

**STUDY ON BIOTIC STRESS MANAGEMENT
PRACTICES ADOPTED BY THE SUGARCANE
GROWERS OF SURAJPUR DISTRICT OF
CHHATTISGARH**

M.Sc. (Ag.) Thesis

By

Suryakant Choubey

**DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
FACULTY OF AGRICULTURE
INDIRA GANDHI KRISHI VISHWAVIDYALAYA,
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PRACTICES ADOPTED BY THE SUGARCANE
GROWERS OF SURAJPUR DISTRICT OF
CHHATTISGARH**

Thesis

Submitted to the

Indira Gandhi Krishi Vishwavidyalaya, Raipur

by

Suryakant Choubey

**IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF**

Master of Science

in

**Agriculture
(Agricultural Extension)**

Roll No.: 120116137

U.E. ID. No.: 20161724893


JANUARY, 2021

CERTIFICATE – I

This is to certify that the thesis entitled “STUDY ON BIOTIC STRESS MANAGEMENT PRACTICES ADOPTED BY THE SUGARCANE GROWERS OF SURAJPUR DISTRICT OF CHHATTISGARH” submitted in partial fulfillment of the requirements for the degree of Master of Science in Agriculture (Agricultural Extension) of the Indira Gandhi Krishi Vishwavidyalaya, Raipur, is a record of the bonafide research work carried out by Suryakant Choubey under my/our guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instructions.

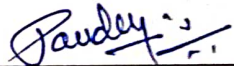
No part of the thesis has been submitted for any other degree or diploma or has been published/published part has been fully acknowledged. All the assistance and help received during the course of the investigations have been duly acknowledged by him.

Date: 11/01/2021


Chairman: Mr. P. K. Pandey

THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE

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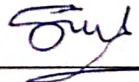
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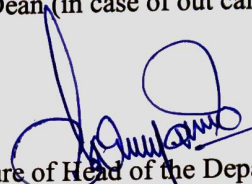


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CERTIFICATE – II

This is to certify that the thesis entitled “**STUDY ON BIOTIC STRESS MANAGEMENT PRACTICES ADOPTED BY THE SUGARCANE GROWERS OF SURAJPUR DISTRICT OF CHHATTISGARH**” submitted by **SURYAKANT CHOUBEY** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, in partial fulfillment of the requirements for the degree of **Master of Science in Agriculture** in the Department of **Agricultural Extension** has been approved by the external evaluator and Student's Advisory Committee after oral examination, under the chairmanship of head of the Department/Dean (in case of out campii).

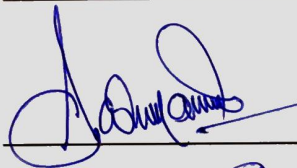

Signature of Head of the Department
(Name: **Dr. M. L. Sharma**)

Date: **24/02/2021**

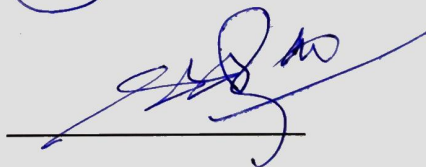
Major Advisor



Head of the Department



Faculty Dean



Approved/Not approved

Director of Instructions

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Place: Raipur

College of Agriculture, IGKV, Raipur (C.G.)

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Suryakant Choubey

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LIST OF SYMBOLS/ABBREVIATION

%	-	Per cent
/	-	Per
<i>et al.</i>	-	and others/ and co-workers
ha	-	Hectare
i.e.	-	That is
ICAR	-	Indian Council of Agricultural Research
KVK	-	Krishi Vigyan Kendra
MPS	-	Mean Percent Score
NGO	-	Non-Governmental Organization
NTFPs	-	Non-Timber Forest Product
Rs.	-	Rupees
S.D.	-	Standard Deviation
S. No.	-	Serial Number
SMS	-	Short Message Service
viz.	-	Namely
IPM	-	Integrated Pest Management
Ai	-	Active ingredients
w/w	-	weight for weight
EC	-	Emulsifiable concentration
RAEO	-	Rural agricultural extension officer
ETL	-	Economic threshold level
2,4-D	-	2,4-dichlorophenoxyacetic acid
f	-	frequency

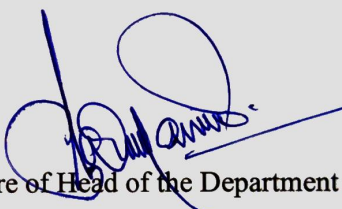
THESIS ABSTRACT

- a) Title of the Thesis : Study on biotic stress management practices adopted by the sugarcane growers of Surajpur district of Chhattisgarh
- b) Full Name of the Student : Suryakant Choubey
- c) Major Subject : Agricultural extension
- d) Name and Address of the Major Advisor : Mr. P. K. Pandey
Department of Agricultural extension College of Agriculture, IGKV, Raipur (C.G.)
- e) Degree to be Awarded : M.Sc. (Ag.) Agricultural Extension


Signature of Major Advisor


Signature of the Student

Date: 11-01-2021


Signature of Head of the Department

ABSTRACT

The investigation entitled “Study on biotic stress management practices adopted by the sugarcane growers of Surajpur district of Chhattisgarh” Pratappur block was selected purposively out of total 6 blocks in the Surajpur district, Total 120 respondents were selected from 15 villages. Data was collected with the help of a semi-structured interview schedule.

From the farmer survey, it was found that that 67.50% percentage of the respondents were of middle age, also majority of them having education up to higher secondary, and had agriculture as their main occupation. The finding from the study also indicated that the 39.17% farmers were having land holding of size 4.1 to 10.0

hectare. As per the crop grown in the area, 100% farmers were engaged in sugarcane farming while percentage of farmers growing rice, wheat and vegetables were found to be 71.66%, 39.16% and 55.83% respectively. Sugarcane occupied highest area under cultivation, 56.55% while rice, wheat and vegetables occupied 18.28%, 16.27% and 10.49% of the total area. It was also found that majority of farmers have irrigated fields with 92.68% having tube well for their irrigation with an area of 423.30 ha. in the study area. Main Crop type of sugarcane cultivation was adopted by the 85.53% farmers. Analysis of income data indicates that the 55.00% of farmers were earning income in between Rs.100000.00-250000.00. The study also reveals that the 63.33 per cent respondents acquired credit, whereas 36.67 per cent respondents not acquired the credit and all credit acquiring farmers had taken the short-term credit. In case of sources of credit, 57.50% had acquired credit from the nationalized banks with 94.73 per cent farmers responded to acquire credit easily. As per land type for cultivation, 87.67% used mid-land (*Gader*) with an area of 400.42 ha in the study area. The data are regarding labour type used for sugarcane cultivation indicates that majority (61.00%) hired labours while 39.00% were family labours and majority of labor (28.90%) were used in harvesting because of qualitative traits of sugarcane would get deteriorate with the time so it needs faster harvesting and farmers have to face scarcity of labour sometimes as it is key sugarcane producing area. With reference to source of information, about 97.50 per cent of the farmers had received the information from progressive farmers while 92.5 per cent received from radio. The study also revealed that more than half of the respondents were having medium economic motivation and adopted flatbed sowing method of sugarcane due to its simple and time saving quality. 69.93% farmers were found to be growing CO-62175 sugarcane variety with 68.34 per cent farmer in study area had medium level of farming experience i.e., 5-10 years.

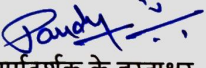
The knowledge of biotic stress management practices, among the sugarcane growers was accessed on knowledge of cultural, physical, chemical, and biological control practices. The overall knowledge regarding plant protection practices revealed that 72.50% had high level of knowledge while 17.50 per cent had medium level of knowledge. Stem borer (95.00%), Pyrilla (97.50%) and termites (94.17%)

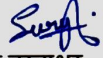
are the major insects while red rot of sugarcane (93.33%) and whip smut (95.83%) were more prominent problem in the study area. Assessment of the knowledge level of farmers about biotic stress management measures of sugarcane indicates that the for control of Stem borer highest knowledge index (94.17%) was found about carbofuran, for control of sugarcane *Pyrilla*, highest knowledge index (100.00%) was found about burning of trash, for termite control practices the highest knowledge index (95.00%) was about destruction of termitarium while regarding diseases, for control of red rot (95.00%) highest knowledge level was found removal of affected clumps and for control of whip tail and wilt, highest knowledge level (100.00%) was found about burning of trash. Knowledge regarding weed control revealed that highest knowledge level (100.00%) was about deep ploughing, mulching and crop rotation and regarding rodent control highest knowledge level (97.50%) was found about snap trap. The study regarding overall adoption regarding biotic stress management practices clearly revealed that the majority of respondent (55.83%) had high level of adoption, while 28.33 per cent of them had medium level adoption.

It was also found that majority of respondents (65.83%) perceived lack of subsidy from govt. on IPM control measures as a main pecuniary constraint and 68.33% farmers perceived non-availability of bio-control agents as main infrastructural constraint. Analysis of major suggestions received from the farmers indicate that the 96.67% suggested that training should be conducted, followed by, demonstration should be conducted regarding IPM technologies (95.00%) and technological knowledge should be given by RAEO' and sugarcane development officer (90.83%).

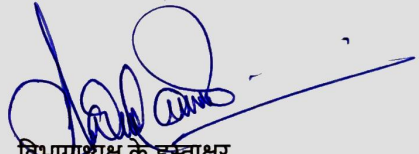
शोध-ग्रन्थ सारांश

(अ) शोध ग्रन्थ का शीर्षक	:	"छत्तीसगढ़ के सूरजपुर जिले में गन्ना-उत्पादकों द्वारा अपनाई गयी जैविक-तनाव प्रबंधन पद्धतियों का अध्ययन"
(ब) छात्र का पूरा नाम	:	सूर्यकान्त चौबे
(स) प्रमुख विषय	:	कृषि प्रसार
(द) प्रमुख मार्गदर्शक का नाम एवं पता	:	डॉ. पी. के. पाण्डेय (कृषि प्रसार विभाग) कृषि महाविद्यालय, इं. गा. कृ. वि., रायपुर (छ.ग.) ४९२०१२
(इ) उपाधि	:	एम.एस.सी. (कृषि) कृषि प्रसार


प्रमुख मार्गदर्शक के हस्ताक्षर


छात्र के हस्ताक्षर

दिनांक: 11/01/2021


विभागध्यक्ष के हस्ताक्षर

सारांश

यह शोध, "छत्तीसगढ़ के सूरजपुर में गन्ना-उत्पादकों द्वारा अपनाई गयी जैविक-तनाव प्रबंधन पद्धतियों का अध्ययन" भारत के छत्तीसगढ़ राज्य के सूरजपुर जिले के प्रतापपुर विकासखण्ड में सम्पादित किया गया। सूरजपुर के कुल ६ विकासखण्डों (भैयाथान, ओडगी, प्रेमनगर, रामानुजनगर, प्रतापपुर और सूरजपुर) में से १ विकासखण्ड प्रतापपुर को अध्ययन के उद्देश्य को ध्यान में रख कर चयन किया गया। इस तरह कुल (१५×८= १२०) उत्तरदाताओं का चयन यादृच्छिक रूप से १५ विभिन्न ग्राम से किया गया। आंकड़े एक साक्षात्कार अनुसूची के मदद से एकत्रित किये गए।

किसानों के सर्वेक्षण से यह पाया गया कि, ६७.५०% उत्तरदाता माध्यम आयु वर्ग के थे, तथा बहुधा कि शिक्षा का स्तर उच्चतर माध्यमिक, तथा कृषि उनका मुख्य व्यवसाय था। अध्ययन से यह भी परिणाम प्राप्त हुए कि, ३९.१७% किसानों के जोत का आकार ४.१-१०.० हेक्टेयर है। सभी कृषक गन्ने के खेती में संलग्न रहे इसके अतिरिक्त, धान (७१.६६%), गेहूँ (३९.१६%) तथा सब्जियाँ (५५.८३%) का भी उत्पादन करते थे। कुल कृषि भूमि का सर्वाधिक हिस्सा (५६.५५%) गन्ने से तथा धान (१८.२८%), गेहूँ (१६.२७%) १०.४९ प्रतिशत सब्जियों से आच्छादित था। उत्तरदाताओं कुल भूमि जिसका रकबा ४२३.३० हेक्ट. पाया गया, का ९२.६८% ट्यूब वेल से सिंचित था। गाने को मुख्य फसल के रूप में ८५.५३% कृषकों द्वारा अंगीकृत किया गया। आय सम्बंधित

विश्लेषण यह दर्शाता है कि, ५५.००% किसानों की आय १,००,०००.००-२,५०,०००.०० ₹. के बीच थी। ६३.३३% उत्तरदाताओं के द्वारा ऋण लिया जाता था तथा सभी के द्वारा लघु-अवधि ऋण लिया जाता है। ऋण के स्रोत के सम्बन्ध में, ५७.५०% उत्तरदाता राष्ट्रीयकृत बैंकों द्वारा ऋण प्राप्त करते थे तथा ९४.७३% उत्तरदाताओं के अनुसार ऋण प्राप्त करना आसान बताया गया। अध्ययन क्षेत्र में खेती के लिए प्रयुक्त भूमि के आधार पर सर्वाधिक उत्तरदाता (८७.६७%) मध्यम-भूमि (गादर) का प्रयोग गन्ने के उत्पादन के लिए करते हैं जिसका कुल रकबा ४००.४२ हेक्ट. है। श्रमिक उपयोगिता के अर्थन से यह स्पष्ट होता है कि, ६१.००% किराये के श्रमिक तथा अधिकतम श्रमिक (२८.९०%) कटाई के लिए प्रयुक्त किये गये। सर्वाधिक उत्तरदाताओं (९७.५०%) के द्वारा सूचना का मुख्य स्रोत उन्नत किसान रहे, जबकि, ९२.५०% रेडिओ द्वारा सूचना प्राप्त करते हैं। शोध से यह भी प्राप्त हुआ कि, आधे से ज्यादा गन्ना-उत्पादक मध्यम आर्थिक अभिप्रेरणा से अभिप्रेरित हैं तथा रोपाई के लिए समतल-क्यारी विधि का प्रयोग करते हैं क्योंकि, यह आसान और समय बचाने वाला है। सर्वाधिक किसान (६९.९३%), गन्ने के खेती के लिए CO-६२१७५ किस्म का प्रयोग करते हैं एवं ६८.३४ प्रतिशत किसानों को गन्ना उत्पादन का ५-१० वर्ष का अनुभव है।

किसानों के जैविक-तनाव प्रबंधन पद्धतियों की जानकारी का अभिगम सस्वीय, भौतिक, रासायनिक और जैविक नियंत्रण क्रियाओं के आधार पर किया गया। पौध संरक्षण क्रियाओं के सम्पूर्ण ज्ञान के सन्दर्भ में यह प्रतिपादित हुआ कि, ७२.५० प्रतिशत उत्तरदाता उच्च स्तर के ज्ञान वर्ग में आते हैं। अध्ययन क्षेत्र में तना छेदक (९५.००%), पाईरिल्ला (९७.५०%) तथा दीमक (९४.१७%) मुख्य कीट एवं लाल सड़न (९३.३३%) व व्हिप स्मट (९५.८३%) रोग, महत्वपूर्ण समस्या रहे। गन्ने के जैविक-तनाव प्रबंधन उपायों का किसानों के ज्ञान के सम्बन्ध में निर्धारण से पता चलता है कि, किसानों को तना छेदक के नियंत्रण का सर्वाधिक ज्ञान रहा, उच्चतम ज्ञान स्तर अवशेषों को जलाने के सम्बन्ध में प्राप्त हुआ, दीमक के भूद को तोड़ना सर्वाधिक कृषकों द्वारा दीमक नियंत्रण के लिए, जबकि लाल सड़न रोग प्रबंधन के लिए उच्चतम (९५.००%) ज्ञान संक्रमित पौध गुच्छों को निकालना तथा व्हिप स्मट के नियंत्रण हेतु भी रोग-ग्रसित गुच्छों को अलग करना ही सर्वाधिक ज्ञान स्तर रखता है। खरपतवार नियंत्रण के सम्बन्ध में जानकारी से पता चला कि, उच्चतम ज्ञान स्तर गहरी जुताई, मुल्लिंग और फसल-चक्रण में था, कृन्तक नियंत्रण के सन्दर्भ में उच्चतम ज्ञान स्तर (९७.५०%) स्नेप ट्रेप हेतु पाया गया।

गन्ने के जैविक-तनाव प्रबंधन उपायों का किसानों के द्वारा समग्र अंगीकरण अध्ययन से स्पष्ट रूप से ज्ञात होता है कि बहुसंख्य उत्तरदाताओं (५५.८३%) के द्वारा उच्च स्तर अंगीकरण जबकि, २८.३३% को माध्यम स्तर का अंगीकरण स्तर था।

शोध परिणाम यह भी दर्शाते हैं कि बहुसंख्य (६५.८३%) उत्तरदाताओं ने सरकार के तरफ से एकीकृत प्रबंधन हेतु अनुदान की कमी को मुख्य आर्थिक समस्या बताया है तथा ६८.३३ प्रतिशत उत्तरदाताओं के द्वारा जैव-प्रबंधन एजेंटों कि अनुपलब्धता को मुख्य संरचनात्मक समस्या बताया।

किसानों से प्राप्त सुझाव यह बताते हैं कि, बहुधा (९६.६७%) उत्तरदाताओं का मानना है कि प्रशिक्षण प्रदान किया जाय, ९५ प्रतिशत का सुझाव रहा कि, एकीकृत कीट-व्याधि प्रबंधन तकनीकी का प्रदर्शन किया जाना चाहिए तथा तकनीकी ज्ञान, ग्रामीण कृषि विस्तार अधिकारी एवं गन्ना विकास अधिकारी के द्वारा समय-समय पर दिया जाना चाहिए।

CHAPTER – I

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is an old source of human energy and is a significant money crop in numerous tropical and subtropical nations. The essential source of sugarcane in India plays an unmistakable situation as a business money harvest and it represents 65 % of the worldwide sugar supply. During 2016-17, the world total sugarcane area was 26.77 million ha with output of 1890 million metric tons. Compared to India, Brazil has the largest area, with 10.22 mha. and an output of 768 million metric tons. India ranks second in area and sugarcane production, with 4.95 and 348 million metric tons worldwide. Sugarcane productivity also trends in the same direction as Brazil having first rank with a productivity of 71.5 tons/ha whereas India rank was second with a productivity of 70.3 tons/ha. According to estimates by the Food and Agriculture Organization of the United Nations, world sugarcane production only accounts for 45% of potential production, and 55% of the loss is mainly due to pests and diseases.

Mature stalks typically consist of 11-16% fiber, 12-16% soluble sugar, 2-3% non-sugar and 63-73% water. Sugarcane crops are sensitive to the environment, type of soil, irrigation, fertilizer, insects, control of diseases, variety and time of harvest. Sugarcane stalks have an average annual yield of 60-70 tons per hectare. However, depending on the expertise and methods of crop management used for sugarcane cultivation, this number can vary from 30 to 180 tons per hectare. Sugarcane is an economic crop, but has also been used as feed for livestock.

Sugarcane provides various useful by-products, such as alcohol used by the pharmaceutical industry, ethanol used as a fuel, power generation and production of chipboards, and press mud used for crop production as a rich source of organic matter. Sugarcane, which also holds a prominent role as the commercial cash crop, is the primary source of sugar in India. It accounts for more than 65% of the global supply of sugar. The world's total sugarcane area was 26.77 million ha with production of 1890 million metric tons having Brazil has the highest sugarcane area

and production in relation to India. The second occupies India rank in production of sugarcane in the world.

In India, about 527 sugar factories were in operation in the country during 2010-11, with an annual production capacity of approximately 24.2 million tons of assembled sugar. In India, there are approximately two distinct agro-climate regions i.e. tropical (Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Goa, Pondicherry and Kerala) and subtropical (Maharashtra, Pondicherry and Kerala) regions. (UP, Bihar, Haryana) and Punjab). However, five agro climatic zones identified, mainly for variety development. They are (i) Northwestern Region (ii) Northern Central Region (iii) Northeastern Region (iv) Peninsula Region (v) Coastal Region. Maharashtra is the country's largest sugar producer, accounting for 34% of the country's total sugar, followed by Uttar Pradesh.

To control diseases and pest, setting aside farmer money and time and is essential to control substance emanations with the guide of coordinated irritation and sickness the executives (IPDM). By burning-through roots, the stick grub can diminish crop yield considerably; With Confidors, or Lorsban, it very well may be controlled. The hatchlings of some butterfly/moth species, including the turnip moth, sugarcane drill (*Diatraea saccharalis*), Mexican rice drill (*Eoreuma loftini*), leaf-cutting ants, termites, spittlebugs (particularly *Mahanarva fimbriolata* and *Deois flavopicta*) and the *Migdolus fryanus* insect are likewise significant irritations. *Eumetopina flavipes*, the planthopper moth function as a phytoplasma vector that causes the ramu trick of the sugar stick illness. There are 1300 species worldwide and 220 types of creepy crawlies in India that focus to sugarcane. The *Aphanisticus aeneus* Kerremans leaf miner (Coleoptera: Buprestidae), the *Callispa vittata* Baly leaf scraper (Coleoptera: Hispididae) and the *Heteronychus annulatus* Bates white grub, (Coleoptera: Dynastidae), at the Sugarcane Breeding Institute Regional Base, Kannur, Kerala, and *Chaetocnema basalis* Baly flea beetle (Coleoptera: Alticidae) and *Aclerda takahashii* (Kuwana) scale insect (Hemiptera: Aclerdidae) were observed to infest sugarcane in Coimbatore, India. Some growers have advanced to

medium-level IPM, to take a few extra preventive steps, e.g. cultural controls and plant resistance, coupled with efforts to cut back on broad spectrum pesticide use in order to protect beneficial organisms Besides sugar production. Weed growth exerts a variety of effects on the ecology of sugarcane fields and most obvious being competition with the crop. Infestations by weeds, especially perennials like Johnson grass, can cause substantial economic Losses of up to 84%. The main concern was disease for sugarcane to responsible for its low yield. The most dangerous disease of sugarcane, correctly referred to, as 'cancer' of sugarcane i.e. fungal disease called red rot of sugarcane among all the diseases. Keeping in view the seriousness of this disease, the present review summarizes the distribution, mode and source of infection, description of casual pathogen and disease management.

To diminish the bug assault, the affinity of farmers to utilize substance pesticides aimlessly causes a few issues, for example, the resurgence of bug species and the termination of normal foes and useful bugs. Examination has grown innovations that utilization creepy crawly bugs as an IPM technique for regular adversaries for example hunters, parasitoids, and pathogens to be calmed. Bracons, *Crysoper lacarnea*, *Trichogramma*, *Bacillus thuringiensis*, *Crytaemus montrouzieri*, *Bacillus sphaericus*, Nuclear polyhedrosis viruses (NPV) and Trichoderma are some helpful bioagents and was cost effective too. What's more, other phyto-items, for example, Aazadirachtin (neem), nicotine, pyrethrum, and so forth Biopesticides are additionally significant.

Despite its techno-economic superiority over conventional chemical control, the application of the IPM is still limited to only 2 per cent of the region with plant safety inputs. The prediction was based on the informed views of the researchers, extension workers and policymakers. The agrochemical structure markets also suggests a similar level of adoption; biopesticides share only 2% of the agrochemical market in India (Saxena, 2001). Indian Union Ministry of Agriculture suggested that the use of biopesticides is increasing more rapidly than that of chemical pesticides. Biopesticides use rose by 23% from 2010–2011 to 2016–2017 compared with chemical pesticides were 2% growth. Plant Health, Quarantine & Storage

Directorate, Union Ministry of Agriculture & Farmers Welfare data showed that consumption of all-India biopesticide increased from 5151 tonnes to 6340 tonnes from 2010-2011 to 2016-2017 respectively (Waleden, 2017).

By keeping in mind all the afore mentioned issues an attempt has been made to identify the various biotic stress management practices adopted by the farmers in order to reduce the adverse effect of various biotic stress on the sugarcane productivity, particularly in Surajpur district of Chhattisgarh. In this way an investigation entitled "**Study on biotic stress management practices adopted by the sugarcane growers of Surajpur district of Chhattisgarh**" was conducted in the year 2017-2018 in Surajpur district of Chhattisgarh State with the following specific objectives given below:

Objectives:

1. To determine the socio-personal, socio-economic, communicational, technological and psychological characteristics of sugarcane growers.
2. To find out the level of adoption of various biotic stress management practices by sugarcane growers.
3. To identify constraints faced by the sugarcane growers in adoption of biotic stress management practices.
4. To obtain their suggestions to overcome the constraints.

Significance of the study

- Understanding the definition of sugar cane crop biotic stress management practices as well as the limitations associated with its choice would lead to powerful preparation, monitoring and evaluation by planners, policy makers concerned with the implementation of agricultural production, and program & policies for extension.
- It takes the initiation for scientific study in the state; since there is limited research available in the area. So, it can be used as a ground for further study in the area.

- The result of the study will have a modest contribution to the existing literature by showing the constraints and opportunities, issues and realities of adoption of biotic stress management practices in sugarcane crop.

Limitation of the study

There may be large number of factors associated with the adoption of biotic stress management practices in sugarcane crop. Among them, some important limitations are lack of time, money and resources, the sample size of 120 sugarcane growers, which may not be completely, provide the valid results of such a vast area of Surajpur district of Chhattisgarh.

CHAPTER – II

REVIEW OF LITERATURE

Reviewing previous literature is one of the significant aspects of science. At every point, the researcher has to review the relevant literature. It is not a one-time exercise, but a continuous operation, while the researcher is acquainted with the subject, techniques and materials while going through the literature and guides his efforts in the desired direction. Researchers learn about the procedures, processes and strategies as well as the outcomes of previous studies through analysis. Throughout the study method, it offers hints and guidance. Steady attempts have been made to collect research results with equivalent characteristics from the research studies. In line with the major objectives of the study, an attempt is made to review the available national and international literature to support present study “study on biotic stress management practices adopted by the sugarcane growers of Surajpur district of Chhattisgarh”

2.1 Profile of the Sugarcane Farmers in Surajpur district of Northern Hills Zone of Chhattisgarh

- 2.1.1 Age
- 2.1.2 Education
- 2.1.3 Caste
- 2.1.4 Occupation
- 2.1.5 Social participation
- 2.1.6 Annual Income
- 2.1.7 Land holding
- 2.1.8 Credit acquisition
- 2.1.9 Sources of information
- 2.1.10 Economic motivation
- 2.1.11 Experience of sugarcane farming

2.2 Knowledge of plant-protection measures of sugarcane

2.3 Adoption Level of various biotic stress management practices of Sugarcane

2.4 Constraints to adoption of biotic stress management practices as perceived by the sugarcane growers

2.5 Suggestions from the sugarcane growers to overcome the constraints.

2.1. Profile of the Sugarcane Farmers in Surajpur district of Northern Hills Zone of Chhattisgarh

2.1.1 Age

Singh and Rajendra (1990) proposed that there is a positive and important relationship between age and the adoption of sugarcane variety COs-767.

Karthik eyan waited. (1995) recorded the important and similar relationship between the age of the interviewee and the degree of adoption of sugarcane production technology. Singh *et al.* (1998) also found a similar result.

Tiwari and Lall (1998) found that farmers' age was positively and significantly correlated with sugarcane growers' scientific attitudes.

Shrivastava *et al.* (2002) reported that the age of pepper growers is directly proportional to their level of adoption and is and significantly related to this parameter.

Sahu *et al.* (2003) also concluded that that age is positively correlated with the degree of adoption of new technologies by the farmers.

Dwivedi (2007) found that most of the respondents of the study were middle-aged.

Nagle (2009) reported that most participants of the study belonged to the middle-aged age group in the study area.

Ferrazino *et al.* (2014) found that the average age of farmers is 46 years. The most representative age group is 40-50 years old.

Gurjar (2014) reported that middle-aged people accounted for 45.84%; secondly, 25.00% were young people, and 29.16% were old people.

