ECONOMIC ANALYSIS OF GROUNDNUT PRODUCTION UNDER DIFFERENT TECHNOLOGICAL STATUS OF FARMS IN KHARGONE DISTRICT OF MADHYA PRADESH

THESIS

Submitted to the

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya

In partial fulfilment of the requirements for the Degree of

MASTER OF SCIENCE

In

AGRICULTURE

(AGRICULTURAL ECONOMICS AND FARM MANAGEMENT)

by

Mahendra Sawle

Department of Agricultural Economics and Farm Management

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

R.A.K. College of Agriculture

Sehore (M.P.)

2016

CERTIFICATE-I

This is to certify that the thesis entitled **"Economic analysis of groundnut production under different technological status of farms in Khargone district of Madhya Pradesh"** submitted in partial fulfilment of the requirements for the Degree of **MASTER OF SCIENCE**/DOCTOR OF PHILOSOPHY in **Agriculture Economics & Farm Management** of Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior is a record of the bona-side research work carried out by **Mr.Mahendra Sawle** under my guidance and supervision. The subject of the thesis has been approved by the student's Advisory Committee and the Director of Instruction.

No part of the thesis has been submitted for any other degree or diploma or has been published. All the assistance and help received during the course of this investigation has been acknowledged by scholar.

Signature

Place: Sehore

Date: 16-2-2017

(Dr.S.N.Soni)

Chairman of the Advisory Committee

MEMBERS OF STUDENT'S ADVISORY COMMITTEE

(Chairman) Dr. S.N.Soni .....

(Member) Dr. P.K. Malviya .....

(Member) Dr. K.N.Pathak .....

CERTIFICATE-II

This is to certify that thesis entitled **"Economic analysis of groundnut production under different technological status of farms in Khargone district of Madhya Pradesh"** submitted by **Mr.Mahendra Sawle** to the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior in partial fulfilment of the requirements for the degree of Master of Science in **Agriculture** in the Department of **Agriculture Economics & Farm Management** has been accepted after evaluation by the External Examiner and approved by the Student's Advisory Committee after an Oral examination on the same.

Place: Sehore

Date: 19-5-2017

Signature

(Dr.S.N.Soni)

Chairman of the Advisory Committee

MEMBER OF THE ADVISORY COMMITTEE

(Chairman) Dr. S.N.Soni .....

(Member) Dr. P.K. Malviya .....

(Member) Dr. K.N.Pathak .....

Head of the Department: .....

19/5/17

DEAN

R.A.K. College of Agriculture

Sehore (M.P.)

Dean of the collage:.....

Director of Instructions: .....

DIRECTOR INSTRUCTION

R.V.S.K.V.V., GWALIOR (M.P.)

ACKNOWLEDGEMENT

Thanks to Almighty God for giving me this opportunity to express my heartfelt gratitude to all the dedicated people whose support and kind co-operation encouraged me during the course of investigation. I avail this opportunity to express my deep sense of gratitude to my guide and Chairman of the Advisory Committee, Dr.S.N.Soni, Professor and Head of Department of Agricultural Economics and farm management for his inspiring guidance, untiring interest, immense labour, thought provoking comments, constructive criticism, constant encouragement and generous help throughout the course of investigation and the course of writing this manuscript.

I am deeply obliged to all the members of my Advisory Committee, namely, Dr.P.K.Malviya, Professor, Department of Agricultural Economics and Farm Management and Dr.K.N.Pathak, Professor, Department Extension Education, R.A.K. College of Agriculture, Sehore. I also express my deep sense of gratitude to Dr.P.S.Raghuwanshi, Professor, Department of Agricultural Economics and Farm Management, Sehore for their valuable guidance.

I am also thankful to Dr.A.K.Singh Hon'ble Vice Chancellor, RVSKVV, Gwalior, Dr. R.L. Rajput, Director of Instruction, RVSKVV, Gwalior and Dr.(Smt)S.B.Tambi, Dean R.A.K. College of Agriculture, Sehore for providing me the necessary facilities during the studies.

I feel short of words to express my gratitude to my parents Shri.Ramesh Sawle, Mother Smt.Laxmi Bai, Sisters Seema Sawle and Brothers Vikram and Kanhiya Sawle for their utmost co-operation, love and encouragement during the course of this work.I am also thankful to Friend Amit, Kundan, Gutam, Omprakash, Mahesh.

Last, but not least, my grateful thanks are due to all the respondents for the study and staff of R.A.K. College of Agriculture, Sehore of their co-operation during thesis work.

Place : Sehore

Date : 16/02/2017

(Mahendra Sawle)

CONTENTS

LIST OF TABLES

LIST OF FIGURE

CHAPTER - I

INTRODUCTION

The state has diverse agro climatic conditions and the crops grown and cropping practices followed in these areas found to as per their suitability in different agro climatic condition. On the other hand, the farming society in Madhya Pradesh is not homogenous in respect of social, economic and other developmental process. Apart from the economic differentiation arising from land ownership, productivity and application of improved production technologies, there are the socio-economic gradations resulting from the deep rooted farming system. Agriculture is now growing on industrial footing. The present trend of population growth is putting heavy pressure on agricultural land, especially on the face of fact that with the growth of industries and civilization every thing is increasing except agricultural land. The only alternative for boosting our economy now rests with increasing productivity on what ever land is available.

