

**A STUDY ON RESOURCE USE EFFICIENCY IN MAIZE
PRODUCTION IN SURAJPUR DISTRICT OF
CHHATTISGARH**

M.Sc. (Ag) Thesis

by

Sonam Bharti

DEPARTMENT OF AGRICULTURAL ECONOMICS

COLLEGE OF AGRICULTURE

INDIRA GANDHI KRISHI VISHWAVIDYALAYA

RAIPUR (Chhattisgarh)

June, 2021

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PRODUCTION IN SURAJPUR DISTRICT OF
CHHATTISGARH**

Thesis

Submitted to the

Indira Gandhi Krishi Vishwavidyalaya, Raipur

by

Sonam Bharti

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FOR THE DEGREE OF**

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CERTIFICATE – I

This is to certify that the thesis entitled “A Study on Resource Use Efficiency in Maize Production in Surajpur District of Chhattisgarh” submitted in partial fulfillment of the requirement for the degree of **Master of Science in Agriculture Agricultural Economics** of the **Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.)**, is a record of the bonafide research work carried out by **Sonam Bharti** under my guidance and supervision. The subject of the thesis has been approved by the Students 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 part has been fully acknowledged. All the assistance and help received during the course of the investigation have been duly acknowledged by him/her.

Date: 30/06/2021


Signature of Major Guide

Name - Dr. A.K. Koshta

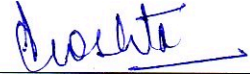
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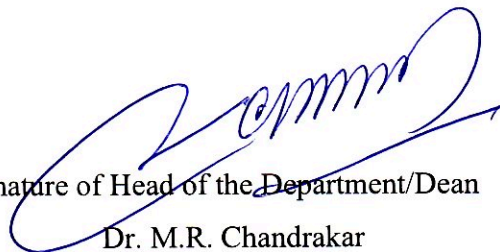




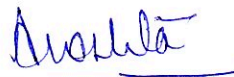
CERTIFICATE - II

This is to certify that the thesis entitled “**A Study on Resource Use Efficiency in Maize Production in Surajpur District of Chhattisgarh**” submitted by **Sonam Bharti** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, (C.G.), in partial fulfillment of the requirements for the degree of **Master of Science in Agriculture** in the **Department of Agricultural Economics** has been approved by the external examiner and Student’s Advisory Committee after oral examination, under the chairmanship of Head of the Department/Dean.

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THESIS ABSTRACT

Title of Thesis	A Study on Resource Use Efficiency in Maize Production in Surajpur District of Chhattisgarh
Name of The Student	Sonam Bharti
Major Subject	Agricultural Economics
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Signature of Student



Signature of Major Advisor

Date:- 05/10/2021



Signature of Head of The Department

ABSTRACT

The present study entailed “A study on resource use efficiency of maize production in Surajpur district of Chhattisgarh” has been undertaken with an objective of (1) to work out the costs and returns of maize production, (2) to estimate resource use efficiency of maize production, (3) to examine the marketing pattern of maize and (4) to identify the constraints in production and marketing of maize in the study area. The study was conducted in Chhattisgarh state of Surajpur district under which two blocks were selected from the district *i.e.*, Surajpur and Pratappur. From the each selected block 3 villages have been considered and 10

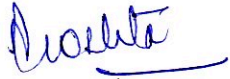
maize growers from each selected villages have been undertaken for the study. Finally, a sample of 60 maize growers were categorized into marginal, small, medium and large farmers. From the sampled farmers, the primary data were collected through personal interview method on well structured questionnaire and schedule. The collected data were analyzed by applying simple averages and percentage methods and tabulate as per the objectives designed for the study.

The empirical findings of the study envisaged that average family size of the sampled farmer was 5.53 members and have the literacy percentage was 71.08 percent. The average, operational size of land holding of sampled farmers as 2 hactares with a cropping intensity of 192.00 percent. Irrespective to the farm size, the cost of cultivation was Rs. 29427.78 per ha. The variable cost have contributed more than 70 percent to total cost of production in cultivation of maize. The cost cultivation of maize have also been calculated as per the methodology decided by the Commission of Agriculture Cost and Prices (CACP) and it found that 54.72 percent, 54.72 percent, 55.61 percent, 67.72 percent 90.91 percent and 78.79 percent of Cost A1, Cost A2, Cost B1, Cost B2, Cost C1 and Cost C2 respectively. The overall estimated net return in maize cultivation of sampled farms was Rs. 33967.76 per ha and input- output ratio was 1:2.20. To estimate the resource use efficiency in maize cultivation on plant protection measures, machine power, manure and fertilizers have found the significant impact on the production of maize. Overall, marketable surplus of maize was 50.04 percent.

The major challenge in cultivation of maize was shortage of labour at the time of harvesting, lack of availability of high variety seeds, high input prices. The Maize growers have reported during marketing of maize, facing the problem of lack of storage facility, unavailability of market information and lack of transportation facilities.

शोध ग्रन्थ सारांश

शोध का शीर्षक	: छत्तीसगढ़ में सूरजपुर जिले में मक्का के उत्पादन की संसाधन उपयोग दक्षता का अध्ययन
विद्यार्थी का पूरा नाम	: सोनम भारती
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प्रमुख सलाहकार के हस्ताक्षर



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विभागाध्यक्ष के हस्ताक्षर

सारांश

वर्तमान अध्ययन में छत्तीसगढ़ के सूरजपुर जिले में मक्का के उत्पादन की संसाधन उपयोग दक्षता का अध्ययन शामिल है। यह अध्ययन निम्नलिखित विशिष्ट उद्देश्यों के साथ किया गया है। 1) चयनित क्षेत्र का मक्का उत्पादन से लागत और प्रतिफल का अध्ययन। 2) संसाधन उपयोग दक्षता की गणना मक्का के उत्पादन में। 3) विपणन के तरीकों की जाँच करना। 4) उत्पादन एवं विपणन में चयनित क्षेत्र के सामने आने वाली विभिन्न बाधाओं की पहचान करना। वर्तमान अध्ययन छत्तीसगढ़ के सूरजपुर जिले में किया गया तथा सूरजपुर जिले से दो विकासखण्ड का चयन किया गया अर्थात् सूरजपुर और प्रतापपुर चयनित विकासखण्ड से छः गावों का चयन किया गया। अन्त में संभाव्यता अनुपात मापदण्ड की सहायता से 60 मक्का

उत्पादकों का चुनाव किया गया। निजी साक्षात्कार के माध्यम से अच्छी तरह से संरचित सारणी का उपयोग करते हुए सर्वेक्षण विधि द्वारा चुने गए परिवारों से प्राथमिक आँकड़े एकत्र किया गया, आँकड़ों के विश्लेषण के लिये तालिका और कार्यात्मक विधि का प्रयोग किया गया। जिसमें औसत परिवार का आकार 5.53 पाया गया इनका साक्षरता प्रतिशत 71.08 प्रतिशत पाया गया चयनित परिवारों का औसत परिचालन भूमि 2.00 हेक्टेयर एवं फसल सघनता 192.00 प्रतिशत पाया गया। मक्का की खेती की औसत लागत रु. 29427.78/हेक्टेयर पायी गई। कुल उत्पादन लागत 70 प्रतिशत से अधिक हिस्सा चल कारकों पर खर्च किया गया। औसत COST-A₁, COST-A₂, COST-B₁, COST-B₂, COST-C₁ और Cost-C₂ का हिस्सा कुल लागत का क्रमशः 54.72 प्रतिशत 54.72 प्रतिशत 55.61 प्रतिशत 78.79 प्रतिशत 67.72 प्रतिशत एवं 90.91 प्रतिशत पाया गया। चयनित परिवार का उत्पादन से कुल लाभ रु. 33967.76/हेक्टेयर पाया गया। चयनित परिवारों का औसत निवेश-उत्पाद अनुपात 1:2.20 पाया गया वर्तमान अध्ययन में कॉब-डगलस उत्पादन फलन सबसे अच्छा पाया गया। मक्का उत्पादन पर मशीन श्रम, पौध संरक्षण का उपयोग से लाभ को पौध संरक्षण, मशीन क्षम का अनुकूलतम उपयोग करके बढ़ाया जा सकता है। औसतन मक्का के कुल उत्पादन का 50.04 प्रतिशत विपणित अधिशेष के रूप में पाया गया। मक्का उत्पादन में चयनित परिवारों द्वारा सामना की जाने वाली प्रमुख बाधाएँ मजदूरों की कमी, उच्च किस्म की बीजों में कमी, निवेश की उच्च किमतें इत्यादि पाई गई। मक्का के विपणन में प्रमुख बाधाएँ संग्रहण सुविधाओं की कमी बाजार सूचना की उपलब्धता की कमी परिवहन सुविधाओं की कमी इत्यादि पाया गया।

CHAPTER - I

INTRODUCTION

Background of the study

Maize (zea mays) is one of the most important cereal crop after rice. Maize named "Queen of Cereals," also known as maize, is one of the world's most important cereal crops. Maize, botanically known as Zea mays, belongs to the Graminae family of grains. Maize can be stored long, provide numerous useful food products and it is the main cereal crop for monsoon season in areas. It is grown both for grain and forage. Maize has the highest productive role among all the world's cereal crops.

Worldwide the area under the crop is estimated at 179 million ha, with production estimated at 5.7 metric tons per ha in year 2016-17 (United states department of Agriculture). In India, maize is next in important only to rice & maize crop was sown on area of 8.85 million ha and the production was 22.84 million tonnes in 2014-15 (Directorate of economics & statistics DAC & FW, Agricultural statistics at a glance,2011-15). Maize is growing in kharif and rabi seasons in Chhattisgarh state.The major area & production of maize was found in Kharif than that of Rabi season. The area & production of maize in Kharif was 114.62 thousand/ha and 193.98 thousand mt during 2015-16. However, area & production of maize in Rabi was 11.73 thousand/ha and 23.75 thousand mt during 2015-16. (Agricultural statistics, land register commissioner, Govt. with Chhattisgarh.)

2. Area, production and productivity of maize in Surajpur district

Chhattisgarh is a chief agricultural land and is known as the "rice bowl" because of the high rice production. The total area covered of maize crop was 10.405 thousand ha with the production of 20778 metric tonnes in Surajpur district of Chhattisgarh in year 2016. (Agricultural statistics, land register commissioner, Govt. with Chhattisgarh).

3. Justification of the study

In India farming is a striking feature of the small size of farms. That causes difficulties in implementing improved production and marketing methods.

Successful maize growing requires specific production and marketing expertise, skill, precision and thoroughness. Maize production plays a major role in improving the economic conditions of farmers, especially marginalized and small farmers and fulfilling the dietary needs of the people of India. A maize marketing study is needed to improve the marketing system to support development and provide efficient services in the transfer of agricultural products and input from producers to consumers. In all sections of society an effective marketing strategy minimizes costs and benefits. Looking at the above details, it is essential to understand by which comprehensive insight can be obtained in order to identify the “a study on resource use efficiency in maize production in Surajpur district of Chhattisgarh” with the following clear objectives:

4. Objectives:

1. To work out the costs & returns of maize production in sampled farms of the study area.
2. To estimate the resource use efficiency of maize production in sampled farms.
3. To examine the marketing pattern of maize in the study area.
4. To identify the constrains in production and marketing of maize in the study area.

Setup of the study

The present thesis research work was summarized into five chapters, including the current chapter for introduction, which consist of background of the study area, trend of area, production and productivity on of maize in study area, justification of the study and objectives of the study. In Chapter II and Chapter III, a review of the literature of work done in the past were discussed and the materials and methods were used to accomplished the objectives of the study were used. Chapter IV, discuss results obtained after analysis of the data and their discussion, and in last Chapter V represents the summary, conclusion and suggestions for future research work.

CHAPTER - II

REVIEW OF LITRATURE

An attempt has been made in this chapter to review the relevant literature in view of the problem entitled, “A Study on Resource Use Efficiency in Maize Production in Surajpur district of Chhattisgarh”. A brief account of the work reported by past investigators was discussed in the following.

A brief resume of work done in India and abroad:

Akhtar et.al. (2000) analyzed that maize being an important crop (cereal crop) in Bihar covers 14% of the national area and 15% of the total production having 700kg/ha of the average productivity (1950-98). They conducted in Bihar revealed that during the winter season a strong maize crop may be taken. Some of the varieties raised their average grain yield from 35.2 q/ha to 52.7 q / ha during the winter season.

Ofori and Baffour (2000) found that due to the warming and increasing climate patterns will reduce maize yields, especially among smallholder maize farmers who may lack the resources to cope with these situations. With the effect of climate change resulting in lower rainfall and increased soil and plant evapotranspiration, one important objective is to increase drought resistance in maize and other cereal crops, That would be of great benefit to those regions with less favorable agricultural conditions. Solutions must go beyond increasing production, because it is also necessary to increase the nutrient content of maize. We also revealed that high yield breeding; high varieties of nutrients with limited use of water could provide a part of the answer. Small-scale farmers grow most maize in the tropics and subtropics, usually for subsistence as part of farming systems that feature multiple crops, and sometimes livestock. The system often lacks inputs such as fertilizer, seed development, irrigation, and labor. Most industrialized world maize-producing countries employ extensive inputs, and highly mechanized crop production systems and hybrid maize seed is commonly used.