Patel (2014) found that in most respondents, middle-aged people accounted for 65.83%, followed by young and elderly respondents, accounting for 18.34% and 15.83%, respectively.

Raghuwanshi (2015) recorded that middle-aged people accounted for 61.90%, followed by young people and old people at 19.05% and 19.05%.

Sihare (2015) estimates that 65.00% of the total number of organic farmers belong to the middle-aged age group, followed by 25.00% of the elderly and 16.67% of the young.

Dinesh (2018) found that 62.50% of the respondents were between 40 and 57 years old, while 14.16% were over 58 years old.

Lamkane and Yogesh (2018) pointed out that the middle-aged age group is the majority of respondents (57.50%).

(2018) announced that the largest proportion of soybean growers (45.83%) belong to the middle-aged age group, followed by (40.00%) belong to the young age group, and (140.00%) belong to the middle-aged age group.

Subhash (2018) reported that most farmers (59.44%) belong to the middle-aged group, followed by (22.78%) belong to the elderly group, and (17.78%) belong to the young group.

2.1.2 Education

Dubey and Sawarnkar (1992) researched that regarding paddy field technology, the marginal and small farmers' adoption activities have an important relationship with education.

Lianbeka and Nishade (1993) pointed out that education has a negative relationship with the adoption activities of pineapple growers in Mizoram.

Krishnamurthy *et al.* (1997) revealed that education was found to be highly related to the level of adoption of sugarcane farming.

Padmaiah *et al.* It was observed (2000) that it was found that education and the knowledge of various aspects of production technology in the farming system were linked and made a significant contribution.

Shinde *et al.* (2000) pointed out that a large part of the interviewees (67.30%) had received secondary education about the views of farmers on television.

Singh *et al.* (2004) pointed out that there is a great correlation between the level of education and the level of implementation of recommended milk management practices.

Tarde *et al.* (2006) revealed that education is highly correlated with the knowledge level of pomegranate growers.

Chouhan (2007) pointed out that the number of people receiving primary education is the largest (27.20%).

Bhosale (2010) recorded that nearly two-fifths (36.67%) of rural youth have secondary education, followed by university and higher education (28.65%), high school education (25.83%) and elementary education (25.83%) (09.17%)

Sihare (2015) recorded that the same percentage of farmers out of total organic farmers, i.e. 23.33 percent had education up to middle school and graduation, followed by higher secondary (18.83 percent) and high school education (16.67 percent), 10.00 percent of respondents had primary education, and 8.33 percent were illiterate organic farmers.

Raghuwanshi (2015) reported that majority (29.76 per cent) of the respondents were having middle level of education followed by 16.67 per cent of respondents who can read and write only.

Mukati (2016) found in his study on SHC holders in Tikamgarh district of Madhya Pradesh that majority of the farmers had middle or high school education (middle school- 27.35 percent and high school- 31.37 percent).

Patel *et al* (2017) reported that nearly 66.7 per cent of the soil health card users had secondary or higher secondary level of education (secondary- 43.34 per cent and higher secondary- 23.34 per cent), whereas 11.3 per cent of the farmers were illiterate.

Dinesh (2018) reported that most farmers (51.67%) passed middle school, while illiterate, primary, high school and college graduates were 12.50%, 19.16%, 10.00% and 6.66%, respectively.

Gayathri (2018) published a report on the impact of new structural measures on fruit and vegetable marketing in Davangere District, Karnataka. Author

The report points out that (75.00%) farmers have higher education, followed by (15.00%) respondents with secondary education and (10.00%) respondents with lower education.

Sagar (2018) conducted a research on "Trends in the use of ICT equipment by farmers in Chikkmangalur area". The author pointed out that (41.67%) of the respondents have completed high school education, (26.67%) of the respondents have completed pre-university education, and (15.83%) of the respondents have completed secondary education.

Singh and others (2019) are in the Khandwa district of Madhya Pradesh, India. Investigators who studied "Soybean growers in Khandwa District, Madhya Pradesh, India adopt IPM practices" pointed out that respondents (31.82%) have received primary education (31.82%), followed by illiterate (24.55%), who are in the middle Level of high school (10.90%), university (5.45%) and high school education (3.64%).

2.1.3 Caste

Singh and Rajendra (1990) through their study concluded that there is a positive and significant association between caste structure and adoption of COs-767 variety of sugarcane.

Singh (1993) studied on adoption, non-adoption, and reversion behaviour of farmers in relation to paddy technology and observed that there was a positive and significant relationship between caste and the adoption behaviour of small farmers.

Singh *et al.* (1998) stated that caste has a non-significant link with the adoption of technology for the production of sugar cane.

Limje (2000) noted that most of the respondents belonged to other backward classes and found that the caste was not significantly associated with soybean production technology adoption.

Padekar (2004) reported that majority of the respondents (51.87%) were found under the category of other backward class followed by 23.75 per cent and 15.62 per cent of respondents were belonged to scheduled caste and schedule tribe respectively. While only 8.76 per cent of the respondents belonged to general category.

Parmanand (2012) recorded that in the sample area, more than three-fifth (67.08 percent) respondents were in the other backward class group, (15.42 percent) of respondents were in the scheduled caste, (11.25 percent) of respondents were in the general category, and (6.25 percent) in the non-tribal classes.

Lal (2014) examined that the maximum number of respondents (52.50%) in the sample region were in the OBC group followed by (30.62%) and (16.88%) of respondents in the SC and GEN groups, respectively.

Lal (2017) suggested that most respondents (45.28%) were found to be in the General category in the survey area, followed by (41.39%) and (13.33%) of

respondents in the OBC and SC categories, respectively. In the Kadapa district of Andhra Pradesh.

Sreekanth *et al.* (2018) emphasized that more than three-fifths (64.66 percent) of rice growers belonged to the general group.

2.1.4 Occupation

Mandal (2000) told that the percentage of labor and service industries in agriculture is declining, while the percentage of people engaged in non-agricultural labor and non-governmental services has increased.

Pandey (2000) found that the majority of respondents (43.75%) only engaged in one occupation. Similarly, in the use of rice production technology, approximately 37.50% are in two occupations and only 18.73% are in two or more occupations.

Raghuvanshi (2003) reported that the majority of respondents (70.00%) were engaged in two occupations, while in terms of adoption behavior of rice farmers, only 1.25% were engaged in more than two occupations.

Prajapati (2006) pointed out that most wheat growers (61.67%) only use agriculture as their source of income, while 38.33% of farmers have other sources of income besides agriculture.

Patel (2008) revealed that among the selected soybean growers, the respondents who are interested in agriculture are the most (52.00%), followed by agriculture + labor (14.00%), agriculture + services (12.66%), agriculture + livestock Industry + service (their main occupations are respectively 7.34%), agriculture + other (8.00%) and agriculture + professional + service (6.00%).

Kumar and Singh (2009) observed that the majority (93%) of wheat growers depend on agriculture for their livelihoods.

Bhatt *et al* (2011) found that great majority (94.37 per cent) of the trainees were having agriculture and animal husbandry as their main occupation, while only 5.63 per cent were had agriculture and other services as their occupation.

Parvez *et al* (2013) recorded that the 51.12% of fish farmers adopted agriculture + fish farming as their primary occupation, while 38.88% and 10.00% of fish farmers, had agriculture + fish farming + labor and only fish farming as their main occupation, respectively,

Patel (2015) reported that followers of organic farming (4.16 percent) had agriculture as their main occupation.

2.1.5 Social participation

Panwar *et al.* (1998) concluded from the study that social participation of farmers had positive correlation with the adoption of recommended soybean practices at with high significance.

Tiwari and Lall (1998) found the optimistic and important relationship between social engagement and the scientific attitude of sugarcane growers.

Sharma *et al.* (2000) observed that soyabean and maize cultivation activities were important and positively linked to social participation.

Pal *et al.* (2001) noted that the involvement of organizations was strongly related to the adoption of recommended practices of sugarcane cultivation

Choudhary (2003) stated that the maximum number of the respondents (34.54%) were found to be no membership in any organization regarding scientific storage practices of food grains.

Kumar *et al.* (2011) found that there was no membership of most farmers in any rural social organization, suggesting very low social involvement.

Rokonuzzaman (2013) conducted a survey. The researcher found that fewer than three-fourths (73.68%) of respondents had a very low level of social involvement, with a

modest level of social part (24.21%) of respondents and (1.05%) of respondents had a medium level of social participation.

Sihare (2015) reported that out of total organic farmers, 85.00 per cent were having medium level of social participation followed by 15.00 per cent were having high level of social participation.

Jakkawad *et al.* (2017) researched “knowledge and adoption level of the pomegranate growers in Marathwada village Maharashtra”. The researchers reported that majority (67.50%) of the respondents had a medium level of social participation, (17.50%) of respondents had a low level of social participation, and (13.75%) of respondents had a high level of social participation.

Ahire *et al.* (2018) found out that farmers (42.50 percent) had medium social participation, farmers (35.83 percent) had low social participation, and farmers (21.67 percent) had high social participation.

Dinesh (2018) recorded that the majority of farmers had a medium level of social participation of 56.66 per cent, followed by a high level of social participation of 28.34 per cent.

2.1.6 Annual income

Gogai and Phukan (2000) proposed that income is significantly related to the adoption of improved rice cultivation methods. The middle- and low-income groups are the largest non-adopters.

Chaudhary *et al.* (2001) found that in terms of improved rice technology, annual income is closely related to the level of adoption.

Raghuvanshi (2005) concluded through the study that more than one-third of farmers had an annual income of up to Rs. 60,001 and also observed the high level of adoption behavior of rice growers was seen to various pest control measures of rice crops.

Kumaran *et al.* (2004) concluded that a large share of respondents belonged to the low-income category.

Naik (2005) concluded that majority of sugarcane growers (61.66%) had incomes below Rs. 68,590 /- in the middle-income group followed by the income between Rs. 68,590 rupees. 1,61,820 /-, followed by the low-income group (20.83%) and the high-income group occupied 17.50%, whose income exceeds Rs. 1,61,820/-.

Mahoviya (2006) found that most mustard growers (66.66%) have low annual incomes.

Patidar (2007) found that the proportion of respondents in the average annual income group was higher (59.17%).

Paikra (2008) concluded that most respondents have poor annual income (44.17%).

Sen (2008) found that majority of the respondents (44.17%) had a low annual income while 37.50% had a medium annual income.

Chauhan (2009) conducted research on the experience of viewers of Doordarshan's Krishi darshan service in the Sehore district of Madhya Pradesh, and found that the majority of respondents (52.50 percent) were in the medium annual income category.

Madhu (2010) observed that in the Karnataka district of Krishi community radio station in Dharwad, 70.39 percent of the majority respondents fall under the above poverty line.

Parida (2010) highlighted that majority of respondents (45.00%) had an average annual income.

Raghuwansi (2010) observed that large percentage of the soybean growers i.e. 41.67 per cent had medium income level.

Itawdiya (2011) found that an equal percentage of the sugarcane growers i.e. 34.44 per cent were having low and medium annual income, while high annual income occupied 31.12 per cent

Patel (2015) studied the communication channel mode used by farmers in Sehor District, Madhya Pradesh, and concluded that the prevalence of using communication channels among the agricultural population shows that 50.00% of the annual income category is higher, followed by the middle-income category (30.00%) And low annual income category (20.00).

Patidar (2015) studied the role of electronic communication in the transformation of agricultural technology and reported that most consumers of online communication services (54.17%) have a small annual income.

Kamal *et al.* (2018) reported that "Vegetable farmers in Chennedah District, Bangladesh adopt IPM practices". Researchers report that more than three-quarters (76.24%) of respondents have a medium annual income, followed by those with low annual income (7.92%) and those with high annual income (15.84%).

2.1.7 Land holding

Abdul *et al.* (1993) pointed out that land holding (farm size) has an strong relationship with the agricultural technology adoption in study area

Fernandez *et al.* (1994) found that adoption is more related to the activities of large-scale irrigation farms. The use of more family labor, local variables and the types of crops also have an impact on the use of integrated pest management.

Khubde *et al.* (1999) reported that there is a significant relationship between land ownership, the area of knowledge of soybean crops and the adoption of soybean production technology.

Shinde *et al.* (1999) concluded that 52.50% farmers own 2.00 to 5.00 hectares of land for adoption of rabies.

Gogai and Phukan (2000) concluded that a high degree association was observed between size of land holding and extent of adoption in improved rice cultivation.

Kumar, Surendra (2005) observed that a significant and positive relationship between the land holding and adoption of improved sugarcane production technology.

Maraddi (2006) observed that majority of sugarcane growers (45.55%) were medium farmers, 22.77% were small farmers , semi-medium farmers (16.66%) and large farmers (16.66%). (15%). None of farmer belongs to the marginal farmer group.

Singh *et al.* (2007) pointed out that the majority of abandoned land holders (84.00%) have medium land holdings.

Kulhade (2007) observed that majority of soybean growers belonged to large farmer category.

Shivanand (2007) concluded that majority of sugarcane growers (32.00%) are large farmers, followed by medium farmers (30.00%), semi-medium farmers (22.00%), small farmers (14.00%) and marginal farmers.

Paikra (2008) observed that about 50 per cent of rice growers have average land holdings.

Itawdiya (2011) concluded that a higher proportion (30.00%) of the respondents own medium-scale land, followed by 27.78%, 22.22% and 20.00% of the respondents respectively own large, small and marginal land.

George waited. (2012) conduct a sample survey titled "Integrated pest management methods for vegetable crops in Karnataka", researchers observed that most of the respondents, accounting for 44.1%, own 2.5 to 5 acres of land.

Vishwanath (2013) emphasized that (45.84%) of respondents have medium-scale land ownership, (34.16%) of respondents have smaller land ownership, and (24.00%) of respondents have higher land ownership ownership.

Vasanthi (2017) recorded her study on the awareness impacts of the agricultural community on climate change management, that more than three-fourths of non-attached farmers (80.00 percent) had marginal landholdings, (16.67 percent) had small landholdings, (2.23 percent) had medium landholdings, and none of them had large land holdings.

Sreekanth *et al.* (2018) also analyzed a sample survey in " Knowledge and adoption of IPM by rice growers in Kadapa district in Andhra Pradesh and found that 38.00% of the farmers had semi-medium landholding farmers (5.01-10.00 acres), and (49.33%) of farmers had 1 acre of landholding.

Sagar (2018) had done analysis on the trend of usage of ICT resources by farmers in the Chikkamangalur district, concluding that 32.50% were small farmers having 2.51 to 5.00 acres of land holdings followed by medium (29.20%), small (20.00%) and marginal 18.30 per cent landholders.

2.1.8 Credit acquisition

Limje (2000) observed a strong and optimistic link between credit facilities and the adoption of soybean production technology.

Mukim (2004) believes that the majority of respondents (96.09%) have a good and meaningful relationship with the implementation of sunflower processing technology to obtain credit and credit.

Pandey *et al.* (2004) showed that most respondents (62.96%) received short-term credit for rice crops, followed by medium-term (25.92%) and long-term credit (11.12%).

Mishra (2006) observes that the availability of credit is irrelevant to the acceptance of recommended technologies in sugarcane development.

Prajapati (2006) shows that most respondents (60.83%) do not have credit facilities, while 39.17% of respondents have credit facilities for wheat production technology.

Dhruw (2008) indicated that the majority of the respondents (50%) had taken loan from nationalized bank for adoption of maize production technology.

Lanjewar (2009) concluded in his research on the adoption of suggested cabbage production technology, that the majority of respondents (55.00 percent) had acquired short-term credit; cooperative society was the key source of credit and credit facilities were very easily and quickly accessible to them.

2.1.9 Source of information

Hedau (2000) revealed that there is a positive and significant relationship between variable information sources and the adoption of paddy field production techniques.

Choudhary *et al.* (2001) It was found that trends in the use of information sources are extremely important and are directly proportional to the adoption of rice production technology in the United States. Faizabad area.

Lalitha *et al.* (2002) pointed out that in the research on the trend of information consultation for sugarcane farmers, agricultural assistants are the largest source of information for information consultation.

Mazher *et al.* (2003) revealed that large 70.00 % smallholder farmers collect data through their peer farmers and progressive farmers. The big farmer (20.00%) has acquired knowledge through the Ministry of Agriculture (Extension) and the Sugarcane Processing Technology Research Institute. Between 10.00% and 20.00% of large farmers collect data through mass media (radio/TV and printed materials).

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

Ferrer *et al.* (2003) studied that the regression analysis is used to delineate significant determinants associated with the use of Internet applications by commercial sugarcane farm businesses in the KwaZulu-Natal Midlands. Eighty-six percent of farm businesses surveyed had Internet connections and 83 percent used Internet applications (including e-mail, on-line banking and gathering information from the World Wide Web) for business purposes. Results indicate that significant determinants of the range of Internet applications by farm businesses include a) the period of time for which the farm business has been connected to the Internet, b) the principal farm decision-maker's education, time available to spend on the Internet and his or her perceptions of the Internet as a source of information, and c) characteristics of other farm computer users. Activities that may promote use of the Internet applications by farm businesses include the development of policies and software to reduce risks of Internet use, and improving the Internet skills of farmers.

Rajni (2006) uncovered that out of 14 chose data source, the preparation/visit framework was used by penny percent of the respondents. Companions (66.66%), neighbor (57.14%) and family members (56.35 %), were used as a source of data. However, equivalent rate (54.76%) of respondents used TV and paper as source of data. Other data sources were horticulture magazine (37.30%), Sarpanch (30.95%) and just 12.69 percent respondents, used town pioneer as wellspring of data with respect to mushroom creation and preparing on homestead ladies.

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

Singh and Kumar (2007) reported that all categories of the wheat cultivators used almost all the sources of information. However, majority of the farmers, irrespective of size of land holding had other farmers as their source of agriculture information. The large numbers were using, all the sources i.e. Press, T.V., Radio, other farmers, Agriculture Department and Research Institute to gather information. The trend was more or less similar in case of medium farmers too. The uses of press

and T.V. were less amongst the small and marginal farmers. The farmers ranked fellow farmers first, followed by Agriculture Department, Research Institutes, Television, Radio and Press.

2.1.10 Economic Motivation

Sakharkar (1995) found that in his research on fertilizer usage patterns and stresses in soybean cultivation by farmers in the district of Nagpur, Maharashtra, the majority of soybean farmers (76.33 percent) had a medium level of economic motivation. While (14.00%) and (9.67%) of farmers, respectively, had low and high categories of economic motivation.

Srinivasreddy (1995) conducted a study on the understanding and adoption of recommended mango planting methods among farmers in the Koral region, and reported that 40.00% of mango growers have high economic motivation, followed by moderate (34.00%) and low (26.00%) economic motivation.

Yaligar (1997) conducted an analysis and research on farmers growing soybeans in the Belgaum area, and reported that most respondents (83.33%) had moderate economic motivation, while 10.42 and 6.25% of respondents had low and high levels Economic motivation. category.

Joshi *et al.* (2002) found that a higher proportion of respondents (39.31%) were financially motivated.

Shinde (2004) concluded that the higher the proportion of respondents who increase soybeans, the higher their economic motivation.

Sharma (2007) concluded that a moderate proportion of economic motivations leads to a higher proportion of soybean growers (62%).

Jadhao (2008) stated that there was good economic incentive for a higher percentage of respondents.

Iske (2009) found that a greater percentage of respondents (42.14 percent) had a medium degree of economic motivation.

Itawdiya (2011) recorded that 41.11 per cent of respondents had low economic motivation, followed by a high and medium level of economic motivation of 33.00 per cent and 25.56 per cent of respondents.

2.1.11 Experience of sugarcane farming

Thiranjangowda (2005) recorded that in "Awareness and Development of Land and Water Management Activities" (40.62 percent) of respondents had a high level of agricultural experience, followed by (35.93) respondents with medium farming experience, and (23.45 percent) respondents had a low level of agricultural experience.

Kumar *et al.* (2009) noted in their "Awareness and Acceptance of Rose Farmers" research report, that 53.33 percent of respondents have low farming skills, followed by medium (45.00 percent) and high 1.67 percent farming skills..

Madhushekar (2009) conducted a marketing behavior survey on cold farmers in the Guntur region of Andhra Pradesh, and found that (41.25%) of the respondents had moderate agricultural experience, followed by (37.50%) with high agricultural experience and (21.25%). The interviewee has insufficient experience in low temperature farming.

Muhammad *et al.* (2012) showed that "(45.00%) of fruit and vegetable farmers conducted post-harvest knowledge assessment of fruit and vegetable farmers in Nigeria", with farming experience (10-20 years), followed by (30.00%) farmers (31 -40) Years), 20.00% of the respondents (21-30 years old) have farming experience, 5.00% of the respondents have farming experience, and 5.00% of the respondents have 40 years of farming experience.

Etonihu *et al.* (2013) in Nigeria, found out that 35.00 percent of the respondents had farming experience (1-10 years), followed by (33.00 percent) of the respondents had farming experience (11-20 years), (19.00 percent) of the respondents had farming experience (21-30 years) and (13.00 percent) of the respondents had farming experience (31-40 years).

Jakkawad *et al.* (2017) was published a study on the awareness and rates of adoption of pomegranate growers in the Aurangabad district of the Marathwada area of Maharashtra. The authors indicated that the majority of respondents (62.50 percent) had small farming experience, (26.25 percent) had medium farming experience, and (11.25 percent) had high farming experience.

Gayathri (2018) conducted a study on the impact of the new systemic policies in Dafingrad on the marketing of fruits and vegetables. Researchers report that 65.00% of farmers participating in the public sector have medium-scale experience, followed by 20.00% farmers and poor agricultural experience (15%). The average agricultural experience of most cooperative market farmers is 67.50%, followed by the small 20.00%, and the poor agricultural experience is 12.50%. Among the respondents in the private sector, most people have medium (67.50%) agricultural experience, followed by the lowest (17.50%) and poor (15.00%) agricultural experience.

Allahyari *et al.* (2017) conducted a study Regarding "IPM farmers' technical knowledge in olive cultivation in northern Iran. The researcher revealed that the interviewee has 30 years of agricultural experience and the interviewee also has 28 years of olive production history.

2.2 Knowledge of plant-protection measures of sugarcane

Chapke (2000) reveals that farmers in Cha Cha (60.00%) are fully aware of activities such as spraying. Use one teaspoon of detergent (100g) per 250ml of HaNPV; spray the second time for 15-20 days.

Bhople *et al.* (2001) It is estimated that in 73.33% of respondents, less than three-quarters have low awareness scores, while (22.00%) moderate and (4.68%) microbial control information methods are recommended for cotton pest management.

Nagaraju *et al.* (2002) conducted a study in "Farmers' Understanding and Practice of Tomato Leaf Roll Virus Disease Management" (ToLCVD) in Karnataka. More than four-fifths (86.2%) of the respondents knew about ToLCVD,

which is triggered by high temperature, and only (2.3%) of the respondents knew that whiteflies would spread

Veeraiah *et al.* (2005) pointed out that according to the IPM technology, (70.00%) of the respondents have a medium level of knowledge, while (20.00%) and (10.00%) have higher and smaller knowledge levels respectively.

Narayan (2006) found that (38.46%) of the interviewees had a "high degree" knowledge of chemical practice. However, there are (36.15%) and (25.38%) respondents respectively having "medium" and "low" awareness of IPM chemical operations.

Singh *et al.* (2013) conducted a "report on "the use of integrated pest management practices by rice farmers". The author pointed out that there are major knowledge gaps in removing previous crop residues, light and pheromone traps, and insect harvesting and fishing. Handheld. Destruction, pest control, rope use in stagnant crops, and the use of biological agents.

Singh and Narain (2014) conducted their research on the consciousness and level of acceptance of IPM practices among tomato growers in the Indore District of Madya Pradesh, Researchers observed that respondents had less knowledge of the methods of biological Incorporate Pest Management such as bio pesticide use, BPV and NSKE.

Singh *et al.* (2014) revealed that knowledge and age of the farmers were non significantly related with each other.

Sharma *et al.* (2015) in the study entitled "Knowledge of tomato growers in Kheda district of Gujarat about tomato production technology". The researchers concluded that signs of leaf curl disease were identified precisely (83.00 percent) of the respondents, followed by knowledge of control measures (64.00 percent), name of fungicides/insecticides (44.00 percent), and dosage of fungicide/insecticide (35.00 percent).

Sharma *et al.* (2015) conducted the study in “Knowledge of tomato growers about tomato production technology Kheda district of Gujarat”. Investigators revealed that more than four-fifth (82.00%) of the respondents had knowledge on symptoms in the late blight of tomato, 65.00% of the respondents had knowledge of control measures, 46.00% of the respondents had knowledge of the name of the fungicide use; In comparison, 45.00% of the respondents knew the dosage of fungicide.

Sharma *et al.* (2015) researched "Knowledge of tomato growers of Gujarat district's Kheda tomato production technology." Researchers revealed that more than fifty percent, i.e. (53.00 percent) of respondents had knowledge of symptoms in the early tomato blight, (37.00 percent) of respondents had control measurement knowledge, specifically (25.00 percent) had knowledge of the fungicide used to control the disorder disease and (24.00%) of the respondents had knowledge on the dosage of fungicide.

Kumar *et al.* (2017) conducted a study titled "Impact of Awareness on Adoption by Sugarcane Growers in the Integrated Pest Management Practice Meerut". Researchers revealed that most (67.50%) of the respondents had partial knowledge, and the second (25.00%) respondents had complete knowledge about crop rotation.

Mahalakshmi and Tulasiram (2018) studied the IPM practices of pepper farmers in Raichur District, Karnataka. 40.00% of the respondents have a high level of understanding of IPM activities. 100% of pepper growers know the elimination of previous crop residues, summer farming, FYM application, field packing pruning and mutual farming.

Materu *et al.* (2018) A sample survey was conducted on "Farmers' Knowledge of IPM in Cucurbitaceae Production". The author revealed that exactly nine in ten (90.00%) of the interviewees have knowledge of using pesticides provided by agricultural input suppliers to treat different pests.

Sreekanth *et al.* (2018) conducted a study in "Knowledge and adoption of IPM by rice growers in Kadapa district in Andhra Pradesh. The study revealed that (100.00%) of the farmers had knowledge on cultural practices. More than half of the farmers (59.33%) had medium level of knowledge on IPM in rice.

Raj and Aski (2019) used an ex-post-facto research design to evaluate the level of awareness of improved sugarcane growers' cultivation practices in 2018-19 in the Belagavi and Bagalkot districts of Northern Karnataka. Authors reported that more than a third of respondents (38.33%) had a medium level of knowledge, followed by a low (35.83%) and moderate (25.84%) level of knowledge, respectively.

2.3 Adoption Level of various biotic stress management practices of Sugarcane

Pawar *et al.* (2005) found that in terms of soil and planting time, the ratio of using improved sugarcane production technology exceeded 90.0%, the adoption rate of pre-tillage was 66.0%, and the adoption rate of recommended fertilizer nutrients was 15.0%. It was also observed that the situation with the 2-bud kit was poor, and green fertilizer appeared. More than 65.0% of people have adopted emergency management practices.

Poswal *et al.* (2005) shows that 41.36% of farmers use sugarcane technology at a low level, while intermediate and senior farmers use 34.09 and 24.55%, respectively.

Poswal *et al.* (2006), the practice of improving sugarcane planting in varying degrees of acceptance was found, ie. Improved soil preparation system (28.64%), planting time (39.73%), planting process (46.36%), planting rate (26.18%), settlement treatment (33.18%), soil treatment (40.68%) and line-to-line (27.50%).

Nagarja *et al.* (2008) found that the use of weedicides was adopted by 100 percent of respondents and 80.0 percent used the prescribed seed rate, sowing time and 50 percent of respondents adopted the variety of COC-671 and COC-7804 and the use of bio-fertilizer Azotobacter as per recommendation.

Ofuoku *et al.* (2008) studied "Adoption of IPM among farmers in the central agro-ecological zone of delta state of Nigeria". Investigators found that 84.37% of the respondents are non-adopter of IPM practices and (15.63%) of the respondents are the adopter.