No doubt, India made a commendable progress in agriculture after green revolution the rate of growth in food production has been marginally more than the rate of growth of population. Of all the food articles, main food crops including cereals, pulses and oilseeds constitute the most significant part of the Indian diet. After the green revolution cereal crops was given more importance due to sufficient supply for million of poor's diet. In the domestic agriculture sector, oilseeds occupy a distinct position after cereals sharing 13 per cent of the country's gross cropped area and accounting for nearly 3 per cent of the gross national product (GNP) and 10 per cent of the value of all agricultural products. The oilseed sector has been playing major role in not only reducing the gap in domestic demand and supply but also in earning valuable foreign exchange from its by-products. India is blessed with diverse agro-ecological conditions ideally suited for growing nine annual oilseed crops viz., groundnut, rapeseed-mustard, sunflower, sesame, soybean, safflower, castor, linseed and niger; two perennial oilseed crops (coconut and oil palm) besides secondary oil crops such as maize and cotton.

In India, amongst the total oilseeds the groundnut ranks first contributing (32.4%) of the total output followed by soybean (31.1%), rapeseed and mustard (24.5%) and the other six oilseed crops (12.0%). The production of 29.46 million tonnes (total) oilseeds in India shows the importance of oilseed in Indian economy. The importance of oil seed economy in India also reflected that the edible oil industry of the country comprises of 50,000 expellers, 600 solvent extraction plants, 300 vegetable oil refineries and 175 hydrogenation plants. The edible oil sector occupies a distinct position in Indian economy as it provides job to millions of people. It achieves on an average a domestic turn over of US $10 billion per annum and earns foreign exchange of US $90 million per annum.

Groundnut is a major oilseed crop in India accounting for 45 per cent of oilseed area and 55 per cent of oilseed production in the country. India has been producing groundnut since it was introduced in Asia in the 16th century. The weather in the Indian subcontinent suited well to the crop and India transformed into an important contributor to the world production. Groundnut contains on an average 40.1 per cent of fat and 25.3 per cent of protein and is a rich source of calcium, iron and vitamin B complex like thiamine, riboflavin, niacin and vitamin A. It has multifarious usages: It is used not only as a major cooking medium for various food items but also for manufacture of soaps, cosmetics, shaving creams and lubricants. In fact, it plays a pivotal role in the oilseed economy of India. In nut shell it can be said that groundnut is called as the 'king' of oilseeds. It is one of the most important food and cash crops of our country. While being a valuable source of all the nutrients, it is a low-priced commodity. Groundnut is also called as wonder nut and poor men's cashew nut. India exports groundnut kernels, shell, hand picked selected (HPS) groundnut and oil cake forms. Groundnut haulms and leaves serve as a rich source of cattle feed and raw material for preparation of silage. Being a leguminous crop, groundnut is also grown in crop rotation as it synthesises atmospheric nitrogen and adds 100-120 kg of nitrogen in the field per hectare per season. It maintains the fertility of soil and helps in reducing soil erosion. In order to bring groundnut production to the forefront and to achieve even higher level of production various research and extension programmes, play the most pivotal role in terms of providing viable technological inputs.

Keeping the view of importance of technology in agricultural development most extension services are actively engaged in promoting new technologies with farmers. Resources are invested in various extension activities, such as field days or demonstrations, and the extension service may undergo considerable reorganization, such as with the training and visit (T&V) system. But only infrequently are resources reserved for monitoring the outcome of these extension efforts and using the analysis to understand why some recommendations or extension techniques are more successful than others. For those farmers who have not adopted, do they find disadvantages with the new practice and improved technology is the practice too far removed from farmers' knowledge base, or has the extension methodology not been effective in acquainting these farmers with the new technique? There are several reasons to invest in studying the adoption of agricultural technology. These include improving the efficiency of technology generation, assessing the effectiveness of technology transfer, understanding the role of policy in the adoption of new technology, and demonstrating the impact of investing in technology generation.

Several studies revealed that if the benefits of the new technology are largely expressed as increased yield, the first step is to estimate yield changes due to adoption of different level of technology, ids called yield gap. Yield gap refers to the difference between the potential yield (yield on progressive farms) and actual farm yield (realized on the general farmers' filed). These facts nevertheless, signify the broad scope for increasing the crop yields through proper application of inputs at the recommended levels and better management practices.

Once the yield difference has been estimated, it is possible to calculate a value of increased yield and calculate the total value of increased production resulting from adoption of improved technology in crop production in the study area. It may also be important to obtain an estimate of the increased income for farmers who have adopted the new technology. Such an estimate will require good data on the variable costs of the technology. Estimates of the benefits of a new technology should be balanced against possible costs implied by changes in other parts of the farming system. The

long-term sustainability of a new practice may also need to be examined when considering costs and benefits.