Badal and Singh (2001) Revealed that there was some concentration on the maize markets, but there was a greater concentration in the wholesale retail sector than in the retail sub-sector. Temporary price relationship showed that price spreads were commensurate with storage costs, which meant that it was essentially successful. However, the intermarket price relationship showed monthly price differentials exceeding transfer costs, probably due to certain production and marketing characteristics that make it difficult to respond effectively to intermarket price differentials.

Kushwaha and Adanu (2001) revealed that 40 % of wholesalers- retailers handled 14.8 % of total monthly sales volume, 30 % handles 26 % of total sales while 10% accounted for 28 % of total sales. For retailers 47 % of those with monthly sales earnings account for 26 % of the total value of monthly sales 33 % handled 36 % of sales while 7% accounted for 15 % of the total volume of monthly sales. Findings indicated maize markets with the wholesaler-retailer sub sector having a greater degree of concentration with a Ginni coefficient of 0.58 compared to that of retailers with a coefficient of 0.5.

Badal and Singh (2001) showed that if local varieties maize growers just shift from local variety of maize to cultivation of HYV of maize they can increase their income by 30% of their existing income in kharif and in rabi maize 45%. Development of maize based agro industries in the state would help better realize better price of maize to the farmers.

William & Jhonson (2002) Study conducted on Improving Nitrogen Uses cereal production efficiency. The authors found that increased NUE cereal is unlikely unless a device approach is introduced that uses varieties with a high harvest index, integrates NH₄-N fertilizer, applies prescribed rates consistent with in-field variability using sensor-based systems in production fields, low N levels for flowering and a system for forage production.

Babatunde and Oyatoye (2004) Analyzed uneven marketing margin distribution and productivity across the state coupled with marketing difficulties led to a fragmented food market in Kwara state. The imbalance in the food market led to food surplus in some areas and food shortages in other areas leading to for the serious implications state's food security situation. Building good road network

and supplying basic market facilities such as secure stalls, storage, processing and packaging facilities required to eliminate this problem.

Chaudhary and Jha (2006) found that maize + turmeric – moong sequence fetched the highest net return (Rs.10044/ha) closely followed by maize arhar (Rs. 9180/ha) and maize-oat+pea (Rs.8457/ha).The lowest monetary income was obtained from maize –gram(Rs.2706/ha) sequence on account of poor-gram yield. This sequence also recorded the higher LUE (Land Use Efficiency).

Umoh G.S. (2006) Made an study on Resource Use Efficiency in Urban Farming and found that many urban dwellers turned to urban farming to fill the gap between urban food demand and supply. Nevertheless, as with other economic activities, the issue of efficiency is at the core of urban farming. The author used the stochastic frontier development method in this to analyze the resource utilization output of urban farmers in Uyo, Southeast Nigeria. The result shows that 65 percent of urban farmers is effective with 70 percent of technology; maximum efficiency is 0.91, while minimal efficiency is 0.43 on urban farm.

Ogundari et al (2006) made an empirical study of economies of scale and cost efficiency of small scale maize production in Ondo State of Nigeria. Authors use farm level survey data collected from 200 farms in the study area. The analysis shows that although small-scale farmers are poor, However, they are fairly efficient in the use of their resources and that any expansion in their present production level would reduce production costs per output, given the prevailing but fairly economies of scale obtained for the study, which are consistent with the results of earlier studies showing higher relative efficiency for small farms.

Suresh et al. (2006) The author has made an attempt the resource productivity and allocation as well as the technical efficiency of paddy production were examined in the Peechi Command Area of Thrissur district in the state of Kerala. He has selected 71 rice farmers of the study area to collect primary data using the stratified random sampling. The author has calculated the Price of paddy cultivation in the Rs. 21603/ha area of study resulting in a BC ratio of 1.34. He observed that the elasticity coefficients for chemical fertilizers, FYM & human labor were significant and positive. Allocative efficiency suggested that Rs.2.83, Rs 1.57 and Rs 1.17, respectively, would be marginal return per one rupee increase

under these heads. Average technological performance was found to be 66.8%. Supplementary irrigation provided the factor that could enhance the technical efficiency during water stress days. The author has done the study for an equitable distribution of canal water and enhanced resource management extension services in the region.

Hasan (2008) Conducted a study on Economic efficiency and maize production constraints in the Northern Region of Bangladesh. The study was carried out at the Dinajpur and Panchagarh Sadar upazila to estimate the costs, returns and economic efficiency of maize production compared to Boro rice. The study sample size was 100 from each district in equal proportion. The technical efficiency was found at Dinajpur on average to 0.84 and at Panchagarh to 0.80. Farmers in the study area were also found to have scope to increase maize productivity by achieving full efficiency through resource reallocation. Compared with Boro rice and Boro-based crop pattern, economic analysis of maize and maize-based crop patterns indicates the high profitability of the maize production system compared to that of Boro rice. As the composite and hybrid varieties were introduced in this period, comparatively high growth rate was found in area, production as well as maize yield from 1987-88 to 2005-06. The top three constraints as indicated by maize farmers are high seed prices, low grain prices and unavailability of fertilizers at the time required. It was suggested that providing inputs at a fair price when necessary and an organized marketing system is important to expand the country's maize production.

Jaipaul *et.al.* (2008) Revealed that the treatment conducting residual farmyard manure & biofertilizers have higher yield and returns as compared to control. The higher yields under the treatment containing residual farmyard was an indication that farmyard applied to crop can significantly contribute to preceding crop. Treatment based on fertilizer recommended have higher yields & returns compared to other treatment. Though the B: C ratio values were not higher than yield target 1.0 tonnes/ha + residual farmyard manure + phosphobacteria + Azobactor treatment . B:C values were low due to low input cost.

Ephraim W. Chirwa (2009) Revealed that smallholder farmers have alternative market networks for selling their agricultural products, including maize

and those market outlets, including state marketing agencies, private traders, local markets, unions, cooperatives and private companies. This survey explains the choice of marketing channel for maize among rural Malawi smallholder farmers using A multinomial logit model. The results of the analysis show that education, recurrence, distance-to-day markets are positively linked to the choice of private traders, while distance to the tarmac and distance to the post office are disincentives for the choice of private traders.

The findings underline the importance of building trust and credibility and investment in infrastructure to support policies for liberalization of agricultural marketing in low income economies.

Chahal S.S. et al. (2010) The author has made an attempt to address constraints in Punjab's maize production and marketing. The author was selecting 300 maize growers from the three Punjab districts using multi-stage random sampling technique based on region concentration under maize. The study findings revealed that the selected maize growers were confronted with constraints as the maize crop was specific technology was affected. The institutional, marketing, and socio-economic constraints have been found in maize production. He found that the sample farmers suffered because of non-credit availability, poor marketing facilities, lack of storage facilities, non-availability of seed suited to local needs, late crop sowing etc. Detailed analysis of the constraints that hinder maize production and marketing illustrates the urgent need to reform the entire marketing system.

Manjunath & Patil (2011) Conducted a study on Maize market dynamics and price forecasting in Belgaum, Karnataka district. In this analysis the authors choose major markets for Maize based on the maximum number of arrivals for the Belgaum District markets. For maize these are Gokak, Saudatti, Bailahongal and Ramadurg, the writers have selected four major markets. The secondary data were obtained from the register maintained in the respective APMC' for monthly arrivals and maize prices. Such data were subjected to specific statistical analyzes later. In all markets the trend pattern across arrivals and maize prices was close. The results showed that all the markets showed an increasing trend in both arrivals in the long run and prices of maize over the years.

Ajit Singh, (2012). The author revealed that deficiencies in the public delivery system in agriculture were highlighted on the basis of a 2010 field survey of nearly 3500 farmers in Uttar Pradesh. He found that farmers face various problems related to agricultural marketing and input delivery. The main problems reported are non-availability or insufficiency and high credit costs; high irrigation costs and irregular electricity supply, and non-availability of fertilizers and good quality seeds if required. A further area of concern is the high input prices. The transportation problems of products to market and lack of storage and processing facilities have also been mentioned as a major constraint by farmers and the author has suggested that there is a clear need for grass root level input and service delivery systems to reduce the problems faced by farmer.

Navadkar et al (2012) Conducted a study on Economic Production and Marketing of Kharif Maize in Ahmednagar District of Maharashtra State, this research attempted to study the resource utilization system, estimate the cultivation costs and study the marketing of maize. The authors selected 90 farmers from the Ahmednagar district of Karjat tahsil in west Maharashtra. For the present study, they also use data relating to the 2008-09 Agricultural year. The sample farmers had been classified into three size holding groups. i. e. Small, medium, big. The production feature model Cobb-Douglas was used for the functional analysis. The study findings showed that the use of human labour by male and female was 77.19 and 106.45 man days per hectare.

Oladejo et al (2012) An attempt was made to analyze the economics of the production of maize (*Zea mays L.*) in Oyo State of Nigeria. The authors use multi-stage random sampling technique to select and analyze two hundred and twenty maize interview schedules using descriptive statistics and the Cobb-Douglas regression model estimation. The results further revealed that respondents invest in the production of maize on every naira Could produce N1.26k in return.

Semerci, A., (2013) Has made an attempt to determine physical production inputs, which are used for wheat production, made in rainfed conditions in agricultural enterprises in Edirne, located in European Continent, Turkey, and also to determine the resource use efficiency of the research activity. He has collect the data from 90 agricultural enterprises in Edirne in 18 settlements using “Multi

Stratified Random Sampling Method” by the means of questionnaire. He was analyzed that 21,70 kg crop, 55,32 kg chemical fertilizer and 87,31 cc pesticide were needed in wheat production for the yield of about 405,64 kg da-1. He determine the Determination coefficient equation (R²), by using the Cobb-Douglas production function, it is 0.965 and there is an increasing return to scale due to functional analysis ($\sum\beta_i = 1.119$). He found that all the variables in production equation are significant at 5% level and their elasticity coefficients have positive. The result of the research, it is proved that land value and pesticide factors are used in wheat production. However, for higher yield, an increase in the quantity of seed and fertilizer is required.

Kasim et al (2014), conducted a study on Technical Efficiency in Maize Production & its Determinants. He revealed that Most agricultural research focussed on how high yields can be achieved. Nonetheless, few researchers consider allocating rational resources to improve efficiency. This research considers the need to increase agricultural productivity by using resources properly and has measured the technical efficiency of maize production in northern Nigeria and identified the socio-economic factors that determined it in various ecological agro-zones. The study was based on the conceptual framework that input use is related to inefficiency in maize production in the area. The function of Stochastic frontier production and Tobit models.

The study supported the conceptual framework that the use of inputs is technologically inefficient, and certain socioeconomic factors have led to inefficiency. The study's principal contribution is in calculating Technical output of maize production from different States.

The study implies that farmers and policy makers need to be rational about the use of inputs in order to achieve high technical efficiency levels.

Emmanuel et al. (2014) has made an attempt to analyse the Small Scale Maize Production Technical Efficiency in Zambia's Masaiti District: A Stochastic Frontiers approach. He studies that maize is Zambia's main staple food crop produced dominantly by smallholder farmers. The author collects data using a standardized questionnaire administered to 100 randomly selected smallholder maize farmers in the district of Masaiti in Zambia. The author analyzed data using

descriptive statistics and a stochastic frontier production approach. The estimated production function of the stochastic frontier Cobb-Douglas showed that maize land size and fertilizer were the major factors which affected maize production. The results indicated that the technological performance of the farm level ranged from 52.2% to 93.2% with an average of 79.6%.

This suggests that, overall, maize production among smallholder farmers in the study area is likely to increase by 20.4 percent through the efficient use of present technology. The seed types used, the farmers' rotational practices and level of education have had negative effects on technical efficiency.

Kausar *et al.* (2015) The study shows the marketing system of maize in Gaibandha district of Bangladesh. The author explores that the marketing of maize in the study area began from farmers and reached the feed mills through various channels. The common modes of transportation were van, pick-up, bus, and bicycle. He studied that market information was gathered via mobile phone, personal market visit, discussion with fellow farmers and traders & the price of maize was calculated through the market supply and demand situation. Wholesaler marketing costs were the highest among all intermediaries, and the lowest for Farmers.

Transportation costs were the largest and the cost of finding information was the lowest of all marketing costs. He studies that farmers and other market participants need information about the marketing mechanism to do their business better.

Awunyo-Vitor *et al.* (2016) The author has made an attempt to keep the maize farmers in the country experiencing low yields despite the enormous importance of maize in Ghana, rendering Ghana self-insufficient in the crop production. In order to help maize farmers increase productivity, it is important to analyze carefully how they make the maximum use of technology or inputs are open to them. The author examined resource use output for the maize farms in Ghana. The data used were collected using a formal questionnaire, using a cross-sectional sample of Ghana. For the analysis, the author should use the Descriptive statistics, stochastic frontier analysis and the marginal value product ratio to marginal factor cost approaches. The results showed that maize farmers in Ghana in general were inefficient in using the resources available to them. Fertilizer,

herbicide, pesticide and so on were underused, while the farmers overused labour and capital. The author found that the maize farmers in Ghana are increasingly showing returns to value, indicating that farmers can increase their output by increasing the use of resources. The aim is to encourage farmers to optimize fertilizer, herbicide, etc. use to improve maize productivity in Ghana. Currently, incentives and strategies could take the form of better government management of the current fertilizer subsidy program and efficient distribution of inputs through farmer-based organizations to ensure farmers have easy access.