Balamurugan and Vetrivelan (2010) showed that 36 percent of marginal farmers had low sugar cane technology adoption rates, while only 47.50 percent of small farmers had medium adoption rates. In the case of large growers, 58.75 percent of them had high adoption levels.

Sasane *et al.* (2010) showed that most sugarcane growers have fully adopted the planting season (38.33%), seed rate (58.33%), intercropping (92.50%), improved varieties (67.50%) and plant protection (48.33%). .

Saju George *et al.* (2012) The study was conducted by "Adopting IPM Practices in Vegetable Crops in Karnataka". The author found that the majority of vegetable farmers (63.71%) adopted moderate IPM practices. IPM operations, such as field pruning, crop rotation, high-bed planning, seed care, use of high-quality seedlings, and summer farming are widely accepted.

Bhingrdawe (2013) found that 80% of sugarcane growers did not use soil testing for comprehensive nutrient management. In terms of chemical fertilizer treatment, 60% of farmers did not use proper fertilizer time and quantity during the sugarcane planting season of Adsali and Suru.

Chouhan *et al.* (2013) found that the majority of respondents (74.16%) had a medium degree of adoption of improved cultivation practices for sugarcane. A negligible percentage of respondents, 13.34 percent and 12.50 percent, respectively, had low and high levels of adoption. Further, majority of sugarcane growers had poor adoption level about green manure application, soil testing, bio-fertilizer application, seed treatment, disease management and integrated pest management.

Kiruthika (2013) conducted a study in "Adoption of IPM practices of onions in Tamil Nadu." The researcher revealed that more than one-sixth (17.42%) of

respondents adopted *Trichoderma viride*, (15.33%) of respondents adopting *pseudomonas fluorescens* and (1.89 %) of respondents adopted VAM in biological practices.

Peshin (2013) was carried out by a research on the adoptability of integrated cotton pest management by farmers, revealed by a new approach. Researchers have discovered that farmers have very different attitudes towards adoption. In particular, farmers have typically adopted practices that have no difficulties, economic benefits and observability that are more important. IPM methods have been widely accepted, with adoptability indices higher than 0.60. A correlation coefficient of 0.88 was well associated with the expected adoptability and real successful implementation of IPM.

Kumar (2019) is a study conducted by sugarcane growers in the Champaran district of eastern Bihar. The majority of sugarcane growers have adopted moderate agronomic practices (49.16%). In the land preparation strategy, most respondents (50.50%) adopted leveling. Most respondents (70.83%) used improved varieties; most respondents (86.66%) chose sugarcane with eye buds; most respondents (74.16%) used diammonium phosphate fertilizer; In the case of management, most respondents (80.84%) used irrigation in the sugarcane formation stage; most respondents (60.00%) took weeding measures on sugarcane within 60-70 days; in terms of insect control, most respondents Respondents (64.16%) adopted sugarcane sprout bore control measures; in terms of disease management, most respondents (72.50%) used Dithane M-45 to control rust. Most respondents (86.66%) adopted logging management. The main reason for not adopting improved technologies is insufficient knowledge and unavailability of these technologies.

2.4 Constraints to adoption of biotic stress management practices as perceived by the sugarcane growers

Chitinis and Kothikhane (2000) revealed that lack of visit of scientists to farmers field (13.00%) and lack of opportunity for direct interaction with the

scientists (4.0%) were constraints for non-adoption of IPM technology by the farmers, which in turn effect the implementation of IPM program on their field.

Chandler (2002) pointed out that road facilities are poor (46.67%), land is scarce and fragmented (45%), soil fertility is low (21.67%), stray animals damage crops (18.33%) and young people who are not interested in agriculture The main socio-economic constraints faced by sugarcane growers (13.33%). The crop damage caused by stray animals to disaster-stricken farmers is very important, because most farmers have a small area under sugarcane planting, and each invasion destroys about 2-3 tons of sugarcane. This caused huge losses to farmers. The farmers believe that these factors have greatly affected their production and put forward their suggestions to solve this problem urgently.

Nagaraja (2002) revealed that various constraints expressed in the adoption of sugarcane cultivation are high cost of fertilizer, delay in release of loan by the banks, high rate of interest, delay in transport of harvested cane from field by the factory.

Khan & Khan (2004) found that major difficulties faced by farmers in adoption of recommended sugarcane cultivation practices include the high cost of farm machinery, high cost of herbicides, scarcity of irrigation water, lack of credit facilities, lack of finance, and lack of awareness.

Poswal (2005) observed that the limitations of adopting improved sugarcane production technology are lack of knowledge, lack of technical guidance, high input costs, lack of funds, drought, dishonesty in weighing raw materials, low sugarcane production and late payment.

Singh and Singh (2007) found that the main constraints of IPM in sugarcane planting are insufficient knowledge of the recommended dosage of pesticides, insufficient knowledge of harmful and beneficial insects, lack of timely and appropriate technology transfer and provision of relevant information in promotion organizations. Information about sugarcane cultivation, high cost of pesticides and

biological agents, lack of funds to purchase pesticides, lack of pesticide-resistant varieties, and agricultural literature on low-quality pesticides.

Nagaraja *et al.* (2008) found that various constraints to the adoption of sugarcane cultivation include high fertilizer costs, delayed bank lending, high interest rates, and delays in transporting sugarcane harvested from factories from the field.

Singh *et al.* (2008) revealed that most important constraints faced by sugarcane growers were irregular supply of electricity and canal water for irrigation during cropping season, low price of produce in comparison to cost of cultivation, and lack of confidence about purity of seeds.

Sasane *et al.* (2010) revealed that all sugarcane growers faced constraints like load shading of electricity. A large majority i.e. 76.67 per cent of the respondents faced the constraints of non-availability of improved varieties and non-availability of fertilizer 72.50 per cent. About 70.0 percent of farmers faced the constraints of lack of quantity of water supply for irrigation and 70.0 percent faced the constraints of technical knowledge about proper use of micronutrients.

Banerjee and Biswal (2010) pointed out that the main obstacles to adopting sugarcane practices are timely bank financing, high labor costs, inability to obtain the required amount of high-quality planting materials, poor performance of existing varieties, and lack of knowledge of suitable varieties. Sugarcane varieties. High output value and insufficient demonstration of the latest technology.

Rai *et al.* (2012) found that the main obstacle to adopting the recommended sugarcane production technology is the inability to obtain credit in time, followed by the inability to obtain seeds in time, the lack of irrigation facilities, the inability to obtain improved seed varieties in time, and the lack of training programs on improving agriculture and plant protection . Insufficient knowledge, lack of appropriate information, lack of timely fertilizer, lack of timely input, and failure of extension staff and agricultural officials to conduct field visits.

Bhingardeve *et al.* (2013) found that all sugarcane growers are faced with such constraints: lack of technical knowledge about fertilizer dose conversion based on soil test results, unavailable soil testing laboratories in nearby areas, high prices, and unavailability of direct access in time. fertilizer.

Teeluck *et al.* (2016) reported that in the months from September to December, sugarcane growers faced repeated problems with irrigation water shortages. This water shortage is particularly serious in the north and west of Mauritius, where the total sugar production accounts for about 30% of the total production, and this happens when the daily water demand of crops is about 6 mm.

2.5 Suggestions from the sugarcane growers to overcome the constraints.

Maraddi (2006) concluded the suggestions expressed by sugarcane growers. In light of constraints faced, the major suggestion expressed was providing credit at lower interest rate and at required time cost of complex fertilizers should be reduced, conduct demonstrations on different sustainable cultivation practices in sugarcane to show their efficacy proper schedule of varietal harvesting must be followed by sugar factories, organize training programmes on sustainable cultivation practices in sugarcane, provide pest and disease resistant varieties through sugar factories and research stations/KVKs. conduct as many as group discussions, krishimela and exposure trip to sugarcane growers to convince the benefit of various sustainable cultivation practices. establish sugarcane growers club and conduct regular meetings with scientist and progressive farmers.

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.

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

CHAPTER – III

RESEARCH METHODOLOGY

The following chapter includes all the statistical analysis, method and many procedures which were used during the entire research work. Each and every step which has been taken during the time of investigation is clearly presented in the chapter. The research methodology used for the purpose is presented under the following headings:

- 3.1 Location of the study area
- 3.2 Sample and Sampling procedure
 - 3.2.1 Selection of the district
 - 3.2.2 Selection of block
 - 3.2.3 Selection of village
 - 3.2.4 Selection of respondents
- 3.3 Variables of the study
- 3.4 Operationalization of independent variables and their measurement
- 3.5 Operationalization of dependent variables and their measurement
- 3.6 Constraints faced by the sugarcane growers and suggestions for the improvement.
- 3.7 Type of the data obtained from the respondent in view of the objectives of the study
- 3.8 Development of interview schedule
- 3.9 Collection of data
- 3.10 Statistical methods
- 3.11 Conceptual model of the study

3.1 Location of the study area

The study was carried out in Surajpur district of Chhattisgarh State of India. Surajpur district is falls on the latitude line 23.22° north and the longitude line 82.85° east (Source: <http://www.mapsofindia.com>). The elevation of Surajpur district is 528 meters (1,732 ft). It is spread around an area of approximately 2,786 square

kilometers (Source: surajpur.nic.in). Surajpur lies under Northern hills of Chhattisgarh agro climatic zone of Chhattisgarh. (Source: agropedia.iitk.ac.in).

3.2 Sample and Sampling Procedure

3.2.1 Selection of district

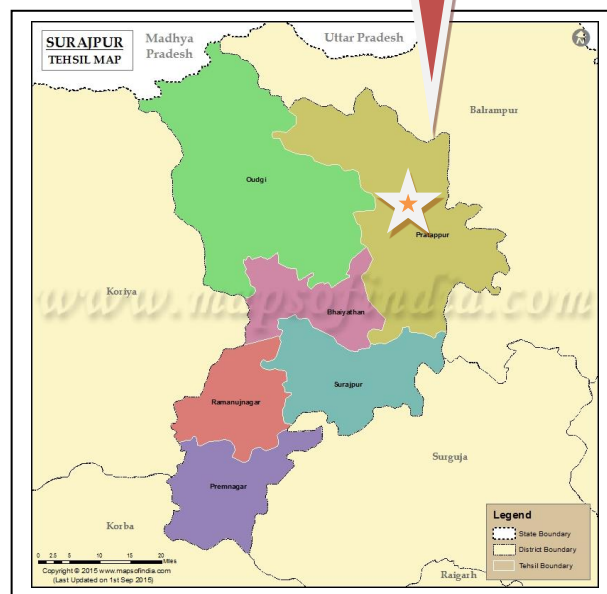
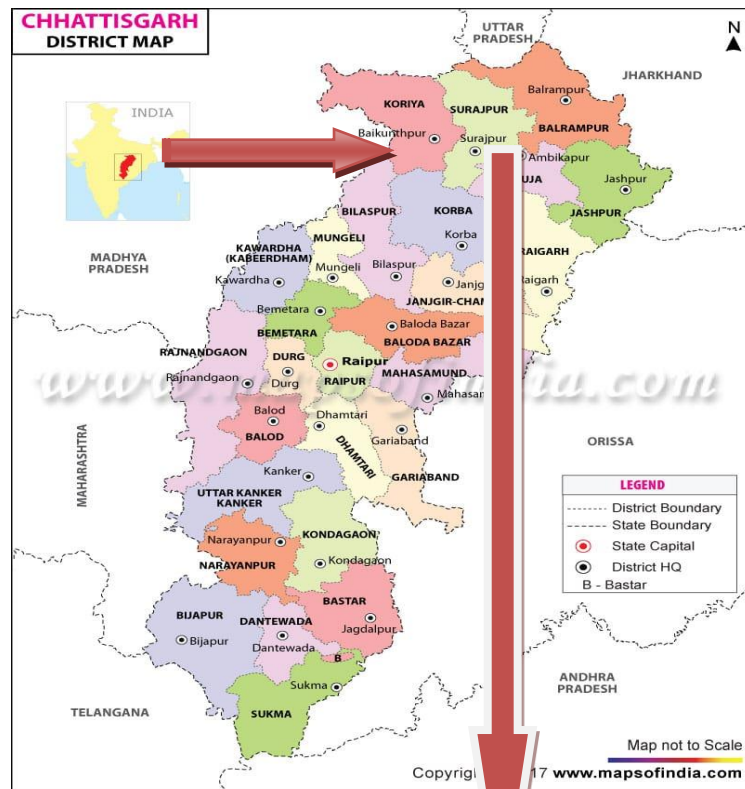
The study was carried out in the Surajpur district of Chhattisgarh during 2018-2019 Surajpur district was selected purposively due to the reason of because of the maximum area under the sugarcane in Northern Hills Agro-climatic Zone of Chhattisgarh. The district is spread around an area of 2,786 square kilometers. Geographically, the district lies between the latitude $23^{\circ}13'$ and 23.22° north and the longitude $82^{\circ}51'$ and $82^{\circ}85'$ east. The district is surrounded by Balrampur district in the east, Surguja district in south-east, Korba district in the south and Korea district in the west. It also touches the Singrauli district of Madhya Pradesh in north. According to the reports of Census India 2011 population of district Surajpur is 789,043 out of which male population was 398,381 and female population was 390,662. The district has 547 number of villages. 79.89 per cent was the literacy rate of the district, with the female having 72.66 per cent literacy rate.

3.2.2 Selection of blocks

There are 6 blocks in this district, namely Pratappur, Odagi, Bhaiyathan, Ramanujnagar, Preminger and Surajpur. Out of total 6 blocks in the Surajpur district only 1 block namely Pratappur was selected purposively looking to the maximum area under the sugarcane.

3.2.3 Selection of village

Out of the total 72 villages in the block, 15 villages were selected randomly for the study.



★ = Selected district

Fig 3.1: Map showing the location of the research area (Pratappur block of Surajpur)

3.2.4 Selection of respondents

Village wise list of sugarcane growers were prepared and from each village, 08 sugarcane growers were selected randomly. Thus, 120 sugarcane growers (08x15=120) were considered as respondents for the present study.

3.3 Variables of the Study

Variables	Measurement
Independent variables	
➤ Age	Chronological age of the respondents
➤ Education	The scale developed by Pareek and Trivedi (1963)
➤ Caste	The caste of the respondents was categorized
➤ Occupation	The procedure followed by Virendra Kumar Painkra (2014)
➤ Land holding	The procedure followed by Mirza Altaf Beg (2016)
➤ Annual income	Income from all sources per annum
➤ Credit acquisition	The scale was developed by Rahul K Tiwari (2014)
➤ Land type used for sugarcane cultivation	Self-prepared arbitrary method
➤ Labour use	Self-prepared arbitrary method
➤ Source of Information	Sources from which farmer get information regarding biotic stress management of sugarcane
➤ Economic motivation	The scale developed by Supe, S.V. (1969)
➤ Planting method	Self-prepared arbitrary method
➤ Varieties	Self-prepared arbitrary method
➤ Knowledge of plant-protection measures of sugarcane	The procedure followed by Rahul K Tiwari (2014)

➤ Experience of sugarcane Farming	The experience of a farmers of sugarcane cultivation in years.
Dependent variables	
➤ Level of adoption of biotic stress management practices	The procedure followed by Rahul K Tiwari (2014)

3.4 Operationalization of Independent Variables and their Measurement

3.4.1 Age:

Age refers to the actual age i.e. chronological age of the respondents which he or she has completed at the time of interview. The data on age was collected by asking the respondents and were categorize into three categories of age and the score for each category were assigned as follows:

S. No.	Categories	Score
1.	Young (<25 years)	1
2.	Middle (26-45 years)	2
3.	Old (> 45 years)	3

3.4.2 Education:

It is measured as the reading and writing capability or as number of years which the respondents have spent in acquiring the formal education. The Scale developed by Pareek and Trivedi (1963) was used to measure this variable, with some due modification. According to the level of education the respondents were divided into following six categories and scores were assigned scores as follow as:

S. No.	Categories	Score
1.	Illiterate	0
2.	Primary School (Up to 5 th class)	1
3.	Middle School (6 th to 8 th class)	2
4.	High School (9 th to 10 th class)	3
5.	Higher Secondary (11 th to 12 th class)	4
6.	Graduate and above	5

3.4.3 Caste

The caste of the respondents was categorized as follows:

S. No.	Categories	Score
1.	General	1
2.	Other Backward Caste	2
3.	Scheduled tribe (ST)	3
4.	Scheduled caste (SC)	4

3.4.4 Occupation:

This is regarded as the various activities performed by the respondent whole round the year to incur income. The scale used by Virendra kumar Painkra (2014) was used to measure this variable. The occupation performed by the Kisan mobile advisory services like agriculture, agriculture labour, other labour, services, business, animal husbandry and other such as non-timber forest produce etc. was used for the current study. Based on the occupation performed, the respondents were categorized into seven different groups as follows:

S. No.	Categories	Score
1.	Agriculture	1
2.	Agriculture labour	2
3.	Other labour	3
4.	Service	4
5.	Business	5
6.	Animal husbandry	6
7.	Other (NTFP's)	7

3.4.5 Size of Land holding:

It can be defined as the total land possessed or taken as rent by the farmer at the time of personal interview. The scale used by the procedure followed by Mirza Altaf Beg (2016) was used for measuring this variable. The respondents were divided into four categories as follows:

S. No.	Categories	Scores
1.	Marginal farmer (Up to 1 ha.)	1
2.	Small farmer (1.1 to 2 ha.)	2
3.	Medium farmer (2.1 to 4 ha)	3
4.	Larger farmer (more than 4 ha)	4

3.4.6 Annual Income:

It referred to the total annual income earned by the respondent by engaging in various activities whole round the year. The data on this was collected directly by asking the respondents during the time of interview. According to their yearly income, the respondents were divided into following groups and the scoring was done as follows:

S. No.	Categories	Score
1.	Up to Rs. 100000	1
2.	Rs. 100000-250000	2
3.	Rs. 250001-500000	3
4.	Above Rs.500000	4

3.4.7 Credit acquisition

The availability of credit needed to purchase the required inputs may influence the extent of adoption of new techniques to the farmers. The adoption of improved agricultural technology requires more investment of capital in farming to purchase the inputs like fertilizers, pesticides, improved seed, implements etc. Sources of credit were identified including cooperative society, nationalized banks, moneylenders, friends, neighbours, relatives, etc and each source was given equal weight-age and the availability of credit identified by farmers were then measured by the following scores.

S. No.	Particulars	Score
1.	Not Acquired	0
2.	Acquired	1

3.4.8 Land type

The different forms of soils of study area which is Pratappur block of Surajpur district are described as below.

S. No.	Type of Land	Score
1.	Up land (Dand)	1
2.	Mid land (Chanver)	2
3.	Low land (Bahra)	3

3.4.9 Labour use

Actual number of labour i.e. family or hired were used for different activities man-days/hectare were recorded.

3.4.10 Source of Information:

Source of information play a vital role in the diffusion and adoption of new ideas and innovation. To know the source of information about soil health card, a list of specific information sources were prepared initially based on literature available and discussion with the scientists/ field extension functionaries. Each respondent were asked to indicate his or her response about use of sources information by indicating as ALWAYS, SOMETIMES or NEVER answers. THREE TWO ONE scores was given respectively for the answers.

The respondents were grouped into three levels of source of information by using mean and standard deviation.

S. No.	Categories	Score
1.	Low (up to 3 sources)	1
2.	Medium (4-5 sources)	2
3.	High (> 5 sources)	3

3.4.11 Economic Motivation:

It can be defined as the maximum benefit, which one gets from his/her occupation and the relative value put forward by a farmer on economic terms. The scale developed by Supe, S.V. (1969) is used to measure the variable with some due

modifications. The scale includes six statements. Out of all the six statements, only sixth statement was negative rest all were positive. The modifications were made on the continuum range i.e. instead of taking responses on five continuum, three continuums have been used for measurement. For the positive statements, the scoring was done as 2 for Agree, 1 for undecided, and 0 for disagree. In addition, for the negative statements the scoring was reversed. economic motivation score of the respondents, they can be grouped into three categories namely ‘Low’, medium’ and ‘high’ by using mean and standard deviation.

S. No.	Categories	Score
1.	Low (<mean- S.D.)	1
2.	Medium (mean \pm S.D.)	2
3.	High (>mean + S.D.)	3

3.4.12 Planting method

In the study area, mainly 4 types of planting methods are applied for the sugarcane cultivation i.e. Flat-bed method, Sowing pit method, Trench method and Ring-pit method. To computation of the data was performed under the above-mentioned planting methods.

3.4.13 Varieties

Under this investigation, the sugarcane varieties cultivated by the respondents were recorded and area under the particular varieties were incorporated in the study and scoring was done in following manner.

S. No.	Categories	Score
1.	Only traditional varieties	1
2.	Traditional + recommended varieties	2
3.	Only recommended varieties	3

3.4.14 Experience of sugarcane farming

This made reference to the number of years in which the respondents were actually engaged in farming. Based on the actual number of years, classification of respondents into 3 categories as low, medium and high agricultural experience, as set out below.

S. No.	Categories	Score
1.	Low (4-5 years)	1
2.	Medium (5-10 years)	2
3.	High (> 10 years)	3

3.4.15 Knowledge of plant protection measure of sugarcane

Knowledge about innovation may be an important factor affecting the adoption behavior of farmers. Bloom defined knowledge as “those behavior and best situation which emphasized the remembering either by recognition or recall of ideas, materials on phenomenon.” Operationally knowledge was used in this study as actual knowledge of farmers regarding four selected practices i.e. physical, cultural, chemical, biological control etc. The responses of respondents regarding knowledge were obtained into three-point continuum as under.

S. No.	Categories	Score
1.	Partial level of knowledge	1
2.	Medium level of knowledge	2
3.	High level of knowledge	3

Knowledge Index =

$$\text{Knowledge Index} = \frac{\text{Obtained score}}{\text{Maximum obtainable score}} \times 100$$

3.5 Operationalization of Dependent Variable and their Measurement

3.5.1 Level of adoption of biotic stress management practices

It is mental process through which an individual pass from hearing about an innovation to final adoption (Roger, 1995).

It is operationalized as the degree of the use of recommended practices. Adoption refers to the extent of use of recommended farming practices of sugarcane cultivation by sugarcane growers.

The level of adoption in this study refers to the degree to which the respondents adopt Recommended plant protection practices in sugarcane cultivation. Adoption of plant protection practices by sugarcane growers was the dependent variable of the study.

S. No.	Response	Score
1.	Non-Adoption	0
2.	Partial Adoption	1
3.	Full Adoption	2

The respondents were requested to answer each question. The answer to each question may be 'Yes' or 'No'. The responses to each question given by the respondents were divided into two different categories and assigned the score of 1 and 0 for 'Yes' and 'No' answer respectively. The scores on all the items of knowledge test of each respondent were summed up and this sum total indicated the knowledge score for that individual respondent. The level of adoption categories were formulated into low, medium and high on the basis of $\text{Mean} \pm 1 \text{ S.D.}$

3.6 Constraints faced by the sugarcane growers and suggestions for the improvement.

To measure the constraints faced by the sugarcane growers in adoption of recommended plant protection technology in sugarcane production, simple ranking technique was applied, each farmer was asked to mention his constraints in adoption of recommended sugarcane plant protection technology in order of degree of difficulties.

Considering the constraints faced by the sugarcane growers regarding adoption of plant protection technology sugarcane in production and to overcome the same in adoption of plant protection technology sugarcane in production successfully, farmers were asked to give their valuable suggestions. The suggestions offered were summed up and ranked on the basis of number and per cent of farmers who reported for the respective suggestions.

3.7 Type of the data obtained from the respondent in view of the objectives of the study

The data pertaining to selected characteristics about socio-personal, socio-economic, technological, communicational, socio psychological, adoption, constraints perceived in terms of adoption and suggestions of respondents were collected as per objectives of the study as primary data. The official information and records were also consulted from the concerning departments as secondary data.

3.8 Development of Interview Schedule

The interview schedule was prepared in accordance with the objectives of the study. The various independent variables and dependent variable was selected on the basis of information collected from various government reports, research articles, and discussions with the officials of Krishi Vigyan Kendra. The interview schedule has been finalized after thorough examination of each and every question or statement by the experts. Possible discussions have been made with subject specialists, scientists for inclusion of relevant variable. The questions were formulated by taking adequate care and precautions for easy understanding of the respondents. Also, the interview schedule was converted in the local language, so that the farmers can easily respond to the interviewer.

3.9 Collection of Data

Both the type of data i.e. primary as well as secondary data was collected for the study purpose. Primary data was collected with the help of a semi structured interview schedule made for the purpose of data collection. The respondents were interviewed personally and several questions regarding the subject were asked to them. Various government reports, census, survey reports and government websites was used for collection of secondary data.

3.10 Statistical analysis

Statistical analysis of quantitative data is an important aspect of research work, as it facilitates the condensation and interpretation of collected data, interpretation of complicated data in simple form, help in predicting future trends,

helps in establishing relationship between different variables and provides sound base of policy formation. After data collection, the data were presented in 'data matrix' in the form of ungrouped data for further analysis. Data were analyzed in light of objectives set forth for the study. The statistical techniques used for data analysis were as follows:

3.10.1 Frequency

It was calculated to find out the number of respondents in a particular cell.

3.10.2 Percentage

Percentage values were calculated to make simple comparisons. The frequencies of a particular cell were divided by total number of respondents and multiplied by 100.

$$P = (n/N) \times 100$$

Where,

n = Frequency of a particular cell

N = Total number of respondents in that particular cell

P = Percentage

3.10.3 Arithmetic mean

Mean scores for each category were calculated separately by the following formula:

$$\text{Arithmetic Mean}(\bar{X}) = \frac{\sum_{i=1}^n X_i}{n}$$

Where,

X_i = i^{th} Score

n = Number of observations

3.10.4 Standard deviation

It is a measure of variability in a set of scores and was computed for the purpose of analysis and further categorization. The formula used for calculating standard deviation was as follows:

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

Where,

σ = Standard deviation

X_i = i^{th} score Value

\bar{X} = Arithmetic Mean

n = Total number of observations

3.10.5 Mean Percent Score (MPS)

Based on the total scores obtained by the respondents, need mean score was worked out by using the following formula:

$$\text{MPS} = \text{Total obtained score} / \text{Maximum obtained score} \times 100$$

3.11 Conceptual model of the study

Conceptually the variables under the study are presented in fig. 3.2. It is conceived that the dependent variables adoption was influenced by the independent variables.

CHAPTER IV

RESULT AND DISCUSSION

This chapter deals with research findings of the study together with relevant discussion on the facts. Findings of the study have been presented and inferences were drawn from them in relation to specific objectives of the study set forth. Findings of the present investigation on study on biotic stress management practices adopted by the sugarcane growers of Surajpur district of Chhattisgarh are presented under the following headings:

4.1 Profile of the Sugarcane Farmers in Surajpur district of Northern Hills Zone of Chhattisgarh

- 4.1.1 Age
- 4.1.2 Education
- 4.1.3 Caste
- 4.1.4 Occupation
- 4.1.5 Size of land holding
- 4.1.6 Annual Income
- 4.1.7 Credit acquisition
- 4.1.8 Land type used for sugarcane cultivation
- 4.1.9 Labour use
- 4.1.10 Sources of information
- 4.1.11 Economic motivation
- 4.1.12 Planting method
- 4.1.13 Varieties
- 4.1.14 Experience of sugarcane farming

4.2 Knowledge of plant-protection measures of sugarcane

4.3 Adoption Level of various biotic stress management practices of Sugarcane

4.4 Constraints to adoption of biotic stress management practices as perceived by the sugarcane growers

4.5 Suggestions from the sugarcane growers to overcome the constraints.

4.1 Profile of the Sugarcane Farmers in Surajpur district of Northern Hills Zone of Chhattisgarh

The farmers sampled for present study represent Sugarcane growers in Surajpur district of Chhattisgarh sampled randomly for to meet the objectives of the study. The profile of the farmers is studied in three contexts, firstly, in context of socio-personal attributes; secondly, socio-economic characters and lastly, communicational sources use pattern of the farmers.