Another important use of the information from level of adoption of crop production technology and its economic studies is to assess the impact of technology on agricultural development and to measure the returns to investments. Adoption studies are an important tool for measuring and assessing impact of adoption of technology at various farm situations. Such an analysis may be used to justify further investment in these sectors or to help identify the most productive opportunities for investment within crop production system.

An important question on the minds of policymakers is who benefits from new technology. Adoption studies may be designed to document what kinds of farmers and what areas of the country have profited most from the development of a particular technology. The evaluation of impact and returns to investment is also a common feature of agricultural development projects, but these evaluations are often done without access to solid data on adoption. Adoption studies are also useful for illustrating the degree to which acceptance of new technologies is limited by insufficient inputs, credit, or marketing infrastructure. If it appears that farmers are unable to take advantage of a new technology because they lack inputs, this information can be presented to policymakers who have responsibility for the agricultural inputs that are available and the way they are distributed. The present study would be determine the answer of that, if adoption study shows that access to credit significantly influences the type of technology that farmers use, then this information may be presented to those responsible for designing and funding credit programmes. Similarly, adoption studies may be used to highlight marketing bottlenecks that limit the acceptability of new technologies.

In the last it is highlighted that any programme that attempts to develop and promote improved farming practices should be able to assess progress and use that information to make future actions more effective. The aim of this study is to help strengthen institutional capacity to carry out such adoption studies. This capacity is important for agricultural research organizations that develop innovations for farmers, extension institutions that promote new technology, various types of rural development projects that introduce

changes in agricultural technology, and a range of non-governmental organizations (NGOs) and community level efforts that are working to improve farming practices. Taking above views the present study was therefore, under taken "Economic analysis of groundnut production under different technological status of farms" with the following objectives:

Objectives:

1. To determine socio economic characteristics of groundnut growers in study area.
2. To estimate the different adoption levels of groundnut production technology at existing farm situation.
3. To assess the extent of yield gap at different adoption levels of groundnut production technology.
4. To estimate the profitability of groundnut production at different adoption levels of production technology.
5. To identify the constraints responsible for the existing yield gap in groundnut production.
6. To suggest ways and means for reducing yield gap in groundnut production.

Limitation of the study:

A. In this study, no reference is made for factors like risk and uncertainty, only those factors are considered which are under the control of farmers and contributes significantly towards the returns and use of resources.

B. The coverage of study area was limited. This is due to the fact that coverage of large area is beyond the capacity of investigator.

C. The primary data collected for the study were entirely based on memory of the cultivators because cultivators do not keep any records regarding their farm practices.

D. The data are pertaining to the agriculture year 2014-15 only. Hence, the generalization of research result can be only made for study area.

Significance of the study

The study is expected to throw some light on extent of technological gap in adoption of improved cultivation practices of the groundnut crop. Any attempt to understand the basic problems in the adoption of recommended technology package assumes special significance. This step needs a scientific evaluation of the extent of yield gap. The farmers also spend the scare capital in production technology according to level of profitability, needs a critical analysis of cost involved in production and level of return realized. The present study is of paramount importance on the above point of view. The findings of this study will provide valuable information to all the private, voluntary and government agencies for the development of appropriate extension strategies for boosting the groundnut production as well as productivity. The study also aims to analyse the constraints faced by the farmers in adoption of recommended cultivation practices of the crop. This will help the concerned authorities to take the problems of the groundnut cultivation to their best satisfaction.

CHAPTER – II

REVIEW OF LITERATURE

Scanning of relevant literature is helpful in formulating the framework of research problem undertaken. The researcher would be able to make an improvement over the existing studies and also expand the horizon of investigation on the subject matter. The review could also help in refracting the concept and statement, which were made in the earlier studies as well as for supporting of the present study. The attempt of new research worker is to study the literature related to the problem undertaken. Therefore, it forms an integral part of any systematic research work. Hence, efforts have been made in this chapter to review the selected references available for study as per the stated objectives in following subheads:

1. Adoption levels of groundnut production technology.
2. Yield gap at different adoption levels of groundnut production technology.
3. Profitability of groundnut production.
4. Constraints responsible for the existing yield gap.
5. Suggest ways and means for reducing yield gap.

2.1 Adoption levels of groundnut production technology:

Adoption behaviour of farmers tends to be specific to particular technology, individuals, and environment of the farming situation. Farmer's incentives and disincentives to adopt particular technology are determined by his personal belief about its value and permissiveness of his environment. So adoption of a technology varies not only from area to area but also from farmer to farmer. The findings of different investigators regarding this aspect are presented as under.

Hapase (1996) revealed that two third (66.67 per cent) of the respondents had medium level of extent of adoption of recommended groundnut technology followed by 18.33 per cent and 15.00 per cent of them who had low and high extent of adoption, respectively.

Reddy and Rao (1998) revealed that 52.33% of the respondents showing average adoption level about cultivation practices of crops followed by 85% low adoption. However, the farmers falling in the category of high adoption were 19.6%.

Dubolia and Jaiswal (2000) conducted a study on technological gap in groundnut cultivation practices and revealed that majority of the farmers not adopted the recommended package of practices of groundnut due to ignorance about the improved technology and poor socio-economic conditions. Shortage of manual labor due to coal mines in the area was the main problem for adoption of improved technologies.