CHAPTER - III

MATERIALS AND METHODS

The chapter is a detailed exploration of the methodological framework. The whole chapter is subdivided into five subsections. The entire sampling procedure is outlined in the first section, while the nature and type of information required for the study is given in the second section.

The third section consists of a separate analysis procedure for each goal and a brief profile of study area is been described in fourth section.

3.1 Sampling design:

The selection of agroclimatic – zone, selection of district, block, selection of villages and selection of farmers as discussed in the sub-sections below:

3.1.1 Selection of Agro-climatic Zone

The state of Chhattisgarh has 3 agroclimatic zones viz. Chhattisgarh plains, Northern hills and Bastar plateaus. Northern hills agroclimatic zone of the state occupied major area & production of maize than other two agro-climatic zones of the state. Therefore, Northern hills agro-climatic zone is being selected purposively; which accounted to be 42.90% area of the states.

Table 3.1: Area of maize by agro-climatic zones of Chhattisgarh state, 2016:

S.N.	Agro-climatic zone	Area(in 000ha)	%
1.	Chhattisgarh Planes	30676	24.28
2.	Bastar Plateau	41351	32.72
3.	Northern Hills	54329	43.00
	Total	126356	100

Source: Agriculture Statistics, 2016 Commissioner of Land Records, Chhattisgarh State.

3.1.2 Selection of District:

Nothern hills have comprised of 5 districts namely Surguja, Balrampur, Surajpur, Korea, and Jashpur. Among them Surajpur District is selected randomaly.

Table 3.2: Area of maize by district of northern hills, 2016:

S.No.	Name of districts	Area	%
1.	Surguja	9425	17.3480
2.	Balrampur	21701	39.9437
3.	Surajpur	10405	19.1518
4.	Korea	7347	13.5232
5.	Jashpur	5451	10.0333
	Total	54329	100

Source: Official records office of the Deputy Director of Agriculture, Surajpur district, 2016.

3.1.3 Selection of blocks

Surajpur district consisted 6 blocks, Pratappur and Surajpur blocks have taken into consideration randomly for the study.

Table 3.3: Area of maize by block of Surajpur District, 2016-17:

S.N.	Name of Blocks	Area (ha)	
		2016-17	%
1.	Surajpur	3110.00	18.72
2.	Ramanujnagar	2125.00	12.79
3.	Premnagar	1665.00	10.02
4.	Bhaiyathan	1535.00	9.24
5.	Odagi	3380.00	20.35
6.	Pratappur	4795.00	28.86
	Total	16610.00	100

Source of the last table: Official records office of the Deputy Director of Agriculture, Surajpur district, 2016-2017.

3.1.4 Selection of villages

Among the sampled blocks 3 villages for each block will be undertaken for selection of maize growers.

3.1.5 Selection of farmers

From the sampled villages, 10 maize growers for each villages will be randomly selected for interview required for the study. Therefore, total 60 maize

growers considered for the study; which comprised of 30 maize growers for Pratappur block & 30 maize growers for Surajpur block.

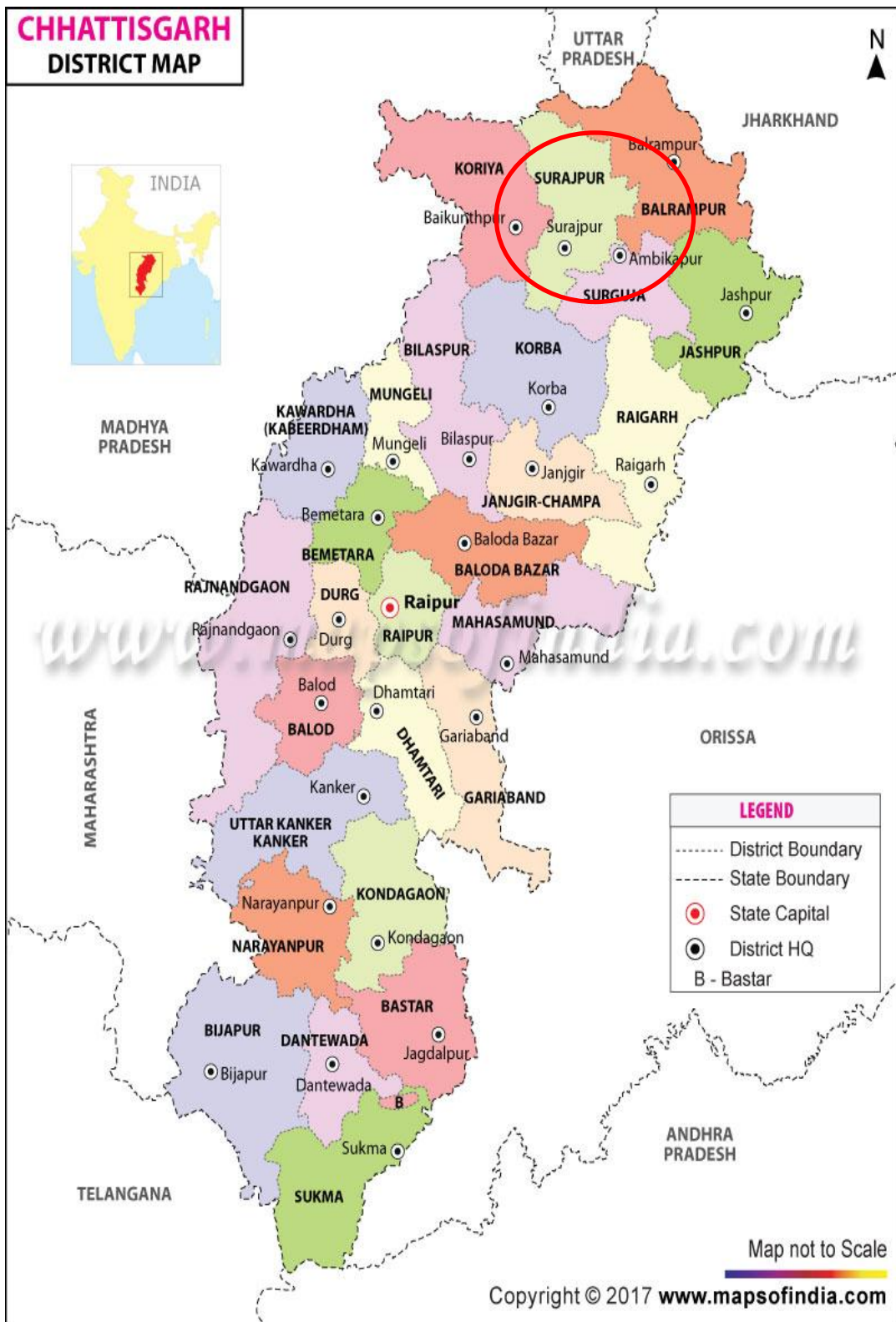


Fig 1 . MAP-I: Map of India and Map of Chhattisgarh .

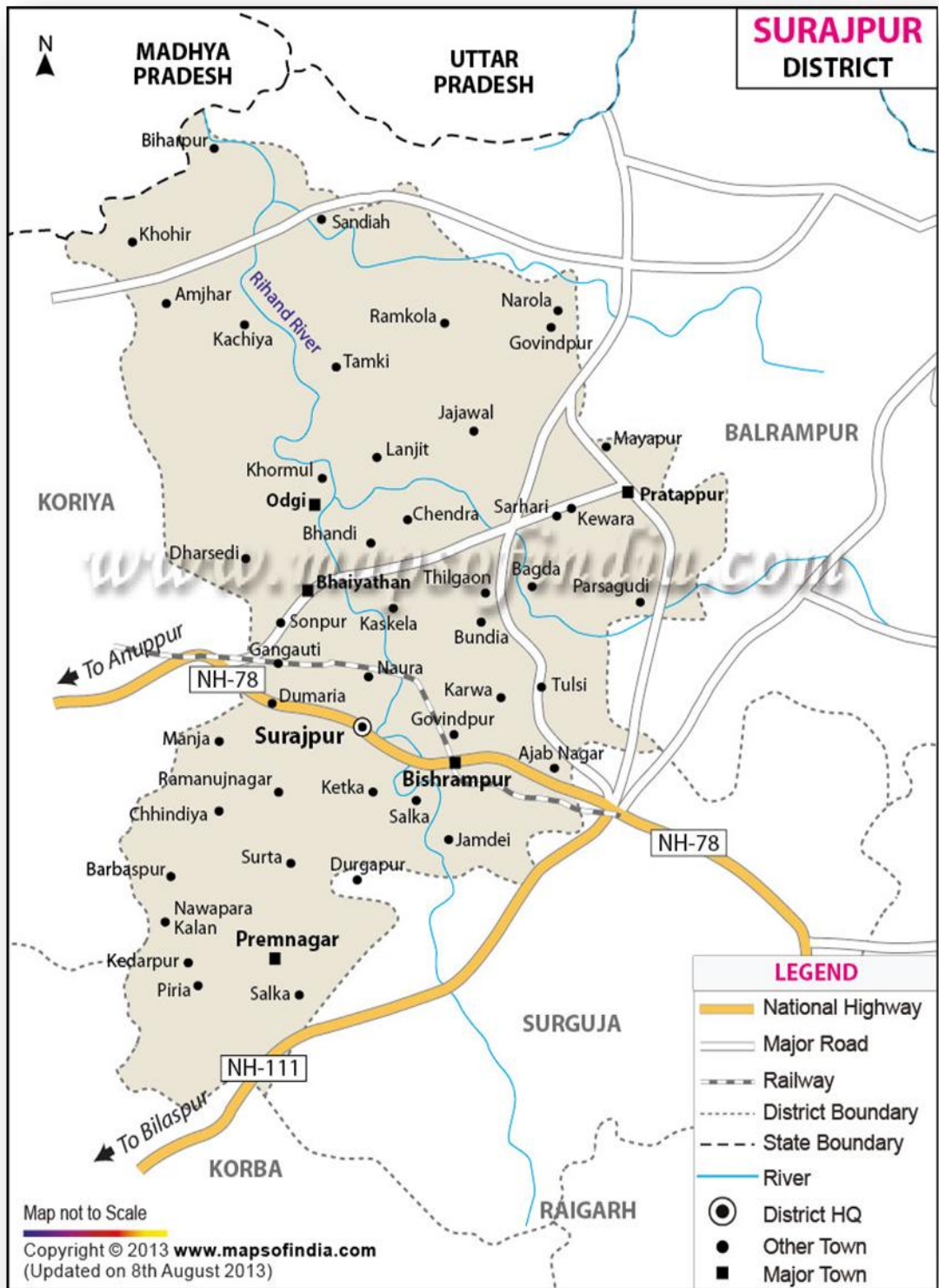


Fig.2 MAP-II: Map of Surajpur district.

Table 3.4: Number of sample households within the study area under different categories:

S. No.	Particulars	Number of households selected	Per cent
1	Marginal	14	23.33
2	Small	24	40.00
3	Medium	12	20.00
4	Large	10	16.67
	Total	60	100

3.2 Method of enquiry and data collection

Primary data required for this study: which will be taken from the sampled maize growers Using pretested schedule and questionnaire, personal interview methods on various aspects to fulfill the research objective. The data pertaining for the Agricultural year 2017-18.

3.3 Analytical tools:

3.3.1 Functional analysis

To accomplish the objectives, the simple averages & percentage statistical methods will be used to represent the results in order to figure out the costs & returns of maize production. A standard method of calculating the costs & returns of maize will be used which is given by the Commission of Agricultural Price & Cost.

The objective on to estimate the resource use efficiency of maize a Cobb-Douglas production function will be applied. It is because of this function is superior to determine the variable input effect. This function is also permitted for regression in logarithm yields coefficients under ordinary least square, which

represents elasticity in production. This function has merit to provide returns to scale (constant, increasing, decreasing). The details of functional form of Cobb-Douglas function is as under :

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}X_7^{b_7}X_8^{b_8}$$

The estimated form of this function given as under:

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9$$

Where,

Y = Yield of maize (kg/ha)

a = Constant or intercept term

X₁ = Seed rate (kg/ha)

X₂ = Quantity of manure (kg/ha)

X₃ = Quantity of Urea (kg/ha)

X₄ = Quantity of Single Super Phosphate (kg/ha)

X₅ = Amount of Murate of Potash (kg/ha)

X₆ = No. of irrigation (No.)

X₇ = Human labour days (mandays/ha)

X₈ = Bullock pair days (ha)

X₉ = Machine power (hours)

ln = Natural log

b₁.....b₉ = Coefficients of respective variables.

The elasticity of production of factor input from Cobb-Douglas production function shall be used to measure the Geometric Mean Level (GM) Marginal

Value of Product (MVP) for the average farms (Yamane 1973). The ratio of Marginal Value Product (MVP) to Marginal Factor Cost (MFC) for each input was compared and tested for its equality to 1, i.e. 1 (Yotopoulos, 1976) in order to test the resource efficiency.

For fulfillment of the objective to examine the marketing pattern of the maize & constraints involved in production & marketing of maize. The simple average & percentage statistical method will be used to analyze the data.

3.3.2 Marginal value productivity (MVP)

To arrive at resource use efficiency of various variables, marginal value productivity of significant variables were computed of the most suitable production function, i.e. In the present case Cobb-Douglas was worked out.

