectively i.e. they are fully engaged in agriculture.

Yadav (2007) reported that, education, occupation, source of information and extension contacts of trained and untrained farmers were found positively and significantly correlated with knowledge and adoption level of the respondents.

Mao *et al.* (2008) noticed that, all the respondents did their on-farm work during the wet season, while some of them had extra cultivation in the dry season, and most of families head did their off-farm employment in addition to on-farm work. In terms of off-farm employment, some of them were lecturer, carpenter, house constructor, masonry, sugar palm making, nurse, commune agricultural extensionist, worker, motor taxi, find firewood, and labor hired.

Patel (2008) observed that, the majority of the soybean growers (52.00%) were involved in farming, followed by farming + labour (14.00%), farming + service (12.66%), farming + animal husbandry + service (7.34%), farming + others (8.00%) and farming + occupation + service (6.00%), as their main occupation.

Yadaw (2008) revealed that, maximum numbers of the respondents (30.00%) were doing farming + mushroom production followed by 25.34 per cent respondents who involved in farming + mushroom production + services, whereas 19.33 per cent respondents were involved in farming + mushroom production + dairy. About 15.33 per cent respondents involved in farming + mushroom production + business as their main occupation and only 10.00 per cent respondents were involved in farming + mushroom production + labour.

Kumar and Singh (2009) observed that, the majority of the wheat growers (93.00%) were actively involved in agriculture for their livelihood.

Kulshrestha (2010) revealed that, two to three subsidiary occupation along with farming, less possession of agricultural assets, favorable attitude towards watershed programme, availed irrigation and credit facilities, less to average innovative in nature and utilized medium to low communication sources.

Kumar (2010) revealed that, the occupation had negative and non-significant association with adoption of recommended wheat production technology.

#### **2.1.4 Land holding and soil types**

Gogoi and Phukhan (2000) revealed that a high degree association was found between size of land holding and extent of adoption in improved rice cultivation.

Chandra (2001) reported that 38.60 per cent of the respondents possessed 1.95 to 3.79 acres of land, 33.4 per cent of them possessed 1.95 acres land and 28.0 per cent possessed more than 3.78 acres of land.

Jana and Verma (2004) concluded that paddy growers who were having larger size of land holding and better socio-economic status were found to have

higher level of adoption in the recommended plant protection practices for paddy cultivation.

Sudheendra *et al.* (2004) reported that the majority of respondents 32.50 per cent were big farmers, then 29.70 per cent were marginal farmers, 20.30 per cent were small farmers, 17.50 per cent were landless labours.

Shrivastava (2005) observed that majority of the rice growers (41.25%) had medium size of land holding (4.01 to 10 ha) followed by 35.00 per cent of the respondents who had semi-medium size of land holding (2.01 to 4.00 ha). About 13.75 per cent of the respondents had small size of land holding (1.01 to 2.0 ha), whereas 9.37 per cent of the respondents had large size of land holding (above 10.00 ha).

Maraddi *et al.* (2007) found the size of land holding to be non significantly associated with adoption level of sustainable sugarcane cultivation practice.

Nagadev and Venkataramaiah (2007) reported that 39.33 per cent of respondents belonged to semi medium category, 20.00 per cent belonged to medium land holding, while 26.67 per cent possessed small land holding, 12.00 per cent possessed marginal land holding and only meager number (2.00%) had large land holding.

Dhruw (2008) found that, maximum number of the maize growers (37.50%) had small size of land holding (1 to 2 ha), followed by 35.00 per cent respondents who belonged under marginal category (up to 1 ha), whereas 20.83 per cent of the respondents were having medium size of land holding (2 to 4 ha), however only 6.67 per cent respondents had large size of land holding (above 4ha).

Kumar (2010) revealed that, maximum number of the wheat growers (41.67%) had large size of land holding (above 4 ha), followed by 25.00 per cent respondents who belonged to small size of land holding (1 to 2 ha), whereas 17.50 per cent of the respondents were having medium size of land holding (2.1 to 4 ha) however only 15.83 per cent respondents belonged under marginal category (less than 1 ha).

Sathish (2010) concluded that, majority (50.84%) of the respondents were medium land holders followed by big and small landholders. In the study area farmers had very good access for irrigation facilities in the form of tube wells, river water and canal and on applying conversion factor of one acre of irrigated land is equivalent to 2.50 acres of dry land, many would belong to big land holdings category. This could be the reasons for the majority belonging to large land holding category.

### **2.1.5 Irrigation facilities**

Pandey (2000) revealed 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.

Pandey (2000) found that, the highest coverage of area under irrigation was due to tubewells (25%), followed by pump (23%), well (20%) and canal (19%). However, ponds contributed only 13 per cent area.

Rajput *et al.* (2003) concluded that, one irrigation at pre-flowering stage and weed management through application of Isoproturon @ 1.0 kg ha<sup>-1</sup> at pre-emergence can be most suitable for maximum seed yield and net return from chickpea (*Cicer arietinum L.*).

Mukim (2004) found that, the highest coverage of area under irrigation was through tube well (42.19%) followed by Canal + well (32.81%). Canal + tubewell and pond contributed 23.44 and 1.56 per cent area under irrigation, respectively.

Maraddi (2006) observed that, with 76.11 and 78.88 per cent of the respondents having full knowledge regarding application of irrigation once in 10 to 15 days through furrow method, while 17.77 and 17.22 per cent of respondents having partial knowledge regarding application of irrigation once in 15 to 20 days through alternate furrow method.

Nayak(2006) revealed that, the majority (81.88%) of the respondents had knowledge about different types of irrigation. Whereas, (70.62%) of the

respondents having the knowledge about time lag between first irrigation and subsequent irrigation.

Thanh and Singh (2006) reported that, due to the advantage of natural condition, 100.00 per cent Vietnamese farmers used the canals for the main sources of irrigation; whereas, for Indian respondent, it is one of the main constraints in their production when more than half of them used tube-wells (66.00%), followed by canal (22.00%), rainfall (10.00%) and wells (2.00%).

Nayak (2007) revealed that, the majority (81.88%) of the respondents had knowledge about different types of irrigation. Whereas, (70.62%) of the respondents having the knowledge about time lag between first irrigation and subsequent irrigation.

#### **2.1.6 Sources of Information**

Hedau (2000) revealed that, the sources of information were positively and significantly associated with the adoption of paddy production technology.

Choudhary *et al.* (2001) found that, information sources utilization pattern had highly significant and positive correlation with extent of adoption of rice technology.

Manohari (2002) concluded that, majority of the respondents were using friends, neighbours and local leaders as the main source of information for adopting better practices in agriculture and allied field which ultimately leads to enhance the crop-yields and better living.

Gupta *et al.* (2003) indicated that, electronic media like Television and radio are mostly used and preferred for seeking information on agriculture and development.

Maraddi and Verma (2003) revealed that, majority of (91%) respondents were found to be of low to medium mass media exposure category, whereas only (9%) of the respondents belonged to high. Mass media exposure of respondents had positive and significant association with the adoption of cotton production technology.

Raghuwanshi (2005) revealed that, majority of the respondents (59.30%) utilized medium level of information sources followed by 23.12 per cent respondents who had utilized low level of information sources, while 17.50 per cent respondents had utilized high level of sources of information.

Shrivastava (2005) observed that, the majority of the respondents (63.75%) were having medium degree of sources of information, followed by 20.00 per cent of the respondents with high degree and 16.25 per cent of the respondents belonged to low degree of sources of information.

Yadaw (2008) found that, maximum number of the respondents (58.00%) utilized medium level of information sources followed by 33.33 per cent and 8.67 per cent respondents utilized low and high information sources, respectively.

Kumar (2010) found that, the majority of the respondents (75.83%) had high level of exposure to various sources of information for getting the information about wheat cultivation practices, followed by 14.17 per cent of the respondents were found to have medium level of exposure to various sources of information and 10.00 per cent of the respondents were found to have low level use of information sources category.

Singh and Varshney (2010) found that, mass media exposure was non significant and exerted positive influence on adoption of new rice production technology.

### **2.1.7 Extension contacts**

Bhosle *et al.* (2000) concluded that, maximum number (53.33%) of the respondents had medium extension contact, while 25.34 per cent and 21.33 per cent of the respondents had low and high extension contact, respectively regarding informative programmes.

Gogoi and Phukan (2000) concluded that, low level of adoption of the respondents may be due to non-availability of village level extension workers and lack of practical oriented agricultural training programme and demonstration.

Tamilselvi and Somasundaram (2000) reported that, there was positive and highly significant relationship of extension contact and mass media participation

with adoption of cultivation practices among both of the categories of farm women. It needs no explanation since they would have exposed, persuaded and motivated them to adopt the production technologies.

Kareem and Manohari (2001) suggested that, the extension personnel with take care at the nil and partial adopted practices like adoption of various operations by conducting exposure visits and result demonstrations in paddy production practices.

Bhosle *et al.* (2002) concluded that, maximum number (53.33%) of the respondents had medium extension contact, while 25.30 per cent and 21.33 per cent of the respondents had low and high extension, respectively regarding information programme.

Maraddi and Verma (2003) found that, extension contact of cotton growers had highly positive and significant relationship with their knowledge level of recommended practices of cotton crop.

Venkataramalu *et al.* (2004) indicated that, 35.83 per cent of the respondents contacted private agency extension personnel once in a week, while 25.00 per cent had contact with village level worker once in a month and 25.00 per cent had contact with Agriculture Officer (A.O.) whenever problem occurs 15.83 per cent and 12.50 per cent of respondents had contacted university scientist, whenever problem occurs and extension personal once in a month, respectively.

Singh *et al.* (2004) concluded that, introduction of high yielding varieties and extension agencies can play a significant role to enhance the lentil grain yield. Therefore, yield gap at farmers and research field can be bridged by demonstrated scientific practices.

Singh and Varshney (2010) revealed that, the extension contact had positive influence on the adoption level of rice production technology.

### **2.1.8 Attitude towards modern agricultural technologies**

M. U. Rashid (2008) found that, Attitude of the big farmers towards some selected agricultural technologies was categorized into three as 'unfavorable attitude', 'moderately favorable attitude' and 'favorable attitude' according to their

mean attitude score (30.33%) and standard deviation (8.0%), it indicates that the highest proportion (71.43%) of the big farmers had moderately favorable attitudes while (10.99%) and (17.58%) that showed unfavorable and favorable attitudes, respectively, towards selected modern agricultural technologies. In fact, most of the big farmers had an orientation towards Jabalpur and other places, which was reflected in their attitude formation.

### **2.1.9 Existing cropping patterns**

Menon *et al.*, (1995) reported that utilization patterns of farm information sources are significantly influenced by variables such as educational status, extent of social participation, material possession, extent of cosmopolitanism, extent of mass media utilization and level of adoption.

Sidhu *et al.*, 2010; World Bank, (2003), it can be viewed as a mixed blessing for Punjab because it led to the establishment of Wheat-Rice-Cropping-Pattern (WRCP) as a main cropping pattern in many parts of Punjab by eliminating all the other available cropping patterns during the pre Green Revolution period. The WRCP has been, and remains, the most preferred cropping pattern across Punjab due to its comparative economic advantages, assured marketing and stable productivity levels. As a result, WRCP continues to occupy more than 77% of net cropped area of Punjab (GoPb, 2009) which has further dropped the crop diversification index from 0.75 in 1975-76 to 0.58 in 2006-07.

### **2.1.10 Cropping intensity**

Roder *et al.* (1997), it is well documented that weed pressure increases and the weed composition changes with increased cropping intensity. In fact, Becker and Johnson (2001) suggested that cropping intensification induced yield loss appeared to be related mainly to increased weed infestation and declining soil N availability in West Africa. However, weeds are not likely to be the sole factor in reduced rice yields because even when weeds are controlled, yields decline. In addition to increased cropping intensity, water availability is another major constraint for rainfed upland rice production.

Schiller *et al.* (2001) showed that between 1966 and 1999 drought was a problem in one third of the years. Furthermore, farmers in northern Laos mentioned that drought was one of the main problems associated with upland rice production. Asian Development Bank (2003), Cropping intensity varied from 15 years of fallow to five years of continuous annual upland rice cultivation. Declining upland rice yields with increasing cropping intensity is a finding that is consistent with reports from northern Laos based on farm surveys while significant effects of cropping intensification on rice yields were observed, there was high yield variation among the fields within the same fallow index—especially where the fallow index was 0 (upland rice grown for one year before) or 1 (one year fallow).

Linguist *et al.* (2005), Intensifying upland rice cultivation without appropriate management has resulted in declining yields in Asia. The cause of declining yields is not clear but may be related to a combination of the following: a decline in soil fertility, an increase in soil compaction, and increased weed and insect pressure. Upland rice yield data were collected from fields with different cropping histories to quantify the effect of cropping intensity on productivity. These data were from agronomic and cultivar trials conducted from 1992 to 2005. Only yield data for traditional upland rice cultivars, Vieng and Dam, were used for analysis. Included in this data set are five long-term experiments ranging from three to six years and initiated between 1992 and 2001.

Hernández-Rivera and Mann (2008), Agricultural intensity or cropping intensity is reflected in the volume of outlays per one area unit. The attitude to this problem has been changing with time, mainly in the context of selecting the most suitable intensity assessment parameters.

## **2.2 System productivity (REY- Rice Equivalent Yield)**

Yadav *et al.* (2000) revealed that the rice-potato-cowpea provided the highest rice grain equivalent yield of 22.55 t/ha than rice-potato-okra (20.02 t/ha)

Abha Sharma (2001) reported that, increase in income, living conditions, increase in productivity of the corps over the previous year was due to the effective participation of beneficiaries in watershed development programme.

Kumar *et al.* (2001) found that highest rice equivalent productivity (kg/ha) was obtained in rice-potato + onion, mustard + black gram system having productivity of 53.1 kg/day/ha.

Singh *et al.* (2001) found that rice-lentil-maize + fodder cowpea system gave significantly highest rice-equivalent yield.

Rathore *et al.* (2003) reported that in rainfed rice-chickpea cropping system, dry seeding of rice and sowing of chickpea just after or 3 days after harvest of rice are the economical options for assurance of economical double cropping in lowland rice fields under rainfed conditions of the Chhattisgarh region.

Swarnkar *et al.* (2003) studied the residual effect of integrated nutrient management of rice in chickpea for *Alfisols* of Jagdalpur, Chhattisgarh, India. The study revealed that integrated nourishment of 100kg N ha<sup>-1</sup> by 50% N through urea, along with 50% N through sunhemp to kharif rice followed by application of 20:50:20 kg NPK ha<sup>-1</sup> to chickpea can be practiced for good soil health as well as to get higher yields and net income from rice-chickpea cropping system.

Manjunath and Karikanthimath (2004) observed that system productivity was highest with rice-brinjal system (11222 kg./ha) followed by rice-cowpea system (7681 kg./ha)

Dungani *et al.* (2005) reported that the highest (9689 kg./ha) total production in terms of paddy-equivalent yield was obtained under paddy-wheat-green gram sequence. The next best sequence was paddy-sorghum-groundnut with equivalent of 9609 kg./ha.

Kumar *et al.* (2005) observed that the rice-rice, rice-maize and rice-sunflower cropping sequences gave significantly higher rice equivalent yield ( 11616, 11553 and 10868 kg/ha, respectively)

Singh and Singh (2005) reported that rice-onion gave the highest yield (118.97 q/ha) in the term of rice equivalent yield with maximum production efficiency (33.10 kg/day/ha)

Singh *et al.* (2005) reported that rice equivalent yield (REY) was maximum in coarse rice-potato-sunflower (25.06 t/ha) followed by coarse rice-potato-late wheat (24.90 t/ha), basmati rice-potato-sunflower (17.71 t/ha), basmati rice-potato-late wheat (13.12 t/ha), as compared to traditional coarse rice-wheat (11.23 t/ha) system.

### **2.3 Problems faced by the respondents in following different cropping systems**

Gogoi *et al.* (2000) concluded that the level of knowledge and extent of adoption of trained farmers on recommended rice production practices were significantly higher than the untrained farmers. This can be attributed to the impact of training programme. Lack of availability of certified seed, fertilizer, plant protection chemical and their high cost, inadequate supply of irrigation water and lack of extension contact were the major problems in adopting the recommended practices.

Singh and Rajput (2000) concluded that lack of irrigation facility, low price of farm produce, gap in communication, lack of capital and high price of fertilizers were the major constraints faced by farmers in adoption of wheat production technology.