4.1.1 Age

Table 4.1: Distribution of the respondents according to their age

S. No.	Category	Frequency	Percentage
1	up to35	4	3.33
2	36 to 50	81	67.50
3	above50	35	29.17
Total		120	100.00

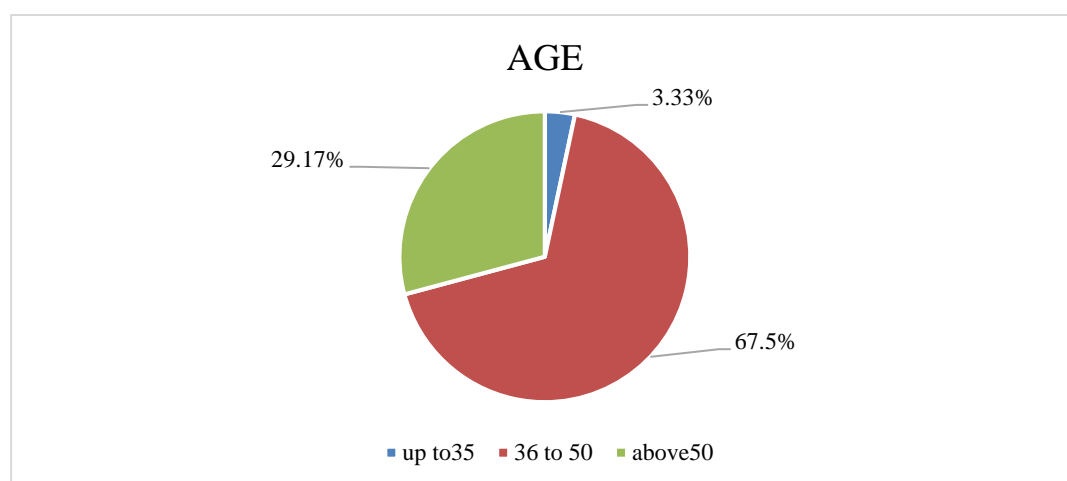


Fig. 4.1: Distribution of the respondents according to their age

The Table no. 4.1 shows that major percentage of the respondents (67.50%) were of middle age i.e. 36 to 50 years old, followed by 29.17 per cent respondents belonging to old age category and only 3.33 per cent of them belonging to young

age category. This observation is in line with the finding of Chauhan (2016) and Ganeshan *et al.* (2013).

4.1.2 Education

The Table 4.2 shows the education level of the respondents and according to it majority of the respondents (26.66%) were educated up to higher secondary, followed by middle school (24.17%), graduate and above (14.17%), high school (11.67%), primary school (5.00%) and (18.33%) among the respondents was illiterate. This is in conformity with the result by Shafi *et al.* (2018), Ogbeide, and Ele (2015).

Table 4.2: Distribution of the respondents according to their education

S. No.	Education categories	Frequency	Percentage
1	Illiterate	22	18.33
2	Primary School (Up to 5 th class)	6	5.00
3	Middle School (6 th to 8 th class)	29	24.17
4	High School (9 th to 10 th class)	14	11.67
5	Higher Secondary (11 th to 12 th class)	32	26.66
6	Graduate and above	17	14.17
Total		120	100.00

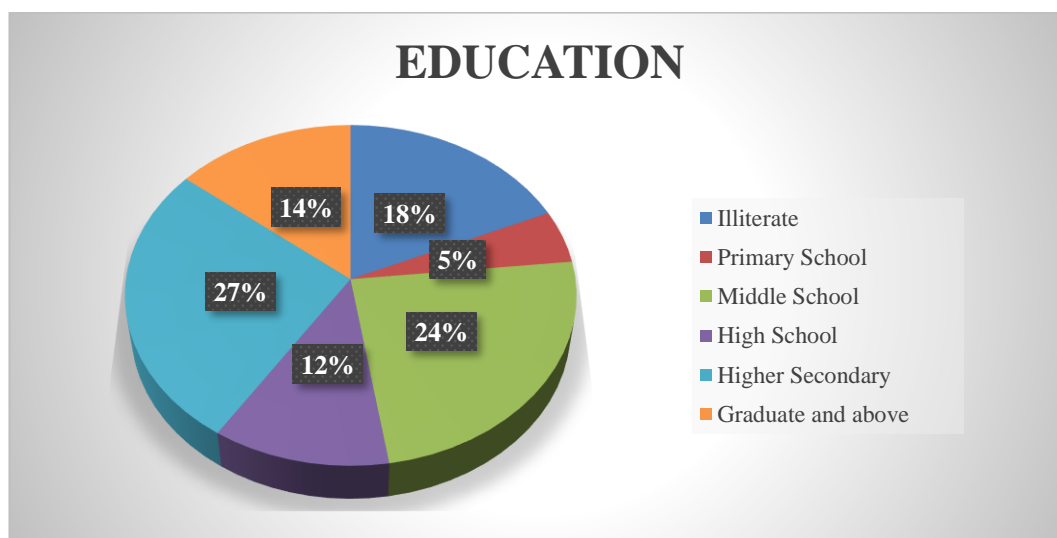


Fig. 4.2: Distribution of the respondents according to their education

4.1.3 Caste

To build up a thoughtful about the caste of preferred beneficiaries, they were confidential in 4 classes, i.e. General, OBC, ST and Schedule Caste. The consequences have been offered in Table 4.3.

Table 4.3 Distribution of the respondents according to their caste

S. No.	Caste	Frequency	Percentage
1	General	39	32.5
2	OBC	48	40
3	ST	18	15
4	SC	15	12.5
	Total	120	100

The facts on hand in Table 4.3 and fig. 4.3 shows that 40.00 per cent beneficiaries found to OBC, 32.50 per cent of beneficiaries observed to General caste, 15.00 per cent beneficiaries observed to ST and 12.50 per cent respondent belonged to SC. Findings are in agreement with Chaturvedi (2014) who found that about 57.80 per cent of small scale dairy farmer belonged to Yadav caste. It was their traditional occupation. But people belonging to Brahmins, Rajputs and SC/ST have also shown their interest in these activities.

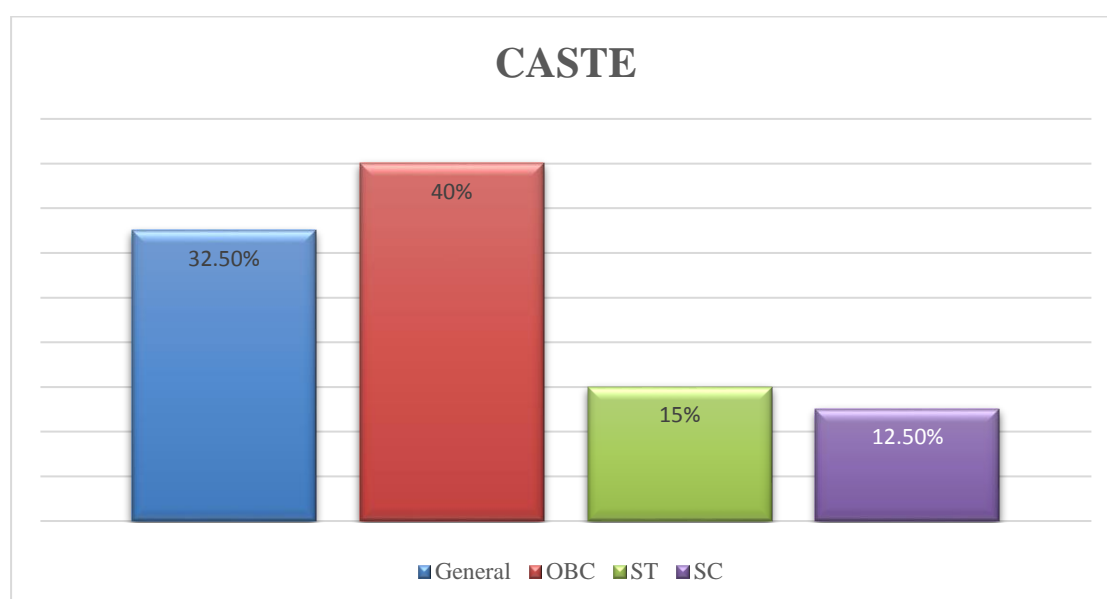


Fig. 4.3: Distribution of the respondents according to their caste

4.1.4 Occupation:

The Table No. 4.4 and fig. 4.4 shows that the higher percentage of the respondents (68.33%) was performing agriculture as their main occupation, followed by 14.17 per cent respondents were doing service as their main occupation, with 9.17 per cent respondents doing business as their main occupation, followed by 8.33 per cent respondents having other labour work as their main occupation, and nobody was performing agriculture labour, animal husbandry and other (NTFPs) as their main occupation.

Table 4.4: Distribution of the respondents according to their occupation

S. No.	Occupational categories	Main occupation		Subsidiary occupation		Overall	
		f	%	F	%	f	%
1	Agriculture	82	68.33	38	31.67	120	100
2	Agri. Labour	0	0.00	6	5.00	6	5.00
3	Other Labour	10	8.33	12	10.00	22	18.33
4	Service	17	14.17	0	0.00	17	14.17
5	Business	11	9.17	3	2.50	14	11.67
6	Animal husbandry	0	0.00	6	5.00	6	5.00
Total		120	100.00				

While the results for the occupation also shows that in the below table that majority of them (31.67%) were having agriculture as their subsidiary occupation, followed by 10.00 per cent respondents having other labour work as subsidiary occupation, 5.00 per cent respondents performing agriculture labour and animal husbandry as subsidiary occupation, 2.50 per cent respondents performing business as subsidiary occupation and nobody was performing service and other (NTFPs) as subsidiary occupation. This observation is in conformity with the conclusion of Sandhu *et al.* (2016).

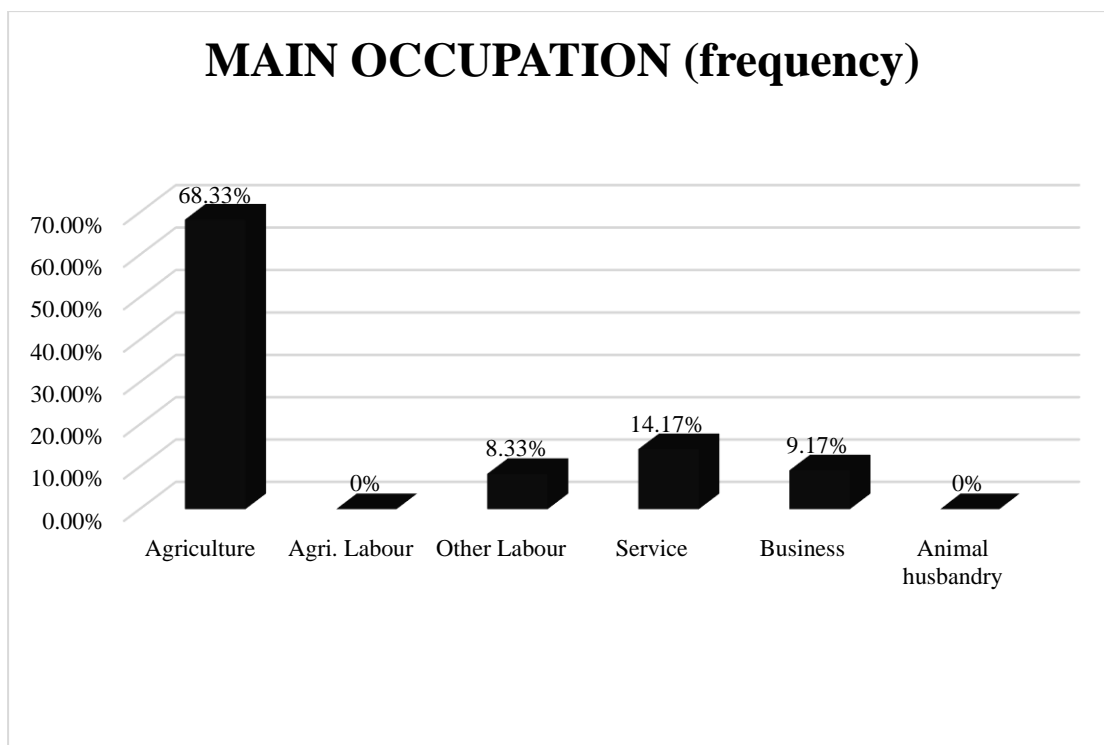


Fig. 4.4: Distribution of the respondents according to their occupation

4.1.5 Size of land holding:

The Table No. 4.5 shows that maximum percentage of respondents (39.17%) were having land holding of size 4.1 to 10.0 hectare, followed by 24.17 per cent respondents having land holding of 2.1 to 4.0 hectare, 20.00 per cent respondents having land holding of 1.1 to 2 hectare and only 9.17 per cent of respondents having land holding more than 10.0 hectare, the least size (up to 1.0) of land holding acquired by 7.50 per cent of respondents. This observation is in conformity with the conclusion of Chauhan (2016), Bhatnagar (2016) and Patra *et al.* (2016).

Table 4.5: Distribution of the respondents according to their size of land holding

S. No.	Size of land holding	Frequency	Percentage
1	Marginal (Up to 1.0 ha.)	9	7.50
2	Small (1.1 to 2 ha.)	24	20.00
3	Semi-medium (2.1 to 4.0 ha.)	29	24.17
4	Medium (4.1 to 10.0 ha.)	47	39.17
	Big (>10.0 ha.)	11	9.16
	Total	120	100.00

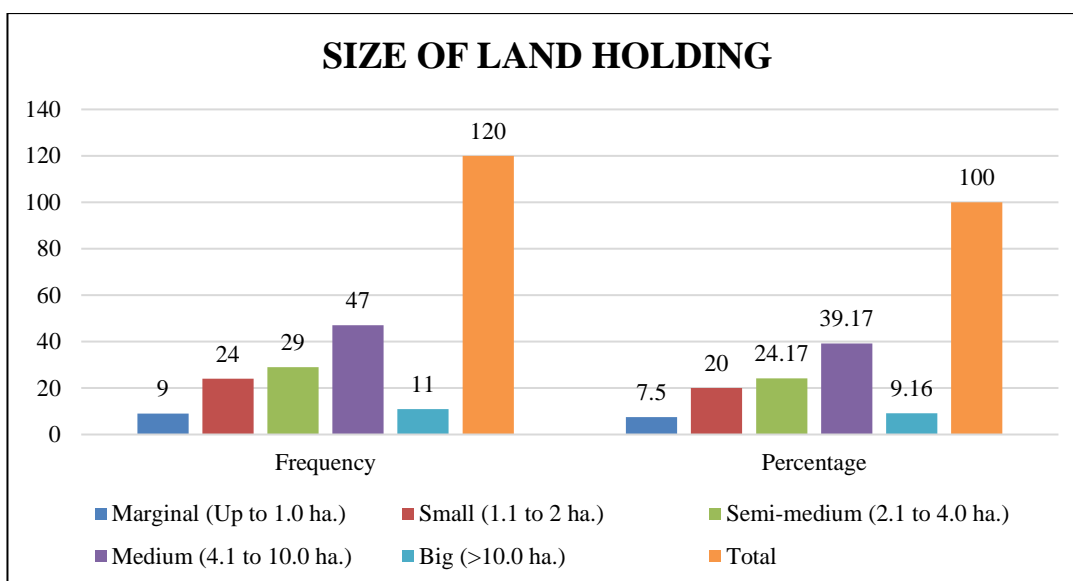


Fig. 4.5: Distribution of the respondents according to their size of land holding

4.1.5.1 Distribution of respondent according to crops grown

Different crops grown by the respondent in the study area. There were four major crops grown by selected respondent and the details are as follows.

Table 4.6: Distribution of the respondents according to different crops grown

S. No.	Crops	Respondents		Area	
		Frequency	Percentage	Area(ha.)	Percentage
1	Sugarcane	120	100	456.74	56.55
2	Rice	86	71.66	147.65	18.28
3	Wheat	47	39.16	131.44	16.27
4	Vegetables	67	55.83	84.77	10.49

*Data are based on multiple responses

The data pertaining in table 4.6 regarding different crops grown by farmers showed that percentage of respondent was found to be 100% in sugarcane farming which was maximum than other crops such as rice, wheat and vegetables having 71.66%, 39.16% and 55.83% respectively.

Further the study also revealed that the area acquired for sugarcane was maximum i.e. 56.55% by selected respondents whereas rice, wheat and vegetables acquire 18.28%, 16.27% and 10.49% of the total area which is 807.67ha.

It can be concluded from the study that maximum respondent and area both engaged in sugarcane cultivation.

4.1.5.2 Distribution of Land according to irrigation availability and sources

Table 4.7: Distribution of Land according to irrigation availability and sources

S. No.	Particulars	Area (ha.)		
		Irrigated	Unirrigated	Total
1.	Own Land	635.34	33.57	668.91
2.	Leased-in Land	265.70	0	265.70
3.	Leased-out land	-93.37	0	-93.37
4.	Waste/Fellow Land	0	17	17
5.	Homestead Area	0	6.75	6.75
	Total Area	807.67	57.32	864.99

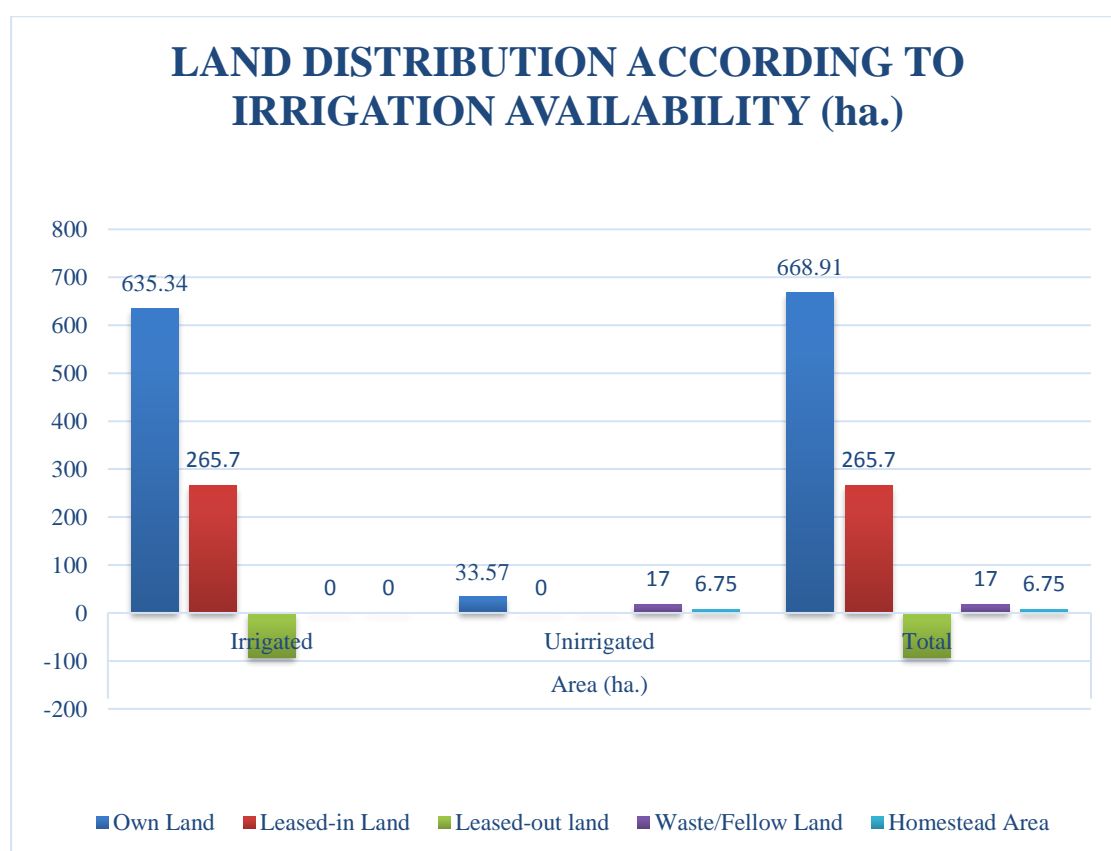


Fig. 4.6: Distribution of Land according to irrigation availability and sources

Further it was found that majority of respondent fall under irrigated condition having an area of 635.45ha. of own land, 265.70ha. leased-in and 93.37ha. was leased-out.

4.1.5.3 Availability of Irrigation under different sources

Table 4.8: Distribution of Availability of Irrigation under different sources

S. No.	Irrigation Source	Area (ha)	Percentage
1.	Open wells	13.66	2.99
2.	Tube wells	423.30	92.68
3.	Canal	15.03	3.29
4.	Other (Dhodhi, etc.)	4.75	1.04
Total		456.74	100

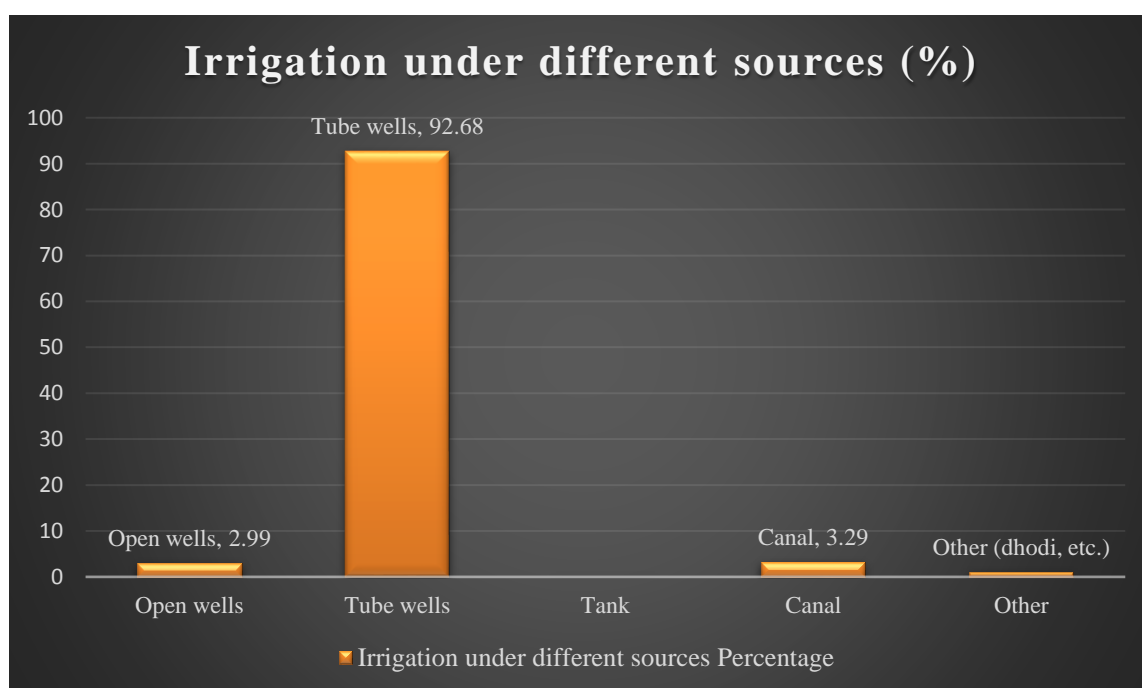


Fig. 4.7: Distribution of Availability of Irrigation under different sources

The data are regarding irrigation source availability is presented in Table 4.8. The finding indicates that the majority of respondents (92.68%) having tube well for their irrigation need with an area of 423.30 ha. in the study area, followed by 3.29 per cent dependent on canal and 2.99 per cent respondent fall under open wells with

an area of 13.66 ha whereas least (1.04%) dependent on the other source of irrigation with an area of 4.75 ha.

4.1.5.4 Distribution of respondent according to type of sugarcane cultivation

Type of sugarcane cultivation adopted by the farmers of the study area given as follows.

Table 4.9: Distribution of respondent according to method of sugarcane cultivation

S. No.	Crop type	Frequency	Percentage	Area(ha.)
1	Main crop	103	85.83	378.88
2	Ratoon	81	67.50	302.30

*data are based on multiple responses

4.1.6 Annual income

Farmers with sound economic conditions, ultimately results in higher adoption of the technology by the farmers. Keeping this in view, the annual income of the respondents was studied.

Table 4.10: Distribution of the respondents according to their annual income

S. No.	Categories	Frequency	Percentage
1.	Up to Rs. 100000	24	20.00
2.	Rs. 100000-250000	66	55.00
3.	Rs. 250001-500000	16	13.33
4.	Above Rs. 500000	14	11.67
Total		120	100

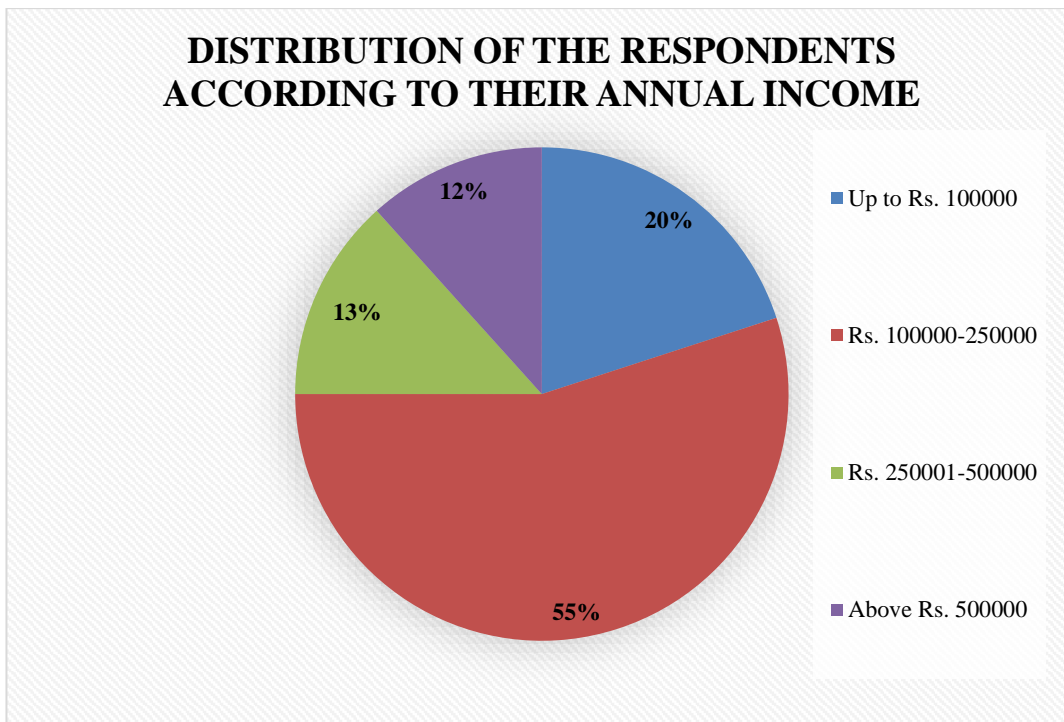


Fig. 4.8: Distribution of the respondents according to their annual income

The result on annual income is presented below in Table No. 4.10 and it can be seen that the major group of respondents (55.00%) were earning income in between Rs.100000.00-250000.00, followed by 20.00 per cent respondents earning up to Rs.100000.00, 13.33 per cent respondents earning in between Rs. 250000.00-500000.00 and very few of them (11.67%) earning above Rs. 500000.

4.1.7 Credit acquisition

The data provided in table 4.11 showed that 63.33% of respondents received credit, while 36.67% of respondents did not receive credit. The majority of respondents (100.00 percent) took short-term credit out of the credit-acquiring respondents (total 76), and none of the respondents acquired medium-term and long-term credit.

In the case of credit sources, the highest number of respondents (57.50 per cent) received loans from nationalized banks, followed by 36.67 per cent receiving loans from cooperative firms, 5.83 per cent receiving loans from associates, neighbors and relatives, etc. The form of credit required by cooperative companies is of a kind. The data revealed that the respondents were aware about the sources of

credit and facilities provided by nationalized banks. This finding is in conformity with findings regarding availability of credit, 94.73 per cent respondents acquire credit easily whereas, 5.27 per cent respondents faced some difficulty to acquire credit from nationalized bank. This may be concluded that majority of the respondents had acquired short term credit from nationalized banks whereas the major sources of credit and the credit facilities were available very easily and quickly. Limje (2000), Mukim (2004) and Lanjewar (2009) also reported similar findings.