Cobb– Douglas production function

$$Y = a_1 x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} \dots x_n^{b_n}$$

3.3.3 Resource use efficiency

It measures whether The inputs are or are not used efficiently. They are used effectively when the MVP input shall be the same as its price per unit. So, e.g.

$$MVP_i = b_i \frac{Y}{X}$$

Where,

b_i = Estimated regression coefficient associated with i th variable.

Y = Geometric mean of Y variable.

X = Geometric mean of X variable

To assess the efficiency of resource usage, the marginal value product of different inputs was worked out for significant regression coefficient in the estimated production function. Any divergence of the MVP product from its unit price could be considered resource use inefficiency. The greater the difference between the MVP of an input and the price of its unit, the higher the inefficiency,

and vice versa. In addition, the following t-statistics were used to check the statistical significance of the difference between the MVP of an input and the unit price of it.

$$t = \frac{|MVP_i - P_i|}{S.E.(MVP_i)}$$

S.E. (MVP_i) = Standard error of MVP_i which is computed follows:

$$S.E. (MVP_i) = S.E. (b_i) \bar{X}$$

Where,

S.E. (b_i) is the standard co-efficient regression error associated with ith input.

P_i = Unit price of the input.

3.3.4 Disposal pattern

Simple tabular research was employed by different categories of farmers to analyze the marketing pattern of maize. To estimate the marketable surplus of the commodity, the total quantity used for different purposes is deducted from total crop production.

Marketable Surplus:

$$MS = P - C$$

Where,

MS = Marketable Surplus

P = Total Production

C = Total requirement

3.3.5 Tabular analysis

The tabular analysis was used to estimate the production costs of maize, the returns from maize production, and disposal pattern of maize by sampled

households The socio-economic profile of households were also studied using tabular analysis.

3.3.5.1 Costs and returns concepts

To estimate the maize crop production costs, the entire cost is divided into two heads, i.e. variable costs and fixed costs. Various cost components such as human labour, bullock and machine labour, manure and fertilizer, crops, irrigation, plant protection and chemicals have been taken into account in order to determine the variable cost of cultivation per hectare. The return on labour capital involved in production is also calculated at the prevailing interest rate.

A. Fixed cost

Fixed costs are the expense incurred, whether or not the production is being carried out.

B. Variable cost

Fixed costs are those costs incurred on the basis of the fixed output variables and that can be altered in the short term.

Cost concepts as per the CACP classification

The approach to costing concepts for farming is commonly employed in India. A common cultivation cost system used by the Commission for Agricultural Costs and Prices (CACP), Directorate of Economics and Statistics, Government of India has been adopted to work out the cultivation costs.

The A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3 are included. Specific costs were worked out using the formula below. The cost of the output is determined by using simple mathematical analysis.

The cost of standard cultivation method which includes costs A1, B1 and C1 has been adopted.

Cost A₁: Consists of the following 15 cost items:

1. Value of hired human labour (permanent & casual)
2. Value of owned bullock labour
3. Value of hired bullock labour
4. Hired machinery charged
5. Value of fertilizers
6. Value of manure (produced on farm and purchased)
7. Value of seed (both farm-produced and purchased)
8. Value of insecticides and fungicides.
9. Irrigation charges (both of the owned & owned and hired tube wells, pumping sets, etc.)
10. canal-water charges
11. Land revenue, cesses and other taxes
12. Depreciation on farm implements (both bullock drawn & worked with human labour)
13. Depreciation on farm building, farm machinery.
14. Interest on the working capital.
15. Miscellaneous expenses (wages of artisans, and repairs to small farm implements)

Cost $A_2 = \text{Cost } A_1 + \text{Rent paid for Leased in Land.}$

Cost $B_1 = \text{Cost } A_1 + \text{Interest on value of Owned fixed Capital assets (excluding land)}$

Cost $B_2 = \text{Cost } B_1 + \text{rental value of owned land.}$

Cost $C_1 = \text{Cost } B_1 + \text{Imputed value of family labour.}$

Cost $C_2 = \text{Cost } B_2 + \text{Imputed value of family labour.}$

Cost $C_3 = \text{Cost } C_2 + \text{Value of management input at 10\% of Cost } C_2.$

Income over cost $A_1 = \text{Output Value} - \text{Cost } A_1$

Income over cost $A_2 = \text{Output Value} - \text{Cost } A_2$

Income over cost $B_2 = \text{Output Value} - \text{Cost } B_1$

Income over cost $B_2 = \text{Output Value} - \text{Cost } B_2$

Income over cost $C_1 = \text{Output Value} - \text{Cost } C_1$

Income over cost $C_2 = \text{Output Value} - \text{Cost } C$

Income over cost $C_3 = \text{Output Value} - \text{Cost } C$

Family human labour

The value of the human family labour used on the farm was related to the prevailing levels of hiring wages in the region.

Bullock labour

Own bullock labour was paid for Bullock pairs at the prevailing local hiring rates.

Seed

At the time of sowing, the cost of home grown seeds was calculated at the prevailing market rates in the area.

Manures

Manures generated at the farm yard are assessed at the prevailing local rates (i.e., by cart load basis). Manures that are bought are priced at the actual prices paid, plus transport costs. The residual impact of the farms manures has been neglected.

Fertilizers

Fertilizer like Iffco, Urea, for example, is charged at the actual price paid plus transport costs.

Irrigation charges

The cost is exclusively related to the irrigation of the crops under this head. The actual source of irrigation is the canal, tanks, and nala. Irrigation payments are known as the days of human labour.

Land revenue and other cases

Followed the land income and other cases among the crops were allocated on the basis of the proportionate area under crops and their duration.

Rental value of land

The rental value of the land was calculated on the basis of prevalent rates in the area of study.

Interest on working capital

The interest rate paid for working capital, i.e. cost items A, was 3%, and charged for half the growing season of the crop. Fixed capital interest was paid at a rate of eight per cent, i.e., farm building, machinery and livestock except land.

Depreciation on machinery and implements

Depreciation is a wear and tear lowering in the value of permanent properties. Depreciation calculation using straight line method. The standard rate of 10% on the total value of machinery, farm equipment, farm buildings and livestock billed and only the proportionate price per hectare were allocated to maize crops.

Evaluation of Output

Farm goods are priced at the actual price that the farmers receive. Unsold products are assessed at a price fixed by state government of Chhattisgarh.

Measures of Comparison

The following steps were introduced for comparison:

- a. The cultivation costs per hectare.
- b. Net yield per hectare.
- c. Production cost per quintal.
- d. Price of the material per hectare.

e. Ratio of input to output.

f. Analyzing the Income.

a. Cost of Cultivation per hectare

Cost of cultivation per hectare has been worked out at different cost concepts for the sample holdings. It is worked out by dividing total cost by area under the crops.

b. Net Income per hectare:

Net income per hectare was calculated by deducting the respective costs on the various cost concepts from the gross monetary returns per hectare.

c. Material cost per hectare

The concept of material cost was recently introduced. Materials costs include seed, manures, fertilizers, irrigation and plant protection chemicals etc.

d. Cost of production per quintal

The average cost of production per quintal was calculated by dividing the costs by total output (i.e. cost A1, cost B1 and cost C1, respectively).

e. Input-Output ratio

Input-output ratio shows the efficiency of inputs. Calculated to be as follows:

Input-output ratio = Gross return ÷ Total cost of input

3.3.3 Marketable Surplus:

$$MS = P - (C + C f + W + S)$$

Where,

MS = Marketable surplus

P = Total production

C = Family consumption

C f = Quantity used for cattle feed

W = Quantity use for wage

S = Quantity kept for seed purpose

3.4 Brief profile of the study area:

This study was limited to Surajpur District of Chhattisgarh. The villages chosen represent the agro-climatic, socio-economic situation of the Chhattisgarh State fairly well. Understanding the general characteristics of the area of study is essential to conduct the study.

The general characteristics of the study area were divided into seven parts, namely general profile of the study area, land holding distribution, soil and topography, climate and rainfall, population distribution, land use pattern, irrigation source.

3.4.1. General profile of Surajpur district:

Surajpur district is located in the north-eastern corner of the state and is located between 23.22° N 82.85° E with varying sea level elevations from 528 metres. This district has an area of 4998.26 ha composed of 550 villages in total. Of which 550 villages are populated, and 1 are desert villages. There are 6 tahsils and 6 development blocks within the district. District topography consists of understanding land full of various hills, lined with dense forest. Surajpur district's climate is considered sub-humid, mild in summer and cool in winter. The Region's mean annual rainfall is 1338.4 mm. The South-West Monsoon begins June 3rd week and withdraws during September 3rd week. The annual mean day time temperature ranges from 26°C to 27°C.

3.4.2 Distribution of land holdings:

Table 3.1 shows the distribution of land holdings by no farmers and the total cultivated area of each group. The largest number of holdings fell within the category of marginal farm size followed by marginal (54.7), small (22.1), medium (13.9) and large (9.3 per cent) farms, respectively.

Table 3.5: Distribution of land holdings in district Surajpur:

Size of farm holdings	Surajpur	
	No. of farmers	Per cent
Marginal (up to 1 ha.)	68,376	54.70
Small (1-2 ha.)	27,643	22.10
Medium (2-4 ha.)	17,375	13.90
Large (above 4 ha.)	11,582	9.30
Total	1,24,976	100.00

Source: Census 2011 Government of India.

3.4.3 Soil and Topography:

The landscape in the district is undulating, and four types of soil are found viz. Red and yellow soils, alluvial soils, light blue soils and laterite soils. Humus and organic matter are very poor soils in the district. The soils in the plain are acidic. There are high hills and plateaus in the eastern and western parts of the district known as 'Plates,' where the central plateau is flat.

3.4.4. Climate and rainfall:

The district's climate varies between humid and dry sub-humid types. The district has three different seasons; winter, summer and rainy. The average annual district rainfall varies from 1250 mm to 1388.4 mm. There's a lot of variations in local rainfall and temperature. Winter sets in at the beginning of November and last nearly to the start of stays open. The summer season begins in March and continues through to June. The season remains dry and hot but from the beginning of May until the middle of June the oppressive heat last. Generally, the rainy season begins by the last week of June and last until October. Rains are quite hard, and rare for long breaks.

3.4.5 Population distribution:

Surajpur district is fourth populated district in the Chhattisgarh state. The district's total population is 7,89,043 (2011 census), 91 per cent of which is rural

and only a small proportion of 9.1 per cent is urban. Population densities are 157.86 per sq. Kilometers ahead.

In urban areas the density of population is greater than that of rural population. Population is the scheduled caste, and the scheduled tribe is 4.8% and 43.9%.

Table 3.6: The distribution of Surajpur district population:

S.No.	Particulars	Surajpur
1.	Total population	7,89,043 (100.0)
2.	Rural population	7,17,507 (90.90)
3	Urban population	71,5,36 (9.10)
4	Scheduled caste	34,990 (4.80)
5	Scheduled tribe	2,99,186 (43.90)
6	Cultivators	1,03,905 (13.16)
7	Agriculture labour	43,927 (5.56)
8	Total workers	3,80,851 (48.26)

Source: Census 2011 Government of India

3.4.6 Land use pattern:

The total Surajpur district geographical area is 4,99,826 hectares. The district occupied 35.25% of the total geographical area, followed by 31.57%, 8.00% and 37.06%, net crop area, double crop area and total crop area respectively. The cropping intensity of Surajpur district is 128 per cent only.

Table 3.7: The pattern of land use in Surajpur district:

S.No.	Particulars	Surajpur
1	Geographical area	4,99,826 (100.00)
2	Forest	1,76,193 (35.25)
3	Net cropped area	1,57,830 (31.57)
4	Double cropped area	39,808 (8.00)
5	Total cropped area	1,85,278 (37.06)
6	Cropping intensity (Per cent)	128

3.4.7 Source of irrigation:

The main source of irrigation was tube wells and canal, which shared 31.41 and 22.43 per cent of the total irrigation, respectively.

Table 3.8: Irrigation source in Surajpur district:

S. No.	Sources	Surajpur districts	Per cent
1	Canal	10733	22.43
2	Tank	1342	2.81
3	Well	1358	2.84
4	Tube-well	15025	31.41
5	Others	19372	40.51
	Total	47830	100.00

Source: Agriculture Statistics Commissioner of Land Record and Settlement, Government of Chhattisgarh, Raipur.

Note: Figures in parentheses indicate percentages to the total geographical area.

3.6 Profile of the selected block and villages:

3.6.1 Cropping pattern:

Rice, pulses, maize, oil seeds and vegetables were the major crops in kharif season in the district and sample area while wheat, sugarcane, oil seeds, Pulses and vegetables were the major crops in rabi season. While those farmers having irrigation, they cultivate vegetables during summer season and found to be the major crops and the cropping intensity was being 128.00 per cent of the Surajpur district.

Table 3.9: Cropping pattern and cropping intensity of Surajpur district

S. No.	Crops	Area (thousand ha)
A.	Kharif	
1	Paddy	96.48
2	Maize	14.32
3	Pulses	16.96
4	Oil seeds	12.61
5	Vegetables	4.43
	Sub total	144.80
B	Rabi	
1	Wheat	18.35
2	Sugarcane	5.04
3	Pulses	7.29
4	Oil seeds	10.28
5	Vegetables	2.84
	Sub total	43.80
C	Summer	
1	Vegetables	7.56
2	Other crops	5.88
	Sub total	13.44
D	Gross cropped area	202.04
E	Net cultivated area	157.83
F	Cropping intensity	128.00 (Per cent)

Source: Agriculture Statistics, 2014-15 Commissioner of Land Record and Settlement, Government of Chhattisgarh, Raipur

3.4.5. Administrative units:

Chhattisgarh state is administratively divided into 27 districts and 146 blocks. Out of these, 85 blocks are the tribal blocks. The state consists 20,308 villages. Surajpur district is administratively divided into 6 blocks. The whole information related to Surajpur district is provided in Table 3.10.