Sharma *et al.* (2003) concluded that non-availability of agricultural inputs at proper time, lack of knowledge, inadequate credit facility, lack of extension contacts were found as the major constraints in adoption of recommended chickpea production technology. Hence, it is recommended that intensive efforts should be made to minimize the above constraints for increasing the chickpea production at farmer's fields in Chhattisgarh.

Kumar (2004) in his study on tomato growers in Belgaum district of Karnataka reported that, majority of the farmers (75.83%) faced the problem of technical knowledge. Whereas, 65.00 per cent of the respondents faced the problem of high fluctuation in market price, followed by high transportation cost (62.53%), labour shortage and high wages (55.83%) and lack of irrigation facilities and power shortage (46.66%).

Thanh and Singh (2006) revealed that 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.

Singh and Varshney (2010) found that non-availability of suitable high yielding varieties was the most important constraint reported by 63.33 per cent of the respondents. Occurrence of heavy weed growth ranked as the second important constraint by 51 per cent of the respondents. High cost of the high yielding variety seeds was expressed as a constraint by 45.33 per cent of the respondents. Complexity of view practices was ranked as the fourth important constraint by 41.67 per cent of the respondents. High cost of labour was expressed as a constraint by 72.50 per cent of the respondents as the agricultural labourers were demanding higher wages irrespective of nature of work. Non-availability of trained labour in time was also considered as a constraint by 54.17 per cent of the respondents. High cost of inputs as a constraint was expressed by 60.00 per cent of the respondents. Lack of conviction in new technology was expressed by 35.00 per cent of the respondents. Non-availability of desired technology was seen as a constraint by 30.83 per cent of the respondents in rice cultivation.

#### **2.4 Suggestions given by the respondents to overcome the problems faced by them in following different cropping systems**

Sivanarayana *et al.* (2000) suggested that the steps to ameliorate the process of the existing system of diffusion and adoption process encourages the extension personnel to concentrate their efforts to suitably provide redressal in an appropriate manner to the best of their abilities.

Rao *et al.* (2001) observed in his studies in A. P. that majority of (80.80%) farmers suggested that in-service training should be provided to field extension workers on sustainable rice farming practices. As the field extension workers were lacking in knowledge regarding sustainable rice cultivation practices, in service training should be given to them to acquire the latest technology. Rice cultivation requires high input and intensive cultivation, so farmers must learn techniques from extension workers to reduce the pressure on production environment. The

other suggestion were arranging field visits to the farmers that have been practicing sustainable agriculture and bringing out periodical publications on rice-farming with latest cultivation practices.

Rafee (2008) reported that the major suggestions were suggested *viz.* irrigation facilities should be increased more, off and on campus training programmes should be organized on new agricultural technology, more subsidies should also be provided to purchase FYM/Bio-fertilizers, Bio-pesticides etc.

## CHAPTER-III MATERIALS AND METHODS

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The present investigation “**Assessment of cropping systems followed by big farmers with reference to productivity in Balod district of Chhattisgarh state** ” was carried out during the year 2014-15. This chapter deals with the methods and procedures used for the study, during the course of investigation. The different steps that were undertaken are listed below in following heads and the details under each step are explained in the succeeding part of the chapter.

### 3.1 Location of study area

### 3.2 Sample and sampling procedure

#### 3.2.1 Selection of districts

#### 3.2.2 Selection of villages

#### 3.2.3 Selection of respondents

### 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 Problems faced by the respondents in assessment of cropping systems with reference of productivity

### 3.7 Suggestions given by the respondents in assessment of cropping systems with reference of productivity

### 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 study area**

This study was conducted during the year 2014-15 in one selected district, namely Balod of Chhattisgarh state. Chhattisgarh state is divided into 27 districts i.e., Sarguja, Korba, Bilaspur, Korba, Jashpur, Kawardha (Kabirdham), Durg, Raipur, Baloda Bazar, Janjgir-Champa, Raigarh, Rajnandgoan, Dhamatari, Mahasamund, Kanker, Bastar, Dantewada, Narayanpur, Bijapur, Bemetara, Surajpur, Balarampur, Balod, Koandagoan, Mungeli, Gariyaband and Sukma. Out of the said district, Balod district is purposively selected for the study. Balod is located at a distance of 99 km, from the University headquarter at Raipur.

### **3.2 Sample and sampling procedure**

#### **3.2.1 Selection of district**

This study was conducted during the year 2014-15 in the Balod district of Chhattisgarh state. The Chhattisgarh state consists of 27 districts, out of which Balod district was selected because the sizeable number of big farmers of this district followed various types of cropping systems.

#### **3.2.2 Selection of blocks**

Out of the total 5 blocks in Balod district, 3 blocks namely Balod, Dondi, and Gunderdehi were selected purposively for the study because the maximum numbers of big farmers are following various cropping systems residing in these blocks.

#### **3.2.3 Selection of villages**

From each selected block, 5 villages (Total  $5 \times 3 = 15$ ) were selected on the basis of maximum availability of cropping systems follower farmers in the villages. Village Semarkona, Baghmara, Orma, Jhalmala and Heerapur from Balod block, Kotagaon, Salhaitola, Chhindgaon, Dhhotimtola and Adjaal from Dondi block and Barbaspur, Mokha, Jewartala, Bhardakala and Mundara from Gunderdehi block were selected randomly.

#### **3.2.4 Selection of respondents**

From each selected village, 8 big farmers were selected randomly as respondents. Thus a total of 120 farmers were chosen for the study who followed various types of cropping systems in this way total sample size was 120.



Fig: 3.1 map of study area

Table 3.1: Selected blocks and villages for the study:

Balod	Dondi	Gunderdehi
Semarkona	Kotagaon	Barbaspur
Baghmara	Salhaitola	Mokha
Orma	Chhindgaon	Jewartala
Jhalmala	Dhhotimtola	Bhardakala
Heerapur	Adjaal	Mundara

### 3.3 Variables of the study

#### 3.3.1 Independent variables

Table 3.2: Independent variables

Socio-personal	Socio- economic	Communicational	Socio- psychological
<ul style="list-style-type: none"> <li>• Education</li> <li>• Type of family</li> </ul>	<ul style="list-style-type: none"> <li>• Land holding and soil types</li> <li>• Irrigation facility</li> <li>• Occupation</li> <li>• Cropping intensity</li> <li>• Existing cropping patterns</li> </ul>	<ul style="list-style-type: none"> <li>• Source of information</li> <li>• Contact with extension agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Attitude towards modern agricultural technologies</li> </ul>

#### 3.3.2 Dependent Variable

- System productivity (Rice equivalent yield)

### 3.4 Operationalization of independent variables and their measurement

#### 3.4.1 Socio-personal characteristics of the respondents

##### 3.4.1.1 Education

Level of formal education obtained by the respondent farmers may influence their social status, attitude and adoption. The reading and writing capability acquired by the farmers was considered as their education status and it was categorized as under:

<b>Categories</b>	<b>Score</b>
➤ Illiterate	0
➤ Primary school	1
➤ Middle school	2
➤ High school	3
➤ Higher Secondary school	4
➤ Graduate and above	5

### **3.4.1.2 Type of family**

A family may be nuclear or joint. Nuclear family is the social group consisting of married man and woman with their children living together under the same roof and sharing a common hearth. Joint family is the social group consisting of several related individual families, especially those of a man and his sons residing in single large dwelling. In this study the type of family was categorized in the following manner:

<b>Categories</b>	<b>Score</b>
➤ Nuclear	1
➤ Joint	2

### **3.4.2 Socio-economic characteristics of the respondents**

#### **3.4.2.1 Size of land holding and soil types**

It is operationally defined as the actual land holding of the family of farmers at the time of investigation. The categorization of the farmers was done as follows:

<b>Categories</b>	<b>Score</b>
➤ 4 to 6 ha	1
➤ 6.1 to 8 ha	2
➤ 8.1 to 11 ha	3

Farmers had a large land holding as they are big farmers, so variation in soil types had been seen. According to depth and topography, the soils are mainly classified as Bhata (*Entisols*), Matasi (*Inceptisols*), Dorsa (*Alfisols*), Kanhar (*Vertisols*) and Bharri (*Lateritesols*).

<b>Categories</b>	<b>Score</b>
➤ Bhata( <i>Entisols</i> )	1
➤ Matasi( <i>Inceptisols</i> )	2
➤ Dorsa( <i>Alfisols</i> )	3
➤ Kanhar( <i>Vertisols</i> )	4
➤ Bharri( <i>Lateritesols</i> )	5

#### 1.4.2.2 Irrigation facilities

The extent of availability of irrigation resources with the farmers may affect the adoption and non-adoption of different improved agricultural technology. The farmers were asked to specify the availability and non-availability of irrigation sources. 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, hand pump, pump on river or canal and tube well were identified.

<b>Categories</b>	<b>Score</b>
<b>Irrigation availability</b>	
➤ Not available	0
➤ Available	1
<b>Sources of irrigation</b>	
➤ Canal	1
➤ Hand pump	2
➤ Pump on river/canal	3
➤ Other- Tubewell	4

### 3.4.2.3 Occupation

The number of occupations may also influence the adoption level of the respondents because as occupation increases, farmer may not give his full attention for a single occupation i.e. agriculture. In present study, number of occupations practiced by each respondents were recorded and categorized in the following manner:

Categories	Score
➤ Agriculture	1
➤ Agriculture + Labour	2
➤ Agriculture + Business	3
➤ Agriculture + Horticulture	4
➤ Agriculture + Animal husbandry	5
➤ Agriculture + Others	6

### 3.4.2.4 Cropping intensity

The cropping intensity is defined as a ratio between net sown area (NSA) & gross cropped area (GCA). It thus indicate the additional percentage share of the area sown more then once to NSA. It may be measured by the formula:

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

### 3.4.2.5 Existing cropping patterns

The yearly sequence & spatial arrangement of crops and flow on a given area is known as cropping pattern . The cropping pattern used on a farm and its interactions with farm resources other farm enterprises and available technology which determine their makeup.

### 3.4.3 Communicational characteristics of the respondents

#### 3.4.3.1 Sources of Information

Source of information are supposed to be directly associated with the availability and exposure of respondents towards the innovations. This awareness related to various innovations may support the farmers for adopting the new ideas. For assessing this variable different 17 possible sources of information (Personal localite, Personal Cosmopolite and Mass media) were identified. To determine the extent of utilization of each information sources the responses of the farmers were recorded on a three point continuum scale i.e. 'Always', 'Sometimes', and 'Not at all'. The weightage given to these categories were 1, 2, and 3, respectively. Afterwards, respondents were categorized into three categories as follows:

Category	Score
➤ Always	2
➤ Sometimes	1
➤ Not at all	0

#### 3.4.3.2 Extension contacts

Many researches in India as well as abroad revealed that extension contact of farmers was the important factor associated with their adoption behaviour. In this study only six extension personnel namely Rural Agricultural Extension Officer, Agriculture Development Officer, Subject Matter Specialist, Agriculture Scientist , Agricultural Development Officer and others were identified and considered for the study. Farmers were categorized and scored on the basis of prevailing norms in the area regarding the visit of any mentioned extension person as:

Categories	Score
➤ Never	0
➤ Some times	1
➤ Frequent	2
➤ Regular	3

### **3.5 Operationalization of dependant variables and their measurement**

#### **3.5.1 System productivity (Rice Equivalent Yield)**

Rice equivalent yield was worked out by converting the economic yield of the each crop on the basis of marketable price ratio of each crop and rice and expressed in kg ha<sup>-1</sup>.

Rice grain equivalent yield (kg) =

$$\frac{\text{Productivity of component (kg) X Cost of component (Rs. Unit}^{-1}\text{)}}{\text{Cost of rice (Rs. Kg}^{-1}\text{)}}$$

### **3.6 Problems faced by the respondents in assessment of cropping systems with reference of productivity**

The oxford dictionary meaning of the word constraints is confinement restriction of liberty or compulsion of circumstances or compulsion put upon the behaviour. Constraints thus led to limitation in the process of adoption and hence can't be over looked. In the context of the present investigation, the constraints has been operationally defined as the problems faced by the respondents in following the different cropping systems. For the present study the problems encountered by the respondents were identified by taking responses to an open question.

### **3.7 Suggestions given by the respondents in assessment of cropping systems with reference of productivity**

Considering the constraints faced by the farmers in assessment of cropping systems with reference of productivity and to overcome the same the big farmers were asked to give the valuable suggestions. The given suggestions with their frequencies and percentage to each were worked out.

### **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 regarding to socio-personal, socio-economic, socio-psychological and communicational characteristics of respondents.
2. Data regarding to assess the existing cropping systems followed by big farmers with reference to productivity.
3. Data regarding to the constraints faced by them with to productivity of different cropping systems.
4. Data regarding to obtain their suggestions to overcome the constraints with reference to productivity of different cropping systems for increasing the productivity and income.

### **3.9. Developing the interview schedule**

The interview schedule was designed on the basis of objectives and independents 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, etc. the analysis was carried out with help of Computer Section of IGKV, Raipur.

### 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 :

$$\bar{x} = \frac{\sum x}{n}$$

Where,

$\bar{x}$  = Mean of the variable

$\sum x$  = Sum of score (observation) of variable

$n$  = Total number of respondents

#### (ii) Standard deviation

Standard deviation was calculated by using following formula:

$$SD = \sqrt{\frac{1}{(n-1)} \left[ \frac{\sum x^2 - (\sum x)^2}{n} \right]}$$

Where,

SD = Standard deviation

$x = x_i - \bar{x}$  = Deviation obtained from mean

$n$  = Number of observations

### 3.11.3 Pearson's coefficient of correlation

This technique was used to find out the relationship between two variables.

The formula used was as follows:

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2 \cdot n \sum y^2 - (\sum y)^2}}$$

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:

$$Y_1 = a + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

Where,

$Y_1$  = Dependent variable

$x_1 \dots x_n$  = Independent variables

a = Constant value

$b_1 \dots b_n$  = the regression coefficient for respective independent variables

## **CHAPTER-IV**

# **RESULTS AND DISCUSSION**

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This chapter deals with the results obtained on various aspects of the study and supported with suitable discussion on each 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-personal characteristics of the respondents

4.1.2 Socio-economic characteristics of the respondents

4.1.3 Socio-psychological characteristics of the respondents

4.1.4 Communicational characteristics of the respondents

### 4.2 Existing cropping systems

### 4.3 Cropping intensity

### 4.4 Area under existing cropping systems

### 4.5 Popular varieties of different crops present in existing cropping systems

### 4.6 Insect management practices by the respondents in existing cropping systems

### 4.7 Disease management practices by the respondents in existing cropping systems

### 4.8 Dependent variable

4.8.1 System productivity (Rice Equivalent Yield)

### 4.9 Correlation coefficient and multiple regression analysis of independent variables with System productivity (Rice Equivalent Yield)

### 4.10 Problems faced by the big farmers following different cropping systems with reference to productivity.

### 4.11 Suggestions to overcome the problems faced by the big farmers following different cropping systems with reference to productivity.

## **4.1 Independent variables**

### **4.1.1 Socio-personal characteristics of the respondents**

With a view to study the socio –personal characteristics of the respondents, some of the important factors like education and family type were considered as socio-personal characteristics of the respondents.

#### 4.1.1.1 Education of the respondents

About education, the data reveal that the most of the big farmers (59.17%) had high school level of education. However, 14.16 per cent of big farmers had higher secondary level of education, followed by 12.50 per cent were middle class level passed, 5.83 per cent were primary school level passed, 4.17 per cent were graduate or above and as similar to illiterates. The findings revealed that most of the respondents in the study area had high school level of education (Table 4.1 and Fig 4.1). Dongerdive (2002) and Christian (2005) also noted almost similar findings.

Table 4.1: Distribution of the respondents according to their education level  
n = 120

S.N.	Category	Frequency	Percentage
1.	Illiterate	05	04.17
2.	Primary	07	05.83
3.	Middle	15	12.50
4.	High school	71	59.17
5.	Higher secondary	17	14.16
6.	Graduate or above	05	04.17
	Total	120	100.00

#### 4.1.1.2 Type of family

The data regarding to type of family are presented in the Table 4.2 and Fig 4.2. The data reveals that both nuclear and joint families were found in the study area but majority of the farmers (55%) belonged to nuclear family, while, 45 per cent belonged to joint type of family.