Table 4.11: Distribution of the respondents according to their credit acquisition

S. No.	Particulars	Frequency	Percentage
1	Credit Acquisition (n=120)		
	Acquired	76	63.33
	Not Acquired	44	36.67
2	Duration of Credit (n=76)		
	Short term	76	100
	Mid term	00	00
	Long term	00	00
3	Source of credit (n=120)		
	Cooperative societies (Kind loan)	44	36.67
	Nationalized Bank	69	57.50
	Friends/relatives/progressive farmers	07	5.83
4	Availability of credit (n=76)		
	Easy	72	94.73
	Difficult	4	5.27

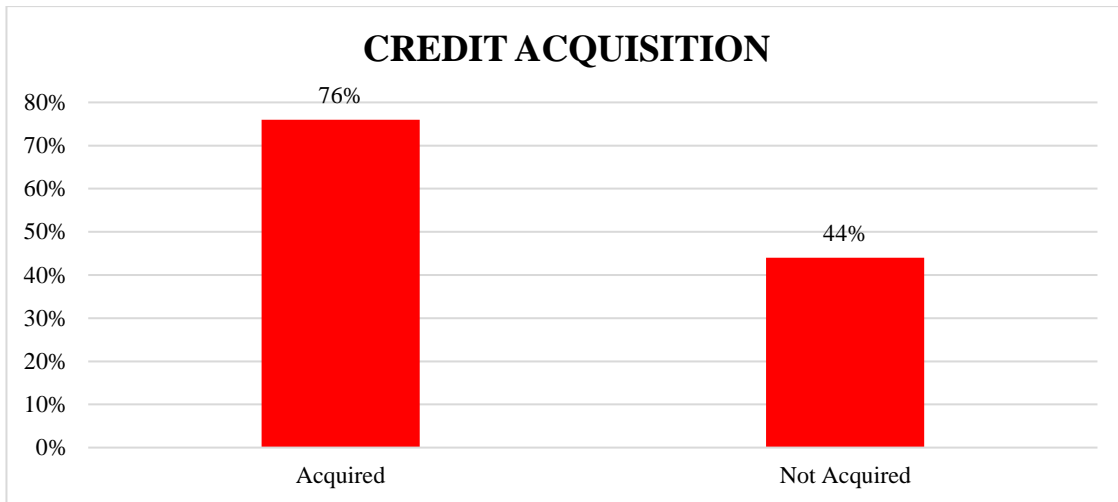


Fig. 4.9: Distribution of the respondents according to their credit acquisition

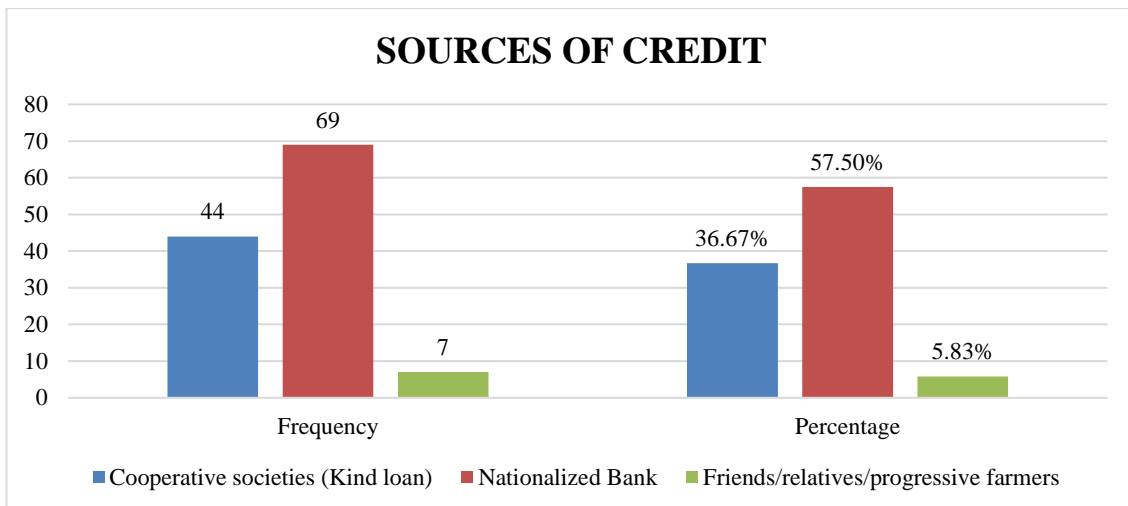


Fig. 4.10: Distribution of the respondents according to their credit acquisition

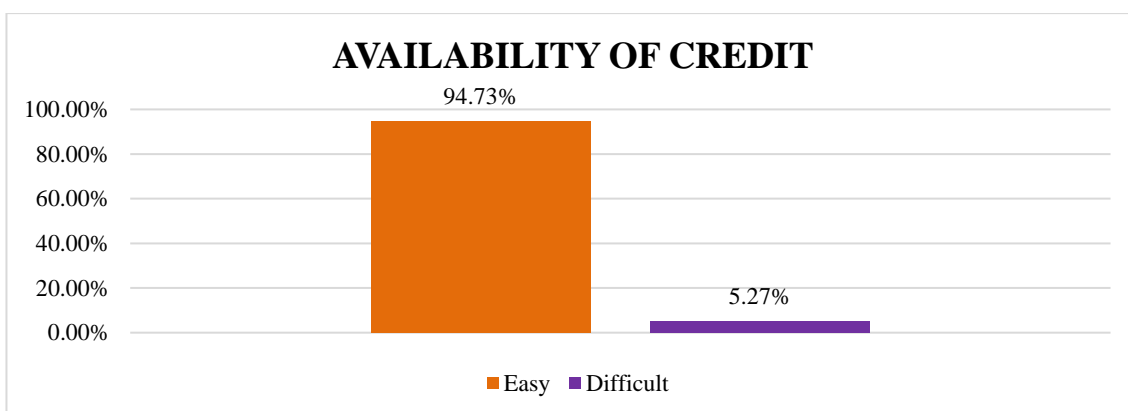


Fig. 4.11: Distribution of the respondents according to their availability of credit

4.1.8 Land type used for sugarcane cultivation

Table 4.12: Distribution of the respondents according to land use for sugarcane farming

S. No.	Type of Land	Area (ha.)	Percentage
1.	Mid land (Chanver)	400.42	87.67
2.	Low land (Bahra)	56.32	23.33
Total		456.74	100

Soils of Chhattisgarh are mainly developed by the action and interactions of relief, parent material and climate. The different forms of soils of study area which is Pratappur block of Surajpur district are described in table 4.12.

The data are regarding land type used for sugarcane cultivation is presented in Table 4.12. The finding indicates that majority of respondents (87.67%) used mid-land (*Gader*) with an area of 400.42 ha in the study area and only 23.33 per cent used low land (*Gadar* or *Bahra*) covering 56.32 ha.

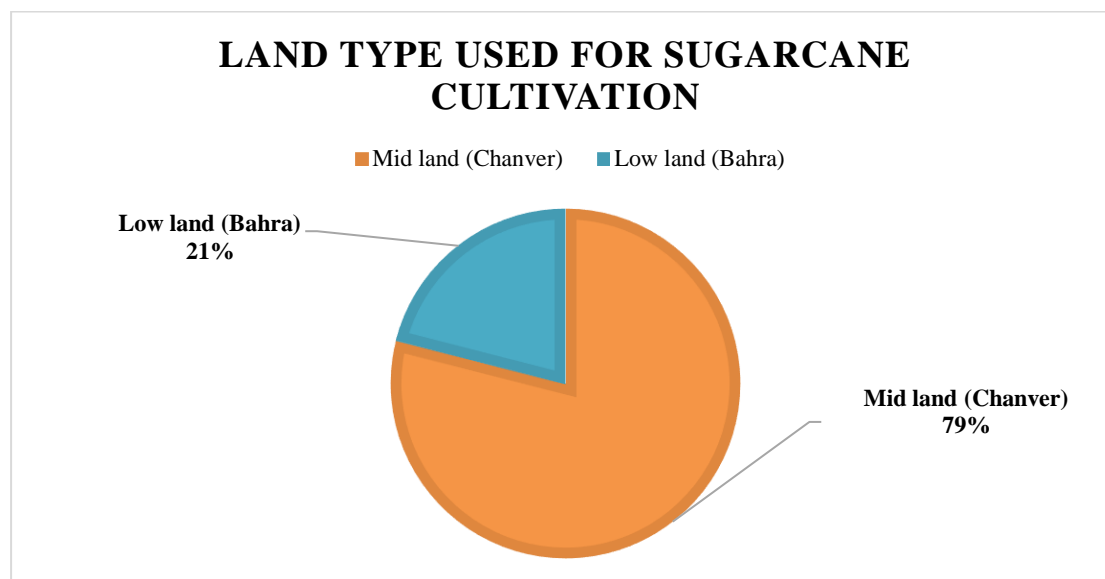


Fig. 4.12: Distribution of the respondents according to land use for sugarcane farming

4.1.9 Labour use

The data are regarding labour type used for sugarcane cultivation is presented in Table 4.13. The finding indicates that majority (61.00%) hired and 39.00% family

labours were used for various operation in field like land preparation, sowing/planting, fertilizer application, earthing, harvesting and other activities.

Further the data presented in table 4.13 regarding labor use among various operations. The finding indicates the majority of labor (28.90%) were used in harvesting with a number of 150, followed by 18.30 per cent labour with a number of 95 in intercultural operations, 11.57 per cent labor used in application of manure and fertilizer, 10.41 per cent labour with a number of 54 used in sowing/planting, 8.28 per cent labour used in earthing with 43 manpower and minimum labour (3.28%) about 17 labour were used in other miscellaneous work.

Table 4.13: Labour utilization pattern regarding sugarcane cultivation practices

S. No.	Practices	Type and number of labours (per ha.)		Total	Share (%)
		Own/Family labour	Hired labour		
1.	Land preparation	12	22	34	6.56
2.	Sowing/planting	14	40	54	10.41
3.	Irrigation	8	18	26	5.00
4.	Manure/Fertilizer application	14	46	60	11.57
5.	Chemical application	6	34	40	7.70
6.	Earthing	17	26	43	8.28
7.	Intercultural/weeding	21	74	95	18.30
8.	Harvesting	27	123	150	28.90
9.	Other miscellaneous work	6	11	17	3.28
Total Labour required		125	394	519	100

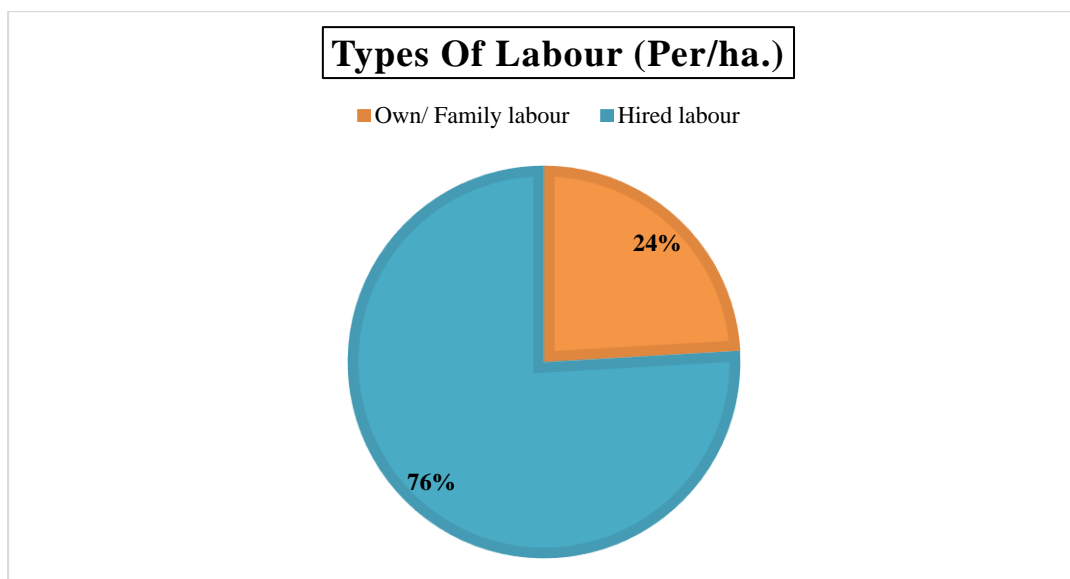


Fig. 4.13: Distribution of respondents according to available labour type

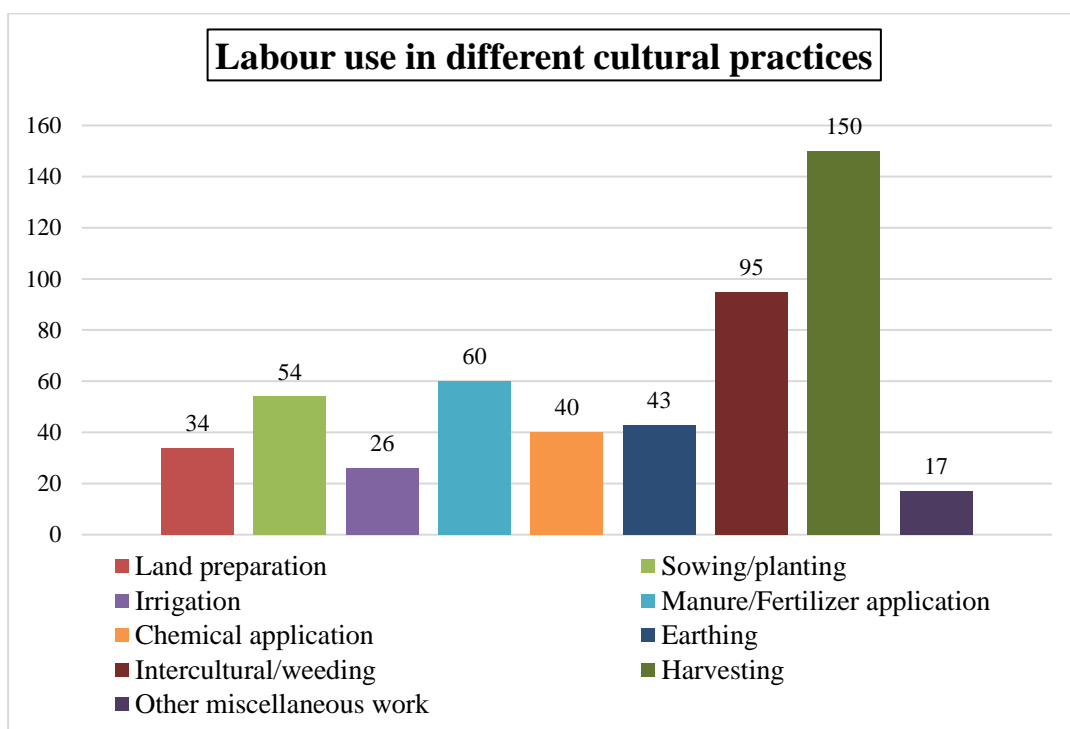


Fig. 4.14: Distribution of respondents according to their labour use pattern

Further it was revealed from study that 7.70 per cent labour used in Chemical application, followed by 6.56 per cent were used in land preparation. Labour used in irrigation was 5.00 per cent with 26 manpower.

The finding clearly indicated that harvesting required maximum number of labour because of qualitative traits of sugarcane would get deteriorate with the time so it needs faster harvesting. Being major producer of sugarcane in the region, farmers have to face scarcity of labour sometimes.

4.1.10 Use of information sources

Table 4.14: Distribution of respondent according to overall use of information source

S No.	Categories	Frequency	Percentage
1	Low	17	14.16
2.	Medium	92	76.66
3.	High	11	9.16
Total		120	100

Table 4.15: Distribution of the respondents according to their use of information sources

S. No.	Sources of Information	Frequency*	Percentage*	Rank
1	Progressive farmer	117	97.5	5
2	Neighbor	108	90	III
3	Friends	34	28.33	VII
4	Local Leaders/Sarpanch	3	2.5	XII
5	Relatives	3	2.5	XII
6	Co-operative society	9	7.5	IX
7	Agriculture magazines	40	33.33	VI
8	Radio	111	92.5	II
9	Television	92	76.66	IV
10	Farmer fair	7	5.83	X
11	Training	44	36.66	V
12	Farm Visit	19	15.83	VIII
13	Leaflet/Pamphlet	5	4.16	XI

*Data based on multiple responses

Approximately 97.50 per cent of respondents received information from radical farmers, 92.50 per cent of respondents received radio information, 90.00 per cent from neighbors, and 76.66. Percentage obtained television knowledge 36.66 percent of information through training, 33.33 percent from agricultural journal, 28.33 percent from friends, 15.83 percent of respondents received information from farm visits, 7.5 percent from cooperative society, 5.83 percent from fair farmers, By leaflet/pamphlet, 4.16% of respondents obtained information, while only 02.5% of respondents obtained information from relatives and local leaders/sarpanch. Painkra (2000), Rajni (2006) and Suryawanshi (2009) have also reported similar findings.

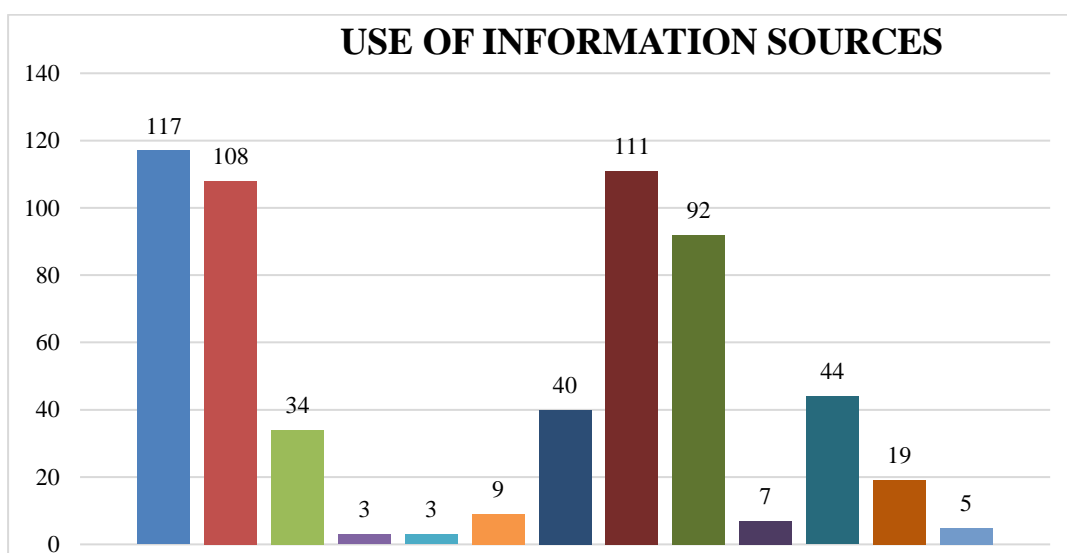


Fig. 4.15: Distribution of the respondents according to their use of information sources

4.1.11 Economic motivation:

Table 4.16: Distribution of the respondents according to their economic motivation

S. No.	Economic motivation	Frequency	Percentage
1	Low (<8.51)	24	20.00
2	Medium (8.51-11.57)	70	58.33
3	High (>11.57)	26	21.67
	Total	120	100.00

The Table 4.16 shows that more than half of the respondents (58.33%) were having medium economic motivation, with 21.67 and 20.00 per cent respondents falling under high and low economic motivation category respectively. This is in conformity with the result by Nargawe (2104) and Chauhan (2016).

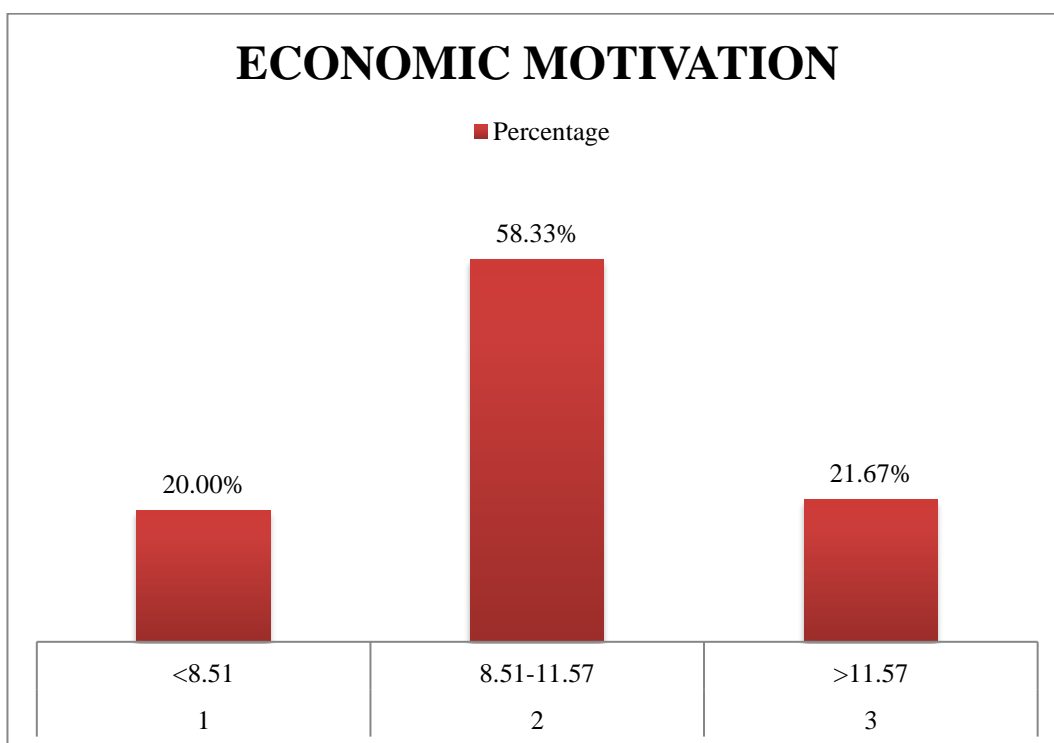


Fig. 4.16: Distribution of the respondents according to their economic motivation

4.1.12 Planting method

Table 4.17: Distribution of the respondents according to planting method of sugarcane

S. No.	Method of planting	Frequency	Percentage	Rank
1	Flatbed method	116	62.37	I
2	Sowing pit method	47	25.27	II
3	Trench method	15	8.06	III
4	Ring-Pit method	8	4.30	IV

The Table 4.17 shows that more than half of the respondents (62.37%) were adopted flatbed sowing method of sugarcane, followed by 25.27 per cent farmer

went up with sowing pit method, 8.06 per cent doing cultivation with trench method and lowest (4.30%) adopted method of planting was ring-pit method.

It was also revealed from current study that alone flatbed method of planting was followed and acquired highest area due to its simple and time saving quality. According to respondent they are very interested to adopt ring-pit method.

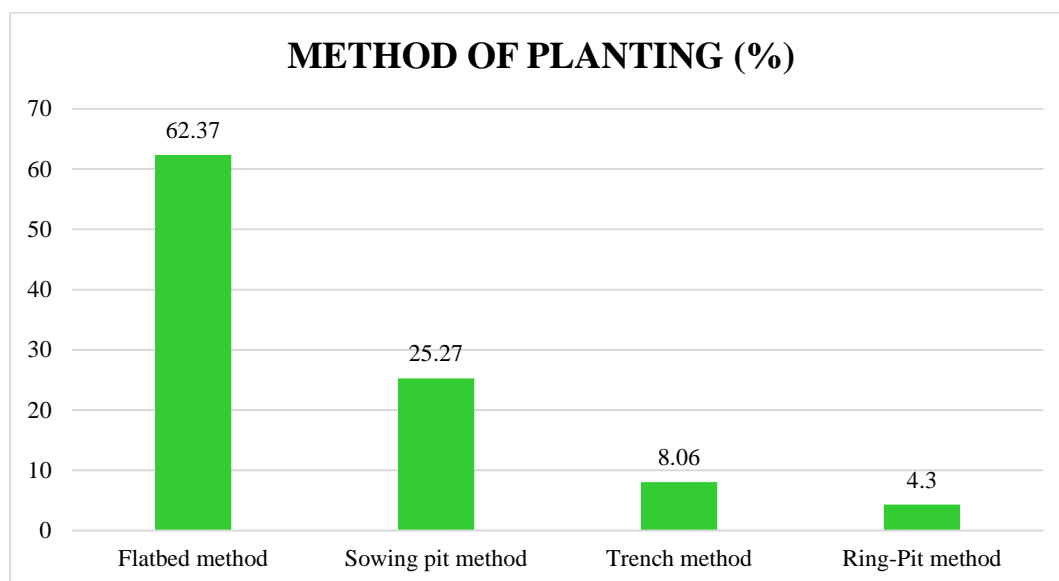


Fig. 4.17: Distribution of the respondents according to planting method of sugarcane

4.1.13 Varieties

Table 4.18: Distribution of the respondents according to varieties of sugarcane grown by them

S. No.	Name of variety	Frequency	Percentage
1.	CO-0118	03	1.85
2.	CO-0238	34	20.86
3.	CO-5191	04	2.46
4.	CO-8036	08	4.90
5.	CO-62175	114	69.93

The data are regarding varieties used for sugarcane cultivation is presented in Table 4.17 and fig. 4.18. Majority of respondent (69.93%) growing CO-62175, followed by CO-0238 holds the second highest (20.86%) grown variety by farmers,

4.90 per cent sugarcane grower raising Co-8036, 2.46 per cent respondent were adopted CO-5191 and CO-0118 was the least sown variety among all. The study also revealed that farmers were moving towards CO-8036 as the performance of this variety is contrasting in this region.

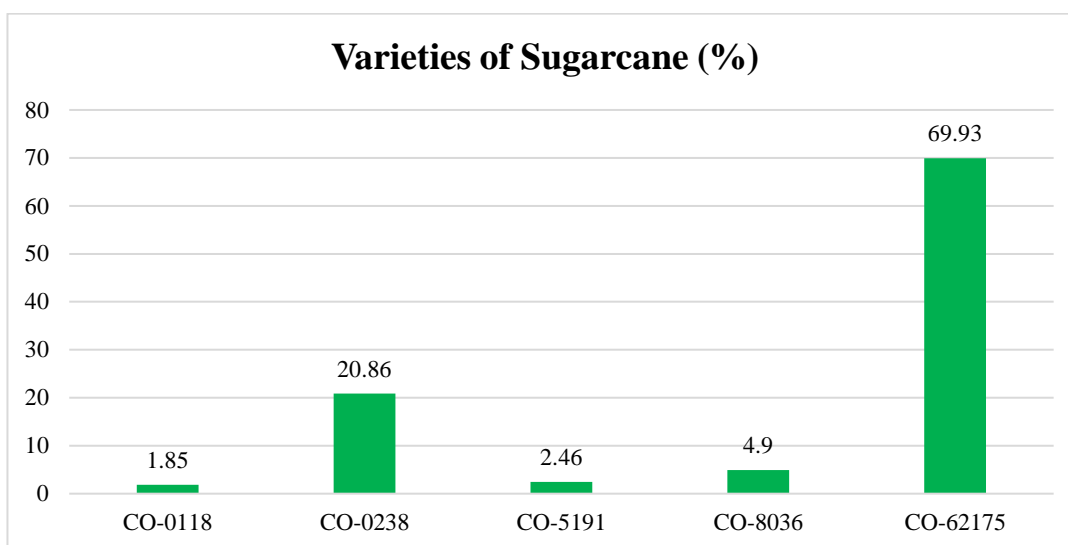


Fig. 4.18: Distribution of the respondents according to planting method of sugarcane

4.1.14 Experience of sugarcane farming

Table 4.19: Distribution of sugarcane growers according to their farming experience

S. No.	Particulars	Frequency	Percentage (%)
1	Low (up to 5 years)	17	14.16
2	Medium (5-10 years)	82	68.34
3	High (more than 10 years)	21	17.50
Total		120	100.00

Table 4.19 indicates that a good number of the respondents was found to be 68.34 per cent in study locale had medium level of farming experience i.e., 5-10 years, 17.50 per cent of the respondents had high level of farming experience (>10 years), and 14.16 per cent of respondents had low level of farming experience i.e., up to 5 years respectively.