Table 3.10: Administrative units of Surajpur district

S. No.	Units	Number
1.	Tehsils	6
2.	Blocks	6
3.	Total villages	550
4.	Total Panchayats	392
5.	Janpad Panchayat	6
6.	Nagar Panchayat	4

Source: <http://www.surajpur.gov.in>

CHAPTER - IV

RESULTS AND DISCUSSION

This chapter is will represented the results outcomes and their discussion as per the objectives designed for study and it is presented under the following subheads:

- 4.1 Demographic features of the maize growers.
- 4.2 The cost of cultivation of maize crop.
- 4.3 Estimate the resource use efficiency of maize production.
- 4.4 Examine the Disposal pattern of maize.
- 4.5 Constraints in production and marketing of maize.

4.1 Demographic features of sampled farmer :

Table 4.1 represents the demographic characteristics of farm families, family size and level of education at the study area sampled farms. The table reveals that maize growers have an average number of family sizes as 5.53. The family size in marginal, small, medium and large farms is estimated at 6.29, 4.62, 6.33 and 5.7 respectively. The overall male- female ratio for the total population is 56.32:43.67 per cent. The table also reveals the pattern of caste and occupation at the sampled farms.

It is also observed that an average of 40.00% of the sampled families belong to the scheduled tribe, 20.00% belong to the scheduled caste, 26.66% belong to the other backward class and 13.33% belong to the general category. The farmers profession is also included in the list.

The level of education in the sampled household is observed that 22.89 per cent of the total sampled populations have primary education while those figures are 20.78 per cent, 18.37 per cent, 9.03 per cent respectively for middle, high school and high school, graduate and higher education.

Table 4.1 Sample-household demographic characteristics:

S.No. Individuals	Marginal	Small	Medium	Large	Total
01. No. of sample households	14 (100)	24 (100)	12 (100)	10 (100)	60 (100)
02. No. of family member	88	111	76	57	332
Male	50 (56.82)	65 (58.56)	42 (55.26)	30 (52.63)	187 (56.32)
Female	38 (43.18)	46 (41.44)	34 (44.74)	27 (47.37)	145 (43.67)
Average family size	6.29	4.62	6.33	5.7	5.53
03. No. of sample households by caste					
A. Scheduled tribe	7 (50.00)	10 (41.66)	4 (33.33)	3 (30.00)	24 (40.0)
B. Scheduled caste	4 (28.57)	6 (25.00)	1 (8.33)	1 (10.00)	12 (20.00)
C. Other backward caste	2 (14.28)	5 (20.83)	5 (41.66)	4 (40.00)	16 (26.00)
D. General	1 (7.14)	3 (12.5)	2 (16.66)	2 (20.00)	8 (13.33)
Total	14 (100)	24 (100)	12 (100)	10 (100)	60 (100)
4. Age of family members					
a. Up to 14 years	35 (39.77)	39 (35.13)	35 (46.05)	23 (40.35)	132 (39.75)
b. 14 -60 years	30 (34.09)	42 (37.83)	23 (30.26)	20 (35.08)	115 (34.63)
c. Above 60 years	23 (26.13)	30 (27.02)	18 (23.68)	14 (24.56)	85 (25.60)
Total	88 (100)	111 (100)	76 (100)	57 (100)	332 (100)
5. Level of education					
a. Illiterate	23 (26.13)	36 (32.43)	22 (28.94)	15 (26.31)	96 (28.91)
b. Primary	19 (21.59)	20 (18.01)	18 (23.68)	19 (33.33)	76 (22.89)
c. Middle	16 (18.18)	32 (28.82)	10 (13.15)	11 (19.29)	69 (20.78)
d. High school & higher secondary	18 (20.45)	19 (17.11)	17 (22.36)	7 (12.28)	61 (18.37)
e. Graduate & Above	12 (13.63)	4 (3.60)	9 (11.84)	5 (8.77)	30 (9.03)
Literacy (%)	73.86	67.56	71.05	73.68	71.08

Note: The parentheses show percentages of the total.

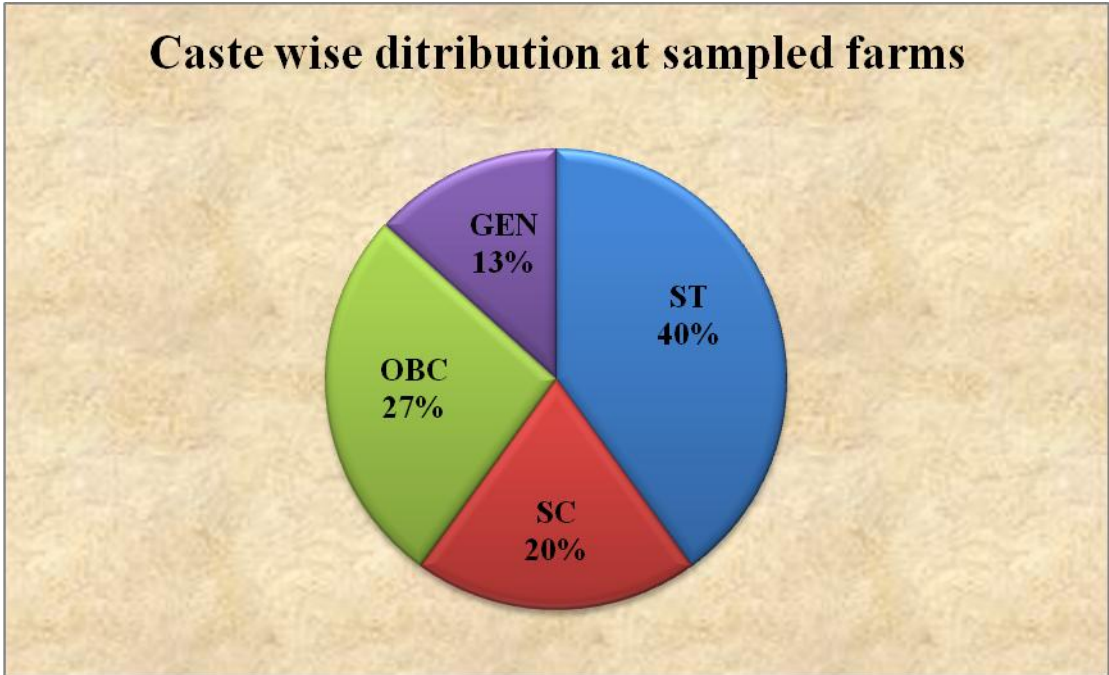


Fig. 4.1: distribution of caste wise in sampled farms.

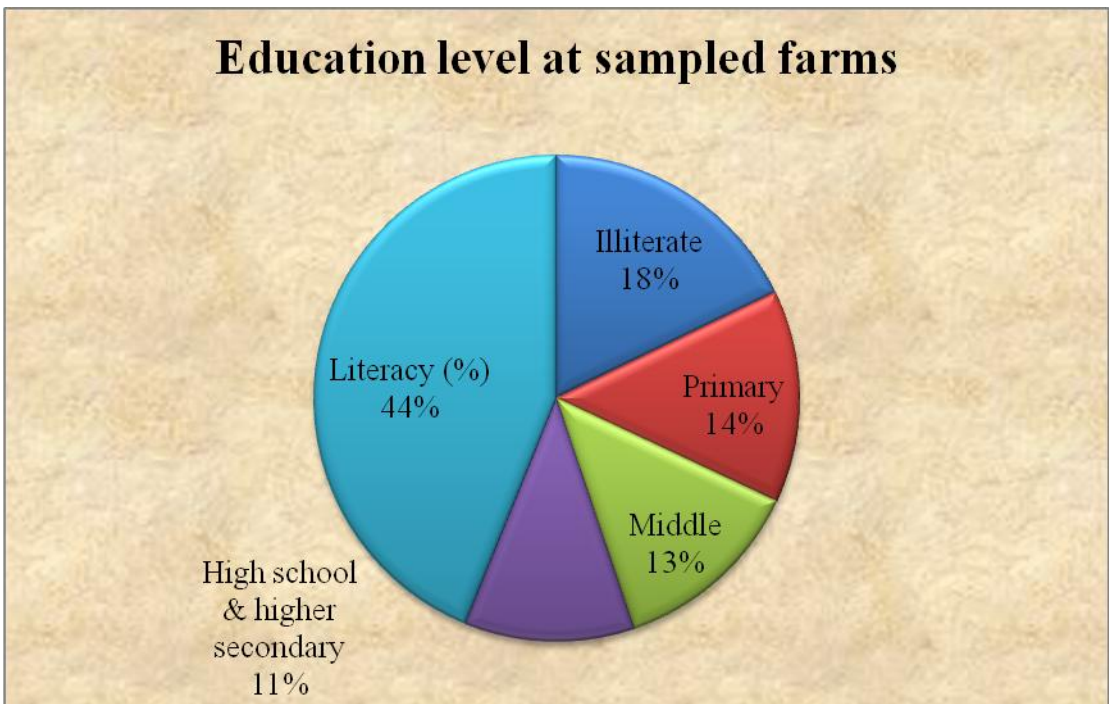


Fig 4.2: Level of education in sampled farms.

4.1.1 Land use pattern:

The pattern of land use at sampled farm is shown in Table 4.2. From the table it is evident that the total area cultivated per farm is 0.51 hectares, 1.66 hectares, 2.50 hectares and 4.75 hectares respectively on marginal, small, medium and large farms, along with 2.07 hectares as a total. The overall percentage of irrigated area is estimated at 56.00 percent of total cultivated land which ranges from 68.00 percent on marginal farms, 0.32 percent on small farms, 62.5 percent on medium farms and 76.38 percent on large farms.

Table 4.2: Holding size and irrigation of sampled farms within the study area (Hectare / farm):

S. No.	Individuals	Marginal	Small	Medium	Large	Overall
1	Total owned land	0.51 (100)	1.66 (100)	2.50 (100)	4.75 (100)	2.07 (100)
2	Total cultivated land	0.50 (100)	1.60 (100)	2.40 (100)	4.70 (100)	2.00 (100)
3	Irrigated land	0.34 (68.00)	0.51 (0.32)	1.50 (62.5)	3.59 (76.38)	1.12 (56.00)
4	Un-irrigated land	0.16 (32.00)	1.09 (68.12)	0.90 (37.5)	1.11 (23.62)	0.88 (44.00)

Note: Figures in the parentheses show the percentages of the total area under cultivation.

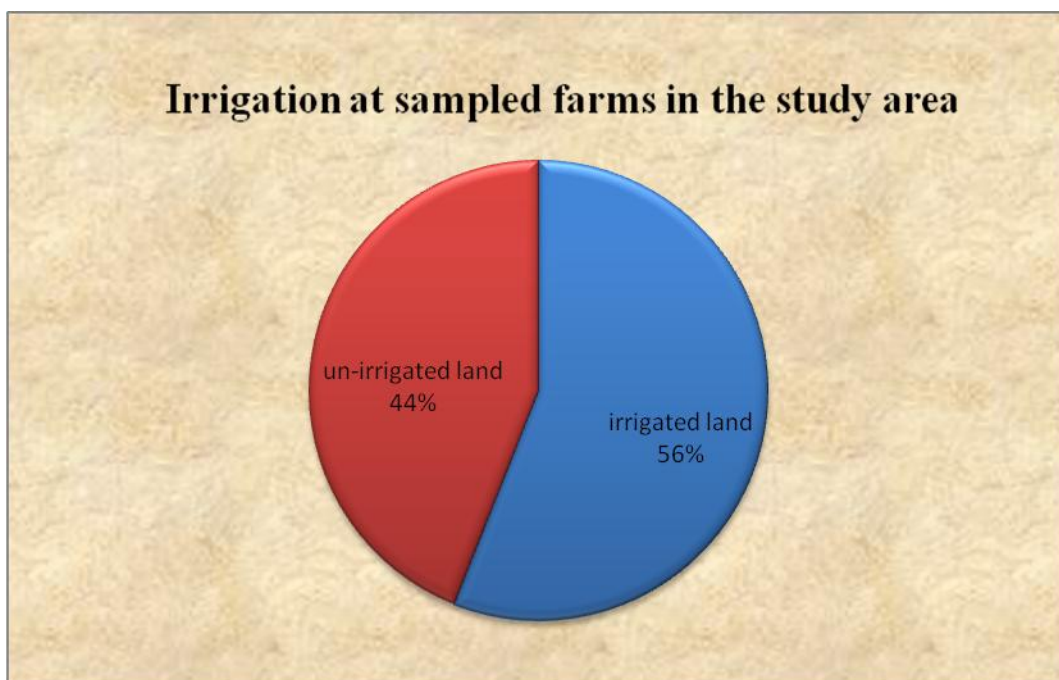


Fig: 4.3 Irrigation in the study area at the sampled farms.