Table 4.2: Distribution of the respondents according to their type of family  
n = 120

S.N.	Category	Frequency	Percentage
1.	Nuclear	66	55
2.	Joint	54	45
	Total	120	100

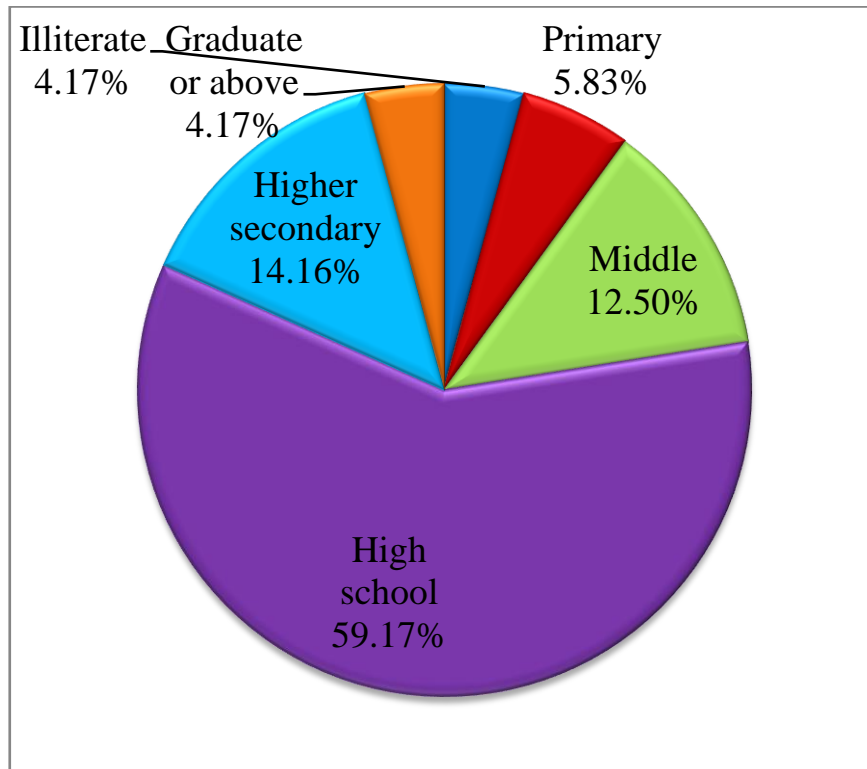


Fig. 4.1: Distribution of the respondents according to their education level

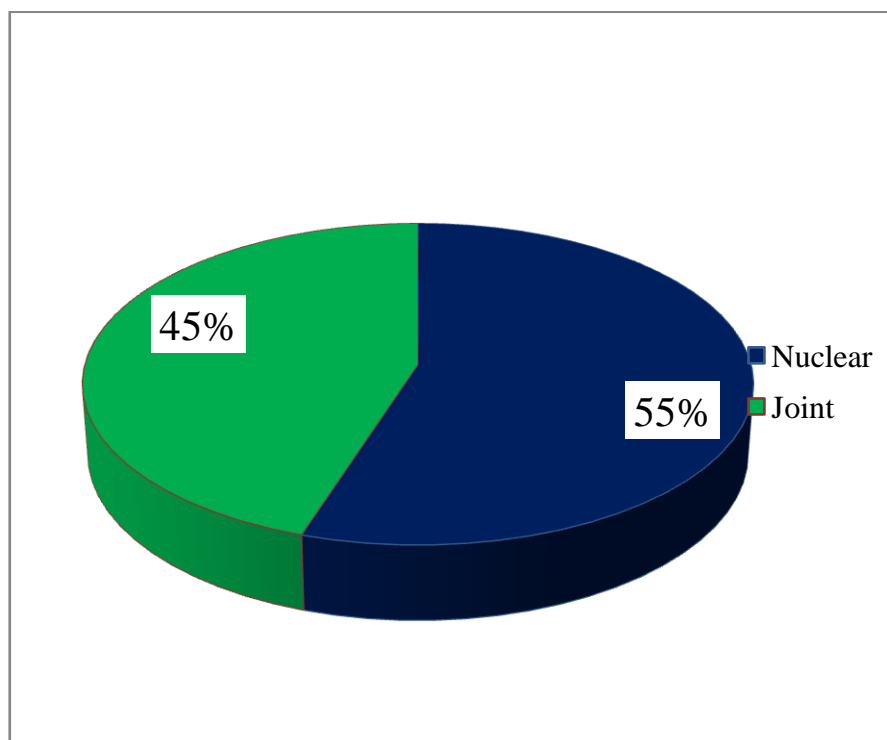


Fig. 4.2: Distribution of the respondents according to their type of family

#### 4.1.2 Socio-economic characteristics of the respondents

The independent variables i.e. land holding and soil types, irrigation facility and occupation were considered as socio-economic characteristics of the respondents.

##### 4.1.2.1 Land holding and soil types

The distribution of the respondents according to their land holdings is presented in the Table 4.3 and Fig 4.3. The data regarding land holdings indicated that of the total, 46.67 per cent of the selected big farmers had 4 to 6 ha of land holdings, followed by 30.00 per cent of the respondents had 6.1 to 8 ha of land holdings, while 23.33 per cent of the respondents had 8.1 to 11 ha of land holdings.

Table 4.3: Distribution of the respondents according to land holdings

S.N.	Category	Frequency	Percentage
1.	4 to 6 ha	56	46.67
2.	6.1 to 8 ha	36	30.00
3.	> 8.1 ha	28	23.33
	Total	120	100.00

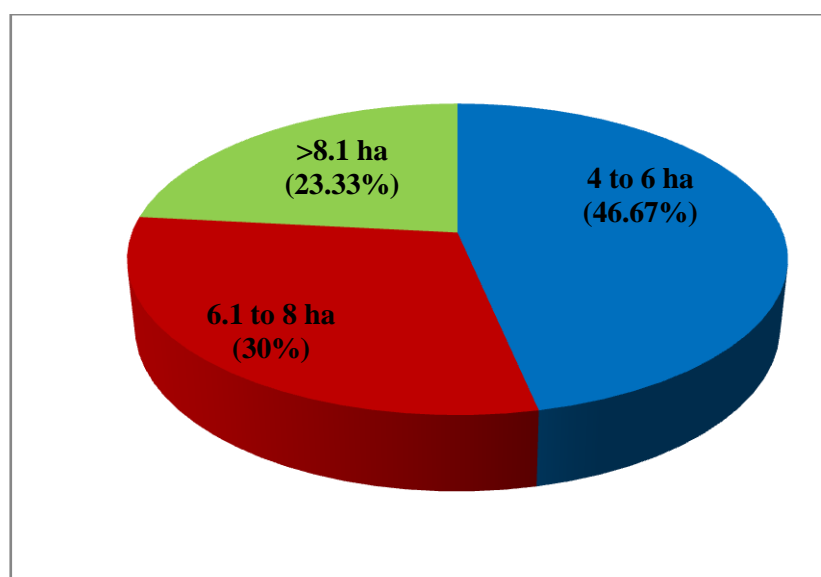


Fig. 4.3: Distribution of the respondents according to land holdings

The data regarding soil types indicated that of the total, maximum number of respondents (54.17%) had matasi soil (*Inceptisols*) and 41.67 per cent respondents had bharri (*Lateritesols*) soil, whereas 35 per cent respondents had kanhar (*Vertisols*), 24.17 per cent respondents had bhata (*Entisols*) and 20.00 per cent respondents had dorsa (*Alfisols*), respectively. The distribution of the respondents according to soil types available in their land holdings are presented in the table 4.4 and Fig 4.4.

Table 4.4: Distribution of the respondents according to soil types available in their land holdings

S.N.	Category	Frequency	Percentage
1.	Bhata ( <i>Entisols</i> )	29	24.17
2.	Matasi ( <i>Inceptisols</i> )	65	54.17
3.	Dorsa ( <i>Alfisols</i> )	24	20.00
4.	Kanhar ( <i>Vertisols</i> )	42	35.00
5.	Bharri ( <i>Lateritesols</i> )	50	41.67

\*Data are based on multiple responses

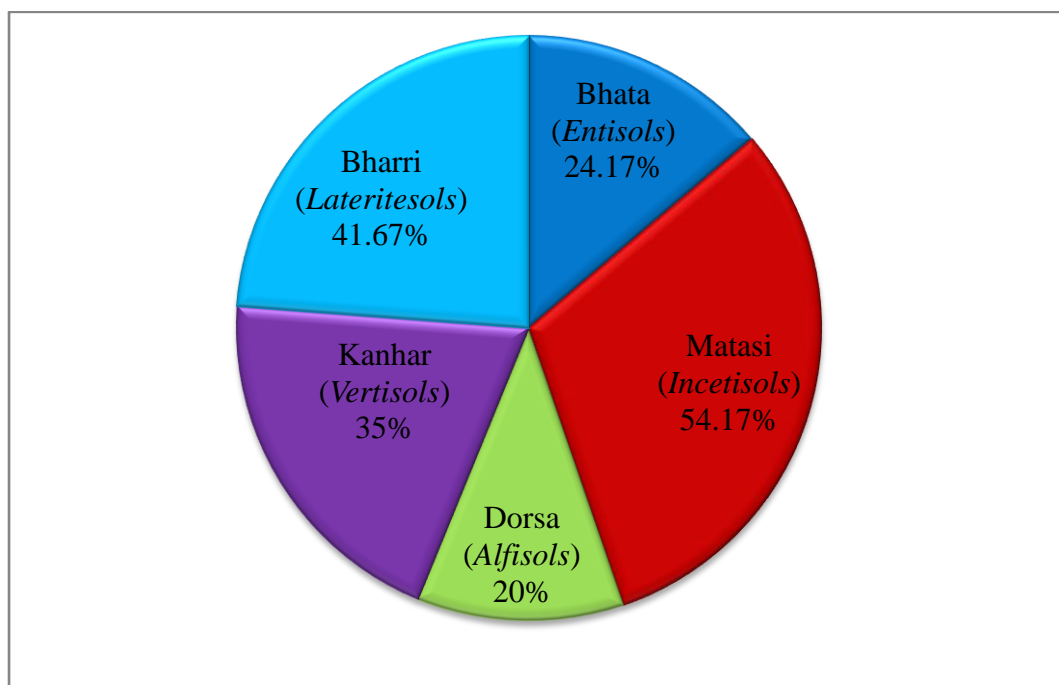


Fig. 4.4: Distribution of the respondents according to soil types available in their land holdings

#### 4.1.2.2 Irrigation facility

The data regarding irrigation facility are presented in the Table 4.5 and Fig 4.5. It is clear from this table that the (86.67%) respondents had availability of irrigation facilities, while about 13.33 per cent of the respondents had no irrigation facilities. The data shows that majority of the respondents (58.33%) used tubewell as irrigation source, followed by 45.83 per cent of the respondents used canal as irrigation source, and 20.00 per cent pump on river/canal as irrigation source. Mukim (2004) and Thanh and Singh (2006) also noticed similar findings in their studies.

Table 4.5: Distribution of the respondents according to irrigation availability

S.N.	Category	Frequency	Percentage
Irrigation availability (n=120)			
1.	Available	104	86.67
2.	Not available	16	13.33
Sources of irrigation (n=104)			
1.	Canal	55	45.83
2.	Pump on river/canal	24	20.00
3.	Tubewell	70	58.33

\*Data are based on multiple responses

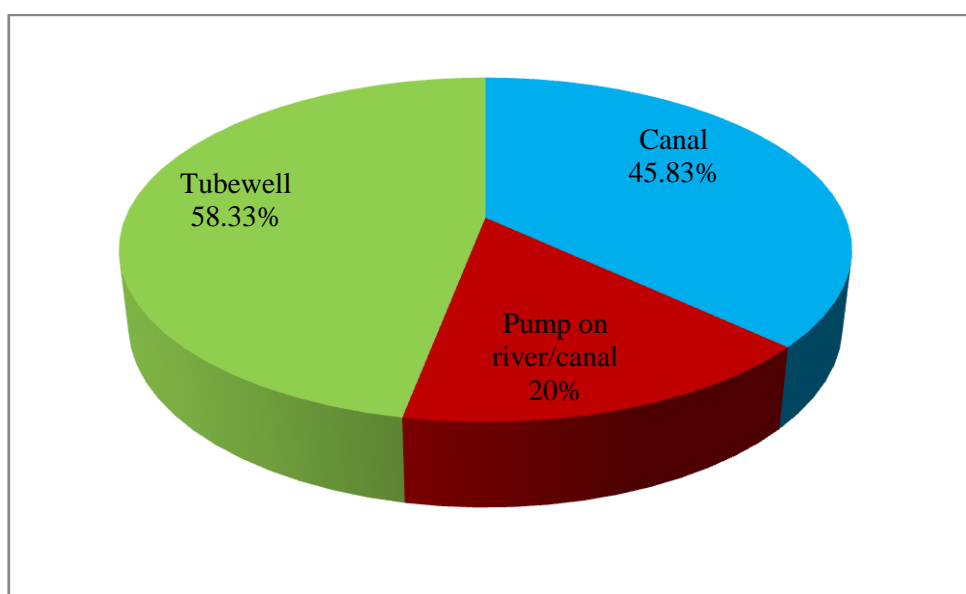


Fig. 4.5: Distribution of the respondents according to irrigation availability

### 4.1.2.3 Occupation

The data regarding involvement of the respondents in different occupation is given in the Table 4.6 and Fig 4.6. As regards to involvement in occupations, about 46.67 per cent respondents were involved in agriculture + animal husbandry, while 36.67 per cent respondents were involved in only agriculture, 28.33 per cent respondents were involved in agriculture + business, 25 per cent respondents were involved in agriculture + service, 21.16 per cent respondents were involved in agriculture + labour, 20 per cent respondents were involved in agriculture + horticulture and only 17.50 per cent respondents were involved in agriculture + other occupation (vegetable selling).

Table 4.6: Distribution of the respondents according to their occupations

n = 120

S.N.	Category	Frequency	Percentage
1.	Only agriculture	44	36.67
2.	Agriculture + Labour	26	21.16
3.	Agriculture + Business	34	28.33
4.	Agriculture + Horticulture	24	20.00
5.	Agriculture + Animal husbandry	56	46.67
6.	Agriculture + Service	30	25.00
7.	Agriculture + Other	21	17.50

\*Data are based on multiple responses

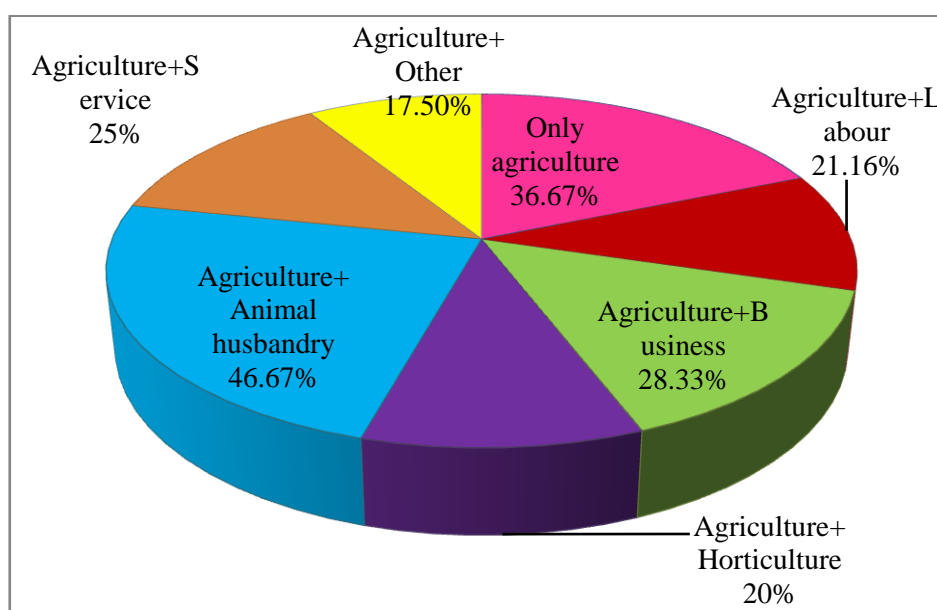


Fig. 4.6: Distribution of the respondents according to their occupations

### 4.1.3 Socio-psychological characteristics of the respondents

#### 4.1.3.1 Attitude towards modern agricultural technologies

The data on attitude of respondents towards modern agricultural technologies are presented in Table 4.7. The findings indicate that the majority of the respondents (66.67%) had moderately favourable attitude, followed by 30.83 per cent of them had most favourable attitude and only 2.50 per cent of respondents had less favourable attitude.