Kaspe and Pimprikar (2000) conducted a study in technological gap in summer groundnut cultivation and revealed that majority of respondents having higher technological gap in respect of application of gypsum (52.86%) followed by use of plant protection measures (37.17%), seed treatment (27.85%) application of chemical fertilizers (25.42%) and intercultural operations (21.94%), respectively.

Nagaraj and Katteppa (2002) in their study on adoption of improved cultivation practices of groundnut by farmers of Tumkur and Chitradurga districts of Karnataka state observed that 38.60 per cent of big farmers belonged to medium adoption category. In contrast to this a similar percentage (37.50%) of small farmers belonged to low level adoption category and more number of farmers (36.90%) belonged to medium level of adoption.

Pate *et al.* (2009) revealed adoption of improved groundnut production technologies under real farm conditions had resulted in 24.00 per cent pod yield increase over the farmers' practices in Banas Kantha district of Gujarat.

Kikon (2010) reported that the mean adoption gap for the demonstrator farmers was 41.55 per cent while it was as high as 79.90 per cent for fellow farmers. A difference of 38.35 per cent can be observed in the means of the adoption gap between the demonstrator and fellow farmers. Unexpectedly, the table also reveals that though, the demonstrations were under the supervision of Scientists of the National Agriculture Research System, there still existed adoption gap to the tune of 41.55 per cent. Only critical inputs and training are provided, remaining inputs are procured by the farmers themselves. Moreover, the frontline demonstrations are only on a pilot basis on the farmer's fields. These results only indicate that there is a possibility of increasing the yields of groundnut. Study also reported that there was a highly significant difference of 38.35 per cent in the means of adoption gap between the demonstrator farmers and fellow farmers.

Venkattakumar and Padmaiah (2010) reported that thorough review on adoption behaviour of oilseed growers reveals that there is scope for improving the adoption behaviour of oilseed growers. This needs intensive transfer of technology efforts. However, there are certain problems exist in public sector in transfer of technology efforts. The strategies to improve transfer of technology efforts targeting oilseeds are also suggested.

Chouhan (2013) reported that at aggregate extent of adoption in respect of improved groundnut production technology, most of the groundnut growers were have medium extent of adoption in respect of groundnut production technology followed by high and low adoption.

2.2 Yield gap at different adoption levels of groundnut production technology:

Karanjkar and Pandya (1985), estimated the yield gap in resource use and crop management practices in Indore region and observed that a larger proportion (53 per cent) of farmers were not applying adequate doses of fertilizers and also were not using proper seed rate. They also estimated the yield gap between reliable potential yield in Indore region at different size of farm and observed that 54 per cent of the realizable potential yield has been obtained by the sample farmers of the region: 46 per cent yield gap in realizable potential yield and actual farm yield was present. Gap in yield was found to decrease with the increase in the size of farm.

Sunandini *et al.* (1988) reported that the reasons attributed by the farmers for the yield gaps, are incidence of pests and diseases, lack of own funds, high cost of inputs, lack of timely supply of these input and rainfall. It is suggested that more demonstrations, subsidized supply of inputs, timely supply of inputs, credit facilities, technical know how and marketing facilities help in reducing the gap.

Bajpai *et al.* (1998) reported that despite increase in land productivity, still there is a considerable gap between the potential yields and the current yield of major crops. In general the programme proved to be beneficial to the farmers specially the small and marginal farmers in the dryland area. Therefore, the involvement of more and more small and marginal farmers under this programme will be helpful in achieving the national objective of uplifting rural poor as well as increasing agricultural production.

Joshi and Bantilan (1998) the groundnut production technology gives 38% higher yields, generates 71% more incomes, and reduces unit cost by 16%. The technology also contributes in improving the natural resource base, and eases certain women specific agricultural operations. The total net present value of benefits from collaborative research and technology transfer is more than US$ 3 million, representing an internal rate of return of 25%. The study suggests important lessons for research and technology transfer policies, and for development of future research priorities.

Basavaraj (2000) in his study on crop yield potentials and constraints in production of major crops in Northern Dry Zone of Karnataka revealed that the magnitude of yield gap-I ranged from 24.00 per cent in sunflower to 33.00 per cent in groundnut and yield gap II was highest for groundnut *i.e.*, 41.00 per cent.

Verma *et al.* (2002) in their study on groundnut productivity and yield gap analysis of groundnut production opined that an average of 36.22 per cent yield gap was observed between frontline demonstration yields and yields obtained by farmers.

Pate *et al.* (2009) revealed adoption of improved groundnut production technologies under real farm conditions had resulted in 24.00 per cent pod yield increase over the farmers' practices in Banas Kantha district of Gujarat.