4.1.2 Cropping pattern:

Table 4.3 presents the cropping pattern at the sampled farms. The gross cultivated area is observed as 0.83 hectares, 2.97 hectares, 3.91 hectares and 7.6 hectares in marginal, small, medium and large farms, with a total of 3.54 hectares in sampled farms, respectively. During the kharif season, the gross crop area of 2.00 hectares (percent) is allocated while the remaining 1.41 hectares (36.71 percent) are allocated overall during the rabi season. In different crops, the area under kharif season is observed as 60.24 percent, 53.87 percent, 61.38 percent, and 60.65 percent, respectively, on marginal, small, medium, and large farms.

The area allocated during the rabi season is estimated as marginal at 36.14 percent, small at 36.70 per cent, medium at 35.03 percent and large farms at 37.89 percent. The crop intensity is observed in marginal farms as 166.00 percent, in small farms 185.62 percent, in medium farms 162.9 percent and in large farms 161.70 percent. In this study area, the overall cropping intensity is estimated at 177.00 percent.

Table 4.3: Sample household cropping pattern (ha / farm):

S. No.	Crops	Farm size				Overall
		Marginal	Small	Medium	Large	
A	Kharif					
1.	Paddy	0.25	1.03	1.10	2.80	1.29
2.	Maize	0.24	0.54	1.10	1.38	0.81
3.	Sugarcane	0.01	0.03	0.19	0.43	0.1
	Sub Total	0.50	1.60	2.40	4.61	2.00
		(60.24)	(53.87)	(61.38)	(60.65)	(56.49)
B	Rabi					
1.	Sugarcane	0.18	0.80	0.90	2.30	1.05
2.	Wheat	0.10	0.25	0.40	0.47	0.30
3.	Mustard	0.02	0.04	0.07	0.11	0.06
	Sub Total	0.30	1.09	1.37	2.88	1.41
		(36.14)	(36.70)	(35.03)	(37.89)	(39.83)
C.	Summer					
	Maize	0.00	0.23	0.06	0.00	0.07
	Vegetable	0.03	0.05	0.08	0.11	0.06
	Sub Total	0.03	0.28	0.14	0.11	0.13
		(3.61)	(9.42)	(3.58)	(1.44)	(3.67)
	Gross cropped area (A+B+C)	0.83	2.97	3.91	7.6	3.54
		(100)	(100)	(100)	(100)	(100)
	Net cropped area	0.50	1.60	2.40	4.70	2.00
	Cropping intensity (%)	166.00	185.62	162.9	161.70	177.00

Note: The parentheses show percentages of the total.

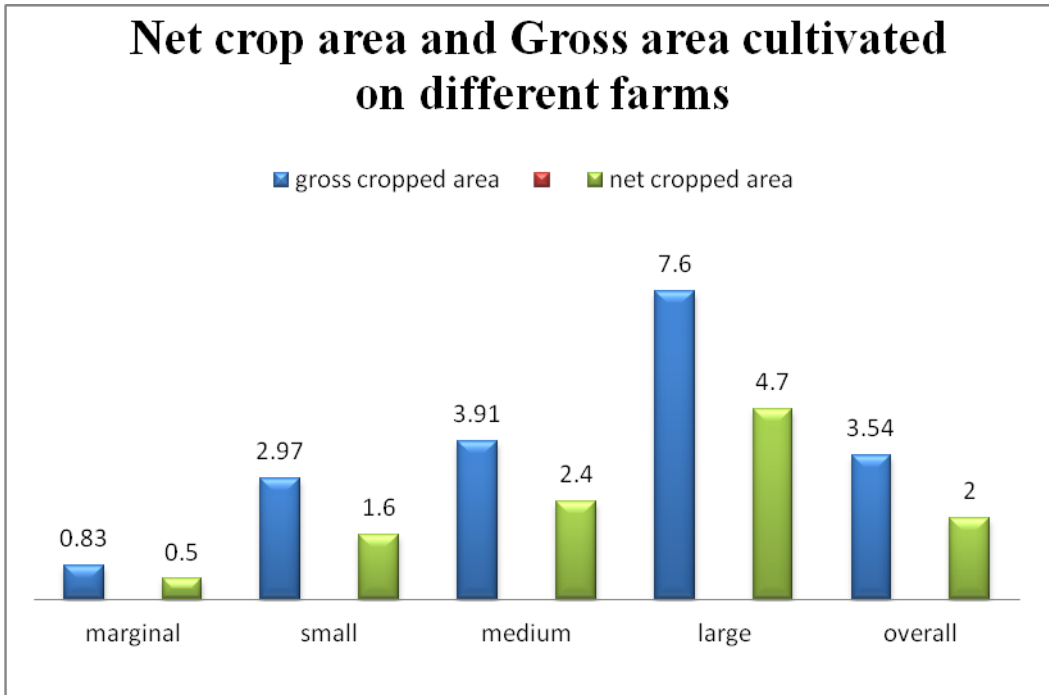


Fig 4.4: Net crop area and Gross cropped area at different farms.

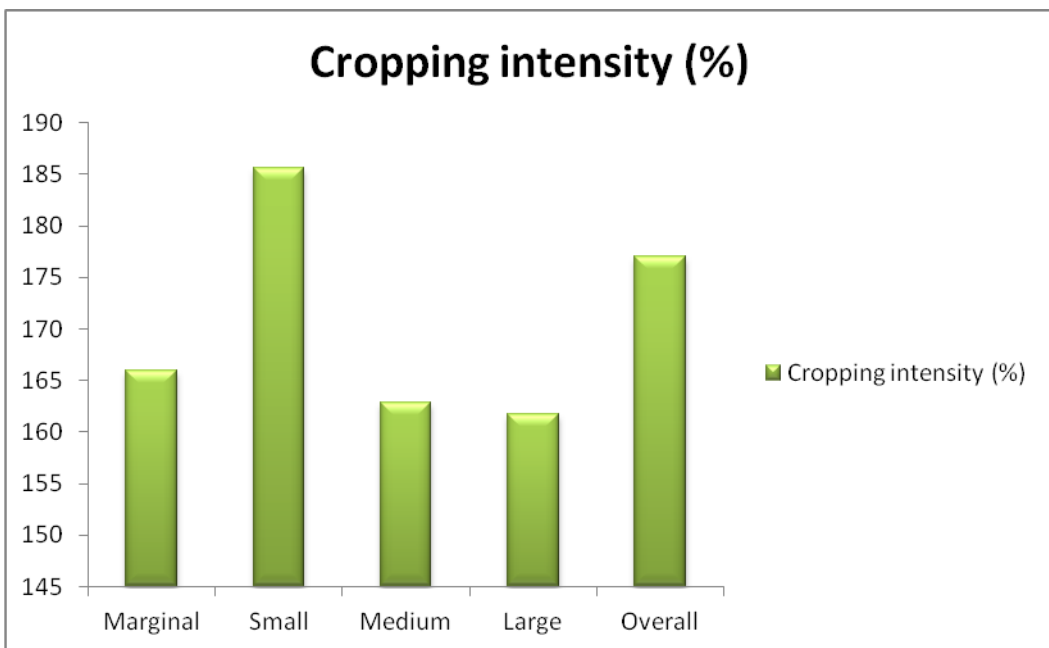


Fig 4.5: Intensity of crops (percentage) in different farms.

4.2. Cost of cultivation of maize

Table 4.4 describes the economics of maize crop. It clearly shows that the cost of maize cultivation per hectare on large farms was higher compared with marginal farms. Overall the cultivation cost per hectare of maize was found to be Rs. 29427.78 per hectare on average.

In large farms the cost of cultivation was higher (Rs.32125.24/ha) compared to marginal (Rs.25288.53/ha.), small (Rs.29141.14/ha.) and medium-sized (Rs.30986.84/ha.) farms.

The cultivation cost per hectare showed a rising trend with farm size increase. It was because the large farmers incurred more expenditure on modern farm inputs such as quality seed, fertilizer, plant protection material, hired labour, etc. as a result of borrowing from credit institutions and improved economic status compared to marginal, small and medium farmers. The higher expenditure returns to higher yields and returns as compared to others on large farms.

Among various input operations overall, the highest cost per hectare was observed for human labor Rs.7535.32 followed by manure and fertilizer Rs.7374.45, machine power Rs. 2445.77, seed Rs. 1283.75, bullock labor Rs. 1217.91, depreciation Rs. 221.32, and land income Rs.12.

Table 4.4: Costs of cultivation of maize under different farm size (Rs/ha):

Particular	Marginal	Small	Medium	Large	Overall
a. Material cost					
I. Seed	1216.00 (4.81)	1246.00 (4.27)	1320.00 (4.26)	1353.00 (4.21)	1283.75 (4.36)
II. Fertilizer	4713.04 (18.63)	7569.25 (25.97)	8630.36 (27.85)	8585.17 (26.72)	7374.45 (25.06)
III. Plant protection	514.77 (2.03)	528.92 (1.81)	556.84 (1.79)	613.14 (1.90)	553.41 (1.88)
IV. Irrigation charges	320.73 (1.26)	376.92 (1.29)	398.14 (1.28)	413.39 (1.28)	377.29 (1.28)
Total material cost	6764.54 (26.74)	9721.09 (33.35)	10905.34 (35.19)	10964.7 (34.13)	9588.9 (32.58)
b. Human labour cost					
I. Family labour	3955.64 (15.64)	4029.07 (13.82)	4010.37 (12.94)	3676.36 (11.44)	3945.19 (13.41)
II. Hired labour	2497.5 (9.87)	3199.18 (10.97)	3815.26 (12.31)	4855.39 (15.11)	3590.13 (12.19)
Total human labour cost	6453.14 (25.51)	7228.25 (24.80)	7825.63 (25.25)	8531.75 (26.50)	7535.32 (25.61)
c. Power use cost					
I. Bullock labour	1434.60 (5.67)	1125.00 (3.86)	1136.54 (3.66)	1175.50 (3.65)	1217.91 (4.14)
II. Machine power	2289.3 (9.05)	2399.7 (8.23)	2401.00 (7.74)	2697.5 (8.39)	2445.77 (8.31)
Total power use cost	3723.9 (14.72)	3524.7 (12.09)	3537.54 (11.41)	3873.00 (12.05)	3663.68 (12.45)
d. Interest on working capital	508.25 (2.00)	614.22 (2.10)	668.05 (2.15)	701.08 (2.18)	623.64 (2.12)
A. Total variable cost	17449.83 (69.00)	21088.26 (72.36)	22936.56 (74.02)	24070.53 (74.92)	21411.54 (72.75)
Fixed cost					
I. Land revenue	12.00 (0.04)	12.00 (0.04)	12.00 (0.03)	12.00 (0.03)	12.00 (0.04)
II. Rental value of land	7500.00 (29.65)	7500.00 (25.73)	7500.00 (24.20)	7500.00 (23.34)	7500.00 (25.48)
III. Depreciation	196.00 (0.77)	231.8 (0.79)	229.00 (0.73)	232.5 (0.72)	221.32 (0.75)
IV. Interest on fixed capital	230.7 (0.91)	309.08 (1.06)	309.28 (0.99)	310.21 (0.96)	282.92 (0.96)
Total fixed cost(B)	7938.7 (31.39)	8052.88 (27.63)	8050.28 (25.97)	8054.71 (25.07)	8016.24 (27.24)
Total cost (A+B)	25288.53 (100.00)	29141.14 (100.00)	30986.84 (100.00)	32125.24 (100.00)	29427.78 (100.00)

Note: The parentheses show percentages of the total cost.

4.2.1 Yield and cost of production per quintal:

The yield, output value per hectare, and production cost per quintal of maize on the sample farms were elaborated in table -

In the sample farms per hectare, a total yield per hectare of maize exceeded 46.25 quintals, ranging from 41 quintals per hectare in marginal farms to 53 quintals per hectare in large farms. The production cost per quintal is, on the whole, worked out as Rs. 647.22. The maize production cost per quintal is estimated as Rs. 613.09 Rs. 682.61, Rs. 709.90 and Rs. 583.29 at shows that the production cost per quintal is marginal, small, medium and large farms respectively.

Due to higher yield, it decreased with the increased size of farms in return for the cost of cultivation on the large farms. The total output value per hectare comes to Rs. 62125 the output value per hectare comes to Rs. 55380, Rs. 58220, Rs. 59640, and Rs. 75260 respectively on marginal, small, medium and large farms. The higher output value on large farms was associated with the greater expenditure on modern farm inputs.

Table 4.5: Cost of production of maize for various land holding catagories (Rs./qt.):

S.No.	Particular	Marginal	Small	Medium	Large	Overall
1	Average yield (qtl/ha)	36.00	50.14	55.00	57.95	49.77
2	Average price (Rs./qtl)	1420	1420	1420	1420	1420
3	Gross returns (Rs./ha)	55380	58220	59640	75260	62125
4	Cost of cultivation (Rs./ha)	23910.88	27987.39	29816.2	30914.47	28157.23
5	Net returns (Rs./ha)	31469.12	30232.61	29823.8	44345.53	33967.76
6	Cost of production (Rs./qtl.)	613.09	682.61	709.90	583.29	647.22
7	Input output ratio	1:2.31	1:2.08	1:2.00	1:2.43	1:2.20

4.2.2 Measures of farm profit

In the study area which ranges from Rs. 55380 per hectare in marginal farms to Rs. 75260 per hectare in large farms, the overall gross return is observed as Rs. 62125 per hectare. The gross return depends on the variety, productivity and price the farmers receive. The total net return per hectare is seen as Rs. 33967.76. It is calculated to be Rs. 31469.12 per hectare, Rs. 30232.61 per hectare, Rs. 29823.8 per hectare and Rs. 44345.53 per hectare respectively on marginal, small, medium and large farms. The average input-output ratio is 1:2.20, which ranged from 1:2.31 in marginal farms to 1:2.43 in large farms.