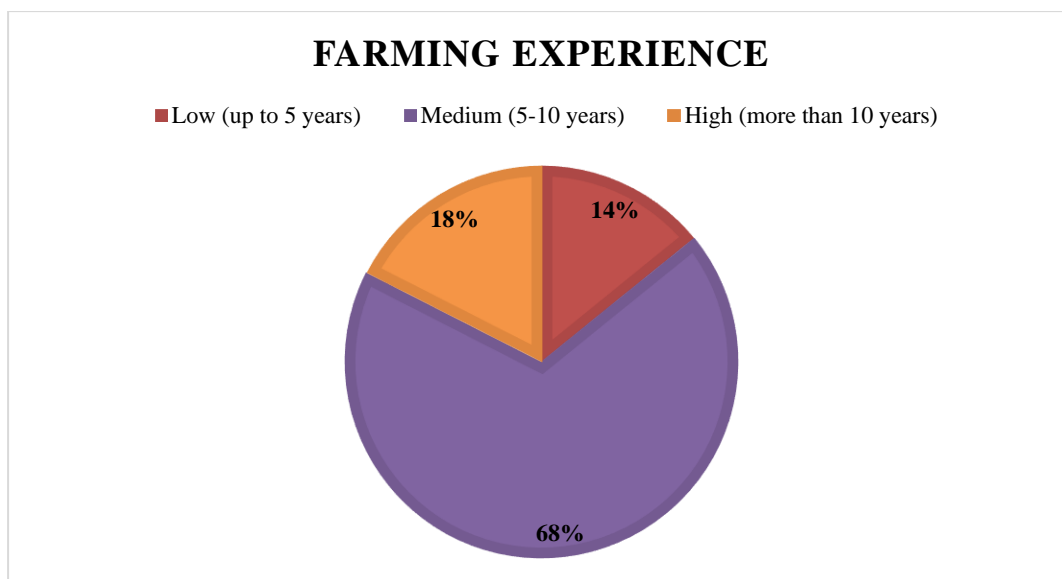


Fig. 4.19: Distribution of sugarcane growers according to their farming experience

This may be due to most of the farmers were engaged in agriculture from their young age and they opted farm as a carrier choice to become self - employed. The results are similar to the Madhushekar (2009) observations.

Hence, it may be concluded from the study that majority of sugarcane growers have more than 10 years of experience of sugarcane farming. The result is also supported by Maraddi (2006), Chauhan *et al.* (2013) and Tiwari *et al.* (2014)

4.2 Knowledge of plant-protection measures of sugarcane

The knowledge of biotic stress management practices, among the sugarcane growers, namely cultural, physical, chemical, and biological control was measured on few important particulars of knowledge test constructed for the study purpose. The knowledge of respondents for different biotic stress management practices was discussed under the following headings:

- 4.2.1 Knowledge regarding cultural practices
- 4.2.2 Knowledge regarding physical practices
- 4.2.3 Knowledge regarding chemical practices
- 4.2.4 Knowledge regarding biological practices

4.2.1 Distribution of respondents according to their practice wise knowledge regarding plant-protection measures of sugarcane

To assess the knowledge level of respondents about plant-protection measures of sugarcane, under cultural practices knowledge index was worked out and the data is compiled in Table 4.20. Regarding cultural practices for control of sugarcane biotic stress, highest knowledge index (96.67%) was found about adequate sowing time. Good level of knowledge level were also recorded towards summer deep ploughing (90.00%), recommended dose of fertilizers and manure (89.17%) and propping (83.33%). Knowledge about selection of healthy setts for sowing (80.83%), first weeding (78.33%), crop rotation with different crop (44.81%), growing resistant varieties (73.33%) avoiding burning of residual (70.83%), avoiding excessive irrigation management (58.33%), growing trap crop (36.67%) was found to be quite low. Poor knowledge level was found for the rouging of diseased clumps (30.00).

Regarding physical practices for control of sugarcane biotic stress, highest knowledge index (89.17%) was found about blind hoing, followed by exclusion of infected plant (70.00%), snap trap (35.84%), removal of dead heart (34.17%) was found to be quite low and least knowledge level was found for moist hot air treatment (10.84%).

While talking about knowledge regarding chemical control practices all the respondent very well aware about pesticide, fungicide and herbicide. The highest knowledge index (97.50%) for chlorpyrifos in terms of pesticide. 85.83 per cent respondents have knowledge about azoxystrobin which is highest and least (60.00%) knowledge about benomyl fungicide. Knowledge regarding herbicide the highest knowledge (100.00%) was found about atrazine followed by diuron (95.83%), simazine (93.33%) and least knowledge level was found for metribuzine (26.67%).

It was also revealed from study that knowledge regarding biological control practices, highest knowledge level (44.74%) was found about sett treatment with *T. viridi* and *T. harzianum*, followed by *Trichogramma* sp. (23.68%), egg parasitoids (18.43) and poor knowledge level was found for *Micromus* larvae (7.89%).

Table 4.20: Distribution of sugarcane growers according to their knowledge regarding plant protection measures of sugarcane

S. No.	Particulars	Knowledge f (%)	No Knowledge f (%)
A. CULTURAL PRACTICES			
1.	Do you know about Summer ploughing?	114 (95)	6 (5)
2.	Do you know about avoiding removal or burning of residues?	85 (70.83)	35 (29.17)
3.	Do you know about resistant or tolerant varieties?	88 (73.33)	32 (26.67)
4.	Do you know about selection of healthy sets for planting?	97 (80.83)	23 (19.17)
5.	Do you know about biodegradable (trash) mulch?	77 (64.17)	43 (35.83)
6.	Do you know about the different trap crops grown in sugarcane (Marigold, Maize, Mustard, Cowpea)?	44 (36.67)	76 (63.33)
7.	Do you know about crop-rotation with different crops?	93 (77.5)	27 (22.5)
8.	Do you know about different Intercrops grow in sugarcane crop (Potato, Lentil, Rajma)?	88 (73.33)	32 (26.67)
9.	Do you about time of sowing/planting?	116 (96.67)	4 (3.33)
10.	Do you know about recommended dose of fertilizers in sugarcane?	107 (89.17)	13 (10.87)
11.	Do you know about removal of water shoots for scale insect control from sugarcane plot?	47 (39.17)	73 (60.83)
12.	Do you know about propping?	103 (85.33)	17 (14.17)
13.	Do you know about first weeding after 20-25 days?	94 (78.33)	26 (21.67)
14.	Do you know to avoid excessive irrigation and give only need based irrigation?	70 (58.33)	50 (41.67)

15	Do you practice rouging of disease clumps?	36 (30)	84 (70)
B. PHYSICAL PRACTICES			
16.	Do you know collection and destruction of diseased leaves and other parts?	63 (52.50)	57 (47.50)
17.	Do you know about removal of dead heart to control borers?	41 (34.17)	79 (65.83)
18.	Do you remove red rot and wilt infected plant?	84 (70)	36 (30)
19.	Do you practice blind hoeing?	107 (89.17)	13 (10.83)
20.	Do you know about snap trap made of bamboo for rodent control?	43 (35.84)	77 (64.16)
21.	Set treatment with moist hot air treatment @54° C for 2-2.5 hours.	13 (10.84)	107 (89.16)
C. CHEMICAL PRACTICES			
22.	Do you know about different insecticide?	120 (100)	0 (0)
a)	Chlorpyrifos 20EC	117 (97.5)	3 (2.5)
b)	Carbofuran 3G	111 (92.5)	9 (7.5)
c)	Phorate 10G	115 (95.83)	5 (4.17)
d)	Endosulphan	113 (94.17)	7 (5.83)
e)	Malathion 0.1%	108 (90)	12 (10)
23.	Do you know about different fungicide?	120 (100)	0 (0)
a)	Propiconazole	98 (81.67)	22 (18.33)
b)	Triadimanol	72 (60)	48 (40)
c)	Benomil 50WP	88 (73.33)	32 (26.67)
d)	Metalaxyl 35% WS	83 (69.17)	37 (30.83)
e)	Azoxystrobin 18% w/w	103	17

		(85.83)	(14.17)
24.	Do you know about herbicides?	120 (100)	0 (0)
a)	Atrazine	120 (100)	0 (0)
b)	Simazine	112 (93.33)	8 (6.67)
c)	Diuron	115 (95.83)	5 (4.17)
d)	Metribuzin	32 (26.67)	88 (73.33)
25.	Do you know about chemical used for seed treatment?	120 (100)	0 (0)
a)	Carbendazim 0.1%	120 (100)	0 (0)
26.	Do you know about chemical used for rodent control?	77 (64.17)	43 (35.83)
a)	Zinc phosphide	77 (100)	0 (0)
b)	Bromodialone	14 (18.18)	63 (81.82)
D. BIOLOGICAL PRACTICES			
27.	Do you know about Biocontrol agents?	38 (31.67)	82 (68.33)
28.	Do you know about Sett treatment with <i>T. viride</i> & <i>T. harzianum</i> ?	17 (44.74)	21 (55.26)
29.	Do you know about <i>Trichogramma</i> sp.?	9 (23.68)	29 (76.32)
30.	Do you know about egg parasitoids?	7 (18.43)	31 (81.57)
31.	Do you know about <i>Micromus</i> larvae?	3 (7.89)	35 (92.11)

4.2.2 Distribution of respondents according to their overall level of knowledge regarding plant-protection measures of sugarcane

The data regarding overall knowledge regarding plant protection practices are presented in Table 4.21. The data clearly revealed that the majority of respondent (72.50%) had high level of knowledge, followed by 17.50 per cent of them had medium level of knowledge and only 10.00 per cent of them had low level of

knowledge. Vedpathak (2008) Vijayragavan (2011) and Narbaria (2013) had found similar findings in his study.

Table 4.21: Distribution of sugarcane growers according to their overall knowledge regarding plant protection practices

S. No.	Particulars	Frequency	Percentage, %
1	Low (up to 33.33 %)	12	10.00
2	Medium (33.34-66.66 %)	21	17.50
3	High (Above 66.66)	87	72.50
Total		120	100.00

4.2.3 Major biotic stresses reported by respondents

Table 4.22: Major biotic stress reported by respondents

S. No.	Particulars	Frequency	Percentage, %
A.	INSECTS		
1.	Stem borer	114	95.00
2.	Pyrilla	117	97.50
3.	Scale insect	73	60.83
4.	White fly	79	65.83
5.	Termite	113	94.17
B.	DISEASES		
1.	Red rot of sugarcane	112	93.33
2.	Whip tail/ whip smut	115	95.83
3.	Wilt	68	56.67
4.	Leaf spot	63	52.50
C.	WEEDS		
1.	Nut grass	113	94.17
2.	Bermuda grass	107	89.17
3.	Kans grass	97	80.83
4.	Slender amaranth	71	59.17
5.	Prickly amaranth	59	49.17

D. RODENTS

1. Rats	111	92.50
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There are various types of biotic factors which influence the production of sugarcane such as Insect pest, diseases, weeds, nematode, rodents, animal pest and some other biotic agents. In this study, insect pests, diseases, weeds and rodents are discussed. Major biotic stress reported by respondents are as followed.

The data regarding major biotic stresses reported by respondents, presented in Table 4.22. the finding indicates that Stem borer (95.00%), Pyrilla (97.50%) and termites (94.17%) are the major insects in the study area. While talking about diseases red rot of sugarcane (93.33%) and whip smut (95.83%) were more prominent problem.

Further from the table it was revealed that rodents are radical problem for sugarcane growers reported by 92.50 respondents.

To assess the knowledge level of respondents about biotic stress management measures of sugarcane followed by the respondents of study area, knowledge index was worked out and the data is compiled in Table 4.23. Regarding control of Stem borer highest knowledge index (94.17%) was found about carbofuran, followed by chlorpyriphos (88.33%). Good level of knowledge level were also recorded towards early planting (74.17%), removal of dead heart (65.00%). Knowledge about ensuring adequate moisture (57.50%), pheromone trap (36.67%) was found to be quite low. Poor knowledge level was found for the granulosis virus (30.00).

Regarding control of sugarcane Pyrilla, highest knowledge index (100.00%) was found about burning of trash, followed by methyle parathion (97.50%), phosphomidon (80.83%), adequate amount of nutrition (73.33%) was found to be quite low and least knowledge level was found for *Epiricania melanoleuca* (15.83%).

While talking about knowledge regarding termite control practices the highest knowledge index (95.00%) was about destruction of termitarium. 97.50 per cent respondents have knowledge about flooding in cultural practice and least (60.00%) knowledge about lindane pesticide.

It was found that knowledge regarding diseases, control for red rot (95.00%) was found about removal of affected clumps, followed by rotational cropping (89.17%), selection of healthy setts (85.83%), seed treatment with carbendazim (85.00%) and least knowledge level was found for use of redomil (65.00%).

It was also revealed from study that knowledge regarding control of whip tail and wilt, highest knowledge level (100.00%) was found about burning of trash, followed by seed treatment with carbendazim (86.67%), selection of resistant variety (80.00%) and poor knowledge level was found for avoiding ratooning (28.33%).

Knowledge regarding weed control revealed that highest knowledge level (100.00%) was about deep ploughing, mulching and crop rotation. Good knowledge regarding atrazine pre-emergence application (94.17%), burying weed seed deep (80.835), crop competition (72.50%) was found to be quite low. Poor knowledge level was found for the grammaxone+2,4-D application (69.17%).

Knowledge regarding rodent control found highest knowledge level (97.50%) was about snap trap and 94.17 per cent for live trap.

Table 4.23: Distribution of respondents according to their knowledge regarding biotic stress management practices

S. No.	Biotic stress	Management practices	Knowledge		
			Knowledge	No knowledge	
			f %	f %	
A.	INSECTS				
1.	Stem borer	Physical:	78	42	
		1. Dead hearts removal	(65)	(35)	
		Cultural:	89	31	
		1. Early planting	(74.17)	(25.33)	
		2. ensure adequate moisture	69	51	

		(57.50)	(42.50)	
	Chemical:	113	7	
	1. Carbofuron	(94.17)	(5.83)	
	2. Chlorpyrifos	106	14	
		(88.33)	(11.67)	
	Biological:	22	98	
	1. Apply granulosis virus	(18.33)	(81.67)	
	2. Use of pheromone trap	43	77	
		(35.83)	(64.17)	
2.	Pyrilla	Physical:	120	0
		1. Burning of trash	(100.00)	(00.00)
		Cultural:	88	32
		1. Adequate nutrition	(73.33)	(26.67)
		Chemical:	117	3
		1. Methyl parathion	(97.50)	(2.50)
		2. Phosphomidon	97	23
			(80.83)	(19.17)
		Biological:	19	101
		1. Use of parasitoid <i>Epiricania melanoleuca</i>	(15.83)	(84.17)
3.	Termite	Physical:	114	6
		1. Locate and destruction of termitarium	(95.00)	(5.00)
		2. collection and destruction of affected setts	101	19
			(84.17)	(15.83)
		Cultural:	117	3
		1. Flooding	(97.50)	(2.50)
		Chemical:	106	13
		1. Seed treatment with chlorpyrifos 20 EC	(88.33)	(11.67)
		2. Use of lindane	97	23
			(80.83)	(19.17)
B.	DISEASES			
1.	Red rot of sugarcane	Physical:	114	6
		1. removal of affected clumps	(95.00)	(5.00)
		2. collection and destruction of affected plant	101	19
			(84.17)	(15.83)
		Cultural:	103	17
		1. Selection of healthy setts	(85.83)	(14.17)
		2. Growing of resistant var.	100	20
			(83.33)	(16.67)
		3. Rotational cropping	107	13
			(89.17)	(10.83)
		Chemical:	102	18
			(85.00)	(15.00)

	1. Seed treatment with carbendazim		
	2. use of redomil	78 (65)	42 (35)
2.	Whip tail/ whip smut	Physical:	
	1. Seed treatment with Steam therapy	43 (35.83)	77 (64.17)
	2. Roguing	39 (32.50)	81 (67.50)
	Cultural:	96	24
	1. Selection of resistant var.	(80.00)	(20.00)
	2. Avoid ratooning	37 (30.83)	83 (69.17)
	Chemical:		
	1. Seed treatment with carbendazim	104 (86.67)	16 (13.33)
	2. use of glyphosate	87 (72.50)	33 (27.50)
3.	Wilt	Physical:	
	1. Burning of trash	120 (100.00)	0 (00.00)
	Cultural:	96	24
	1. Selection of resistant var.	(80.00)	(20.00)
	2. Avoid ratooning	34 (28.33)	86 (71.67)
	3. Mustard as companion crop	52 (43.33)	68 (56.67)
	Chemical:		
	1. Seed treatment with carbendazim	104 (86.67)	16 (13.33)
	2. use of glyphosate	87 (72.50)	33 (27.50)
C.	WEEDS		
1.	Nut grass	Physical:	
2.	Bermuda grass	120 (100.00)	0 (100)
3.	Kans grass	97 (80.83)	23 (19.17)
4.	Slender amaranth	Cultural:	
	1. Mulching	120 (100.00)	0 (0.00)
5.	Prickly amaranth	87 (72.50)	33 (27.50)
	2. Crop competition		
	3. Crop rotation	120 (100.00)	0 (0.00)
	Chemical:	113	7
	Preemergence: Atrazine	(94.17)	(5.83)

		Post-emergence: Grammaxone+2.4-D sodium salt application	83 (69.17)	37 (30.83)
D. RODENTS				
1. Rats	Physical:			
	1. Use of kill trap (made of wooden and bamboo)		117 (97.50)	3 (2.50)
	2. Use of live trap		113 (94.17)	7 (5.83)

4.3 Adoption Level of respondents regarding biotic stress management practices of sugarcane

Table 4.24: Distribution of sugarcane growers according to their adoption regarding biotic stress management practices

S. No.	Biotic stress	Management practices	Adoption		
			Fully Adopted	Partially Adopted	Not Adopted
A. INSECTS			f (%)	f (%)	f (%)
1.	Stem borer	Physical:	97	13	10
		1. Dead hearts removal	(80.83)	(10.83)	(8.34)
		Cultural:	86	27	7
		1. Early planting	(71.67)	(22.50)	(5.83)
		2. ensure adequate moisture	65 (54.17)	33 (27.50)	22 (18.33)
		Chemical:	68	28	24
		1. Carbofuron	(56.67)	(23.33)	(20)
		2. Chlorpyrifos	77 (64.17)	33 (27.5)	10 (8.33)
		Biological:	13	0	107
		1. Apply granulosis virus	(10.83)	(0.00)	(89.17)
		2. Use of pheromone trap	36 (30.00)	13 (10.83)	71 (59.17)
2.	Pyrilla	Physical:	43	37	40
		1. Burning of trash	(35.84)	(30.83)	(33.33)
		Cultural:	73	23	24
		1. Adequate nutrition	(60.83)	(19.17)	(20.00)
		Chemical:	96	13	11
		1. Methyl parathion	(80.00)	(10.83)	(9.17)
		2. Phosphomidon	68 (56.67)	28 (23.33)	24 (20)
		Biological:	0	4	116

		1. Use of parasitoid <i>Epiricania melanoleuca</i>	(0.00)	(3.33)	(96.67)
3.	Termite	Physical:	116	4	0
		1. Locate and destruction of termitarium	(96.67)	(3.33)	(0.00)
		2. collection and destruction of affected setts	77 (64.17)	33 (27.5)	10 (8.33)
		Cultural:	97	13	10
		1. Flooding	(80.83)	(10.83)	(8.34)
		Chemical:	112	5	3
		1. Seed treatment with chlorpyriphos 20 EC	(93.33)	(4.17)	(2.5)
		2. Use of lindane	87 (72.50)	12 (10.00)	21 (17.50)
B.	DISEASES				
1.	Red rot of sugarcane	Physical:	73	23	24
		1. removal of affected clumps	(60.83)	(19.17)	(20.00)
		2. collection and destruction of affected plant	77 (64.17)	33 (27.5)	10 (8.33)
		Cultural:	86	27	7
		1. Selection of healthy setts	(71.67)	(22.50)	(5.83)
		2. Growing of resistant var.	116 (96.67)	4 (3.33)	0 (0.00)
		3. Rotational cropping	65 (54.17)	33 (27.50)	22 (18.33)
		Chemical:	112	5	3
		1. Seed treatment with carbendazim	(93.33)	(4.17)	(2.5)
		2. use of redomil	96 (80.00)	13 (10.83)	11 (9.17)
2.	Whip tail/ whip smut	Physical:	34	29	57
		1. Seed treatment with Steam therapy	(28.33)	(24.17)	(47.50)
		2. Roguing	43 (35.84)	40 (33.33)	37 (30.83)
		Cultural:	116	4	0
		1. Selection of resistant varieties	(96.67)	(3.33)	(0.00)
		2. Avoid ratooning	43 (35.84)	37 (30.83)	40 (33.33)

		Chemical:	112	5	3
		1. Seed treatment with carbendazim	(93.33)	(4.17)	(2.5)
		2. use of glyphosate	77	41	2
			(64.17)	(34.16)	(1.67)
3.	Wilt	Physical:	43	37	40
		1. Burning of trash	(35.84)	(30.83)	(33.33)
		Cultural:	116	4	0
		1. Selection of resistant var.	(96.67)	(3.33)	(0.00)
		2. Avoid ratooning	36	13	71
			(30.00)	(10.83)	(59.17)
		3. Mustard as companion crop	73	23	24
			(60.83)	(19.17)	(20.00)
		Chemical:	96	13	11
		1. Seed treatment with carbendazim	(80.00)	(10.83)	(9.17)
		2. use of glyphosate	77	41	2
			(64.17)	(34.16)	(1.67)
C.	WEEDS				
1.	Nut grass	Physical:	112	8	0
2.	Bermuda grass	1. Deep ploughing	(93.33)	(6.67)	(0.00)
3.	Kans grass	2. burying weed seeds deep	73	23	24
			(60.83)	(19.17)	(20.00)
4.	Slender amaranth	Cultural:	96	13	11
		1. Mulching	(80.00)	(10.83)	(9.17)
5.	Prickly amaranth	2. Crop competition	73	23	24
			(60.83)	(19.17)	(20.00)
		3. Crop rotation	116	4	0
			(96.67)	(3.33)	(0.00)
		Chemical:	117	3	0
		Preemergence: Atrazine	(97.5)	(2.5)	(0.00)
		Post-emergence:			
		Grammaxone+2.4-D	103	11	6
		sodium salt application	(85.83)	(9.17)	(5.00)
D.	RODENTS				
1.	Rats	1. Use of kill trap (made of wooden and bamboo)	43	37	40
			(35.84)	(30.83)	(33.33)
		2. Use of live trap	36	13	71
			(30.00)	(10.83)	(59.17)
		3. Use of chemical	97	13	10
			(80.83)	(10.83)	(8.34)

Distribution of respondents according to their level of adoption regarding the biotic stress management practices of sugarcane measured under the three dimensions i.e. fully adopted, partially adopted and not adopted, and their respective percentages for each dimension is compiled in Table 4.24 and the details discussion given below.

With respect to control of the stem borer there are various method of control, in respect to physical control we found that most of the respondents using the dead heart removal for which the (80.83%) respondents fully adopted, followed by 10.83 per cent partially adopted and 8.34 per cent of the respondent not adopted. With regard to cultural method it was also found that majority of respondents adopting the early planting method for which 71.67% respondent fully adopted, followed by 22.50 percent partially adopted and 5.83 per cent of the respondent not adopted. In regards to chemical method it was revealed that majority of respondents adopting the chlorpyrifos for which 64.17 per cent respondents fully adopted, followed by 27.50 per cent partially and 8.33 per cent of respondent not adopted. The study revealed that biological control had a minimum adoption i.e. only (30.00%) fully adopted the pheromone trap, followed by 10.83 per cent of respondent not adopted.

With respect to control of the *Pyrilla* there are various method of control, in respect to physical control we found that most of the respondents using the burning of trash for which the (35.84%) respondents fully adopted, followed by 30.83 per cent partially adopted and 33.33 per cent of the respondent not adopted. With regard to cultural method it was also found that majority of respondents adopting the supply of adequate nutrients for which 60.83 per cent respondent fully adopted, followed by 19.17 per cent partially adopted and 20.00 per cent of the respondent not adopted. In regards to chemical method it was revealed that majority of respondents adopting the methyl parathion for which 80.00 per cent respondents fully adopted, followed by 10.83 per cent partially and 9.17 per cent of respondent not adopted. The study revealed that biological respondent did not adopt control practice and 3.33 per cent partially adopted.

With respect to control of the Termites there are various method of control, in respect to physical control we found that most of the respondents using the monitoring and destruction of termite for which the (96.67%) respondents fully adopted, followed by 33.33 per cent partially adopted. With regard to cultural method it was also found that majority of respondents adopting the flooding technique for which 83.83 per cent respondent fully adopted, followed by 10.83 per cent partially adopted and 8.34 per cent of the respondent not adopted. In regards to chemical method it was revealed that majority of respondents adopting the chlorpyriphos 20 EC for which 93.33 per cent respondents fully adopted, followed by 4.17 per cent partially and 2.50 per cent of respondent not adopted.

With respect to control of the Red rot there are various method of control, in respect to physical control we found that most of the respondents using the collection and destruction of affected plants for which the (64.17%) respondents fully adopted, followed by 27.50 per cent partially adopted and 8.33 per cent of respondents not adopted. With regard to cultural method it was also found that majority of respondents adopting the resistance variety for which 96.67 per cent respondent fully adopted, followed by 3.33 per cent partially adopted. In regards to chemical method it was revealed that majority of respondents adopting the chlorpyriphos 20 EC for which 93.33 per cent respondents fully adopted, followed by 4.17 per cent partially and 2.50 per cent of respondent not adopted.

Regarding control of the whip tail there are various method of control, in respect to physical control we found that most of the respondents using the rouging for which the (35.84%) respondents fully adopted, followed by 33.33 per cent partially adopted and 30.83 per cent of respondents not adopting. With regard to cultural method it was also found that majority of respondents adopting the resistant varieties for which 96.67 per cent respondent fully adopted, followed by 3.33 per cent partially adopted. In regards to chemical method it was revealed that majority of respondents adopting the seed treatment with carbendazim for which 93.33 per cent respondents fully adopted, followed by 4.17 per cent partially and 2.50 per cent of respondent not adopted.

Regarding control of the wilt there are various method of control, in respect to physical control we found that most of the respondents using the burning of trash for which the (35.84%) respondents fully adopted, followed by 30.83 per cent partially adopted and 33.33 per cent of respondents not adopting. With regard to cultural method it was also found that majority of respondents adopting the resistant varieties for which 96.67 per cent respondent fully adopted, followed by 3.33 per cent partially adopted. In regards to chemical method it was revealed that majority of respondents adopting the seed treatment with carbendazim for which 80.00 per cent respondents fully adopted, followed by 10.83 per cent partially and 9.17 per cent of respondent not adopted.

Sugarcane is affected by various weeds, according to the respondents there are some major weeds namely nut grass, Bermuda grass, kans grass, slender and prickly Amaranthus etc., found in study area. With respect to physical control we found that most of the respondents practicing deep ploughing for which the (93.33%) respondents fully adopted, followed by 6.67 per cent partially adopted. With regard to cultural method it was also found that majority of respondents adopting the crop rotation for which 96.67 per cent respondent fully adopted, followed by 3.33 per cent partially adopted. In regards to chemical method it was revealed that majority of respondents adopting the pre-emergence application with atrazine for which 97.50 per cent respondents fully adopted, followed by 2.50 per cent partially adopted. It can be concluded that for the control of weed deep ploughing, crop rotation and chemically atrazine was strongly adopted by the respondents.

The rodents are the major concern for the sugarcane crop. For the control of rodents, we found that only physical and chemical measures were adopted by the respondents. With respect to physical control we found that most of the respondents practicing snap trap (made of bamboo) also known as kill trap for which the (35.84%) respondents fully adopted, followed by 30.83 per cent partially adopted and 33.33 per cent of the respondents not adopted. In regards to chemical method it was revealed that majority of respondents (80.83%) adopting the zinc phosphide, followed by 10.83 per cent and 8.34 per cent not adopted.