Kikon (2010) reported that the mean adoption gap for the demonstrator farmers was 41.55 per cent while it was as high as 79.90 per cent for fellow farmers. A difference of 38.35 per cent can be observed in the means of the adoption gap between the demonstrator and fellow farmers. Unexpectedly, the table also reveals that though, the demonstrations were under the supervision of Scientists of the National Agriculture Research System, there still existed adoption gap to the tune of 41.55 per cent. Only critical inputs and training are provided, remaining inputs are procured by the farmers themselves. Moreover, the frontline demonstrations are only on a pilot basis on the farmer's fields. These results only indicate that there is a possibility of increasing the yields of groundnut. Study also reported that there was a highly significant difference of 38.35 per cent in the means of adoption gap between the demonstrator farmers and fellow farmers.

Maurya (2013) reported yield gap inrespect of the average yield of groundnut in the study area was found to 13.26 quintal per hectare. The maximum yield (13.74 quintal per hectare) was found on small size of farmers and it was due to efficient use of inputs by this group in fact, the average yield showed lowest with the large farmer that was 12.95 quintal per hectare and it was normally due to injudicious practices by this size of farmers. The data depicted that the yield of groundnut found to decrease with the increase of size of holding.

2.3 Profitability of groundnut production:

Prasad *et al.* (1983) in their study of benefit cost appraisal of rainfed groundnut in Chittoor district of Andhra Pradesh estimated cost A, cost B, and cost C, per hectare as Rs. 1,389.63 Rs. 1,732.15 and Rs. 1,861.45 respectively. The per hectare gross returns and net returns over the cost C were Rs. 2,055.10 and Rs. 193.65 respectively. In cost A the major item of cost was seed which constituted 25.53 per cent in cost C. The low net farm income of Rs. 193.65 was mainly due to low yield of crop during 1980-81, which was considered to be bad agricultural year for rainfed crops.

Dhongade and Dangat (1985) studied the cost and income structure of farm business in Sina command area (Maharashtra). The per hectare cost of irrigated *Kharif* hybrid sorghum worked out to Rs. 43,0349. The average per hectare yield was 23.75 quintals. The gross value of produce was Rs. 6,32,789 and the profit at cost C was Rs.20,2440. The per hectare total cost of cultivation of irrigated *rabi* sorghum was Rs. 21,44.70, the yield of grain was 8.15 quintals and the profit at cost C was Rs.586.05. The per hectare total cost of cultivation of wheat to be worked out to Rs. 2,778.61 and the yield was 15.28 quintals, the per hectare profit at cost C being Rs.153.69. The total cost of cultivation of groundnut was Rs.3,139 and the per hectare profit at cost C worked out to Rs.1501.10.

Mundinamani *et al.* (1989) conducted study a in Gadag and Hubli talukas of Dharwad District, Karnataka State, India to evaluate the economics of production and marketing of groundnut. Tabular analysis was used to evaluate costs and returns of groundnut production and marketing margins. Farmers at the Hubli market incurred higher production costs and received lower prices than those at Gadag market. The profit margins of farmers

increased with increase in the size of holdings for all but small farmers in Hubli taluka. Small farmers in Hubli market incurred a small net loss in groundnut production. Four marketing channels were identified and evaluated. Marketing through cooperative societies was found to be more popular and remunerative in both the markets.

Mruthyanjaya and Kumar (1989) found that the cost of cultivation of crops has increased in all the crops over the years owing to inflationary pressure. The increases in the cost mainly come from the rise in cost of machine power. Fertilizer, human and bullock labour etc. the cost of production has shown on upward trend, the yield levels in general have shown little improvement. Declining profitability and terms of trade were observed in all the crops except sugarcane and cotton on account of little improvement in yield coupled with rising cost of production. The cost of production at constant input prices indicated generally declining trend in all the crops except maize, gram and jute. The share of operational cost and purchased input was increased in the total cost.

Thiruvenkatachari *et al.* (1991) analysed the economics of groundnut in rainfed areas (Tamil Nadu). The study revealed that cost-A constituted 61.05 per cent of the total cost-C in the case of marginal farms whereas it was 77.27 per cent in the case of small and 82.06 per cent in big farms. The net returns over cost-C were Rs.1674 (marginal farms), Rs.2371.'52 (small farms) and Rs.2313.61 (big farms) per hectare. The groundnut cultivation was much more profitable under small and big farms. The small and big farms invested comparatively more on fertilizers and seeds and hence they got higher returns than the marginal farmers.

VijayaKumari *et al.* (2009) estimated the cost of cultivation of groundnut, cost A1 Rs.6245, cost B Rs.8419 and cost C Rs.8881 per hectare respectively. The study also reveled that the groundnut farmers had realized average gross return of Rs.10876 with net return of Rs.1995 per hectare respectively. The yield of ground nut in study area was found to on an average 10.09 quintal per hectare.

Gote *et al.* (2010) calculated that the average cost of cultivation and net income per hectare of groundnut crop was Rs.22526/- and Rs.3581/-, respectively for the year 2005- 2006. The total cost and gross return over Cost-A, Cost-B, Cost-C1 and Cost-C2 of small farmers was highest and decreased with increase in the size of holding.