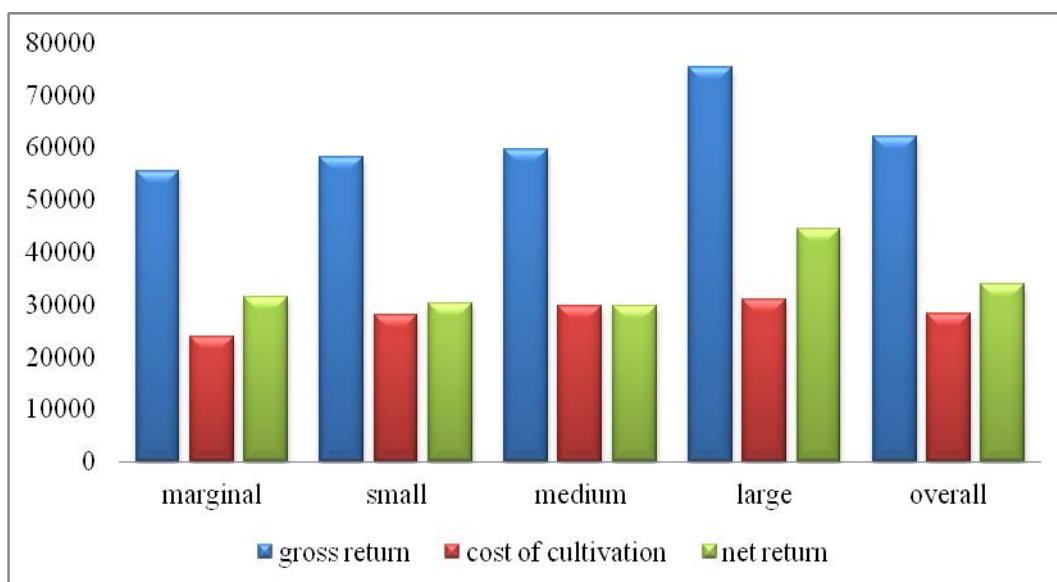


Fig.4.6: Per hectare cost and return of maize crop.

4.2.3 Cost and returns on the basis of different cost concept:

The different cost concepts employed by CACP were presented in Table 4.8. As perusal of table 4.8 showed, cost A1 accounted for total cost Rs. 17702.76 (Cost C3). Costs A1 and A2 were found to be the same as no land on lease was taken. Cost B1, cost B2, cost C1 and cost C2 were found to be Rs.17992.57, Rs.25492.57, Rs.21910.43, Rs.29410.34, and cost C3 was found to be Rs.32351.37 per hectare at 10 percent of cost C2 return over cost A1, cost A2, cost B1, cost B2, cost C1, cost C2, and cost C3 was obtained respectively from Rs. 44422.24, Rs.44422.24, Rs.44132.43, Rs.36632.43, Rs.40214.57, Rs.32714.66, Rs.29773.63.

Table 4.6: Breakdown of total costs and income over different maize farming costs:

Particular	Marginal	Small	Medium	Large	Overall
Break-up of costs					
Cost A1 (All actual expenses)	13702.19 (49.06)	17302.99 (53.97)	19167.19 (56.23)	20638.67 (58.40)	17702.76 (54.72)
Cost A2 = Cost A1+ Rent paid for leased in land	13702.19 (49.06)	17302.99 (53.97)	19167.19 (56.23)	20638.67 (58.40)	17702.76 (54.72)
Cost B1 = Cost A1+Interest on value of owned fixed capital	13932.89 (49.88)	17612.07 (54.94)	19476.47 (57.14)	20948.88 (59.28)	17992.57 (55.61)
Cost B2 = Cost B1+ Rental value of owned land & Rent paid for leased in land	21432.89 (76.74)	25112.07 (78.33)	26976.47 (79.14)	28448.88 (80.50)	25492.57 (78.79)
Cost C1 =Cost B1+imputed value of family labour	17888.53 (64.05)	21641.14 (67.51)	23486.84 (68.91)	24625.24 (69.68)	21910.43 (67.72)
Cost C2 =Cost B2+imputed value of family labour	25388.53 (90.91)	29141.14 (90.91)	30986.47 (90.91)	32125.24 (90.91)	29410.34 (90.91)
Cost C3 =Cost C2+ 10% OF Cost C2 on account of managerial function performed by farmer.	27927.38 (100.00)	32055.25 (100.00)	34085.11 (100.00)	35337.76 (100.00)	32351.37 (100.00)
Return obtained over different costs					
Return over cost A1	41677.81	40917.01	40472.81	54621.33	44422.24
Return over cost A2	41677.81	40917.01	40472.81	54621.33	44422.24
Return over cost B1	41447.11	40607.93	40163.53	54311.12	44132.43
Return over cost B2	33947.11	33107.93	32663.53	46811.12	36632.43
Return over cost C1	37491.47	36578.86	36153.16	50634.76	40214.57
Return over cost C2	29991.47	29078.86	28653.53	43134.76	32714.66
Return over cost C3	27452.62	26164.75	25554.89	39922.24	29773.63

4.3. Resource use efficiency in maize production:

Knowledge of best utilization of limited maize production resources is very important for profit making in maize production. So it is necessary to know whether or not the resources owned by the farmers have been used effectively. Keeping this in mind, this section has worked out and discussed the input-output relationship and resources use efficiency in maize production.

4.3.1 Input-output relationship:

To examine the relationship between output (maize output) and inputs (explanatory variables); the following types of production functions viz. Linear, Cobb-Douglas has been tried. Cobb-Douglas production function was found to be best fit on the basis of sign and significance of the estimated coefficients. The results of the estimated production function are presented in Table 4.7 which gives the regression coefficients, standard error of regression coefficients, their significance and coefficient of multiple determination (R²).

Multiple determination coefficient (R²); The multiple determination coefficient (R²) represents the proportion of total variance in the dependent variable, as stated collectively by the relevant independent variables. As a result, the value of the coefficient of multiple determination showed that the five tools together accounted for 75.65 percent of the variability in maize production. The value of the seed rate coefficient was estimated to be 0.777, meaning that one percent change in seed rate expenditure will result in a change of 0.777 percent in production return. Similarly, one per cent change in expenditure on manure will result in change in return from maize production by 0.530 percent and one per cent change in expenditure on urea will result in change in return from maize production by 1.506 percent and one percent change in expenditure on SSP will result in change in return from maize production by 0.489 percent and one percent change in expenditure on MOP will result in change in return from maize production by 0.177 percent.

Table 4.7: Estimated parameters of 60 maize framers with Cobb-Douglas production function:

R ² (%) = 75.65										
	Constant	Seed rate	Manure	Urea	SSP	MOP	Irrigation	Human labour	Bullock pair	Machine power
Coefficients	18.714	0.777**	0.530**	1.506**	0.489**	0.177**	0.030	0.036	0.062	0.033
Standard Error	4.029	0.320	0.085	0.616	0.075	0.048	0.031	0.051	0.055	0.034

Figure in parentheses shows the estimate standard error.

** * Significant at level 1 percent, * * Significant at level 5 percent

In the production function the value of coefficient, seed rate (X1), manure (X2), urea (X3), single super phosphate (X4), potash murate (X5), variable was found to be significant, so these variables are selected for further analysis.

4.3.2 Resource use efficiency in maize production:

Maize production is a complex process that is affected by several processes of explanation such as seed, manure and fertilizer, labor, etc. Therefore the selection of correct variables is very necessary. The maize production function has been estimated as explanatory variables for overall categories using expenditure on seed rate, manure, urea, ssp, mop, irrigation, human labour, bullock labour, and machine power costs.

In order to assess resource efficiency, the marginal value productivity (MVP) of the various inputs whose regression coefficient was found to be significant in maize production was compared to their respective unit price. T-statistics was used to test the significance of MVP deviation of an input from its unit price. Any deviation of the input MVP from its unit price may be called inefficiency of resource use. The greater the difference between an input's MVP and its unit price, the higher the inefficiency is, and vice versa. In Table 4.8, the marginal value product (MVP) of significant maize production inputs is given.

Table 4.8: Marginal value product (MVP) for maize production:

Input	Seed				
	rate	Manure	Urea	SSP	MOP
MVP	3.648	0.488	2.708	0.769	0.460
Unit Price	1.000	1.000	1.000	1.000	1.000
Difference	2.648	-0.512	1.708	-0.231	-0.540
Standard error	1.502	0.078	1.107	0.118	0.124
T- Value	1.763	-6.577	1.543	-1.955	-4.337

** Significant at 1 % level, * Significant at 5 % level

It is observed from the Table 4.8 that the marginal value product and marginal factor cost for seed rate and urea were positive and significant and for manure, ssp or mop were negative and significant. This implied that the seed rate and urea were underutilized in cultivation of maize in the study area. The results further shows that maize farmers in Surajpur district put more efforts to increase their output by increasing the use of some of the key resources in maize production. The foregoing analysis revealed that manure, ssp and mop were over-utilized in the study area by the farmers which calls for re-allocation of resources which will increase the maize production in the study area. Therefore, it is suggested that farmers should put more efforts for utilisation of resources to increase the maize production. The extension agencies should also take more initiative for giving technical guidance to the farmers about scientific maize farming in general and better management of field in particular, in the area.

4.4. Marketing pattern of maize

4.4.1 Marketing channel:

The system of marketing means the route or process through which a product moves from the supplier to the end consumer. The following two commonly used marketing channels were found viz.,

Channel – I: Producer → Consumer and

Channel – II: Producer → Wholesaler → Consumer.

4.4.2 Marketable surplus :

It is clear from Table 4.13 that the marketable maize surplus is 22.15 quinta ls. From the table, higher quantity of marketable maize surplus was observed in large-scale farm group and decreased as farm sizes decreased.

In the case of consumption, marginal farmers consume a maximum percentage of 40.85 percent of production and a minimum was observed in the case of 14.40 percent large farmers.

Table 4.9: Sampled households maize marketable surplus: (Quintal per farm)

S. No.	Particular	Marginal	Small	Medium	Large	Overall
1	Total quantity produces (qt)	8.64 (100)	38.60 (100)	63.8 (100)	79.97 (100)	47.75 (100)
2	Quantity paid for wages	2.37 (27.43)	8.55 (22.15)	18.94 (29.68)	21.58 (26.98)	12.86 (26.93)
3	Quantity used for consumption	3.53 (40.85)	7.35 (19.04)	14.60 (22.88)	11.52 (14.40)	9.25 (19.37)
4	Total quantity utilized	5.9 (68.28)	15.9 (41.19)	33.54 (52.57)	33.1 (41.39)	22.11 (46.30)
5	Marketable surplus	2.74 (31.71)	22.7 (58.80)	30.26 (47.42)	46.87 (58.60)	22.15 (46.38)

4.4.3 Disposal pattern of maize:

Farmers' produce are disposed to market directly through the whole seller. It was reported from table 4.11 that higher quantity average of 74.35 percent of the products are disposed to market through the whole seller and the producers have sold the rest to customers.

Table 4.10: Disposable Pattern of Maize of sampled households: (Quintal per farm)

S. No.	Particular	Marginal	Small	Medium	Large	Overall
1.	Marketable Surplus	2.74 (100.00)	22.7 (100.00)	30.26 (100.00)	46.87 (100.00)	22.15 (100.00)
2.	Disposed to wholesaler	0.85 (31.02)	14.17 (62.42)	19.46 (64.30)	31.43 (67.05)	16.47 (74.35)
3.	Disposed to local market	1.89 (68.97)	8.53 (37.57)	10.8 (35.69)	15.44 (32.94)	9.16 (41.35)

Note: The figures show percentage to total in parentheses.

4.5 Constraints in production and marketing of maize

Table 4.11 shows the constraints faced by maize growers. Labor shortages were the main problem for cultivation of maize cultivation as reported by more than 93% maize growers. The second most important constraint faced by the maize growers was hike human labor wage rates, which reported by 91.66%.

The other major constraints identified by the growers were lack of improved and high yielding variety seeds (70.00%), high input prices (68.33%). The other limitations were also reported by maize growers i.e., lack of facility for soil testing (45%). Looking at the maize grower's question, it's important to tackle these constraints. On the production of high yielding maize variety should be provided according to the use of low cost machine for maize and cultivation There is also a need to impart training skills to maize growers on production aspect through extension support such as farm training, demonstration, etc. Credit support would make the maize growers in the area more affordable and accessible.

Table 4.12 demonstrates drawbacks related to maize marketing. The most important constraints were stated to be lack of storage facilities (96.66 percent). The second most important constraints identified by the growers were lack of processing unit (91.66%), lack of regulated market & cooperative market (66.66%), lack of transportation facilities & high transportation costs (63.33%), reliance on agents (45.00%), lack of market knowledge awareness (31.66%).