Table 4.7: Distribution of respondents according to their attitude towards modern agricultural technologies

S.N.	Level of attitude	Frequency	Percentage
1.	Less favourable ( up to 20 score )	03	02.50
2.	Moderately favourable ( 21 to 24 score )	80	66.67
3.	Most favourable ( above to 24 score )	37	30.83
	Total	120	100.00

$$\bar{X} = 22.15$$

$$S.D. = 1.94$$

### 4.1.4 Communicational characteristics of the respondents

#### 4.1.4.1 Use of Information sources

The data regarding utilization of the information sources for seeking the information about assessment of cropping systems with reference to productivity are presented in the Table 4.8 and Fig 4.7. The findings revealed that in the study area, majority of the respondents (45%) had found information regarding cropping systems from progressive farmers. The study also revealed that 42.50 per cent of the respondents had obtained the information from friends, followed by 26.67 per cent of the respondents had obtained information from the relatives, 23.33 per cent of the respondents had obtained information from the krishi vigyan Kendra, 20.83 per cent of the respondents had obtained information from the R.A.E.O., 17.50 per cent of the respondents had obtained information from the kisan mela, 16.67 per cent of the respondents had obtained information from the neighbours, 15.83 per cent of the respondents had obtained information from the news papers, 10.00 per cent of the respondents had obtained information from the radio, 9.17 per cent of the respondents had obtained information from the television, 7.50 per cent of the respondents had obtained information from the sarpanch/panch, 6.67 per cent of the respondents had obtained information from the kisan call centre, 5 per cent of

the respondents had obtained information from the agril. magazines, 4.17 per cent of the respondents had obtained information from the agril. colleges, 3.33 per cent of the respondents had obtained information from the agril. scientists and 1.67 per cent of the respondents had obtained information from the farmer's field school.

Table 4.8: Distribution of the respondents according to their overall use of sources of information

				n = 120
S.N.	Source of information	Frequency	Percentage	Rank
1.	Friends	51	42.50	II
2.	Relatives	32	26.67	III
3.	Neighbours	20	16.67	VII
4.	Progressive farmers	54	45.00	I
5.	Sarpanch /Panch	09	07.50	XI
6.	R.A.E.O.	25	20.83	V
7.	Agril. Scientists	04	03.33	XV
8.	News papers	19	15.83	VIII
9.	Agril. Magazines	06	05.00	XIII
10.	Radio	11	09.17	X
11.	Television	12	10.00	IX
12.	Kisan mela	21	17.50	VI
13.	Farmer's field school	02	01.67	XVI
14.	Krishi vigyan kendra	28	23.33	IV
15.	Kisan call centre	08	06.67	XII
16.	Agril. Colleges	05	04.17	XIV

\*Data are based on multiple responses

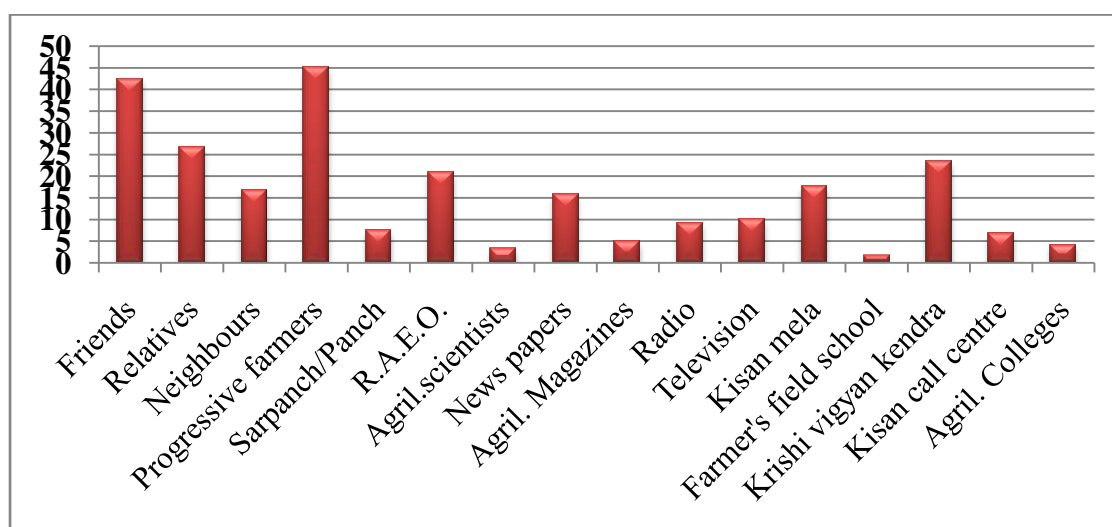


Fig. 4.7: Distribution of the respondents according to their overall use of sources of information

Data regarding number of information sources being utilized by the individual respondents was recorded and the results are presented in Table 4.9. The results revealed that the majority of respondents (52.50%) were utilizing medium level of sources of information (5 to 10 sources ), followed by (30.83) per cent of the respondents were utilizing low level of sources of information (upto 4 sources) and only (16.67) per cent of the respondents were utilizing high level of sources of information (more than 10 information sources).

Table 4.9: Distribution of the respondents according to their utilization of number of the information source for seeking the information about different cropping systems

n = 120

S.N.	Use of information source	Frequency	Percentage
1.	Low ( up to 4 sources )	37	30.83
2.	Medium ( 5 to 10 sources )	63	52.50
3.	High ( > 10 sources )	20	16.67
	Total	120	100.00

#### 4.1.4.2 Contact with extension agencies

The data regarding contact with extension agencies of the respondents were asked and result are compiled in Table 4.10. The data revealed that most of the respondents (42.50%) had some times contact with RAEO's, followed by 34.17, 16.67 and 6.67 per cent of them had regular, never and always contact, respectively. Regarding contact with SADO, 57.50 per cent of them had regular contact, while 35, 5 and 2.5 per cent of them had some times, always and never contact. Regarding contact with Agricultural scientists, majority of respondents (51.67%) had never contact, while only 25,16.67 and 06.67 per cent of them had sometimes, always and regular contact respectively. Regarding contact with SMS( subject matter specialist), majority of the respondents (84.17%) had never contact, while 15.83 per cent of them had sometimes contact. Regarding contact with ADO, the majority of respondents (77.50%) had never contact with ADO, while only 10.00 ,08.33 and 04.17 per cent of them had sometimes, always and regular contact.

Table 4.10: Distribution of respondents according to their contacts with extension agencies.

n = 120

S.N.	Extension contacts	Extent of contact							
		Never		Some times		Always		Regular	
		F	P	F	P	F	P	F	P
1.	RAEO's	20	16.67	51	42.50	08	06.67	41	34.17
2.	SADO	03	02.50	42	35.00	06	05.00	69	57.50
3.	Agril. Scientists	62	51.67	30	25.00	20	16.67	08	06.67
4.	Subject matter specialist	101	84.17	19	15.83	00	00.00	00	00.00
5.	ADO	93	77.50	12	10.00	10	08.33	05	04.17

\*Data are based on multiple responses

Regarding overall contact with extension agencies (RAEO, SADO, Agricultural scientists and ADO), the data are compiled in Table 4.11. From the (Table: 4.11) it is observed that, majority of the respondents (55.83) were found in the medium level of contact with extension agencies, while 30.83 per cent of the respondents were found in low level of contact with extension agencies, and 13.33 per cent of the respondent were found in high level of contact with extension agencies.

Table 4.11: Distribution of respondents according to their overall contact with extension personnel

n = 120

S.N.	Categories	Frequency	Percentage
1.	Low (upto 5 score)	37	30.83
2.	Medium (5-10 score)	67	55.83
3.	High (above 10 score)	16	13.33
	Total	120	100.00

## 4.2 Existing cropping patterns

The data on existing cropping patterns are presented in Table 4.12 and Fig 4.8. The findings indicate that the majority of the respondents (29.17%) had follow the Rice-Wheat cropping pattern, followed by 20.83 per cent of the respondents had follow the Rice-Vegetables cropping pattern, 18.33 per cent of the respondents had follow the Rice-Lentil cropping pattern, 16.67 per cent of the respondents had follow the Rice-Fallow cropping pattern, 15.00 per cent of the respondents had follow the Rice-Chickpea cropping pattern, 12.50 per cent of the respondents had follow the Maize-Linseed cropping pattern, 10.00 per cent of the respondents had follow the Maize-Mustard cropping pattern, 9.17 per cent of the respondents had follow the Rice-Sugarcane cropping pattern, and at last, 8.33 per cent of the respondents had follow the Soybean-Chickpea pattern, 7.50 per cent of the respondents had follow the Rice-Rapeseed cropping pattern, 6.67 per cent of the respondents had follow the Rice-Rice cropping pattern, and 5.83 per cent of the respondents had follow the Blackgram-Chickpea cropping pattern, respectively.

Table 4.12: Distribution of the respondents according to existing cropping patterns

S.N.	Category	Frequency	Percentage	Rank
1.	Rice-Fallow	20	16.67	IV
2.	Rice-Rapeseed	09	07.50	X
3.	Maize-Mustard	12	10.00	VII
4.	Rice-Rice	08	06.67	XI
5.	Maize-Linseed	15	12.50	VI
6.	Soybean-Chickpea	10	08.33	IX
7.	Rice-Sugarcane	11	09.17	VIII
8.	Blackgram-Chickpea	07	05.83	XII
9.	Rice-Wheat	35	29.17	I
10.	Rice-Chickpea	18	15.00	V
11.	Rice-Lentil	22	18.33	III
12.	Rice-Vegetables	25	20.83	II

\*Data are based on multiple responses

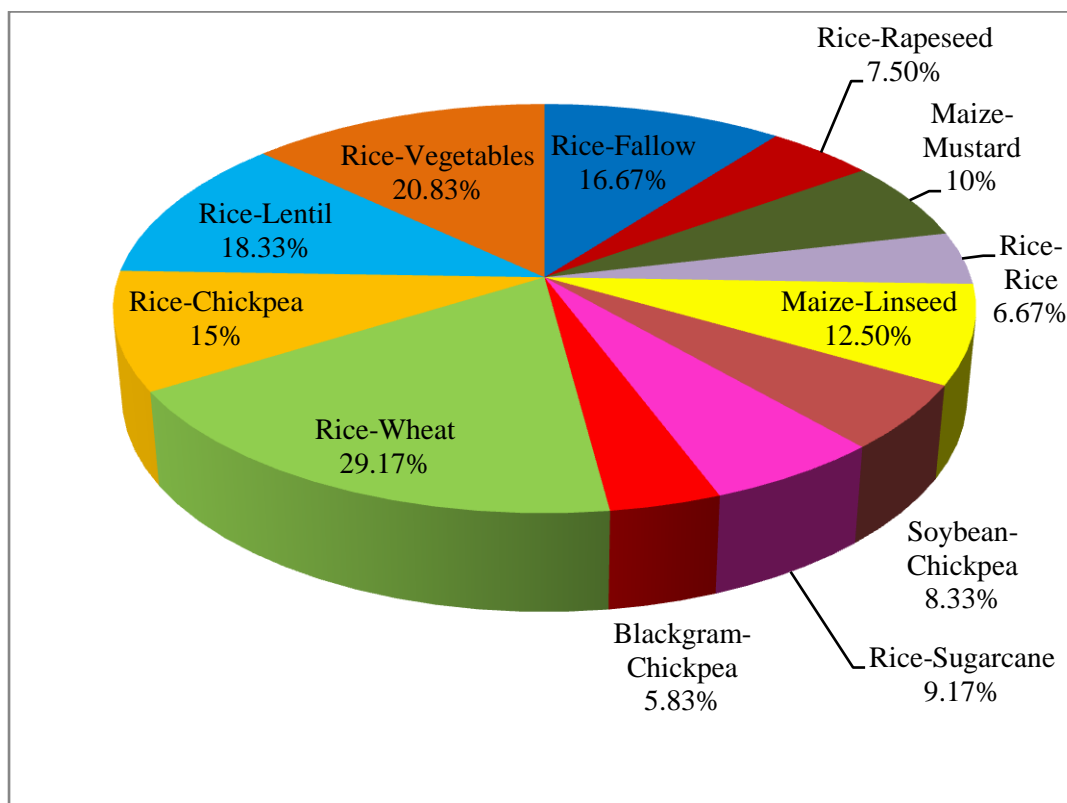


Fig. 4.8: Distribution of the respondents according to existing cropping patterns

### 4.3 Cropping intensity

The data on cropping intensity are presented in Table 4.13 and Fig 4.9. The intensity of cropping, therefore, refers as a ratio between net sown area (NSA) and gross cropped area (GCA). It thus indicates the additional percentage share of the area sown more than once to NSA. The finding revealed that in the study area, most of the respondents (83.33%) had intensity of cropping of more than 100 per cent, while 16.67 per cent of the respondents had intensity of cropping of upto 100 per cent.

Table 4.13: Cropping intensity of various cropping patterns followed by the respondents

n = 120

S.N.	Cropping intensity (%)	Frequency	Percentage
1.	Upto 100 percent	20	16.67
2.	More than 100 percent	100	83.33

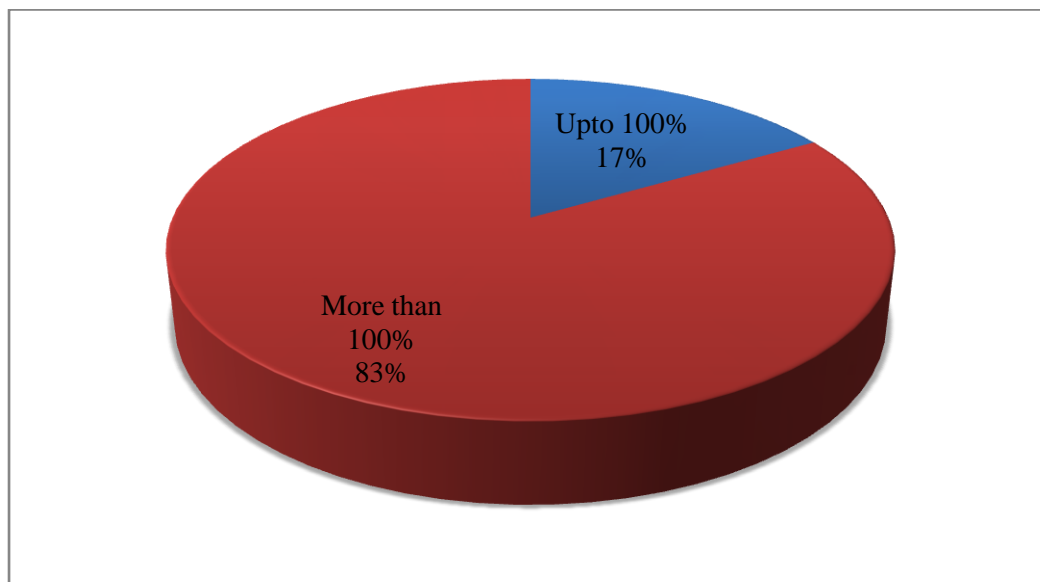


Fig. 4.9: Cropping intensity of various cropping systems followed by the respondents

#### 4.4 Area under existing cropping patterns

Table 4.14 and Fig 4.10 shows that total 252.60 ha area is used by the big farmers for different cropping patterns, out of which the cropping pattern Rice-Wheat occupies 17.97 per cent of area, while the cropping pattern Rice-Vegetables occupies 15.20 per cent, cropping pattern Rice-Lentil occupies 11.40 per cent, cropping pattern Rice-Sugarcane occupies 10.05 per cent, cropping pattern Rice-Chickpea occupies 9.03 per cent, cropping pattern Rice-Fallow occupies 8.08 per cent, cropping pattern Maize-Linseed occupies 5.62 per cent, cropping pattern Soybean-Chickpea occupies 5.07 per cent, cropping pattern Rice-Rapeseed occupies 4.75 per cent, cropping pattern Maize-Mustard occupies 4.44 per cent, cropping system Blackgram-Chickpea occupies 4.27 per cent, and cropping pattern Rice-Rice occupies 4.12 per cent of the total area.