Maurya (2013) reported that the cost of cultivation per hectare of groundnut with different size of farm portrays that the cost A_1 which is the main cost as working capital was found to be minimum (Rs.13269.67) in case of small farm size followed by Rs.16810.93 in case of large farm size and 17826.67 in case of medium farm size group respectively. The average cost of cultivation (cost A_1) of groundnut was estimated Rs.15969.09 per hectare. The average cost of cultivation of groundnut of per hectare was also calculated and it were found to Rs.16043.69 (Cost B_1), Rs.19018.36 (Cost B_2), Rs.22769.36 (Cost C_1), Rs.25744.02 (Cost C_2), Rs.27425.69 (Cost C_2*) and Rs.30168.26 (Cost C_3) respectively. The net income per hectare found to highest with small farmers i.e. Rs.47703 followed by with medium farmers i.e. Rs.37181 and large farmers i.e. Rs.36355 per hectare. The net income also found to decrease with the increase of size of holding.

Narayanamoorthy (2013) reported that this study examines trends in profitability of different crops in India using data from a cost of cultivation survey on six important crops (rice, wheat, Bengal gram, groundnut, sugarcane, and cotton) covering the period 1975/76-2006/07. Results show that crop farmers have suffered substantial losses most of the time considered for the analysis. When profits were earned by the farmers, it was found in majority of cases to be less than 30% over the cost of cultivation. Except in wheat and gram, the returns over the cost of cultivation had also worsened in all other crops especially during the post-1990s. Importantly, the quantum of loss incurred by the farmers in crops like cotton, groundnut and sugarcane was also large in recent years as compared to the pre-1990s situation.

2.4 Constraints responsible for the existing yield gap:

Reddy *et al.* (1986) focused on the levels of constraints to the adoption of improved dryland farming technology in India, found that the adoption of improved seed and intercultural/weeding was mostly accepted by the farmers, where as the adoption of farmer application and pesticides which are costly cash input were used less. The farmers did not cover the complete dryland area with technology. The adoption was more in the case of Rabi sorghum, wheat and commercial crops (groundnut, castor and cotton) as compared to other crops.

Nautiyal (2002) reported the high cost of production for groundnut is mainly due to the heavy seed-rate adopted and the large labour force employed for harvesting and threshing. As groundnut have large seeds and low multiplication ratio, collecting the seed costs about 40 percent of the total cultivation outlay. The expenditure on these and other cultivation operations varies largely between groundnut-growing countries. Farming expenses are conditional on the variety grown, soil and climatic conditions, cultivation practices, implements used for field operations, rate of hire charges for work bullocks, wages of mazdoors plus other factors.)

Sikandar Kumar and Sandeep Kumar (2004) reported that the main aim of the production unit is to coordinate and utilized resources or factors of production in such a manner that together they yield the highest net returns. It is suggested that farmers should use more of high yielding variety seeds, insecticide and pesticide, bullock labour and tractorization, improved implements to turn out negative return in to positive. Again consolidation of land holding and a redistribution of land in favor marginal and small farmers will undoubtedly help in increasing the agricultural production, productivity and rural employment.

Venkataramana *et al.* (2005) reported that the main constraints in groundnut cultivation was found to availability of quality seeds reported by 95.40 farmers followed by fertilizers application reported by 91.40 per cent farmers, erratic/scattered rainfall reported by 90.00 per cent farmers, non-availability of labour during peak season reported by 84.40 per cent and marketing 84.00 respectively.

CHAPTER - III

MATERIAL AND METHODS

In this chapter, the material and methods used in the study along with the research procedure are presented in detail. Material and methods are mainly determined the research procedure and research design which are use on the scientific and mathematical procedure. This research design is split into following sections.

1. The study area
2. Sampling procedure
3. Nature and collection of data
4. Method of enquiry and study period
5. Analytical procedure and concepts used

3.1 The study area:

In this section attempt has been made to discuss the background information of area covered under study. Khargone district of Madhya Pradesh has been selected for the purpose of this study because of that groundnut is the main and important kharif crop in the region. The total geographical area of the district covers 8153 square kilometers and consists of 9 development blocks. Sandy loam and black loam soil is generally found in the area. This soil is quite suitable for growing cotton, jowar, maize, soybean, arhar, moong, groundnut, wheat, chickpea and lentil etc.

3.2 Sampling Procedure:

For the study, multi stage sampling technique was used for drawing the sample. At the first stage, Block in the district was selected. The district comprises of 9 blocks. At the second stage, villages in selected block were selected randomly. At the third stage, for the selection of respondents (groundnut growers), was selected from each village randomly for the study.

Selection of block:

Khargone block in Khargone district has been selected purposively due to most suitable area for groundnut crop and well known for researcher.

Selection of villages:

At the second stage, a list of major groundnut growing villages was prepared and among these 5 villages was selected randomly.

Selection of respondents:

At the third stage for the selection of respondents, a list of groundnut growing cultivators of each village was prepared and among them 60 groundnut grower were selected randomly for the study. Thus, the sample was confined to 60 groundnut growers form 5 villages in Khargone block of the district.

3.3 Nature and collection of data:

For the present study, primary data was collected as per the analysis of present study to draw the conclusions.