4.4. Distribution of respondents according to their overall level of adoption regarding biotic stress management practices of sugarcane

Table 4.25: Distribution of sugarcane growers according to their overall adoption regarding biotic stress management practices

S. No.	Particulars	Frequency	Percentage, %
1.	Low (up to 33.33 %)	19	15.83
2.	Medium (33.34-66.66 %)	34	28.33
3.	High (Above 66.66)	67	55.83
	Total	120	100.00

The data regarding overall adoption regarding biotic stress management practices are presented in Table 4.25. The data clearly revealed that the majority of respondent (55.83%) had high level of adoption, followed by 28.33 per cent of them had medium level of knowledge and only 15.83 per cent of them had low level of knowledge. Kiran and Shenoy (2010), and Narbaria (2013) had found similar findings in their study.

4.5 Constraints to adoption of biotic stress management practices as perceived by the sugarcane growers

The constraints as perceived by the farmers in adoption of modern agricultural technologies are given in Table 4.26, 4.27 and 4.28. The constraints are categorized in some categories like, pecuniary constraints, infrastructural constraints, knowledge and awareness constraints.

4.5.1 Pecuniary constraints

From the Table 4.26, it is observed that majority of respondents (65.83%) perceived Lack of subsidy from govt. on IPM control measures, followed by high cost of tolerant/resistant varieties (14.17%) and high cost of plant protection chemicals (11.67%). It was found that availability of credit as not a matter of big concern as only 8.33 per cent of respondent reported.

Table 4.26: Distribution of sugarcane growers according to their pecuniary constraints

S. No.	Constraints	Frequency	Percentage	Rank
1.	High cost of plant protection chemicals	14	11.67	III
2.	High cost of tolerant/resistant varieties	17	14.17	II
3.	Lack of subsidy from govt. on IPM control measures	79	65.83	I
4.	Availability of credit	10	8.33	IV

4.5.2 Infrastructural constraints

The data revealed from the Table 4.27 that majority of respondents (68.33%) perceived Non-availability of bio-control agents, followed by Lack of training on IPM practices (14.17%), non-availability of technical guidance on the use of IPM practices (10.00%) was found quite low, lack of water scarcity or electricity was perceived poor constraints for which 7.50 per cent responses.

Table 4.27: Distribution of sugarcane growers according to infrastructural constraints

S. No.	Constraints	Frequency	Percentage	Rank
1.	Non-availability of bio-control agents	82	68.33	I
2.	Lack of training on IPM practices	17	14.17	II
3.	Lack of water scarcity or electricity	9	7.50	IV
4.	Non-availability of technical guidance on The use of IPM practices	12	10.00	III

4.5.3 Knowledge and awareness constraints

From the Table 4.28, it is observed that majority of respondents (54.17%) perceived lack of awareness on biological pest control measures, followed by lack of knowledge about effect on crop (24.17%), inadequate demonstration on biotic control practices (14.16%) and lack of ETL for use of chemical pesticides (5.50%).

Table 4.28: Distribution of sugarcane growers according to constraints related to knowledge and awareness

S. No.	Constraints	Frequency	Percentage	Rank
1.	Lack of awareness on biological pest Control	65	54.17	I
2.	Lack of ETL for use of chemical Pesticides	9	7.50	IV
3.	Inadequate demonstration on IPM Technologies	17	14.16	III
4.	Lack of knowledge about effect on crop	29	24.17	II

It can be concluded from the study that lack of subsidy from govt. on IPM control measures, Non-availability of bio-control agents, lack of awareness on biological pest control measures, high cost of tolerant/resistant varieties, lack of knowledge about effect on crop etc., are the major constraints perceived by the respondents in the study area.

4.6 Suggestions from the sugarcane growers to overcome the constraints faced by them

The findings related to the suggestions given by the respondents to overcome the constraints in adoption of recommended technology for biotic stress management practices presented in the Table 4.29. The data revealed that majority of the respondents (96.67%) suggested that training should be conducted, followed by, demonstration should be conducted regarding IPM technologies (95.00%) and technological knowledge should be given by RAEO' and sugarcane development officer (90.83%).

About 89.17 per cent of the respondents suggested that provision of field fencing subsidy by government, while 72.50 per cent of them suggested improved varieties for cultivation provided by government, Rate of improved varieties should be lower (56.67%).

Further, it was reported by the respondents, that electricity should be made available (47.50%), it was also suggested by the respondents that the crop loan and subsidy should be provided timely (46.67%), respectively to overcome 130 the

constraints faced in adoption of recommended technology for biotic stress management practices in the selected study area.

Table 4.29: Suggestion from sugarcane growers for minimizing the constraints faced by them during the adoption of recommended technology for biotic stress management

S. No.	Particulars	Frequency	Percentage	Rank
1	Subsidy from the govt. for IPM practices should be provided	68	56.67	VI
2	Provide field fencing subsidy by govt.	107	89.17	IV
3	Training should be conducted	116	96.67	I
4	Demonstration should be conducted	114	95.00	II
5	Rate of improved varieties should be less	68	56.67	VI
6	Electricity should be made available	57	47.5	VII
7	Provide improved varieties by the govt. agencies	87	72.50	V
8	Technological knowledge should be given by RAEO' and sugarcane development officer	109	90.83	III
9	The crop loan and subsidy should be provided timely	56	46.67	VIII
10	Training on bio-control agents should be provided	109	90.83	III

CHAPTER-V

SUMMARY AND CONCLUSIONS

The main purpose of this chapter is to summarize the results and draw conclusions based on the above analysis, and point out some important significance of this research.

Sugarcane is an important cash crop in India and the main source of money for farmers. According to the government's vision, farmers' output must double by 2022, which is one of the government's highest priorities. Relying on modern and sustainable technologies, implementing these technologies from the laboratory to the land, and minimizing the constraints faced by farmers, can achieve the achievable goal of increasing farmers' income. Because of its ability to produce and store high levels of sucrose, sugarcane is considered one of the world's main economic crops.

Useful research has been conducted on various aspects of the use of biological stress management methods in different regions of India. However, in the Surajpur district of Chhattisgarh, no work has been done to analyze the adoption of biological stress management measures. In view of the above facts, this research is entitled "Study on Biological Stress Management Methods Used by Sugarcane Growers in the Surajpur District of Chhattisgarh", and its objectives are:

1. To determine the socio-personal, socio-economic, communicational, technological and psychological characteristics of sugarcane growers.
2. To find out the level of adoption of various biotic stress management practices by sugarcane growers.
3. To identify constraints faced by the sugarcane growers in adoption of biotic stress management practices.
4. To obtain their suggestions to overcome the constraints.

The major findings of the study are summarized as follows:

Independent variables

- The social personality characteristics of the interviewees indicate that most people (67.50%) belong to the middle-aged age group (36 to 55 years old), and most of them have high school education (up to grade 12). The majority of respondents (40.00%) belonged to other backward groups engaged in sugarcane cultivation.
- The research shows that most interviewees regard agriculture + service industry as their main occupation, and then go to sugarcane planting, thus satisfying their main source of income. In the study area, most respondents (39.17%) own 4.1 to 10.0 hectares of land (medium farmers), followed by semi-medium farmers (2.1 to 4.0 hectares). Regarding the crops planted by the respondents, all respondents planted sugarcane on most of their land.
- Regarding irrigation facilities, the largest area (93.37%) is irrigated, followed by unirrigated (6.635). The largest area of sugarcane planting (92.68%) is covered by tube wells, followed by open hole wells (2.99%). The study also showed that the largest area (378.88 hectares) belongs to the main sugarcane planting area and is the rest area obtained through regeneration.
- Research shows that the majority of respondents (55.00%) have an average annual income (1,00001 to 250,000 rupees), followed by 20.00% with a per capita income of approximately rupees. 250001 to 500,000. Regarding credit acquisition, most respondents (63.33%) received credit. During the six-month period, 36.67% of the people obtained credit to buy fertilizer from the cooperative and repaid their physical loan by selling products to the cooperative.
- About 87.67% of respondents who planted sugarcane in Chanwar (Central Region), followed by Bahra (Central Land) with 23.33%. Data on the type of labor used for sugarcane planting shows that the majority (61.00%) of the labor is employed, while 39.00% is household labor, and the vast majority (28.90%) is used for harvesting. Regarding information sources, about 97.50% of farmers get their information from progressive farmers, while 92.5% get their information from radio stations.

- The study also showed that more than half of the interviewees have moderate economic motivations, and because of the simple and time-saving quality of sugarcane, sowing sugarcane on flat plates. It is found that 69.93% of farmers are planting CO-62175 sugarcane varieties, and 68.34% of farmers in the study area have medium-level farming experience, that is, 5-10 years. The knowledge about plant protection measures showed that 72.50% had a high level of knowledge and 17.50% had a medium level of knowledge. In the study area, bore insects (95.00%), berberines (97.50%) and termites (94.17%) are the main pests, while sugarcane red rot (93.33%) and whip smut (95.83%) are more prominent. The knowledge level of farmers on sugarcane biological stress management measures showed that the control of carbofuran was found to be the highest knowledge index (94.17%) of stem bore, and the control of bagasse insecticide was the highest knowledge index (100.00%). For termite control practices, the highest knowledge index (95.00%) is about termite damage, and in terms of disease, for the control of red rot (95.00%), it was found that the highest knowledge level was to remove affected clumps and control whiplash. The highest level of knowledge (100.00%) of waste incineration is found in tail and withered. The knowledge about weed control showed that the highest level of knowledge (100.00%) was about deep tillage, mulch and crop rotation, while the highest level of knowledge about rodent control (97.50%) was about quick-acting traps.

Dependent Variable

- Regarding the extent to which the recommended sugarcane bio-stress management practices are adopted, 80.83% of the interviewees have completely adopted the method of removing the heart in order to control of insects. Early broadcast was fully adopted by 71.67% of the respondents, while only 22.50% of them partially adopted it. Poisoned pho was completely adopted by 64.17% of the respondents, and only partially adopted by 27.50% of the respondents. In terms of controlling Pyrilla, waste incineration accounted for 35.84%, and respondents accounted for 30.83%. 60.83% of the respondents fully adopted

adequate nutritional supply, followed by 19.17% of cultural control measures. 80,000 respondents completely used methyl parathion in chemical control. Although Pyrilla's respondents did not use biological control. Termites are controlled by floods, with 83.83% of respondents completely adopting termites, followed by 10.83% partially adopting them. Poisoned pho 20 EC was completely adopted as a chemical control by 93.33% of respondents, and only 4.17% of respondents partially adopted it. Most of the interviewees (64.17) completely adopted measures to collect and destroy red rot. 96.67% of respondents fully adopted resistant varieties, followed by 3.33% of respondents partially adopted resistant varieties. Poison pho was completely adopted by 93.33%, followed by 4.17% being partially adopted. Regarding whiptail control, 96.67% of the respondents completely adopted the resistant varieties, and only 3.33% of the respondents partially adopted it. 93.33% of respondents completely adopted carbendazim seed treatment, followed by 4.17% of respondents partially adopted carbendazim. With control of wilt and disease-resistant varieties, 96.67% of the respondents were completely adopted, followed by 3.33% partially adopted. In terms of weed control, 93.33% of the people completely adopted deep tillage, followed by 6.67% of respondents partially adopted deep tillage. Among cultural customs, crop rotation was completely adopted by 96.67%, and only 3.33% of respondents partially adopted it. 97.50% of the interviewees fully used atrazine's pre-emergence application, followed by partial use of 2.50%. Research shows that most respondents (35.84%) completely adopted traps, followed by 30.83% of respondents partially adopted traps. The total use of zinc phosphide as a chemical control measure accounted for 80.83%, followed by a partial use of 10.83%.

- Research on the overall adoption of biological stress management practices clearly shows that the majority of respondents (55.83%) have a high adoption rate, of which 28.33% have a medium adoption rate and 15.84% have a low overall adoption rate.

Correlation and multiple regression analysis

Regarding the correlation coefficient and multiple regression analysis, among the selected 15 independent variables, only 4 variables, namely, education level, credit acquisition, planting methods and knowledge of sugarcane plant protection measures were found to be positively correlated, and were significant at 0.01. Highly correlated between sex level and variable size, the significance probability of finding land ownership and information sources is 0.05. Regarding multiple regression, in the adoption of the recommended biological stress management measures, only 4 variables, namely education, credit acquisition, knowledge of planting methods and sugarcane plant protection measures, have contributed a lot. However, all the 15 selected variables in the model explain the contribution of 26.67% of the recommended biological stress management measures.

Constraints and suggestions

- Among several limiting factors, the inability to use biological control agents (68.33%) is the main limiting factor in the use of recommended biological stress management methods, followed by 65.83% of respondents lacking government subsidies. Regarding IPM control measures. Among them, 51.47% lacked knowledge of biological pest control measures, 24.17% lacked knowledge on crop effects, 14.17% lacked training in integrated pest control methods, high cost of resistant varieties, and 11.67% faced High cost In plant protection chemicals, 10.00% did not use IPM technical guidance, 8.33% had credit, and 7.50% lacked water.
- Regarding the suggestions for overcoming restrictions from the interviewees, 96.67% suggested training followed by demonstration of IPM technology (95.00%), RAEO' and sugarcane development officials should provide technical knowledge (90.83%), are the major suggestions drawn from study.

CONCLUSION

- ✓ Most of the respondents in the study area belong to other backward classes, their ages are between 36 and 55 years old, and these classes have higher education levels. They have a 10-year history of farming.
- ✓ The majority of respondents (100.00%) are engaged in sugarcane cultivation. The sugarcane planting area is the highest at 56.55%, while rice, wheat and vegetables account for 18.28%, 16.27% and 10.49% of the total area respectively.
- ✓ It was also found that the land area irrigated by most farmers was 423.30 hectares, of which 92.68% of irrigation tube wells were good. In the study area. The study also shows that 39.17% of farmers own a land area of 4.1 to 10.0 hectares.
- ✓ The income of most respondents (55.00%) is between 10,0000.00-25,0000.00 rupees. The study also showed that 63.33% of the interviewees had access to credit, while 36.67% of the interviewees did not have access to credit. All farmers who had access to credit received short-term credit. In terms of credit sources, 57.50% of banks obtained credit from state-owned banks, and 94.73% of farmers responded that they could easily obtain credit.
- ✓ Type of cultivated land, the cultivated land (Gader) in the study area accounts for 87.67%, with an area of 400.42 hectares.
- ✓ Data on the type of labor used for sugarcane planting shows that most (61.00%) of the employed labor and farmers sometimes have to face labor shortages because it is the main production area of sugarcane.
- ✓ About 97.50% of farmers received information from progressive farmers, while 92.5% of farmers also received information from radio.
- ✓ Regarding the seeding method, most interviewees used the flat seeding method of sugarcane because it is simple and time-saving. It was found that 69.93% of the farmers planted the CO-62175 sugarcane variety.
- ✓ The overall knowledge about plant protection measures shows that 72.50% of people have a high level of knowledge, while 17.50% have a medium level of knowledge.

- ✓ In the study area, the main pests are Stem (95.00%), Pyrilla (97.50%) and termites (94.17%), while sugarcane red rot (93.33%) and whip smut (95.83%) are the most prominent problem.
- ✓ It is found that the knowledge level of insect pest control is the highest knowledge index of carbofuran (94.17%), and the knowledge level of sugarcane Pyrilla control is the highest knowledge index of burning garbage (100.00%), which is the highest knowledge, for termite control practices the highest index (95.00%) is related to the destruction of termites and termitarium.
- ✓ Knowledge about diseases, for the control of red rot (95.00%), the highest knowledge level was found to remove the affected clumps, for the control of whiptail and bacterial wilt for burning garbage, the highest knowledge level (100.00%). Knowledge about weeding indicates that the highest level of knowledge (100.00%) is about deep tillage, mulch and crop rotation.
- ✓ Research on the overall adoption of biological stress management practices clearly shows that the majority of respondents (55.83%) have a high adoption rate, and 28.33% of them have adopted a moderate level.
- ✓ Regarding the correlation coefficient and multiple regression analysis, among the selected 15 independent variables, only 4 variables, namely education level, credit acquisition, knowledge of planting methods and sugarcane plant protection measures were found to be positively correlated and highly correlated. Regarding multiple regression, in the adoption of the recommended biological stress management measures, only 4 variables, namely education, credit acquisition, planting methods and knowledge of sugarcane plant protection measures contributed significantly. However, all 15 selected variables in the model explained the contribution of using the proposed biological stress management method to 26.67%.

Suggestion for future work

According to the results, the following points of experience obtained after completing the survey are recommended for further research:

1. Similar research should also be conducted by more refiners/respondents.
2. Research should be conducted among different types of biological stress management measures to understand their knowledge and methods of biological stress management measures.
3. The scope of work in the entire Chhattisgarh State is very wide, because there are other sugarcane producing areas, which will help increase production potential.
4. The government-initiated subsidies for field fences to promote sugarcane production and productivity.
5. The study is limited to only 15 villages in the neighborhood of Surajpur district in Chhattisgarh. Therefore, detailed research results covering more villages and regions can be drawn to make recommendations for the entire Chhattisgarh State.

REFERENCES

- Ahire, RD., Kapse, P.S., Deshmukh, PR (2018) Socio-Economic and Psychological Determinants of Knowledge and Adoption of IPM Technology for Management of White Grub among the Farmers. *Int J. Curr Microbiol App. Sci*, 7 (9): 1201-1206.
- Allahyari. M.S., Damalas, C.A., and Ebadattalab, M. (2017). Farmers Technical knowledge about IPM in Olive production, *MDPI agriculture*, 7(12):101.
- Balamurugan, V. and Vetriselvan, M. 2010. Extent of adoption of recommended sugarcane technologies by the different categories of sugarcane growers. *Agriculture Update*, 5(3/4): 292-295.
- Banerjee, P.K. and Biswal, S. 2010. Techno Socio-economic constraint of sugarcane growers in adopting recommended practices for sugarcane cultivation. *Journal of Interacademia*, 14(1): 85-89.
- Bhatt, P. M., Patel, H. B. and Patel, N. P. (2011). Perception of farmers regarding selected aspects of training programme conducted by SSK. *Guj. J. Extn. Edu.* 22 (5): 14-16.
- Bhatnagar, S. 2016. Impact of Kisan Mobile Advisory services in Tikamgarh district of Madhya Pradesh, M.Sc. (Ag.) thesis. JNKV, Jabalpur, (M.P.).
- Bhingardeve, S. D. Kolgane, B.T., Patil, S.S. and Tale, N.N.2013. Knowledge and adoption of Integrated crop by the farmers from Kolhapur District of Western Maharashtra. *International Journal of Agriculture Innovations and Research*, 2(1):35-37.
- Bhosale, U.S. (2010). Participation of rural youth in paddy farming in Anand district of Gujarat state. Unpublished M.Sc. (Agri.) Thesis, AAU, Anand.

- Chand R, Chauhan S (2002). Socio-Economic Factors in Agricultural Diversification in India. *Agric. Situation India*. 58(11): 523 – 529.
- Chaturvedi. B.K. 2014. Personal characteristics and behavior of small-scale dairy farmer: an empirical analysis. *Journal of Humanities and Social Science* 19(5): 41-44.
- Chauhan, R. (2009). A study on perception of viewers Krishi Darshan Programme of Doordarshan in Sehore district of Madhya Pradesh. M.Se (Agri.) Thesis, JNKVV, Jabalpur, Madhya Pradesh.
- Chauhan, S., Singh, S. R K., Pande, A. K., and Gautam, U.S. 2013. Adoption dynamics of improved sugarcane cultivation in Madhya Pradesh. *Indian Research Journal of Extension Education* 13(2): 26-30
- Chauhan, M. and Kansal, S.K. 2014. Awareness Level and Extent of Utilization of Different Mass Media Sources by Dairy Farmers of Punjab. *Indian Journal of Extension Education*, 14(3): 134-136.
- Chitinis, D.H. and Kothikhane, R.R. 2000. Extension methodology for implementing Integrated pest management programme. *Maharashtra Journal of Extension Education*, 2:123-125.
- Choudhary, R.P., Singh, P. and Mishra, B. (2001). Correlation of adoption of improved rice technology India J. Extn. Edn., 37(3&4): 200-201
- Choudhary, S. and Rey, P. (2010). Knowledge and adoption of integrated pest management technique Ind. J. Agric. Res., 44(3) 167-178
- Chouhan D.K. 2007. A study of the technological knowledge possessed by the tribal cotton growers and its adoption in Manawar block of District Dhar (M.P.). M.Sc. (Ag) Thesis (unpublished). RAK College, JNKVV Jabalpur.

- Chouhan, R. 2016. Impact assessment of Kisan Mobile Advisory Services in relation to dissemination of agricultural technology in Rewa district (M.P.), M.Sc. (Ag.) thesis. JNKV, Jabalpur, (M.P.).
- Etonihu, K.L., Rahman, S.A. and Usman, S. (2013). Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa state, Nigeria. *Journal of development and agricultural economics*, 5(5):192-196.
- Ferrazino A, Ratto SE, Cervio V, Giffure L. 2014. The Perception of soil quality of the southeast Pampa of Argentina and social attitudes. *International Journal of Business and Social Science*. 5 (5): 7-11.
- Ganesan, M., Karthikeyan, K., Prashant, S. And Umadikar, J. 2013. Use of mobile multimedia agricultural advisory systems by Indian farmers: Results of a survey. *Journal of Agricultural Extension and Rural Development*, 5(4):88-99.
- Gurajar J. 2014. A study on technological gap in adoption of chickpea production technology among farmers of Tikamgarh district Madhya Pradesh. M.Sc. (Ag.) Thesis. Department of Extension Education College of Agriculture, Tikamgarh, JNKVV Jabalpur, M.P.
- Jadhao, S.M. (2008). A study on technological gap in soybean cultivation. Thesis abstracts, Deptt. Of Extn. Edu., PDKV, Akola, p15.
- Jakkawad, S.R., Sawanth, R.C., and Pauer, S.B. (2017). knowledge and adoption level of the pomegranate growers in Aurangabad district of Marathwada region of Maharashtra. *Trends in Biosciences*, 10(24): 5066-5069.
- Joshi C.P., Agarwal, S.K. and Sharma, L.N. (2002). General profile and communication behaviour of contact farmers. *Madhya Journal of Extension Education*, 4:36-40.

- Karthikeyan, C., Chandrakanandan and Parvathi, S. (1995). Factors, characteristics and behaviour of sugarcane growers. *J. Extn. Edn.* 6(3): 1331-1334.
- Khan Nisar Hussain and Khan G.A. 2004. Impediments in the adoption of recommended sugarcane cultivation practices. *Indus Journal of Plant Sciences*, 3(2):222-223.
- Kubde, V.R. Tekale, V.S. and Bhople, R.S. (1999). Knowledge and adoption of soybean production technology by farmers. *Maharashtra J. Extn. Edu.* .18: 185-189.
- Kulhade, Akhilesh (2007). Socio-economic transformation due to soybean cultivation. Thesis abstracts, Deptt. Of Extn. Edu., PDKV, Akola (MH)., pp. 98-99.
- Kumar, S., Paswan, A., & Divakar, S. (2019). Extent of Adoption of Improved Package of Practices on Sugarcane Cultivation by the Farmers of East Champaran District of Bihar. *Indian Journal of Extension Education*, 55(4), 194-199.
- Kumar, S., Paswan, A., & Divakar, S. (2019). Extent of Adoption of Improved Package of Practices on Sugarcane Cultivation by the Farmers of East Champaran District of Bihar. *Indian Journal of Extension Education*, 55(4), 194-199.
- Kumar, V., Natikar, M.S., Nataraju, H.K. Ankaja and Dhananjaya, D. (2009). Knowledge level of rose growers about improved cultivation practices. *Mysore Journal Agriculture Science*, 43(3): 327-529.
- Kumaran, M.; K. Punnusamy and M. Krishna (2004). Utilization of information sources by shrimp farmers. *Indian J. Extn. Edu.*, 40(1&2): 63-66.
- Lanjewar. O.P. 2009. Attitude of farmers regarding adoption of recommended cabbage production technology, with reference to use of drip irrigation system. in Durg and Raipur district of Chhattisgarh. M.Sc (Ag.) Thesis, IGKV Raipur.

- Limje. S. 2000. A study on adoption of recommended Soybean production technology among the farmers of Rajnandgaon district of MP. M.Sc. (Ag) thesis. IGAU. Raipur (MP)
- Madhushekhar, B.R. (2009). A study on marketing behaviour of chilli growers in Guntur district of Andhra Pradesh. M.Sc. (Agri) Thesis, Acharya N.G. Ranga Agric. Uni., Hyderabad, Andhra Pradesh.
- Mahoviya, Rajkumar (2006). A study to investigate the extent of adoption of recommended mustard cultivation technology in different farm size of farmers of Morena block of Morena district (MP). M.Sc. (Ag). Thesis (unpublished) JNKVV, Jabalpur.
- Maraddi, G.N. (2006). An analysis of sustainable cultivation practices followed by sugarcane growers in karnataka. Ph.D. thesis (unpublished), Univ. of Agril. Sci., Dharwad.
- Muhammad, R.H. Hionu, G.C. and Olayemi, F.F. (2012). Assessment of the harvest knowledge of fruits and vegetables farmers in Garun Mallam L.G.A. of Kano, Nigeria. International Journal of development and sustainability, 1(2): 510-515.
- Mukati A, (2016). Farmers' perception regarding soil health card – a study in Tikamgarh district of Madhya Pradesh. M.Sc. (Ag) thesis (unpublished), JNKVV, Jabalpur.
- Mukim. G.K. 2004. A study on adoption of recommended sunflower production technology among the farmers of Rajandgaon district of Chhattisgarh. M. Sc. (Ag.) Thesis, IGKV, Raipur.
- Nagaraja, M.V. 2002. A study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area in Davanagere district Karnataka. Ph.D. Thesis, submitted to University of Agricultural Sciences, Dharwad.

- Nagaraja, M.V., Shashi Kumar and S. Venkateshalu. 2008. Extent of adoption of recommended sugarcane cultivation practices and constraints faced by farmer of Bhadra Command area, Karnataka. *Mysore Journal of Agricultural Sciences*, 42(2):340-343.
- Nagaraja, M.V., Shashi Kumar and S. Venkateshalu. 2008. Extent of adoption of recommended sugarcane cultivation practices and constraints faced by farmer of Bhadra Command area, Karnataka. *Mysore Journal of Agricultural Sciences*, 42(2):340-343.
- Nagle S. 2009. Impact of front line demonstration on knowledge and adoption level of wheat growers in Indore block of Indore district of M.P. M.Sc. (Ag.) Thesis (unpublished) JNKVV, Jabalpur.
- Naik, R.D. (2005). A Study on knowledge and adoption pattern on improved sugarcane practices in Bidar district of Karnataka state. M.Sc. (Ag) Thesis (unpublished), Univ of Agril. Sci., Dharwad.
- Nargawe, L. 2017. Impact assessment of Kisan Mobile Advisory Services in Barwani district of Madhya Pradesh, M.Sc. (Ag.) thesis. Rajmata Vijayraje Scindia Krishi Vishvavidyalaya, Gwalior, (M.P.).
- Ogbeide, O. A. and Ele, I. 2015. Smallholder Farmers and Mobile Phone Technology in Sub-Sahara Agriculture, Mayfair, *Journal of Information and Technology Management in Agriculture* 1(1): 1-19.
- Paikra, T.S. (2008). A study on adoption of integrated pest management practices by the soybean growers in Pali block of Korba district (CG.), M.Sc. (Ag). Thesis (unpublished), JNKVV, Jabalpur.
- Pal, S.K., Halim, M.A., Kashem, M.A. and Karim, A.Z. 2001. Factor influencing the adoption of recommended cultural practices in sugarcane farming in Ishurdi areas of Bangladesh. *Chiang Mai Journal of Science* 9 (1):61-82.