Table 4.14: Area under existing cropping patterns

				n=120
S.N.	Name of cropping system	Area (ha)	Percentage	Rank
1.	Rice-Fallow	20.40	08.08	VI
2.	Rice-Rapeseed	12.00	04.75	IX
3.	Maize-Mustard	11.20	04.44	X
4.	Rice-Rice	10.40	04.12	XII
5.	Maize-Linseed	14.20	05.62	VII
6.	Soybean-Chickpea	12.80	05.07	VIII
7.	Rice-Sugarcane	25.40	10.05	IV
8.	Blackgram-Chickpea	10.80	04.27	XI
9.	Rice-Wheat	45.40	17.97	I
10.	Rice-Chickpea	22.80	09.03	V
11.	Rice-Lentil	28.80	11.40	III
12.	Rice-Vegetables	38.40	15.20	II
Total		252.60	100.00	

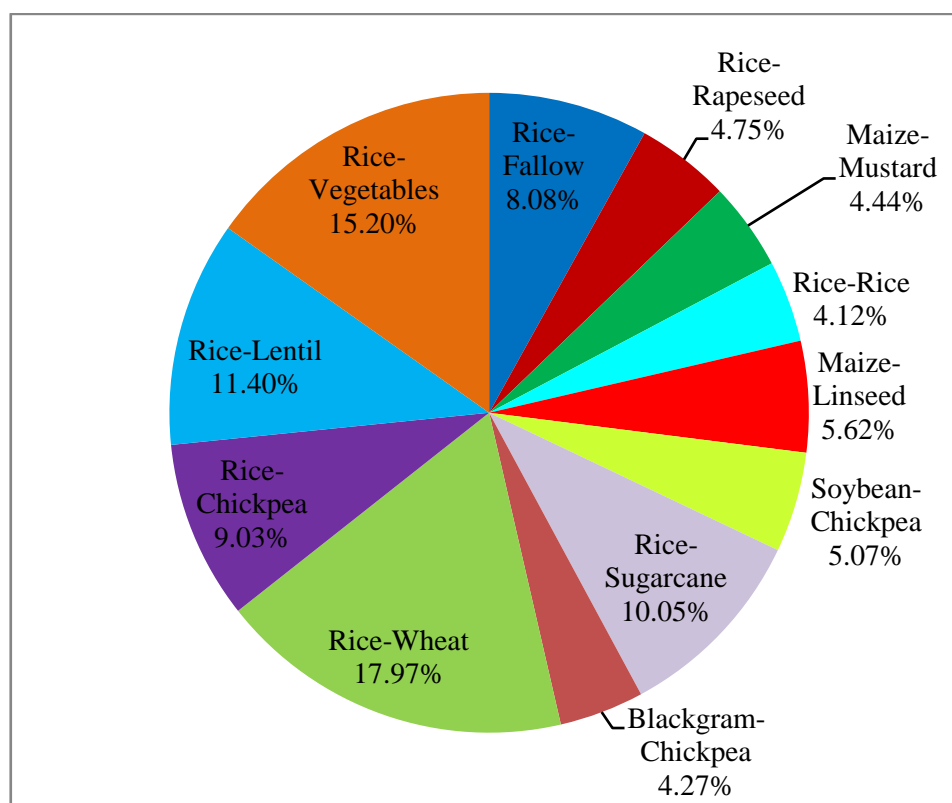


Fig. 4.10: Area under existing cropping patterns

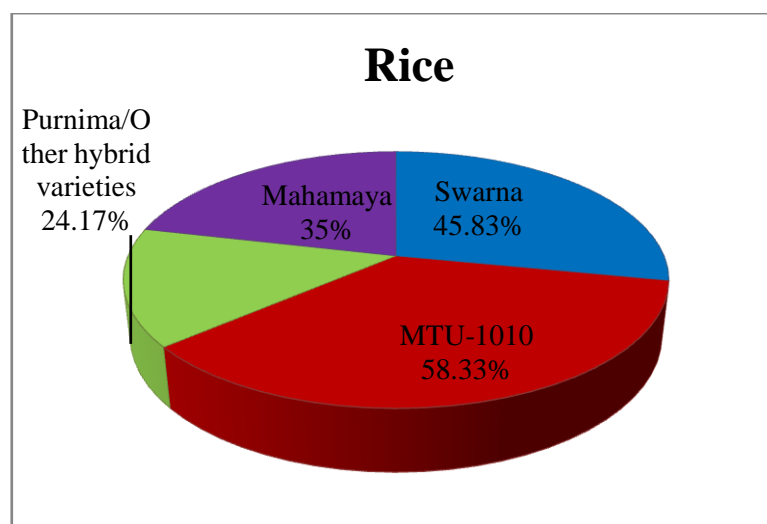
#### **4.5 Popular varieties of different crops present in existing cropping patterns**

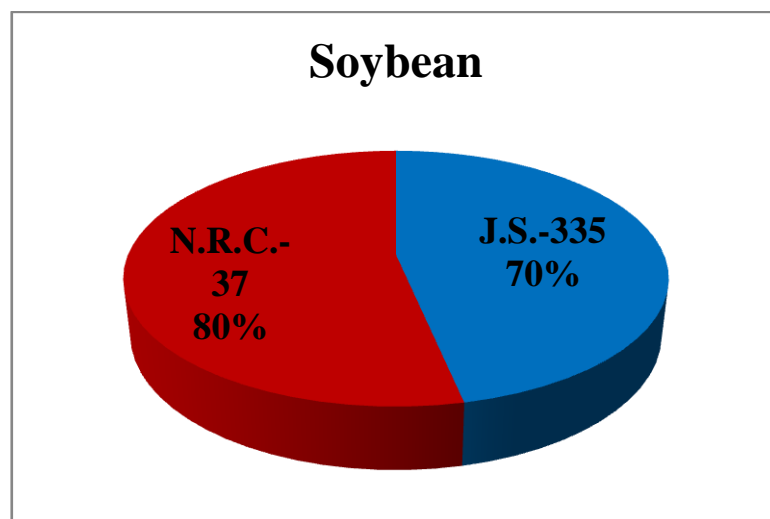
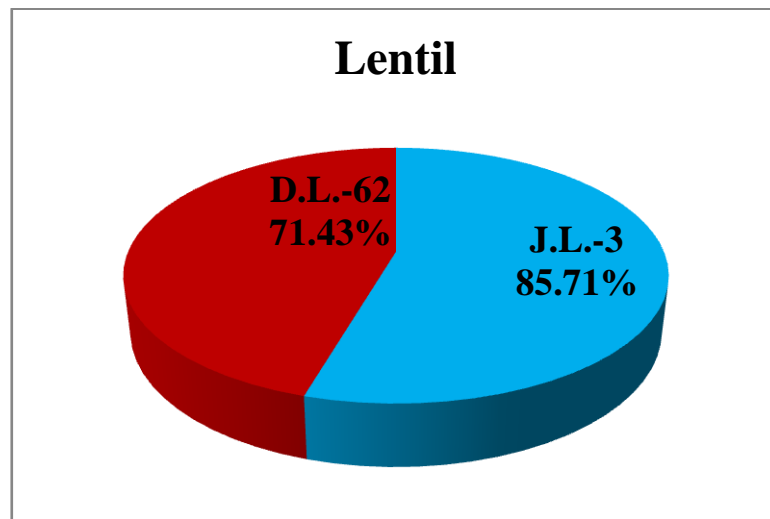
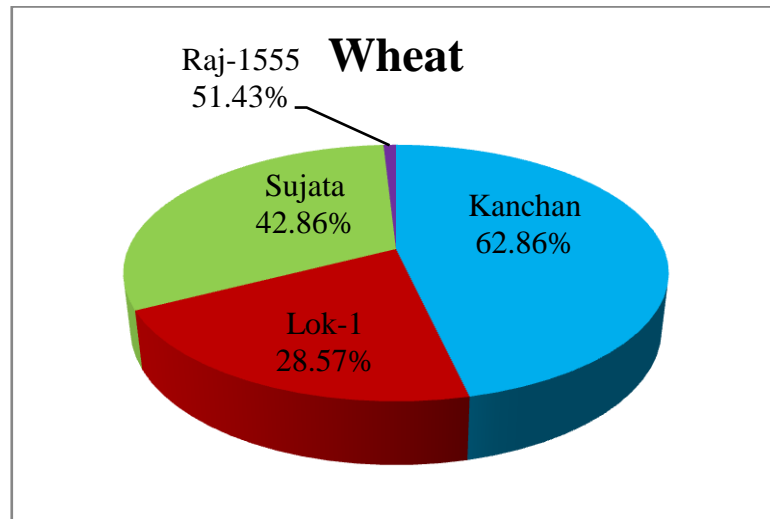
The data on popular varieties of different crops present in existing cropping patterns are presented in Table 4.15 and Fig 4.11. In the study area, MTU-1010 was found as the most popular variety of rice with 58.33 per cent, followed by Swarna, Mahamaya, and Purnima/other hybrid varieties with 45.83, 35, and 24.17 respectively. Kanchan was found as the most popular variety of wheat with 62.86 per cent, while Raj-1555, Sujata and Lok-1 with 51.43, 42.86, and 28.57 per cent respectively. J.L.-3 was found as the most popular variety of lentil with 85.71 per cent followed by D.L.-62 with 71.43 per cent respectively. N.R.C.-37 was found as the most popular variety of soybean with 80 per cent followed by J.S.-335 with 70 per cent respectively. Kartika was found as the most popular variety of linseed with 87.50 per cent followed by R-552 with 62.50 per cent. Chandan was found as the most popular variety of maize with 88.23 per cent followed by Gold and Kisan with 70.59 and 58.82 per cent respectively. J.G.-74 was found as the most popular variety of chickpea with 64.52 per cent followed by C-235 with 54.84 per cent respectively. Vardan was found as the most popular variety of rapeseed-mustard with 77.77 per cent followed by Varuna with 55.55 per cent respectively. From the above findings, it can be concluded that farmers were mostly using high yielding varieties for rice and other existing crops.

Table 4.15: Popular varieties of different crops present in existing cropping patterns

n=120					
S.N.	Name of crop	Name of variety	Frequency	Percentage	Rank
01.	Rice	Swarna	55	45.83	II
		MTU-1010	70	58.33	I
		Purnima/other hybrid varieties	29	24.17	IV
		Mahamaya	42	35.00	III
2.	Wheat	Kanchan	22	62.86	I
		Lok-1	10	28.57	IV
		Sujata	15	42.86	III
		Raj-1555	18	51.43	II
3.	Lentil	J.L.-3	06	85.71	I
		D.L.-62	05	71.43	II
4.	Soybean	J.S.-335	07	70.00	II
		N.R.C.-37	08	80.00	I
5.	Linseed	R-552	05	62.50	II
		Kartika	07	87.50	I
6.	Maize	Gold	12	70.59	II
		Chandan	15	88.23	I
		Kisan	10	58.82	III
7.	Chickpea	J.G.-74	20	64.52	I
		C-235	17	54.84	II
8.	Rapeseed-Mustard	Varuna	05	55.55	II
		Vardan	07	77.77	I

\*Data are based on multiple response





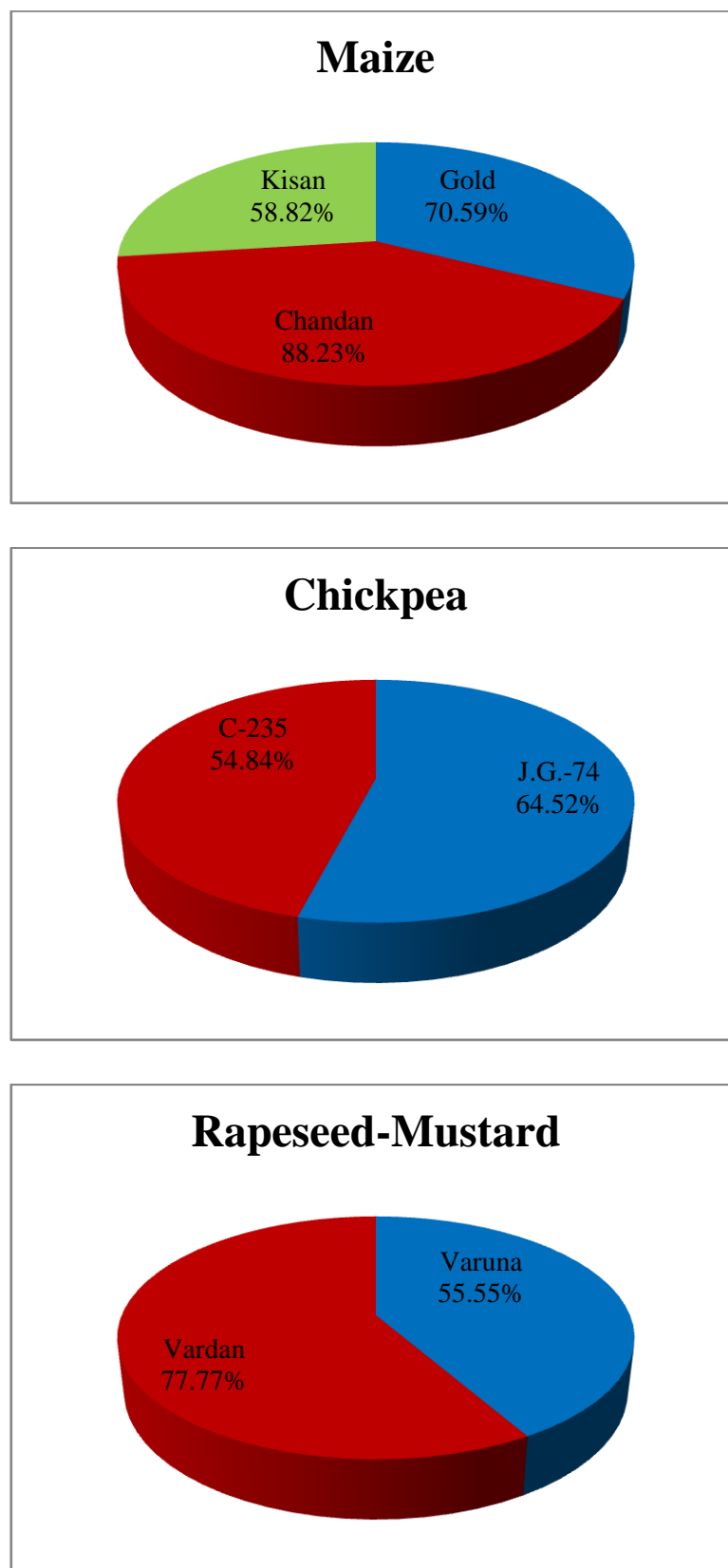


Fig. 4.11 Popular varieties of different crops present in existing cropping patterns

#### **4.6 Insect management practices by the respondents in existing cropping systems**

The data revealed that, in the study area, stem borer (54.17%), brown plant hopper (38.33%) and gall midge (12.50%) were found as the most important insects, respectively in rice, while stem sawfly (60%) and black cutworm (50%) were found as the most important insects, respectively in wheat, pod borer (71.43%) and aphid (57.14%) were found as the most important insects, respectively in lentil, bean leaf beetle (60%) and soybean aphid (72.72%) were found as the most important insects, respectively in soybean, mealy bug (81.81%) was found as the most important insect in sugarcane, and pod borer (64.52%) was found as the most important insect found in chickpea.

Carbofuron (40%) and Kartap (21.54%) were found as the mostly used chemicals in case of rice stem borer, Carbaryl (63.04%) and Imidachloprid (21.74%) were found as the mostly used chemicals in case of rice brown plant hopper, Carbofuron (66.66%) and Forate (60%) were found as the mostly used chemicals in case of rice gall midge, Cypermethrin (52.38%) was found as the mostly used chemical in case of wheat stem sawfly, use of Pheromone trap (45%) and use of Chlorpyrifos/Neem oil were found as the mostly used control measures in case of wheat black cutworm, Metasystox (60%) was found as the mostly used chemical in case of lentil pod borer, Dimethoate (75%) and Chlorpyrifos (50%) were found as the mostly used chemicals in case of lentil aphid, Trizophos (66.66%) was found as the mostly used chemical in case of soybean bean leaf beetle, Cyhelothrin (71.43%) was found as the mostly used chemical in case of soybean aphid, Melathion (55.55%) and Quinolphos (22.22%) were found as the mostly used chemicals in case of sugarcane mealy bug, and Decomethrin (55.55%) was found as the mostly used chemical in case of chickpea pod borer.