Primary data:

Primary data were collected from sample groundnut growers. The primary data were recorded regarding input use pattern and improved practices in groundnut cultivation. On the basis of input use pattern the farms of sampled groundnut growers had been divided into three categories i.e.

Ist groundnut cultivation with use of improved groundnut production technology (progressive farmers).

IInd groundnut cultivation as majority of farmers practices as per their own decision in adoption of groundnut production (general farmers).

IIIrd groundnut growers are least adopter of improved groundnut production technology (poor technological farmers).

The first of all the data were collected regarding level of input utilization pattern adopted by them. The specific and detail information on cost incurred and returns realized in the cultivation of groundnut were also collected from the sample respondents. The information also collected regarding yields obtained per unit of area and their market price obtained. The constraints confronted by the farmers in respect of yield gap of groundnut production also recorded.

The primary data regarding recommended groundnut production technology in respect of input use pattern, yield, cost, return and profitability, the data were collected from the office of Scientist in Zonal Research Station Khargone.

Collection of data:

The data on different aspects were collected through pre-tested interview schedule. Each of the selected sample groundnut growers was approached personally for recording relevant data (Appendix-1).

3.4 Method of enquiry and study period:

The data were collected using survey method. All the collected primary data was related to the agriculture year 2014-15 kharif seasons.

3.5 Analytical procedure and concepts used:

Collected data were edited and checked for their adequacy and accuracy. Keeping in view the objectives of the study, the data were classified and tabulated. The classified and tabulated data were further processed in terms of average and percentage to arrive at conclusive figures for interpretation of data. In present study following mathematic and econometrics tools were used.

Adoption pattern of improved production technology:

Productivity of groundnut depends upon the adoption of recommended production technologies. Adoption is a decision to make full use of new ideas in the best course of action. Consulting literature and scientists, working under Agricultural Research Station Khargone (M.P.), 9 recommended components of groundnut production technologies were identified and presented in table 3.1.

Table: 3.1 Weights for different components of groundnut production technology.

S.No.	Component of technology	Assign weight
1.	High yielding variety seed for specific area	18
2.	Sowing method (recommended plant spacing and sowing depth should be followed to raise the crop)	13
3.	Seed treatment (Thirum @ 2.5 g/kg or Bevisteen @ 2 g/kg	07
4.	Inoculation with Rhyzobium and PSB cultures @ 5g/kg seed each).	06
5.	Fertilizer application (NPK) 30:50:40	11
6.	Interculture operations as per specific needs	09
7.	Insect-pest control as recommended (Clarsijriphos)	08
8.	Disease control (Bevistin)	07
9.	Irrigation (1-2 time)	10

On the basis of adoption score obtained by individual groundnut grower, the selected groundnut growers were classified into three categories with respect to level of adoption [poor resource farmers (least adoption),

general farmers (moderate) and progressive farmers (high)]. Having identified the number of farmers under each category the indices of adoption was calculated as under

$$\text{Adoption index (\%)} = \frac{\text{Adoption score obtained by respondent}}{\text{Possible maximum score}} \times 100$$

Yield gap:

The potential farm yield is that which obtainable on farmer's field with the adoption of recommended groundnut production technology. The difference between the potential farm yield and actual farm yield is termed as a yield gap. In present study to assess yield gaps on groundnut farms when compared to those of demonstration's farms with high (progressive), moderate (general) and least (poor resource) adoption level of at farmer's field level.

The present study is under taken to assess the yield gaps on groundnut farms and the concepts of yield gap used are as follows:

Gap I: Between demonstration farms and progressive farms.

Gap II: Between progressive farms and average farmers practices.

Gap III: Between progressive farmers' practices and least adopted farmers' practices.

Economics of cultivation:

Cost A_1 = All actual expenses in cash and kind incurred in production of groundnut by owner operator

Cost A_2 = Cost A_1 + rent paid for leased in land

Cost B_1 = Cost A_2 + interest on fixed capital (excluding land)

Cost B_2 = Cost B_1 + imputed rental value of owned land

Cost C_1 = Cost B_1 + imputed value of family labour

Cost C_2 = Cost B_2 + imputed value of family labour

Cost C_3 = Cost C_2 + 10% of Cost C_2 (As managerial cost)

Profitability aspects:

For the estimation of profitability, the following income measures were used.

a) Net farm income (NFI) = Gross income – Cost C_3 (total cost)
b) Family labour income (FLI) = Gross income – Cost B_2
c) Farm business income (FBI) = Gross income –Cost A_1
d) B:C ratio (Benefit cost ratio) = Gross income/ Gross expenses

Production constraints:

The different aspects i.e. technological, production and financial constraints was considered to know the overall production constraints faced by the respondents in groundnut growing in study area.

Concepts used in study:

Estimation of profitability:

The estimates of profitability were based on different cost and return incurred in groundnut cultivation.

Cost concepts:

The cost of cultivation classified as recommended, "Special expert committee on cost estimates, GOI, New Delhi", was used in this study. The cost concepts are given below:

Cost A_1: It includes: -

i. Value of hired human labour,
ii. Value of hired and owned bullock labour,
iii. Value of hired and owned machinery labour,
iv. Value of owned and purchased seed,
v. Value of fertilizers, manures and chemical,
vi. Value of insecticide and pesticides,
vii. Expenditure on irrigation,
viii. Land revenue and taxes,
ix. Interest paid on crop loan if taken,
x. Depreciation on farm assets excluding land,
xi. Interest on working capital,
xii. Miscellaneous expenses.