- Pandey, P.K. Suryawanshi, D.K. and Sarkar, J.D. 2004. Credit acquisition pattern of rice grower in C.G. In IRRI (abstract) p. 270.
- Parvez, R., Dubey, M. K., Singh, S. R. K. and Khan M. A. (2013). Factors affecting knowledge of fish farmers regarding fish production technology. *Ind. Res. J. Extn. Edu.*, 13 (2): 126- 128.
- Patel J. 2014. A study on impact of income generating activities on sustainable livelihood of SGSY beneficiaries of Tikamgarh district of Madhya Pradesh. M.Sc. (Ag.) Thesis (unpublished) Department of Extension Education College of Agriculture, Tikamgarh, JNKVV Jabalpur, M.P.
- Patel, C. D. (2015). Awareness and attitude of organic farming followers of South Gujarat. Unpublished M.Sc. (Agri.) thesis, N.A.U., Navsari.
- Patidar D. 2007. Pattern of information management behaviour of sesame oilseed crop growers in selected Sidhi Block of Sidhi District, (M.P.). M.Sc. (Ag.) Thesis (unpublished), JNKVV, Jabalpur, (M.P.).
- Patidar, D. (2007). Pattern of information management behaviour of sesame oilseed crop growers in selected Sidhi block of Sidhi district, M.P. M.Sc. (Ag.) Thesis (unpublished), JNKVV, Jabalpur.
- Patra, J., Singh, D.V. and Pati, J.K. 2016. Kisan Mobile Advisory Service- An Effective ICT Tool for Technology Dissemination, *International Journal of Humanities and Social Science Invention*, 10: 68-72.
- Pawar, P.P., Jadale, U.D., Shinde, C.B. and Kale, P.V. 2005. Adoption of improved production technology on sugarcane farmers in Western Maharashtra. *Cooperative Sugar*, 36(10): 805 –812.
- Poswal, C.S., Mathur, G.P. and Tyagi, B.D. 2006. Adoption of improved planting operation technology in sugarcane crop. *Cooperative Sugar*, 37(6):41-42.

- Poswal, C.S., Mathur, G.P. and Tyagi, B.D. 2006. Adoption of improved planting operation technology in sugarcane crop. *Cooperative Sugar*, 37(6):41-42.
- Poswal, C.S., Mathur, G.P. and Tyagi, S.K. 2005. Constraints in adoption of improved sugarcane production technology in District Muzaffarnagar (UP). *International Journal Science*, 1: 87-90.
- Raghuwanshi N. 2015. Impact of front line demonstration on scientific temperament of wheat growers in Tikamgarh district of Madhya Pradesh. M.sc. (Ag.) Thesis (unpublished) Department of Extension Education, College of Agriculture, Tikamgarh, JNKVV Jabalpur, M.P.
- Raghuwansi, S. (2010). A study on adoption of improved production technology by the soybean growers in Hoshangabad of M.P. Thesis (unpublished), JNKVV, Jabalpur.
- Rai, D.P., Singh, S.K. and Pandey S.K. 2012. Socio-Personal analysis and constraints encountered by sugarcane growers of Berhampur District (MP). *Agriculture Update*, 7(3/4):401-404.
- Ray, G.L., and Mondal, S. (2014). *Research methods in social sciences and extension education*. Kalyani Publishers, Noida (U.P.).
- Rogers, E. M. (1983). *Diffusion of Innovation*. Third Edition. Free Press, New York.
- Rokonuzzamana, M. (2013). Training needs of tribal people regarding income generating activities. *Indian Research Journal of Extension Education*, 13 (2): 10-16.
- Sahu, Birbal., Ambawatia, D.K., Vani, I., Tomar and Badeya, A.K. (2002). Constraints in adoption of improved crop production technologies in Jhabua hills of Madhya Pradesh. *JNKVV Res. J.37(2)*: 112-114.

- Sakharkar, V.S., (1995). A study on knowledge, fertilizer use pattern and constraints in the cultivation of soybean by farmers of Nagpur district, Maharashtra. Ph.D. thesis, Univ. agric. Sci., Dharwad, India.
- Sandhu, J., Singh, G. and Grover, J. 2016. Analysis of Kisan Mobile Advisory Service in South Western Punjab. *Journal of Krishi Vigyan*, 3: 1-15.
- Sasane, G.K., Khule, R.P. and Jagdale, U.D. 2010. Knowledge and adoption of sugarcane management practices by the farmers. *Agriculture Update*, 5(3/4):391-393.
- Sasane, G.K., Khule, R.P. and Jagdale, U.D. 2010. Knowledge and adoption of sugarcane management practices by the farmers. *Agriculture Update*, 5(3/4):391-393.
- Shafi Afroz., Takhe Asha, G.R., Manjunatha and Kanika Trivedy.2018. Constraints Faced by Sericultural Farmers of Murshidabad district with the Advisory Services of SMSs through mKisan portal. *Journal of Community Mobilization and Sustainable Development* Vol. 13(3), 554-560.
- Sharma, T.N., Singh, R.K. and Sharma, V.B. 2000. Effect of adoption on the adoption behavior of trained farmers of Krishi Vigyan Kendra, Chhindwara, Madhy Pradesh. *JNKVV Research Journal* 34 (1&2).
- Sharma, Rohit (2007). A study on knowledge and adoption behaviour of soybean growers in Sehore district of M.P. M.Sc. (Ag). Thesis (unpublished), JNKVV, Jabalpur.
- Shinde, S.N. (2004). A study on adoption of integrated nutrients management practices in soybean by farmers. Thesis abstracts, Deptt., of Extn. Edu., PDKV, Akola (M.H.), pp. 37-38.

- Shinde, S.N. (2004). A study on adoption of integrated nutrients management practices in soybean by farmers. Thesis abstracts, Deptt. Of Extn. Edu., PDKV, Akola, pp. 37-38.
- Shivanand, P. (2007). Human resource development activities initiated by nandi sugar factory Bijapur district of Karnataka state. M.Sc. (Ag). Thesis (unpublished), University of Agril. Sci., Dharwad.
- Sivanarayana, G., Prasad, S. V. and Reddy, S. J. 2000. Constraints in the adoption of improved sheep and goat practices by the small and marginal farmers of diversified farming. *Journal of Research ANGRAU* 28(3): 44-47.
- Shrivastava, K.K., Trivedi, M.S. and Lakhera, M.L. (2002). Knowledge and adoption behaviour of chilli growers. *Agril. Extn. Review.* 7(8): 22-25.
- Sihare A. 2015. A study on farmers knowledge, attitude related to organic farming in tikamgarh district of Madhya Pradesh. M.sc. (Ag.) Thesis (unpublished) Department of Extension Education, College of Agriculture, Tikamgarh, JNKVV Jabalpur, M.P.
- Singh, Bhola Singh, Prakash, Mishra, B. and Das, B., (2007). Adoption of wasteland utilization system, N.D. university security and extension education system perspectives in collaboration with JNKVV and society of extension education Agra march 9-11.
- Singh, G.S. and Singh S.L. 2007. Constraints in adoption of IPM in sugarcane cultivation in Haryana. *Indian Sugar*, 57(2):27-30.
- Singh, M.P., Sharma, B.K., Singh, S.P., Naval Singh and Surender Kumar. 2008. Indicators influencing production gap of sugarcane and wheat crops in Western Uttar Pradesh. *Journal of Farming Systems Research & Development*, 14(1):78-83.

- Singh, S. R. K., Dwivedi, A. P., Mishra, A., & Chouhan, S. (2013). Yield gap analysis vis-à-vis factor affecting sugarcane production in Madhya Pradesh. *Journal of Community Mobilization and Sustainable Development*, 8(1), 60-63.
- Singh, S.P. and Rajendra. (1990). A study on adoption of improved sugarcane variety. *Indian J. Extn. Edn.* 26(1&2): 110-111.
- Srinivasareddy, M.V., (1995). A study on knowledge and adoption of recommended mango cultivation practices among farmers of Kolar district. M.Sc. (Agri). Thesis, Univ. agric. Sci., Banglore, India.
- Suryawanshi, R.K. 2009. A study on adoption of finger millet production technology by the tribal farmers of Bastar district of C.G. M. Sc. (Ag) Thesis, IGKV Raipur.
- Thanh. N.C. and Singh, B. 2006. Constraints faced by the farmers in rice production and export. *Omonrice* 1497-110.
- Thiranjangowda, B.T. (2005). A study on knowledge and adoption level of soil and water- conservation practices by farmers in north Karnataka. M.Sc. (Agri). Thesis, Univ. Agric. Sci., Dharwad, Karnataka.
- Tiwari, R.K. and Lall, A.C. (1988). A study of factors affecting scientific attitude and habit of sugarcane growers in Dudahi block of Padrauna district of U.P. *The Allahabad Times*. 7(1): 13-20.
- Yaligar, S.S.P., 1997, A study on soybean cultivation by farmers of Belgaum district an analytical study. M.Sc. (Agri). Thesis, Univ. Agric. Sci., Dharwad, India.

कृषि विस्तार विभाग
कृषि महाविद्यालय, रायपुर
इंदिरा गाँधी कृषि विश्वविद्यालय, रायपुर (छत्तीसगढ़)
“छत्तीसगढ़ के सूरजपुर जिले में गन्ना-उत्पादकों द्वारा
अपनाई गयी जैविक-तनाव प्रबंधन पद्धतियों का अध्ययन”
गन्ना उत्पादकों के लिए साक्षात्कार अनुसूची

दिनांक: _____

क्रमांक: _____

मुख्य परामर्शदाता: श्री पी. के. पाण्डेय
सहायक प्राध्यापक
कृषि विस्तार विभाग
इं. गा. कृ. वि.वि., रायपुर (छ. ग.)

शोधकर्ता: सूर्यकान्त चौबे
एम. एस. सी. (कृषि)
कृषि विस्तार विभाग
इं. गा. कृ. वि.वि., रायपुर (छ. ग.)

गाँव का नाम: _____

ब्लाक: _____

जिला: _____

साक्षात्कार पत्रिका क्रमांक: _____

१. किसान का नाम: _____ मोबाइल क्रमांक: _____

२. जाति

1) अ०जा०

2) अ०ज०जा०

3) अ०पि०व०

4) सामान्य

४. शिक्षा

1) अशिक्षित

2) प्राथमिक-माध्यमिक

३. आयु

1) ३५ वर्ष तक

2) ३५-५५ वर्ष

३) ५५ वर्ष से अधिक

५. परिवार का आकार

1) छोटा (1-५ सदस्य)

2) मध्यम (६-१० सदस्य)

- 3) हाई स्कूल 3) बड़ा (> १० से ज़्यादा)
- 4) उच्चतर माध्यमिक
- 5) स्नातक या अधिक

६. जोत का आकर: कृपया भूमि की जानकारी दें

भूमि उपयोगिता प्रणाली

कुल भूमि _____

अधिया/रेघ पर दी भूमि _____ अधिया/रेघ पर ली गयी भूमि _____

मौजूदा _____

सिंचित _____ असिंचित _____

कृषि योग्य भूमि _____ कृषि योग्य भूमि के टुकड़े _____

गन्ने की फसल का क्षेत्र (हे.) _____

क्र.	मृदा का प्रकार	सिंचित	असिंचित	अर्ध-सिंचित
१.	भाटा			
२.	मटासी			
३.	डोरसा			
४.	कन्हार			

७. फसल पद्धति

क्र.	फसल	क्षेत्र (हे.)		उत्पादकता (क्वि./हे.)	
		सिंचित	असिंचित	सिंचित	असिंचित
खरीफ (वर्षा)					
1.					
2.					
3.					
4.					

रबी (ठण्ड)					
1.					
2.					
3.					
4.					
जायद (ग्रीष्म)					
1.					
2.					
3.					
4.					

८. कृषि सामग्री / संपत्ति

कृपया अपने पास कृषि संबंधित उपकरणों व अन्य संपत्ति की जानकारी दें

क्र.	वस्तु	संख्या
१	मिट्टी पलट हल	
२	सीडड्रिल	
३	हो	
४	स्प्रेयर	
५	देशी हल	
६	डस्टर	
७	ट्रेक्टर	

9	पम्प	
10	फावड़ा	
11	अन्य :	

९. व्यवसाय: कृपया अपने व्यवसाय सम्बंधित जानकारी देवें

क्र.	व्यवसाय	मुख्य	गौड़	वार्षिक आय
1	कृषि			
2	पशुपालन			
3	नौकरी			
4	व्यापार			
5	मजदूर			
6	अन्य			

१०. ऋण अर्जन प्रणाली

क्र.	स्त्रोत	राशि	मद	कालावधि	ब्याज़ की दर	कर्ज़ अदायगी बकाया/चुकता
1.	प्राथमिक कृषि साख समिति					
2.	जिला सहकारी केन्द्रीय बैंक					
3.	राज्य सहकारी बैंक					
4.	क्षेत्रीय ग्रामीण बैंक					
5.	राष्ट्रीयकृत बैंक					
6.	निजी बैंक					
7.	मित्र / सम्बन्धी					
9.	साहूकार					

10.	किसान क्रेडिट कार्ड					
11.	अन्य					

मद: 1. कृषि आदानों की खरीदी हेतु, 2. कृषि उपकरणों की खरीदी हेतु, 3. मवेशी, भेंडे अथवा बकरियों की खरीदी हेतु, 4. उपचार हेतु, 5. खाद्यान्न हेतु, 6. गृह निर्माण अथवा मरम्मत हेतु, 7. शिक्षा, 8. त्यौहार, 9. व्यवसाय प्रारंभ हेतु, 10. अन्य.....

आपको ऋण अर्जन में कोई कठिनाई होती है?

हाँ /नहीं

यदि हाँ, तो विवरण दें:

1. _____
2. _____
3. _____

११. ग्रामीण संस्थाओं में सहभागिता

कृपया ग्रामीण संस्थाओं में आपकी सहभागिता के बारे में बतायें

क्र.	ग्रामीण संस्थाएं	सहभागिता हाँ/नहीं	पद	
			सदस्य	पदाधिकारी
1.	ग्राम पंचायत			
2.	पंचायत समिति			
3.	जिला परिषद्			
4.	सहकारी समिति			
5.	सहकारी शक्कर कारखाना			
6.	कृषक संगोष्ठी			
7.	स्वयं सहायता समूह			
8.	अन्य (युवा समूह/महिला समूह)			

१२. श्रमिक उपयोगिता:

कृपया श्रमिक उपयोगिता से सम्बंधित जानकारी दें

क्र.	कार्य	प्रकार		दर/दिन
		परिवारिक श्रमिक	किराये के श्रमिक	
1.	भूमि की तैयारी			
2.	रोपण			
3.	सिंचाई			
4.	खाद डालना			
5.	कृषि-रसायन छिड़काव			
6.	मिट्टी चढ़ाना			
7.	अन्य अन्तर्संस्थीय क्रियाएं			
8.	कटाई			

श्रमिक उपलब्धता में कठिनाई होती है?

हाँ / नहीं

यदि हाँ, तो विवरण दें: _____

१३. सूचना का स्रोत:

कृपया बतायें की आपको कृषि सम्बन्धी सूचनाएँ किन-किन माध्यमों से प्राप्त होती हैं?

क्र.	सूचना का स्रोत	नियमित	कभी-कभी	कभी-नहीं
1. व्यक्तिगत				
1.	ग्रामीण कृषि विस्तार अधिकार			
2.	कृषि विस्तार अधिकार			
3.	वरिष्ठ कृषि विस्तार अधिकार			
4.	कृषि विश्वविद्यालय के वैज्ञानिक			

5.	शक्कर कारखाने का कृषि अधिकारी			
6.	कृषि विज्ञान केंद्र			
7.	आदान विक्रेता			
8.	उन्नत किसान			
9.	स्थानीय नेता			
10.	मित्र/पड़ोसी/रिश्तेदार			
11.	अन्य			
2. समूह				
1.	प्रदर्शन			
2.	सभा			
3.	समूह चर्चा			
4.	प्रक्षेत्र भ्रमण/प्रक्षेत्र दौरा			
5.	अन्य			
3. जनसमूह				
1.	अखबार			
2.	प्रक्षेत्र पत्रिका			
3.	रेडियो			
4.	टेलीविज़न			
5.	प्रदर्शनी			
6.	किसान रैली			
7.	मोबाइल			
8.	इन्टरनेट			
9.	अन्य			

१४. आर्थिक अभिप्रेरणा: कृपया इस फसल की आर्थिक संभावनाओं के बारे में जानकारी दीजिये:

क्र.	कथन	सहमत	अनिश्चित	असहमत
1.	किसान को अधिक फसल लेना चाहिए ताकि वो एक फसली पद्धति के जोखिम को कम कर सके			
2.	यदि कृषि कार्य हेतु पूंजी न हो तो, ऋण लेने में कोई परेशानी नहीं है			
3.	अगर किसी किसान के द्वारा नयी तकनीक को सफलता पूर्वक अपना लिया गया है तो हमें भी उस तकनीक को अपनाना चाहिए			
4.	किसान को ऐसी फसल का चुनाव करना चाहिए जिसमें अधिक लाभ के साथ अधिक जोखिम भी समाहित हो, इसके बजाय कि ऐसी फसल को चुने जिसमें मुनाफा व जोखिम दोनों कम हो			
5.	कृषि में नयी तकनीकी का उपयोग करना पूर्णतया जोखिम पूर्ण है, यद्यपि वह तकनीक फायदेमंद भी हो			

१५. रोपण विधि: कृपया गन्ने की खेती में आपके द्वारा प्रयुक्त किये जाने वाले रोपणी के विधि को बताइए:

क्र.	रोपाई की विधि	प्रतिक्रिया		
		पूर्ण	आंशिक	निरंक
1.	समतल क्यारी में बुवाई			

2.	कूड में बुवाई विधि			
3.	खाई विधि			
4.	रायुंगन विधि			
5.	विरल बुवाई विधि			
6.	गड्ढा रोपणी विधि			
7.	एकांतर कुंड विधि			
8.	अंकुरण विधि			
9.	जेब्लोक विधि			
10.	कलिका विधि			
11.	अल्गिन विधि			

१६. गन्ने की खेती में आपका अनुभव (वर्षों में) _____

१७. गन्ने की फसल में लगने वाले जैविक व्याधि-तनाव के सम्बंधित में जानकारी एवं अंगीकरण का स्तर

सरल क्र.	विवरण	जानकारी/अंगीकरण का स्तर		
		पूर्ण	आंशिक	बिलकुल नहीं
अ.	सस्यीय क्रियाएँ			
१.	क्या आप ग्रीष्मकालीन जुताई करते हैं?			
२.	क्या आप अवशेष प्रबंधन के लिए उन्हें जलाने से बचते हैं?			
३.	क्या आप सहिष्णु अथवा प्रतिरोधी किस्मों के बारे में जानते हैं?			
४.	क्या आप रोपण के लिए स्वस्थ गन्ने के टुकड़ों का प्रयोग के बारे में जानते हैं?			

५.	क्या आप जैव-अपघटनीय (कचरे) मलच के बारे में जानते हैं?			
६.	क्या आप गन्ने में उगाये जाने भिन्न पाश फसल जैसे-गेंदा, मक्का,सरसों, रिजका के बारे में जानते हैं?			
७.	क्या आप फसल-चक्र के बारे में जानते हैं?			
८.	क्या आप गन्ने के विभिन्न अन्तर्वर्ती फसलों (आलू,खेसारी,राजमा) के बारे में जानते हैं?			
९.	क्या आप सामयिक बुवाई के बारे में जानते हैं?			
१०.	क्या आप गन्ने के उचित बुवाई समय के बारे में जानते हैं?			
११.	क्या आप गन्ने के खेत में से स्केल कीट के नियंत्रण के लिए वाटर शूट निकालने के बारे में जानते हैं?			
१२.	क्या आप प्रोपिन्ग के बारे में जानते हैं?			
१३.	क्या आप २०-२५ दिन बाद के प्रथम निराई-गुड़ाई के बारे में जानते हैं?			
१४.	क्या आप अधिक सिंचाई के स्तन पर आधारीय सिंचाई देने के बारे में जानते हैं?			
१५.	क्या आप रोग-ग्रसित गुच्छों के लिए रौगिंग के बारे में जानते हैं?			
ब.	भौतिक क्रियाएँ			
१६.	क्या आप पौधों के स्संक्रमित अवशेषों के निपटारन के बारे में जानते हैं?			
१७.	क्या आप सफ़ेद मक्खी के नियंत्रण के लिए डेड-हार्ट निकालने के बारे में जानते हैं?			

१८.	क्या आप लाल-सडन और उकठा रोग-ग्रसित पौधों को खेत से निकालने के बारे में जानते हैं?			
१९.	क्या आप अंधी-गुड़ाई के बारे में जानते हैं?			
२०.	क्या आप क्रिन्तकों के नियंत्रण हेतु स्नेप-ट्रैप के बारे में जानते हैं?			
२१.	क्या आप गन्ने के टुकड़ों का ५४° से. के तापमान पर ग्रीष्म-आर्द्र उपचार के बारे में जानते हैं.			
स.	रासायनिक क्रियाएँ			
२२.	क्या आप विभिन्न कीटनाशकों के बारे में जानते हैं?			
अ)	क्लोरपायरिफोस 20 ई.सी.			
ब)	कार्बोफ्यूथ्रान 3 जी			
स)	फोरेट 10 जी			
द)	इन्डोसल्फान			
इ)	मैलाथियान 0.1%			
२३.	क्या आप विभिन्न फंफून्डनाशकों के बारे में जानते हैं?			
अ)	प्रोपिकोनाजोल			
ब)	ट्राईआडीमानोल			
स)	बेनोमिल ५० डब्लू.पी.			
द)	मेटालाक्सिल 35% डब्लू.एस.			
ई)	एजोक्सीस्ट्रोबिन 18% डब्लू/डब्लू			
२४.	क्या आप विभिन्न खरपतवारनाशियों के बारे में जानते हैं?			
अ)	एट्राजीन			
ब)	सिमाजीन			

स)	डाईयूरोन			
द)	मेट्राबुजीन			
२५.	क्या आप बीजोपचार के लिए उपयुक्त रसायन के बारे में जानते हैं?			
अ)	कार्बेन्डाजिम 0.1%			
२६.	क्या आप क्रिन्तकों के लिए उपयुक्त रसायनों के बारे में जानते हैं?			
अ)	जिंक फोस्फोइड			
ब)	ब्रोमोडिआलोन			
द.	जैविक क्रियाएँ			
२७.	क्या आप जैव-नियंत्रक घटकों के बारे में जानते हैं?			
२८.	क्या आप <i>ट्राईकोडर्मा विरिडी</i> व <i>ट्राईकोडर्मा हाज़ीएनम</i> से गन्ने के टुकड़ों के उपचार के बारे में जानते हैं?			
२९.	क्या आप <i>ट्राईकोग्रामा स्पी.</i> के बारे में जानते हैं?			
३०.	क्या आप अन्डा -परजीवी के बारे में जानते हैं?			
३१.	क्या आप <i>माईक्रोमस</i> लार्वा के बारे में जानते हैं?			

१८. गन्ने की खेती में जैविक तनाव को कम करने के लिए अनुशंसित तकनीकी को अपनाने में आने वाले व्यवधानों का विवरण दें

क्र.	समस्याएं	अत्यन्त महत्वपूर्ण	महत्वपूर्ण	कम महत्वपूर्ण	कोई समस्या नहीं
1.	उन्नत किस्म के उपयोग में				
अ.	उन्नत किस्म के बारे में जानकारी की कमी				

ब.	उन्नत किस्म की रोपणी की उपलब्धता में कमी				
स.	सामयिक उपलब्धता				
द.	उच्च कुद्र मूल्य				
इ.	इसका उपज पर कोई प्रभाव नहीं				
फ.	अन्य				
2.	बीज-उपचार				
अ.	फंफूदनाशी से बीजोपचार कि विधि की जानकारी में कमी				
ब.	बीजोपचार की कोई आवश्यकता महसूस नहीं होती				
स.	प्रयुक्त रसायन का मूल्य अधिक है				
द.	समय पर उपलब्धता				
इ.	उपज पर कोई प्रभाव नहीं				
फ.	अन्य				
3.	पोषण प्रबंधन				
अ.	उर्वरक की अनुसंशित देय मात्रा ली ज्ञान में कमी				
ब.	उच्च कुद्र मूल्य				
स.	समय पर उपलब्धता				
द.	मृदा पर प्रभाव				

इ.	कीट-व्याधि के प्रकोप में वृद्धि				
फ.	उपज पर कोई प्रभाव नहीं				
ग.	अन्य				
4.	सूक्ष्म पोषक तत्वों का प्रयोग				
अ.	ज्ञान की कमी				
ब.	उच्च मूल्य				
स.	सूक्ष्म पोषक तत्वों की उपलब्धता में कमी				
द.	उपज पर कोई प्रभाव नहीं				
इ.	अन्य				
5.	खरपतवार प्रबंधन				
अ.	ज्ञान की कमी				
ब.	उच्च मूल्य				
स.	समय पर उपलब्धता				
द.	उपज पर कोई प्रभाव नहीं				
इ.	अन्य				
6.	जैव उर्वरक				
अ.	ज्ञान में कमी				
ब.	उपलब्धता				
स.	जैव उर्वरक से बीजोपचार की विधि का ज्ञान				
द.	उपज पर कोई प्रभाव नहीं				
इ.	अन्य				

7.	पौध संरक्षण के उपाय				
अ.	उच्च मूल्य				
ब.	पौध संरक्षण में प्रयुक्त उपकरणों की उपलब्धता				
स.	जैविक कीट नियंत्रण की ज्ञान की कमी				
द.	उपज पर कोई प्रभाव नहीं				
इ.	श्रमिकों की उपलब्धता				
फ.	अन्य				
8.	कटाई				
अ.	श्रमिकों का उच्च मूल्य पर उपलब्धता				
ब.	श्रमिकों की उपलब्धता				
स.	अन्य				
9.	फसल परिवहन				
अ.	वाहन की उपलब्धता				
ब.	संस्थानिक वाहन				
स.	उच्च दर				
द.	अन्य				
10.	प्राकृतिक				
अ.	भूमि की कम उत्पादकता				
ब.	अनियमित वर्षा				
स.	न्यून वर्षा				
द.	सूखे की समस्या				

इ.	अन्य				
11.	निजी समस्या				
अ.	घरेलू समस्या				
ब.	जोत का आकार छोटा होना				
स.	शिक्षा की कमी				
द.	आयु				
इ.	अन्य				
12.	सामाजिक समस्या				
अ.	किसानों के द्वारा नई तकनीक के अभिग्रहण में रोचकता की कमी				
ब.	सामाजिक अभिप्रेरणा की कमी				
स.	चराई की समस्या				
द.	अन्य				
13.	आर्थिक समस्या				
अ.	उच्च निवेश की आवश्यकता				
ब.	समय पर ऋण की उपलब्धता				
स.	उच्च ब्याज दर				
द.	कम अनुदान				
इ.	अन्य				
14.	संस्थानिक समस्याएं				
अ.	प्रसार कार्यकर्ता की कमी				

ब.	बेचने का स्थान				
स.	छोटे उद्योग की कमी				
द.	अन्य				

१९. उपर्युक्त समस्याओं के समाधान के लिए अपना सुझाव दीजिये

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RESUME

Name : Suryakant Choubey
Date of birth : 11/09/1991
Present address : C/O – C. S. Chaturvedi, in front of Dwivedi
Manson, Sai Nagar, Zora
Raipur (C.G.) 492015
Phone : 9589733686
E-mail : suryakant92ag@gmail.com
Permanent address : S/O – Om Prakash Choubey, Kiran Rikshaw
Garage, North Ring-Road, Kedarpur,
Ambikapur, District-Surguja, Pin code – 497001

Academic qualification:

Degree	Year	University/ Institute
Higher secondary School certificate	2010	CGBSE Raipur
B.Sc. (Ag.)	2015	IGKV Raipur

Training experience: RAWE (Rural Agricultural work experience)

Membership of professional societies: Nil

Award/ Recognitions : Nil

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Signature