Table 4.16: Insect management practices by the respondents in existing cropping systems

n=120							
S.N.	Crop	Insect	F	P	Control measure	F	P
1.	Rice	Stem borer	65	54.17	Use of Carbofuron	26	40.00
					Use of Kartap	14	21.54
		Brown plant hopper	46	38.33	Use of Carboryl	29	63.04
					Use of Imidachlopid	10	21.74
		Gall midge	15	12.50	Use of Carbofuron	10	66.66
Use of Forate	09				60.00		
2.	Wheat	Stem sawfly	21	60.00	Use of Cypermethrin	11	52.38
		Black cutworm	20	50.00	Use of Pheromone tap	09	45.00
					Use of Chlorpyriphos/Neem oil	07	35.00
3.	Lentil	Pod borer	05	71.43	Use of Metasystox	03	60.00
		Aphid	04	57.14	Use of Chlorpyriphos	02	50.00
					Use of Dimethoate	03	75.00
6.	Soybean	Bean leaf beetle	06	60.00	Use of Trizophos	04	66.66
		Soybean aphid	07	72.72	Use of Cyhelothrin	05	71.43
7.	Sugarcane	Mealy bug	09	81.81	Use of Melathion	05	55.55
					Use of Quinolphos	02	22.22
8.	Chickpea	Pod borer	20	64.52	Use of Decomethrin	11	55.55

\*Data are based on multiple response

#### **4.7 Disease management practices by the respondents in existing cropping systems**

The data on disease management practices by the respondents in existing cropping systems revealed that, in the study area, bacterial leaf blight (39.17%) was found as the most important disease in case of rice, followed by blast (28.33%), brown spot (21.67%) and sheath blight (17.50%), loose smut (77.14%) was found as the most important disease in case of wheat, followed by leaf blight (51.34%), bud blight (54.54%) was found as the most important disease in case of soybean, red rot (45.45%) was found as the most important disease in case of sugarcane, root rot (76.92%) was found as the most important disease in case of chickpea, and white rust (77.77%) was found as the important disease in case of mustard.

Use of Carbendazim/Tricyclozole (47.06%) was found as the mostly used control measure in case of blast of rice, use of Propiconazol (47.62%) was found as the mostly used control measure in case of sheath blight of rice, use of Mencozeb+Carbendazim (23.40) was found as the mostly used control measure in case of bacterial leaf blight of rice, use of Hexachlonozol (57.69%) was found as the mostly used control measure in case of brown spot of rice, use of Vitavax for seed treatment (74.07) was found as the mostly used control measure in case of loose smut of wheat, use of Propiconazol (61.11%) was found as the mostly used control measure in case of leaf blight of wheat, use of Condiphor (66.66%) was found as the mostly used control measure in case of bud blight of soybean, use of Benomyl for seed treatment (60%) was found as the mostly used control measure in case of red rot of sugarcane, use of Carbendazim (76.92%) was found as the mostly used control measure in case of root rot of chickpea, use of Copper oxychloride (57.14%) was found as the mostly used control measure in case of white rust of mustard. (Table 4.17)

Table 4.17: Disease management practices by the respondents in existing cropping systems

n=120							
S.N.	Crop	Disease	F	P	Control measure	F	P
1.	Rice	Blast	34	28.33	Use of Carbendazim/Tricyclozole	16	47.06
		Sheath blight	21	17.50	Use of Propiconazol	10	47.62
		Bacterial leaf blight	47	39.17	Use of Mencozeb + Carbendazim	11	23.40
		Brown spot	26	21.67	Use of Hexachlonozol	15	57.69
2.	Wheat	Loose smut	27	77.14	Use of Vitavax for seed treatment	20	74.07
		Leaf blight	18	51.43	Use of Propiconazol	11	61.11
3.	Soybean	Bud blight	06	54.54	Use of Condiphor	04	66.66
4.	Sugarcane	Red rot	05	45.45	Use of Benomyl for seed treatment	03	60.00
5.	Chickpea	Root rot	20	76.92	Use of Carbendazim	14	70.00
6.	Mustard	White rust	07	77.77	Use of Copper oxychloride	04	57.14

\*Data are based on multiple response

## 4.8 Dependent variables

### 4.8.1 System productivity (Rice Equivalent Yield)

The system productivity is a conversion of yield of different crops into equivalent yield of any crop. The REY was found according to MSP (Minimum Support Price) of rice. The data regarding system productivity indicated that the cropping system of Maize-Mustard had highest REY (61.39 q ha<sup>-1</sup>), followed by Maize-Linseed (56.71 q ha<sup>-1</sup>), while Rice-Wheat had REY (51.92 q ha<sup>-1</sup>), Rice-Rice had REY (50 q ha<sup>-1</sup>), Rice-Sugarcane had REY (47.14 q ha<sup>-1</sup>), Rice-Chickpea had REY (44.93 q ha<sup>-1</sup>), Blackgram-Chickpea had REY (44.79 q ha<sup>-1</sup>), Rice-Lentil had REY (41.93 q ha<sup>-1</sup>), Rice-Rapeseed had REY (40 q ha<sup>-1</sup>), Soybean-Chickpea had REY (38.21 q ha<sup>-1</sup>) and Rice-Fallow had REY (25 q ha<sup>-1</sup>). The data regarding REY (Rice Equivalent Yield) are presented in the Table 4.18 and Fig. 4.12.

Table 4.18: system productivity of different cropping systems

S.N.	Name of cropping system	REY (q ha <sup>-1</sup> )	Rank
1.	Rice-Fallow	25	XI
2.	Rice-Rapeseed	40	IX
3.	Maize-Mustard	61.39	I
4.	Rice-Rice	50	IV
5.	Maize-Linseed	56.71	II
6.	Soybean-Chickpea	38.21	X
7.	Rice-Sugarcane	47.14	V
8.	Blackgram-Chickpea	44.79	VII
9.	Rice-Wheat	51.92	III
10.	Rice-Chickpea	44.93	VI
11.	Rice-Lentil	41.93	VIII

\*Data are based on multiple responses

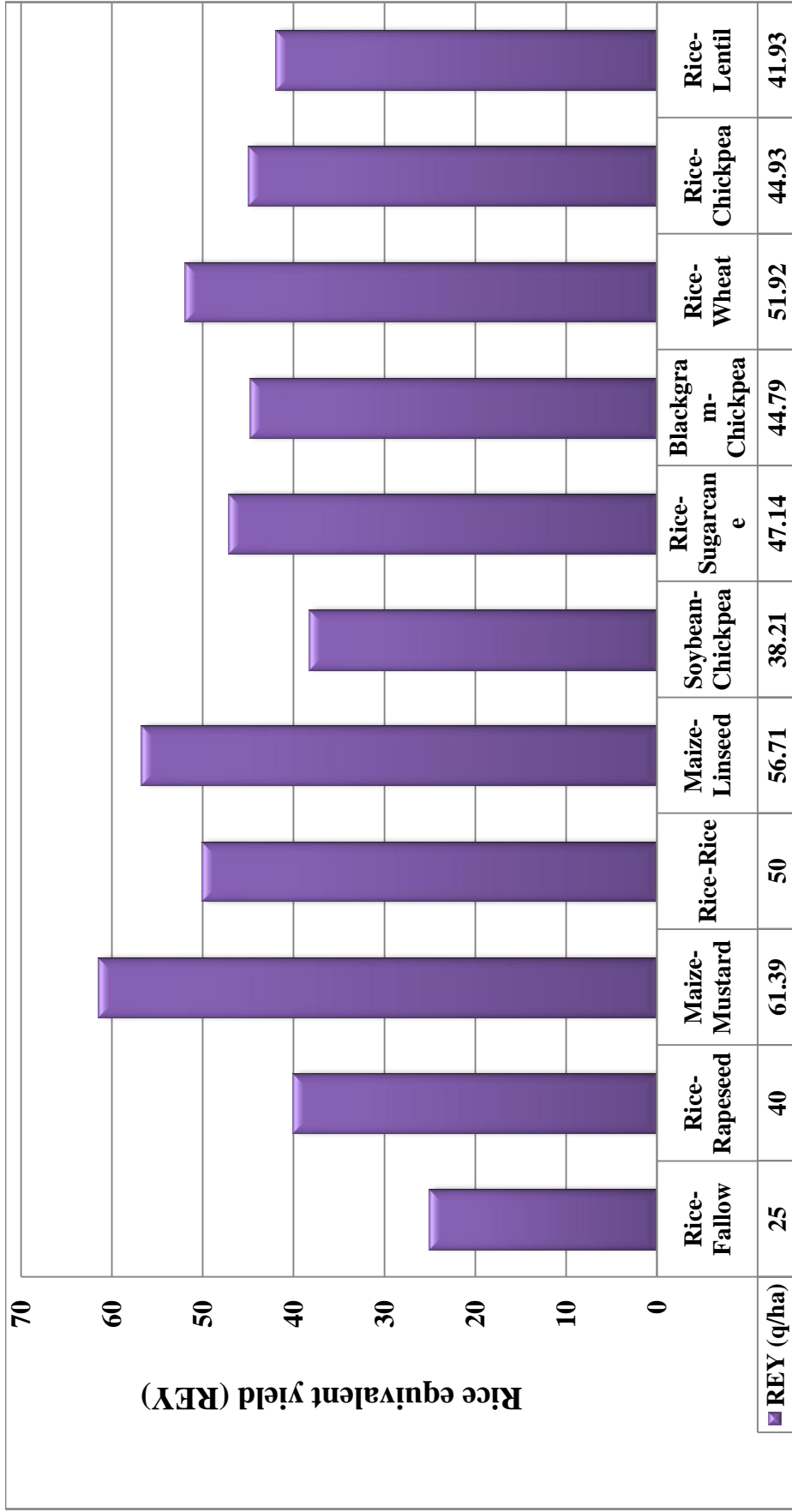


Fig. 4.12: System productivity (REY) of different cropping systems

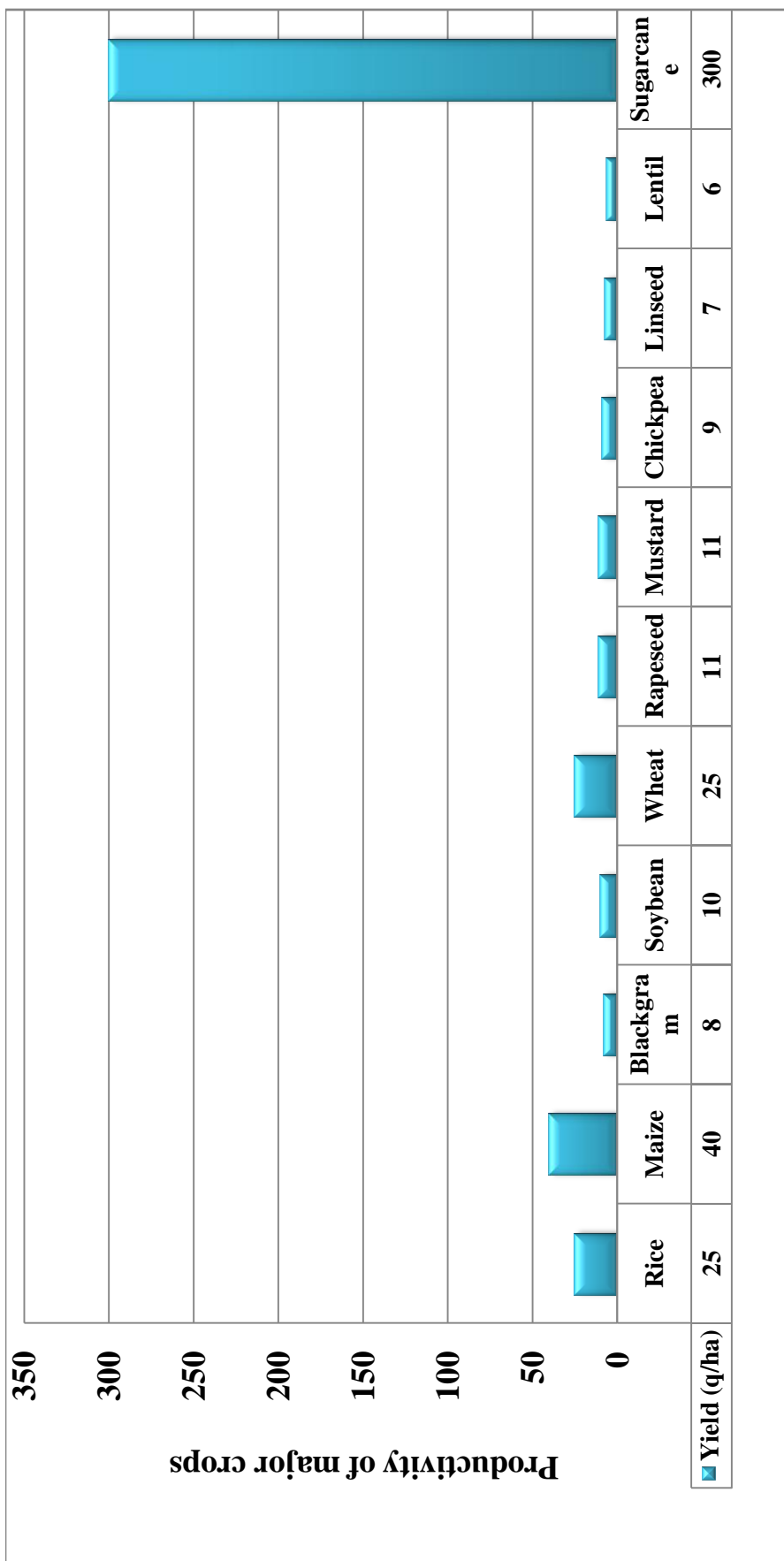


Fig. 4.13: Productivity of major crops

Table 4.19 Productivity of major crops

n=120		
S.N.	Name of crop	Yield (q/ha)
1.	Rice	25
2.	Maize	40
3.	Blackgram	08
4.	Soybean	10
5.	Wheat	25
6.	Rapeseed	11
7.	Mustard	11
8.	Chickpea	09
9.	Linseed	07
10.	Lentil	06
11.	Sugarcane	300

\*Data are based on multiple response

According to Table 4.19 and Fig, 4.13, productivity (yield q/ha) of sugarcane was 300 q/ha, followed by maize (40 q/ha), rice and wheat (25 q/ha) both, rapeseed and mustard (11 q/ha) both, soybean (10 q/ha), chickpea (9 q/ha), blackgram (8 q/ha), linseed (7 q/ha) and lentil (6 q/ha), respectively.

#### 4.9 Correlation coefficient and multiple regression analysis of independent variables with System productivity (Rice Equivalent Yield)

To determine the relationship of selected independent variables with the system productivity/ REY (Rice Equivalent Yield), the correlation analysis was worked out and results are presented in Table 4.20.

The findings revealed that variables soil types, cropping intensity and existing cropping patterns were found to be positive and significantly correlated at 0.05 level of probability. While education and irrigation facilities were found to be positive and significantly correlated at 0.01 level of probability. The remaining variables like; type of family, land holding, occupation, sources of information, contact with extension agencies and attitude towards modern agricultural technologies showed statistically non significant relationship with the system productivity/ REY (Rice Equivalent Yield).

It clearly indicated that, if the education, soil types, cropping intensity, existing cropping patterns and irrigation facilities increases then the system productivity/ REY (Rice Equivalent Yield) correspondingly increases.

Table 4.20: Correlation analysis of independent variables with system productivity (REY)

Variable Code	Independent Variables	Correlation coefficient (r)
X1	Education	0.380**
X2	Type of family	0.109NS
X3	Land holding	-0.085NS
X4	Soil types	0.192*
X5	Occupation	-0.075NS
X6	Irrigation facilities	0.297**
X7	Cropping intensity	0.194*
X8	Existing cropping pattern	0.187*
X9	Source of information	-0.174NS
X10	Contact with extension agencies	-0.086NS
X11	Attitude towards modern agril, technologies	0.135NS

\*\* Significant at 0.01 level of probability (0.232)      NS = Non-significant

\* Significant at 0.05 level of probability (0.178)

In the case of multiple regression analysis, out of selected 11 independent variables soil types, cropping intensity and existing cropping pattern showed positive and significant contribution at 0.05 level of probability, education and irrigation facilities had positive and significant contribution at 0.01 level of probability. Remaining 6 variables did not contribute significantly in the system productivity/ REY (Rice Equivalent Yield). However, all the selected 11 variables in the model show 57.60 per cent contribution in the the system productivity/ REY (Rice Equivalent Yield). Based on the result from multiple regression analysis, improving the level of the three variables *viz* soil types, irrigation facilities and sources of will improve the status of the system productivity/ REY (Rice Equivalent Yield) to a considerable level, which means we can reduce the gap between desired level and existing status to a remarkable level.