Table 4.11: Perception by farmers of constraints on maize cultivation:

S. N.	Particulars	Maize
1.	Shortage of labour at harvest time.	56 (93.33)
2.	Increasing human labour rate of wage.	55 (91.66)
3.	Lack of improved and high yielding variety of seeds.	42 (70.00)
4.	High Input Price.	41 (68.33)
5.	Lack of facility for soil testing.	27 (45.00)
6.	Lack of financing at reasonable interest rate.	24 (40.00)
7.	Lack of resources.	16 (26.66)
8.	Lack of seed availability in due time.	15 (25.00)

Table 4.12: Farmer's perception towards the constraints in maize marketing:

S. N.	Particulars	Maize
1.	Few storage facilities	58 (96.66)
2.	Lack of device to process	55 (91.66)
3.	Lack of market and cooperative market regulations	40 (66.66)
4.	Lack of transport facilities and High transport costs	38 (63.33)
5.	Agent dependence	27 (45.00)
6.	Lack of market knowledge	19 (31.66)

CHAPTER -V

SUMMARY AND CONCLUSIONS

5.1 Summary and conclusions

Maize (*zea mays*) is one of the most important cereal crop after rice. Maize named "Queen of Cereals," also known as maize, is one of the world's most important cereal crops. Maize, botanically known as *Zea mays*, belongs to the Graminae family of grains. Maize can be stored long, provide numerous useful food products and it is the main cereal crop for monsoon season in areas. It is grown both for grain and forage.

Maize has the highest productive role among all the world's cereal crops. Worldwide the area under the crop is estimated at 179 million ha, with production estimated at 5.7 metric tons per ha in year 2016-17 (United states department of Agriculture). In India, maize is next in important only to rice & maize crop was sown on area of 8.85 million ha and the production was 22.84 million tonnes in 2014-15 (Directorate of economics & statistics DAC & FW, Agricultural statistics at a glance,2011-15). Maize is growing in kharif and rabi seasons in Chhattisgarh state. The major area & production of maize was found in Kharif than that of Rabi season. The area & production of maize in Kharif was 114.62 thousand/ha and 193.98 thousand mt during 2015-16. However, area & production of maize in Rabi was 11.73 thousand/ha and 23.75 thousand mt during 2015-16. (Agricultural statistics, land register commissioner, Govt. with Chhattisgarh.).

Considering the economic importance of maize in the study area, the current investigation was carried out in Chhattisgarh, District of Surajpur with the following specific objectives in relation to its production and marketing:

Objectives:

1. To work out the costs & returns of maize production in sampled farms of the study area.
2. To estimate the resource use efficiency of maize production in sampled farms.
3. To examine the marketing pattern of maize in the study area.

4. To identify the constraints in production and marketing of maize in the study area.

5.2 The study produced the following important findings:

1. In the area of study, the average family size was 5.53 per cent.
2. The schedule tribes, schedule caste, other backward caste and general consists of 40%, 20%, 26.66% and 13.33% respectively in the selected sample.
3. The overall cultivated area per farm was 0.50 hectares on the marginal farm, 1.60 hectares on small farms, 2.40 hectares on medium-sized farms and 4.70 hectares on large farms, along with 2.00 hectares as a general average resulting in high yields.
4. The total irrigated area is approximately 56.00 percent in the total cultivated area
5. The gross crop area is observed at marginal, small, medium and large farms as 0.83 hectares, 2.97 hectares, 3.91 hectares, and 7.6 hectares, In that case, respectively.
6. Total crop intensity was 177.00 per cent in the study area.
7. Calculated a total cost per hectare of maize cultivation at Rs. 29427.78 per hectare.
8. A total input – maize output ratio on the sample farms is 1:2.20, respectively.
9. The total gross maize return per hectare is calculated at Rs. 62125 .
10. Within the study area two marketing channels are observed for maize.
Channel - I Producer → Consumer
Channel – II Producer → Wholesaler → Consumer
11. Lack of 96.66 per cent storage facility is a major problem in maize marketing.
- 12 . On an average Marketable Surplus was found 22.15 percent.
13. Labour shortages were major constraints reported by farmers.

5.3 Suggestion for further improvement:

1. The empirical findings of study envisaged the maize growers still growing the traditional variety of maize which low yield potential. Therefore, it is being suggested that extension workers should come forward to aware the maize growers to grow improved or high yielding variety or hybrid.
2. To increase maize production, the government should arrange for the timely supply of quality seeds and other inputs at reasonable prices for maize growers.
3. In order to maintain a hygienic climate, marketing infrastructures should be built
4. Farmers were faced with the question of unavailability of labour. Consequently, it is necessary to implement mechanization in production.
5. The government should promote cooperative societies, in particular from marginal and small producers that can collect the products from producers for transportation and sale on the terminal markets.
6. Market related information, including daily and weekly prices of maize products, should be disseminated among farmers.
7. Extension agencies should provide information about packages of new varieties and methods, standardization and commodity grading processes, and their advantages.
8. Banking institution should provide less financing/credit formality to fulfil the credit criteria.
9. Clear minimum prices should be announced for maize to guarantee benefits for farmers.
10. That's right. Government should promote collaborations between research institutions, agricultural universities, non-governmental organizations and private industries to solve constraints and to help market maize farmers.

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**DEPARTMENT OF AGRICULTURAL ECONOMICS
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**“A STUDY ON RESOURCE USE EFFICIENCY IN MAIZE PRODUCTION
IN SURAJPUR DISTRICT OF CHATTISHGARH”**

Investigator - Sonam Bharti

Major Advisor - Dr. A. K. Koshta

Farmer Schedule

A. General information

1. Name of respondent 2. Age
3. Education 4. Caste (Gen./SC/ST/OBC).....
5. Village 6. Post
7. Tehsil 8. District
9. State 10. Distance from market (km)
11. Distance from pacca road (km) 12. Date of interview
13. Occupation – (i). Main (ii). Subsidiary

B. Details of the family

S.No.	Name of family members	Relation to head	Sex	Age	Education
Total					

* 1= illiterate, 2 = Primary, 3 = Middle school, 4 = High School, 5= Higher Secondary, 6 = Graduate , 7 = Post Graduate

C. Details of land holding

Land use

Particular	Area(ha)	Irrigation	
		Irrigated	Un-irrigated
Owned land			
i. Cultivated			
ii. Homestead			
• Leased in			
• Leased out			
Total Land			

Source of Irrigation

S.No.	Particular	Area (ha)	Irrigation charges (Rs.)
1	Tank		
2	Canal		
3	Tube well		
4	Bore well		
5	Stop dam		
6	Other		
	Total		

D. Cropping pattern

Season	Crops	Variety	Area (ha.)		Production (quintal)	Value (Rs./Qtl).
			Irrigated	Un-irrigated		
Kharif	a.					
	b.					
	c.					
	d.					
	e.					
Total Kharif						
Rabi	a.					
	b.					
	c.					
	d.					
	e.					
Total Rabi						
Summer	a.					
	b.					
	c.					
	d.					
	e.					
Total Summer						

Cost of cultivation

Crop Variety

Area (Irrigated / Unirrigated)

(A) Input cost

S.No.	Input	Quantity	Rate(Rs/unit)	Total value (Rs.)
1.	Seed			
2.	Seed Treatment			
3.	FYM			
4.	Fertilizers a. b. c. d.			
5.	Micronutrients and growth hormones a. b.			
6.	Plant protection chemicals a. b. c. d.			
7.	Weedicides a. b.			
8.	Irrigation Charges a. b. c.			
Total				

(B) Labour cost

S. No.	Operation	Family human labour (days)			Hired human labour (days)			Bullock power (No. of days/ha)			Machine power (hrs/ha)			Total expenditure on particular operation
		M	F	T	M	F	T	O	H	R	O	H	R	
1	Field preparation													
2	Application of manures & fertilizer													
3	Sowing (broadcasting or line sowing)													
4	Intercultural													
5	Irrigation													
6	Plant protection													
7	Harvesting/ threshing													
8	Transportation													
9	Miscellaneous													
	Total													

Bullock pair days/ha rate =....., Rate of machine power =.....

M = Male, F= Female, T = Total , O = Family labour, H= Hired labour,

Rate Hired Labour = Female Rs...../day , Male Rs...../Day

(C). Interest on working capital

(D). Fixed cost

a) Rental value of land / leased in land (Rs.) :

b) Land revenue (Rs.) :.....

(E)Production

Particular	Quantity produced (Q.)	Consumption	Sold	Rate(Rs./Qt.)	Value (Rs.)
Main product Crop					
a.					
b.					
By product					
a.					
b.					
Total					

(F) Disposal pattern

S.No.	Institution	Quantity sold	Rate(Rs/Qt)

(G) Constraints in production of crops :

1. Lack of latest technical know-How about the crop Y/N If No why ?

a. Government non approach

b. Farmer distrust

c. Any other specify

2. Lack of improved and high yielding varieties Y/N If yes, then
 - a. Non availability of seed
 - b. Poor knowledge of technology
 - c. Old farmer practices
 - d. Any other specify
3. Lack of recommended package practices of the crop in the region Y/N If yes why
 - a. No. such type of recommendation
 - b. Not frequent visit of extension workers
 - c. Not proper interest of farmer's
4. Lack of resources i.e. Money, equipment etc. Y/N If yes then How you managing money ?
 - a. From bank
 - b. From relatives
 - c. From traders
5. Lack of irrigation water Y/N If yes, then How you irrigate your crop ?
 - a. With own irrigation
 - b. Crop depends on rains
6. Lack of labour Y/N. If yes then in which operation
 - a. Weeding / Thinning
 - b. Any other (specify)
7. Lack of nutrients in soil and lack of sufficient soil testing facilities Y/N. If yes, then How you come to know the nutrient requirement of plant ?
 - a.
 - b.
8. Lack of financing at reasonable rate of interest Y/N
 - a.

b.

(H). Constraint in marketing of crop :

1. Low demand of final product Y/N

2. Low price paid to farmers due to high marketing margin Y/N If Yes, What should be done ?

1.

2.

3. Lack of transportation facilities and road from village to market Y/N

4. Whether you face problem because the quantity is small Y/N If yes, then What steps you have taken to pool your produce ?

1.

2.

5. Lack of regulated market and co-operative market (Y/N)

6. Whether you visit regulated market regularly Y/N

If no give reasons for not going to the regulated markets

1.

2.

7. Lack of sufficient number of processing unit Y/N

8. Lack of storage facilities in growing area Y/N

9. Whether you like to store your produce in storage to get high prices ? (Y/N)

10. Lack of support price Y/N

11. How to support price will affect the production of crop ?

1. To cropping pattern change

2. Short duration crop

3. Any other

12. Lack of awareness about market news and intelligence ?

13. What media do you have for marketing news ?

1. New paper

2. Radio

3. Television

4. Other (specify)

14. How soon the news is disseminated or spread in producing area.

1. Within 2 days

2. Within 4 days

3. Within a week

15. Whether the market news was some special importance in maize production and marketing Y/N

16. What type of market news you will prefer and in which form

1. Demand of produce

2. Supply of produce

3. Price of produce

4. All above

17. Lack of mechanical grading Y/N

18. Whether mechanical grading is Necessary ? Y/N

APPENDIX – B

LIST OF SAMPLED FARMERS

Marginal			
S.No.	Name	S.No.	Name
1	Hareklal Soni	8	Rajkishan Bahadur
2	Rajkishor Painkra	9	Bhaiya Ram
3	Jawant Ram	10	Keshav Painkra
4	Dilwar Lakra	11	Baratu Ratre
5	Ganesh Chauhan	12	Dubraj Ram
6	Set Ram Gupta	13	Ram Kumar
7	Bharat Lal	14	Balram Pradhan

Small			
S.No.	Name	S.No.	Name
1	Vibhishan Patel	13	Ghurau Chauhan
2	Lalit Patel	14	Anand Ram Chauhan
3	Vidyadhar Pradhan	15	Balak Ram
4	Gopi Chand Banjare	16	Gautam Pradhan
5	Sudarsan Pradhan	17	Shubhash Pradhan
6	Manoj Soni	18	Chetan Nayak
7	Bhusan Das Painkra	19	Hira Lal Nayak
8	Ramcharan Das	20	Arjun Shriwastav
9	Gautam Das Yadav	21	Gokul Ram Seth
10	Bharat Nayak	22	Tula Ram Painkra
11	Chakradhar Ram	23	Kamal Bahadur
12	Govind Ram Chauhan	24	Jagannath Gupta

Medium			
S.No.	Name	S.No.	Name
1	Ganga Ram Nayak	7	Vishwanath Tiwari
2	Jagdish Painkra	8	Girish Chandra Patel
3	Het Ram Lakra	9	Mohan Gupta
4	Ramchand Choudhary	10	Ramesh Painkra
5	Madan Ram	11	Dayanidhi Patel
6	Churamani Patel	12	Phoolchand Soni

Large			
S.No.	Name	S.No.	Name
1	Panchdev Sahu	6	Madan Lal Patel
2	Roop Lal Gupta	7	Kapoorchand Ram
3	Dev Kumar Nayak	8	Gautam Malakar
4	Dindayal Patel	9	Chhote Lal Malakar
5	Shobha Ram Jaiswal	10	Subhash Gupta

RESUME

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Professional Experience (If any) : Nil
Membership of Professional Societies (If any) : Nil
Awards / Recognitions (If any) : Nil
Publications (If any): In numbers only : Nil


Signature