Table 4.21: Multiple regression analysis of independent variables with system productivity (REY)

Variable Code	Independent Variables	Regression coefficient (b)	't' value of b
X1	Education	0.812NS	0.203
X2	Type of family	0.053NS	0.007
X3	Land holding	0.690NS	0.195
X4	Soil types	3.218*	1.992
X5	Occupation	3.168NS	0.587
X6	Irrigation facility	4.768**	2.789
X7	Cropping intensity	1.114	1.270
X8	Existing cropping pattern	2.728	0.605
X9	Source of information	3.119**	2.718
X10	Contact with extension agencies	0.236	0.285
X11	Attitude towards modern agril. technologies	0.760	0.984

\*\* significant at 0.01 level of probability (value=2.617)

\* significant at 0.05 level of probability (value=1.98)

R square = 0.576

F value of r = 32.92

#### **4.10 Constraints faced by the big farmers following different cropping systems with reference to productivity**

Multiple responses were taken to ascertain the constraints faced by big farmers to following different cropping systems. The constraints as perceived by big farmers to following different cropping systems are given in Table 4.22. It was found that majority of the respondents (74.17%) faced problem of non availability of seeds at proper time in case of high yielding variety seeds, followed by high cost of seeds (67.50%), lack of knowledge about seeds (55.83%), susceptible for insect-pests (46.67%), and low production (40%), in case of seed treatment, non availability of seed treatment at proper time (60.83%), high cost of chemicals (56.67%), low production (44.17%), and lack of knowledge about seed treatment (25.83%), in case of field preparation, high cost of cultivation (64.17%), followed by lack of agricultural equipments (30%), difficulty in operation of equipments (26.67%), and lack of knowledge about field preparation (21.67%), in case of use of fertilizers, harmful effect on soil (61.17%), followed by high cost of fertilizers (57.50%), susceptible for insect-pests (52.52%), compulsion of irrigation (40.83%), and non availability at proper time (37.50%), in case of plant protection, high cost (58.33%), followed by lack of agricultural equipments (28.33%) and improper rainfall (25.83%) as the technological constraints. Majority of the respondents (35.83%) faced problem of family as personal constraints, followed by old age (28.33%), lack of education (19.17%), and small land holding (10.00%). Majority of the respondents faced problem of (43.33%) others does not follow improved agril. techniques as social constraints, followed by lack of social appreciation (24.17%) and grazing problem (12.50%). Majority of the respondents faced problem of (57.50%) high rate of interest as economical constraints, followed by non availability of loan at proper time (47.50%), Low subsidy (38.33%) and more than enough investment (30.83%). Majority of the respondents faced problem of (70%) that Cooperation society is far away as institutional constraints, followed by market place is far away (67.50%), Lack of extension work (56.66%) and lack of small industries based on different crops (48.33%) etc.

Table 4.22: Distribution of the respondents according to constraints faced by them to following different cropping systems with reference to productivity

n = 120

S.N.	Constraints	Frequency	Percentage	Rank
1.)	Technological constraints			
A.	HYV seeds-			
1.	Non availability of seeds at proper time	89	74.17	I
2.	Lack of knowledge about seeds	67	55.83	III
3.	High cost of seeds	81	67.50	II
4.	Susceptible for insect-pests	56	46.67	IV
5.	Low production	48	40.00	V
B.	Seed treatment			
1.	Lack of knowledge	31	25.83	IV
2.	High cost of chemicals	68	56.67	II
3.	Non availability of seed treatment at proper time	73	60.83	I
4.	Low production	53	44.17	III
C.	Field preparation			
1.	Lack of agril. Equipments	36	30.00	II
2.	High cost of cultivation	77	64.17	I
3.	Lack of knowledge	26	21.67	IV
4.	Difficulty in operation of equipments	32	26.67	III
D.	Use of fertilizers			
1.	Lack of knowledge	21	17.50	VI
2.	High cost of fertilizers	69	57.50	II
3.	Non availability at proper time	45	37.50	V
4.	Compulsion of irrigation	49	40.83	IV
5.	Harmful effect on soil	74	61.67	I
6.	Susceptible for insect-pests	63	52.50	III
E.	Plant protection			
1.	Lack of agril. Equipments	34	28.33	II
2.	High cost	70	58.33	I
3.	Improper rainfall	31	25.83	III

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2.)	Personal constraints			
A.	Family problem	43	35.83	I
B.	Small land holding	12	10.00	IV
C.	Lack of education	23	19.17	III
D.	Old age	34	28.33	II
3.)	Social constraints			
A.	Others does not follow improved agril. Techniques	52	43.33	I
B.	Lack of social appreciation	29	24.17	II
C.	Grazing problem	15	12.50	III
4.)	Economical constraints			
A.	More than enough investment	37	30.83	IV
B.	Non availability of loan at proper time	57	47.50	II
C.	High rate of interest	69	57.50	I
D.	Low subsidy	46	38.33	III
5.)	Institutional constraints			
A.	Lack of extension work	68	56.66	III
B.	Market place is far away	81	67.50	II
C.	Cooperation society is far away	84	70.00	I
D.	Lack of small industries based on different crops	58	48.33	IV

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\*Data are based on multiple responses

#### 4.11 Suggestions to overcome the constraints faced by the big farmers following different cropping systems with reference to productivity

As regards to suggestions given by the respondents to overcome the problems faced by them the findings are presented in the Table 4.23. The data revealed that the majority of the respondents were suggested that improved technology should be available at cheaper rates (51.66%), followed by regularly training programme should be imparted in local spoken language (41.66%), resistant varieties should be easily available well in time on reasonable rates (37.50%), seed, fertilizer and plant protection chemicals should be supplied at proper time (30.83%), awareness should be developed among other farmers for adoption of improved technology (20%), and visit of farmers on research stations should be organized (16.67%).

Table 4.23: Suggestions given by the farmers to overcome the constraints faced by them

(n=120)						
S.N.	Suggestions	Frequency	Percentage	Rank		
1.	Improved technology should be available at cheaper rates	62	51.66	I		
2.	Seed, fertilizer and plant protection chemicals should be supplied at proper	37	30.83	IV		
3.	time	45	37.50	III		
4.	Resistant varieties should be easily available well in time on reasonable rates	24	20.00	V		
5.	Awareness should be developed among other farmers for adoption of improved	20	16.66	VI		
6.	technology	50	41.66	II		
	Visit of farmers on research stations should be organized					
	Regularly training programme should be imparted in local spoken language					

\*Data are based on multiple response

## **CHAPTER-V**

### **SUMMARY AND CONCLUSIONS**

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The main purpose of this chapter is to summarize the results to state the conclusions on the basis of the foregoing analysis and to indicate some of their implications for actions. The cropping system study is useful to understand the overall sustainability of agricultural system. Agriculture is counted as the chief economic occupation of the state. This study focused to assess the cropping systems followed by big farmers of Balod district with reference to productivity.

Therefore with a view to develop an extension strategy in view of the above facts, the present investigation entitled “**ASSESSMENT OF CROPPING SYSTEMS FOLLOWED BY BIG FARMERS WITH REFERENCE TO PRODUCTIVITY IN BALOD DISTRICT OF CHHATTISGARH STATE**” was carried out at Balod district of Chhattisgarh Plains Agro-climatic Zone during the year 2014-15 with following objectives:

1. To study the socio-personal, socio-economic and communicational characteristics of the farmers,
2. To study about the existing cropping systems among big farmers of Balod district of Chhattisgarh state,
3. To assess the productivity of existing cropping systems,
4. To find out the constraints faced by farmers with reference to productivity of different cropping systems, and
5. To obtain the suggestions from the big farmers for increasing the productivity and income.

#### **Methodology**

The study was carried out during 2014-15 in the 3 selected blocks (*i.e.*, Balod, Dondi and Gunderdehi) of Balod district of Chhattisgarh state. From each block 5 villages were selected randomly, thus 15 villages were selected (Semarkona, Baghmara, Orma, Jhalmala and Heerapur from Balod block, Kotagaon, Salhaitola, Chhindgaon, Dhotimtola and Adjaal from Dondi block and Barbaspur, Mokha, Jewartala, Bhardakala and Mundara from Gunderdehi block) and 8 big farmers were selected randomly from each village, thus 120 farmers

were selected as respondents for data collection. Primary data for the study was collected by personal interview with the respondents with the help of pre-tested structured interview schedule. Collected data were analyzed by using appropriate statistical methods *viz.*, mean, percent, S.D., correlation and multiple regressions etc.

## **Findings**

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:-

### **A- Independent variables**

#### **1. Socio-personal characteristics of the respondents**

The study revealed that majority (59.17%) of the respondents had high school level of education, and (66%) of the respondents belonged to nuclear family.

#### **2. Socio-economic characteristics of the respondents**

As regards to involvement in occupations, Maximum number of the respondents (46.67) per cent respondents were involved in agriculture + animal husbandry, maximum number of the respondents (46.67) per cent of the selected big farmers had 4 to 6 ha of land holdings, the data regarding soil types indicated that of the total, maximum number of respondents (54.17) per cent had matasi soil (*Inceptisols*), and majority of the respondents (86.67%) had availability of irrigation facilities, while about 13.33 per cent of the respondents had no irrigation facilities, that majority of the respondents (58.33%) used tubewell as irrigation source, the findings on existing cropping systems indicate that the majority of the respondents (29.17%) had follow the Rice-Wheat cropping system and the finding revealed that in the study area, most of the respondents (83.33%) had intensity of cropping of more than 100 per cent.

#### **3. Socio-psychological characteristics of the respondents**

According to socio-psychological characteristics , attitude of respondents towards modern agricultural technologies, the majority of the respondents (66.67%) had moderately favourable attitude.

#### **4. Communicational characteristics of the respondents**

For seeking the information about assessment of cropping systems with reference to productivity, majority of respondents (45%) had found information regarding cropping systems from progressive farmers. The majority of respondents (52.50%) were utilizing medium level of sources of information (5 to 10 sources). The data revealed that most of the respondents (42.50%) had some times contact with RAEO's, regarding contact with SADO, majority of the respondents (57.50) per cent had regular contact, regarding contact with Agricultural Scientists, majority of respondents (51.67%) had never contact, regarding contact with SMS( subject matter specialist), majority of the respondents (84.17%) had never contact, regarding contact with ADO, the majority of respondents (77.50%) had never contact with ADO, and regarding overall contact with extension agencies (RAEO, SADO, Agricultural scientists and ADO), it is observed that, majority of the respondents (55.83) were found in the medium level of contact with extension agencies.

#### **5. Other characteristics**

##### **5.1 Existing cropping systems**

The data on existing cropping systems the findings indicate that the majority of the respondents (29.17%) had follow the Rice-Wheat cropping system.

##### **5.2 Cropping intensity**

The data on cropping intensity the finding revealed that in the study area, most of the respondents (83.33%) had intensity of cropping of more than 100 per cent.

##### **5.3 Area under existing cropping systems**

The data on area under existing cropping systems shows that total 252.60 ha area is used by the big farmers for different cropping systems, out of which the cropping system Rice-Wheat occupies 17.97 per cent of area as majority.

##### **5.4 Popular varieties of different crops**

The data on popular varieties of different crops present in existing cropping systems in the study area, MTU-1010 was found as the most popular variety of rice with 58.33 per cent, Kanchan was found as the most popular variety of wheat with 62.86 per cent, J.L.-3 was found as the most popular variety of lentil with 85.71

per cent, N.R.C.-37 was found as the most popular variety of soybean with 80 per cent, Kartika was found as the most popular variety of linseed with 87.50 per cent, Chandan was found as the most popular variety of maize with 88.23 per cent, J.G.-74 was found as the most popular variety of chickpea with 64.52 per cent, Vardan was found as the most popular variety of rapeseed-mustard with 77.77 per cent. From the above findings, it can be concluded that farmers were mostly using high yielding varieties for rice and other existing crops.

### **5.5 Insect management practices by the respondents in existing cropping systems**

The data on insect management practices by the respondents in existing cropping systems revealed that, in the study area, stem borer (54.17%) was found as the most important insect in rice, while stem sawfly (60%) was found as the most important insect in wheat, pod borer (71.43%) was found as the most important insect in lentil, bean leaf beetle (60%) was found as the most important insect in soybean, mealy bug (81.81%) was found as the most important insect in sugarcane, and pod borer (64.52%) was found as the most important insect found in chickpea. Carbofuron (40%) was found as the mostly used chemical in case of rice stem borer, Carbaryl (63.04%) was found as the mostly used chemical in case of rice brown plant hopper, Carbofuron (66.66%) was found as the mostly used chemical in case of rice gall midge, Cypermethrin (52.38%) was found as the mostly used chemical in case of wheat stem sawfly, use of Pheromone trap (45%) and use of Chlorpyrifos/Neem oil were found as the mostly used control measures in case of wheat black cutworm, Metasystox (60%) was found as the mostly used chemical in case of lentil pod borer, Dimethoate (75%) was found as the mostly used chemical in case of lentil aphid, Trizophos (66.66%) was found as the mostly used chemical in case of soybean bean leaf beetle, Cyhelothrin (71.43%) was found as the mostly used chemical in case of soybean aphid, Melathion (55.55%) was found as the mostly used chemical in case of sugarcane mealy bug, and Decomethrin (55.55%) was found as the mostly used chemical in case of chickpea pod borer.

## 5.6 Disease management practices by the respondents in existing cropping systems

The data on disease management practices by the respondents in existing cropping systems revealed that, in the study area, bacterial leaf blight (39.17%) was found as the most important disease in case of rice, loose smut (77.14%) was found as the most important disease in case of wheat, bud blight (54.54%) was found as the most important disease in case of soybean, red rot (45.45%) was found as the most important disease in case of sugarcane, root rot (76.92%) was found as the most important disease in case of chickpea, and white rust (77.77%) was found as the important disease in case of mustard. Use of Carbendazim/Tricyclozole (47.06%) was found as the mostly used control measure in case of blast of rice, use of Propiconazol (47.62%) was found as the mostly used control measure in case of sheath blight of rice, use of Mencozeb+Carbendazim (23.40) was found as the mostly used control measure in case of bacterial leaf blight of rice, use of Hexachlonozol (57.69%) was found as the mostly used control measure in case of brown spot of rice, use of Vitavax for seed treatment (74.07) was found as the mostly used control measure in case of loose smut of wheat, use of Propiconazol (61.11%) was found as the mostly used control measure in case of leaf blight of wheat, use of Condiphor (66.66%) was found as the mostly used control measure in case of bud blight of soybean, use of Benomyl for seed treatment (60%) was found as the mostly used control measure in case of red rot of sugarcane, use of Carbendazim (76.92%) was found as the mostly used control measure in case of root rot of chickpea, use of Copper oxychloride (57.14%) was found as the mostly used control measure in case of white rust of mustard.

### B. Dependent variable

#### System productivity (REY- Rice Equivalent Yield)

The REY was found according to MSP (Minimum Support Price) of rice. The data regarding system productivity indicated that the cropping system of Maize-Mustard had highest REY (61.39 q ha<sup>-1</sup>), and highest productivity (yield q/ha) was productivity of sugarcane (300 q/ha).

### **C. Correlation Analysis**

The coefficient of correlation was found by analyzing the data with the help of computer. The findings revealed that variables soil types, cropping intensity and existing cropping patterns were found to be positive and significantly correlated at 0.05 level of probability. While education and irrigation facilities were found to be positive and significantly correlated at 0.01 level of probability. The remaining variables like; type of family, land holding, occupation, sources of information, contact with extension agencies and attitude towards modern agricultural technologies showed statistically non significant relationship with the system productivity/ REY (Rice Equivalent Yield) in various cropping systems followed by big farmers.

It clearly indicated that, if the education, soil types, cropping intensity, existing cropping patterns and irrigation facilities increases then the system productivity/ REY (Rice Equivalent Yield) correspondingly increases.

### **D. Multiple regression analysis**

In the case of multiple regression analysis, out of selected 11 independent variables soil types showed positive and significant contribution at 0.05 level of probability, irrigation facilities and sources of information had positive and significant contribution at 0.01 level of probability. Remaining 8 variables did not contribute significantly in the system productivity/ REY (Rice Equivalent Yield). However, all the selected 11 variables in the model show 57.60 per cent contribution in the the system productivity/ REY (Rice Equivalent Yield). Based on the result from multiple regression analysis, improving the level of the three variables viz soil types, irrigation facilities and sources of will improve the status of the system productivity/ REY (Rice Equivalent Yield) to a considerable level, which means we can reduce the gap between desired level and existing status to a remarkable level.

### **E. Constraints faced by the mustard growers in adoption of recommended mustard production technology**

Multiple responses were taken to ascertain the constraints faced by big farmers to following different cropping systems. The constraints as perceived by big farmers to following different cropping systems, it was found that majority of

the respondents (74.17%) faced problem of non availability of seeds at proper time in case of high yielding variety seeds, in case of seed treatment, non availability of seed treatment at proper time (60.83%), high cost of chemicals (56.67%), in case of field preparation, high cost of cultivation (64.17%), in case of use of fertilizers, harmful effect on soil (61.17%), in case of plant protection, high cost (58.33%), as the technological constraints. Majority of the respondents (35.83%) faced problem of family as personal constraints. Majority of the respondents faced problem of (43.33%) others does not follow improved agril. techniques as social constraints. Majority of the respondents faced problem of (57.50%) high rate of interest as economical constraints. Majority of the respondents faced problem of (70%) that Cooperation society is far away as institutional constraints etc.

#### **F. Suggestions to overcome the constraints in adoption of recommended mustard production technology**

Multiple responses were taken to ascertain the suggestion by big farmers who followed various cropping systems with reference of productivity. The findings revealed that the majority of the respondents were suggested that improved technology should be available at cheaper rates (51.66%), followed by regularly training programme should be imparted in local spoken language (41.66%), resistant varieties should be easily available well in time on reasonable rates (37.50%), seed, fertilizer and plant protection chemicals should be supplied at proper time (30.83%), awareness should be developed among other farmers for adoption of improved technology (20%), and visit of farmers on research stations should be organized (16.67%).

#### **Conclusions**

- The findings of the study indicated that most of the big farmers who followed various cropping systems were educated at high school level , majority of them belonged to nuclear family.
- As regards to involvement in occupations, Maximum number of the respondents were involved in agriculture + animal husbandry, maximum number of the respondents had 4 to 6 ha of land holdings, the data regarding soil types indicated that of the total, maximum number of respondents matasi soil (*Inceptisols*), and majority of the respondents had

availability of irrigation facilities, that majority of the respondents used tubewell as irrigation source.

- According to socio-psychological characteristics , attitude of respondents towards modern agricultural technologies, the majority of the respondents had moderately favourable attitude.
- For seeking the information about assessment of cropping systems with reference to productivity, majority of respondents had found information regarding cropping systems from progressive farmers. The majority of respondents were utilizing medium level of sources of information (5 to 10 sources). The data revealed that most of the respondents had some times contact with RAEO's, regarding contact with SADO, majority of the respondents had regular contact regarding with Agricultural Scientists, majority of respondents had never contact regarding contact with SMS( subject matter specialist), majority of the respondents had never contact regarding contact with ADO, the majority of respondents had never contact with ADO, and regarding overall contact with extension agencies (RAEO, SADO, Agricultural scientists and ADO), it is observed that, majority of the respondents were found in the medium level of contact with extension agencies.
- The findings on existing cropping systems indicate that the majority of the respondents had follow the Rice-Wheat cropping system and the finding revealed that in the study area, most of the respondents had intensity of cropping of more than 100 per cent.
- The data on area under existing cropping systems shows that total 252.60 ha area is used by the big farmers for different cropping systems, out of which the cropping system Rice-Wheat occupies area as majority.
- The data on popular varieties of different crops present in existing cropping systems in the study area, MTU-1010 was found as the most popular variety of rice, Kanchan was found as the most popular variety of wheat, J.L.-3 was found as the most popular variety of lentil, N.R.C.-37 was found as the most popular variety of soybean, Kartika was found as the most popular variety of linseed, Chandan was found as the most popular variety

of maize, J.G.-74 was found as the most popular variety of chickpea, Vardan was found as the most popular variety of rapeseed-mustard. From the above findings, it can be concluded that farmers were mostly using high yielding varieties for rice and other existing crops.

- The data on insect management practices by the respondents in existing cropping systems revealed that, in the study area, stem borer was found as the most important insect in rice, stem sawfly in wheat, pod borer in lentil, bean leaf beetle in soybean, mealy bug in sugarcane, and pod borer was found as the most important insect found in chickpea. Carbofuron was found as the mostly used chemical in case of rice stem borer, Carboryl in case of rice brown plant hopper, Carbofuron in case of rice gall midge, Cypermethrin in case of wheat stem sawfly, use of Pheromone trap and use of Chlorpyrifos/Neem oil in case of wheat black cutworm, Metasystox in case of lentil pod borer, Dimethoate in case of lentil aphid, Trizophos in case of soybean bean leaf beetle, Cyhelothrin in case of soybean aphid, Melathion in case of sugarcane mealy bug, and Decomethrin in case of chickpea pod borer.
- The data on disease management practices by the respondents in existing cropping systems revealed that, in the study area, bacterial leaf blight was found as the most important disease in case of rice, loose smut in case of wheat, bud blight in case of soybean, red rot in case of sugarcane, root rot in case of chickpea, and white rust in case of mustard. Use of Carbendazim/Tricyclozole was found as the mostly used control measure in case of blast of rice, use of Propiconazol in case of sheath blight of rice, use of Mencozeb+Carbendazim in case of bacterial leaf blight of rice, use of Hexachlonozol in case of brown spot of rice, use of Vitavax for seed treatment in case of loose smut of wheat, use of Propiconazol in case of leaf blight of wheat, use of Condiphor in case of bud blight of soybean, use of Benomyl for seed treatment in case of red rot of sugarcane, use of Carbendazim in case of root rot of chickpea, use of Copper oxychloride in case of white rust of mustard.

- The REY was found according to MSP (Minimum Support Price) of rice. The data regarding system productivity indicated that the cropping system of Maize-Mustard had highest REY (61.39 q ha<sup>-1</sup>), and highest productivity (yield q/ha) was productivity of sugarcane (300 q/ha).
- In correlation analysis, it was found that variables soil types, cropping intensity and existing cropping patterns were found to be positive and significantly correlated at 0.05 level of probability. While education and irrigation facilities were found to be positive and significantly correlated at 0.01 level of probability.
- Similarly, in the case of multiple regression analysis, out of selected 11 independent variables soil types showed positive and significant contribution at 0.05 level of probability, irrigation facilities and sources of information had positive and significant contribution at 0.01 level of probability. However, all the selected 11 variables in the model show 57.60 per cent contribution in the the system productivity/ REY (Rice Equivalent Yield).
- Further, majority of the respondents (74.17%) faced problem of non availability of seeds at proper time in case of high yielding variety seeds, in case of seed treatment, non availability of seed treatment at proper time (60.83%), high cost of chemicals (56.67%), in case of field preparation, high cost of cultivation (64.17%), in case of use of fertilizers, harmful effect on soil (61.17%), in case of plant protection, high cost (58.33%), as the technological constraints. Majority of the respondents (35.83%) faced problem of family as personal constraints. Majority of the respondents faced problem of (43.33%) others does not follow improved agril. techniques as social constraints. Majority of the respondents faced problem of (57.50%) high rate of interest as economical constraints. Majority of the respondents faced problem of (70%) that Cooperation society is far away as institutional constraints etc.
- Finally, majority of the respondents were suggested that improved technology should be available at cheaper rates (51.66%), followed by regularly training programme should be imparted in local spoken language

(41.66%), resistant varieties should be easily available well in time on reasonable rates (37.50%), seed, fertilizer and plant protection chemicals should be supplied at proper time (30.83%), awareness should be developed among other farmers for adoption of improved technology (20%), and visit of farmers on research stations should be organized (16.67%).

- From the above findings, it can be concluded that there is a need to increase the system productivity with reference to other cropping patterns, through proper utilization of sources of information, extension contacts, exhibition, kisan mela and training programme should be conducted in different aspects of cropping systems with reference to productivity by the concerned agencies.

#### **Suggestions for future research works:**

On the basis of the results obtained from the study and the experience gained on completion of the investigation it is suggested that

1. As the number of independent variables, were limited in the present research work a future study may be planned with more and different independent variables to know their contribution in the system productivity (REY).
2. The study was limited to only 15 villages and three blocks of Balod district of Chhattisgarh state. Hence, a detail study covering more blocks and districts may be conducted in order to generalize the recommendations for the entire state of Chhattisgarh.
3. From the study it was found that most of the respondents had no contact with Agriculture university head quarter and this was reflected in the correlation analysis which showed significant relation with system productivity thus a detailed study focusing on the constraints faced by Agriculture university head quarter to have contact with big framers and vice-versa may be done to pin point the causes and suggestions for corrective steps to be taken.
4. The role of sources of information in system productivity may be investigated in detail in order to make reliable suggestions for entire state.

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## APPENDIX – A Interview Schedule

छत्तीसगढ़ के बालोद जिले के बड़े किसानों द्वारा अनुसरित फसल पध्दतियों के उत्पादकता के  
संबंध में मूल्यांकन करना  
साक्षात्कार अनुसूची

क्रमांक .....

दिनांक .....

परामर्शदाता :

डॉ. जे. डी. सरकार

प्रोफेसर,

कृषि विस्तार विभाग

इं.गां.कृ.वि., रायपुर(छ.ग.)

शोधकर्ता का नाम

ललीता साहू

एम.एस.सी. (कृषि) अंतिम

कृषि विस्तार विभाग,

इं.गां.कृ.वि. रायपुर(छ.ग.)

1. कृषक का नाम : ..... 2. ग्राम : .....

3. विकास खण्ड : ..... 4. जिला : .....

5. कृषक की उम्र : .....

6. शिक्षा का स्तर -

अ) अशिक्षित ब) प्राथमिक स) माध्यमिक द) उच्च माध्यमिक इ) उच्चतर माध्यमिक  
उ)स्नातक या अधिक

7. आपके परिवार के कुल सदस्यों की संख्या -

महिला ..... पुरुष ..... बच्चे ..... योग .....

8. परिवार का प्रकार -

अ) एकल

ब) संयुक्त

9. घर का प्रकार -

अ) कच्चा

ब) पक्का

10. आपका मुख्य व्यवसाय क्या है -

क्र.	व्यवसाय	कुल वार्षिक आय	परिवार के सदस्यों की भागीदारी		
			महिला	पुरुष	बच्चे
1.	केवल कृषि				
2.	कृषि + मजदूरी				
3.	कृषि + व्यवसाय				
4.	कृषि + उद्यानिकी				
5.	कृषि + पशुपालन				
6.	कृषि + अन्य				

11. आपके पास कुल कितनी भूमि है -

(अ) कुल भूमि ..... (एकड़/हे.)

(ब) कृषि योग्य भूमि -

(1) सिंचित ..... (एकड़/हे.)

(2) असिंचित ..... (एकड़/हे.)

(3) रेगहा पर दी गयी भूमि ..... (एकड़/हे.)

(4) रेगहा पर ली गयी भूमि ..... (एकड़/हे.)

(5) कुल कृषि भूमि ..... (एकड़/हे.)

क.	भूमि का प्रकार	घर से दूरी	फेन्सिंग	क्षेत्रफल (एकड़/हे.)				
				कुल	सिंचित		असिंचित	
					खरीफ	रबी	खरीफ	रबी
1.	भाटा							
2.	मटासी							
3.	डोरसा							
4.	कन्हार							
5.	भर्री							

12. आपके पास सिंचाई के कौन-कौन से साधन हैं -

क.	सिंचाई के साधन	सिंचित क्षेत्र (एकड़/हे.)	सिंचाई उपलब्धता		
			केवल खरीफ	खरीफ + रबी	वर्ष भर
1.	नहर				
2.	नलकूप				
3.	नदी या नाले पर पंप				
4.	अन्य .....				

13. आपको कृषि की विभिन्न पध्दतियों से संबंधी जानकारी किन स्रोतों से प्राप्त होती है -

क्र.	स्रोत	हां /नहीं	हमेशा	कभी-कभी	बहुत कम
1.	मित्र				
2.	रिश्तेदार				
3.	पड़ोसी				
4.	उन्नत कृषक				
5.	पंच /सरपंच				
6.	ग्रामीण कृषि विस्तार अधिकारी				
7.	कृषि वैज्ञानिक				
8.	अखबार				
9.	कृषि पत्रिका				
10.	रेडियो				
11.	टी.वी.				
12.	किसान मेला				
13.	कृषक खेत पाठशाला				
14.	कृषि विज्ञान केन्द्र				
15.	किसान काल सेंटर				
16.	कृषि विश्वविद्यालय				
17.	अन्य -..... .				

## 14. आपके प्रसार संपर्क की जानकारी दीजिए -

क्र.	प्रसार कार्यकर्ता	संपर्क का स्तर			
		कभी नहीं	कभी-कभी	अधिकतर	नियमित
1.	ग्रामीण कृषि विस्तार अधिकारी				
2.	वरिष्ठ कृषि विस्तार अधिकारी				
3.	कृषि वैज्ञानिक				
4.	विषय वस्तु विशेषज्ञ				
5.	कृषि विकास अधिकारी				

## 15. उन्नत कृषि के प्रति आपकी अवधारणा -

क्र.	कथन	अभिरुचि का स्तर				
		पूर्णतः सहमत	सहमत	अनिर्णित	असहमत	पूर्णतः असहमत
1.	नई कृषि विधियां अपनाकर भोजन की समस्या को दूर किया जा सकता है।					
2.	नई कृषि विधियों में जोखिम उठाने से अच्छा है कि पुरानी विधियां ही अपनायी जाये।					
3.	अधिक फसल उत्पादन के लिए नई कृषि विधियां अपनाना चाहिए।					
4.	नई कृषि विधियां अच्छी हैं फिर भी गरीबी के कारण इनका प्रयोग संभव नहीं है।					
5.	नई कृषि विधियों के प्रयोग द्वारा किसानों का आर्थिक एवं सामाजिक स्तर उंचा हो सकता है।					
6.	नई कृषि विधियां अधिक कठिन हैं।					
7.	नई कृषि विधियों में लागत की अपेक्षा मुनाफा अधिक प्राप्त होता है।					
8.	नई कृषि विधियां अपनाने से फसलों में कीट व्याधियों का प्रकोप बढ़ जाता है।					

16. कृपया पिछले वर्ष लगायी गयी फसलों के बारे में जानकारी दीजिए -

क्र.	फसल का नाम	किस्म का नाम	क्षेत्रफल (एकड़/हे.)			बुवाई विधि	उर्वरक प्रबंधन			
			सिंचित	असिंचित	कुल		N	P	K	खाद
1.										
2.										
3.										
4.										

क्र.	फसल का नाम/ किस्म का नाम	प्रमुख कीट		प्रमुख रोग		औसत उत्पादन/(एकड़/हे.)	
		कीट का नाम	नियंत्रण विधि	रोग का नाम	नियंत्रण विधि	सिंचित	असिंचित
1.							
2.							
3.							
4.							
5.							

17. आपके द्वारा अनुसरित कृषि की विभिन्न पध्दतियों के सापेक्ष कृषि की उन्नत तकनीकों में संभावित व्यवधानों के बारे में जानकारी दीजिए -

क्र.	व्यवधान	हां /नहीं
1.	तकनीकी व्यवधान	
अ.	उन्नत बीज -	
	समय पर बीज नहीं मिलता	
	जानकारी का अभाव	
	रोग-कीट का प्रकोप अधिक	
	उपज में कोई खास बढ़ोतरी नहीं	
ब.	बीजोपचार -	
	जानकारी का अभाव	
	दवाओं का अधिक मूल्य	
	सही समय पर नहीं मिलता	
	उपज में कोई खास बढ़ोतरी नहीं	

स.	जमीन की तैयारी -	
	कृषि यंत्रों का अभाव	
	लागत अधिक	
	जानकारी का अभाव	
	यंत्र चलाने में कठिनाई	
द.	उर्वरकों का प्रयोग -	
	जानकारी का अभाव	
	अधिक कीमत	
	समय पर उपलब्ध नहीं	
	सिंचाई की अनिवार्यता	
	भूमि पर दुष्प्रभाव	
	रोग-कीट का प्रकोप अधिक	
इ.	पौध संरक्षण -	
	कृषि यंत्रों का अभाव	
	लागत अधिक	
	अनियमित वर्षा	
	सूखे की समस्या	
2.	व्यक्तिगत व्यवधान -	
	घरेलु समस्या	
	जोत का आकार	
	शिक्षा का अभाव	
	अधिक उम्र	
3.	सामाजिक व्यवधान -	
	अन्य लोग उन्नत कृषि तकनीकों का पालन नहीं करते	
	सामाजिक प्रोत्साहन की कमी	
	चराई की समस्या	
4.	संस्थागत व्यवधान -	
	प्रसार कार्य की कमी	
	कृषि उपज मंडी दूर है	
	सहकारी संस्था दूर है	
	विभिन्न फसलों पर आधारित लघु उद्योगों का अभाव	

18. इन व्यवधानों को दूर करने के लिए आपके सुझाव -

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Data collection through personal interview

## VITA

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### Academic Qualification :

Degree	Year	University/Institute
1. Higher Secondary	2008	C.G.B.S.E., Raipur
2. B.Sc. (Ag.)	2013	I.G.K.V., Raipur
3. M.Sc. (Ag.)	2015	I.G.K.V., Raipur

Professional Experience (If any) : RAWE

Membership of Professional Societies (If any) : No

Awards / Recognitions (If any) : No

Publications (If any):



Signature