Cost A_2: It includes-

Cost A_1 + rent paid for leased in land

Cost B_1: It includes-

Cost A_2 + interest on value of owned fixed capital assets. (excluding land)

Cost B_2: It includes-

Cost B_1 + rental value of owned land

Cost C_1: It includes-

Cost B_1+ imputed value of family labour

Cost C_2: It includes-

Cost B_2 +imputed value of family labour

Cost C_3: Cost C_2 + 10 percent of cost C_2 to account for managerial input of the farmer.

Evaluation of farm inputs:

Methods followed in evaluating different farm input for the present study are described in the following paragraphs.

i. Hired human labour:

The farmers normally engage permanent farm labour on the basis yearly wages and casual labour on daily wages basis, for performing farm operations. The casual labour was evaluated on the basis of actual wages prevailed in the locality. The wages of male and female labour included payment given both in cash and /or kind. The value of kind components given to the labour was calculated at their prevailing market prices.

ii. Family labour:

The family labour cost was evaluated at the rate of prevailing wages in the locality for casual hired labour at various stages of operations.

iii. Bullock and machinery labour:

Estimation of bullock and machine labour charges on actual wage prevailed in the locality were considered.

For estimation of depreciation, interest on working capital, interest on fixed capital and rental value of owned land, following standard norms were used.

iv. Depreciation on farm assets:

The straight-line method is used for calculating rate of depreciation. The depreciation rates for different farm assets are taken @ of 10 per cent.

v. Interest on working capital:

It is worked out @ 12.50 percent for half of the duration of the crop.

vi. Interest on fixed capital:

Interest is charged @ 10 percent per annum on the value of implements, machineries, farm building, irrigation structure and drought animals. It excludes interest on land input, because rental value of owned land is calculated separately.

vii. Rental value of owned land:

It is calculated on the basis of $1/6^{th}$ of the gross income or prevalent rate in the area for the same.

Value of farm produce:

This includes the value of main product and the by – product of the crop. The harvest price of the crop was considered for calculating the value of main produce. The value of by – produce was calculated at the prevailing price in the locality.

CHAPTER – IV

RESULTS

In this chapter result is presented as per stated objectives of study which is the main chapter of the research work. In chapter of result assembled data after processing and analysis are presented in an appropriate, and logically consistent in tabular form. This chapter is necessary because the collected data are discussed in a logical order that is consistent with the major objectives or focus of the research problem. The purpose of interpretation and generalization is to search for the broader meaning of these answers by linking them to the other available knowledge. As per the objectives of study the chapter of result is presented into six sections as below:

1. Socio economic characteristics of groundnut growers in study area.
2. Different adoption levels of groundnut production technology.
3. Extent of yield gap at different adoption levels of groundnut production technology.
4. Profitability of groundnut production at different adoption levels of production technology.
5. Constraints responsible for the existing yield gap in groundnut production.
6. Suggestions for reducing yield gap in groundnut production.

4.1 Socio economic characteristics of groundnut growers in study area:

It is felt known that socio economic, family structure and farm structures are the main factors which may be affected the level of adoption of improved crop production technology. Many studies also reveal that socio economic characteristics mainly age, education, family structure and farm structure of the farmers are mostly affect the level of adoption of improved technology and decision making pattern of the farm. The study of family structure is also necessary because most of the farmers are using family labour in production process on their farm. Keeping the importance of farm family and farm as a socio economic unit, this part of study is primarily concerned with micro level analyses of general socio economic information of sample groundnut growers. Since, socio economic characteristics of farmers and their family reflect the efficiency of farm, level of resource use and decision making process. Hence, it is very important to study these characteristics of the sample groundnut

growers. The data on distribution of sample groundnut growers according to age and education level is presented in table 4.1.

a) Age and education level of sample farmers:

Table: 4.1 Distribution of groundnut growers according to their age and education.

S.No.	Description	Level of adoption		
		Least	Moderate	High
A.	Average age (year)	44	44	40
B.	Education level			
1.	Illiterate and functionally educated	9 (47.37)	7 (33.33)	6 (30.00)
2.	Primary and middle education	7 (36.84)	9 (42.86)	7 (35.00)
3.	High school and above	3 (15.79)	5 (23.81)	7 (35.00)
4.	Total	19 (100.00)	21 (100.00)	20 (100.00)

Figure in parentheses shows the percentage of total

The data shows that the average "least adopter" sample groundnut growers found to 44 years of age, ranged from minimum 20 years and maximum 64 years old. The "moderate adopter" sample groundnut growers found to on an average 44 years, ranged from minimum 22 years and maximum 65 years old. On the other hand, the "high adopter" sample groundnut growers found to on an average 40 years, ranged from minimum 21 years and maximum 70 years old. It is concluded that the age of sample groundnut growers varied from range of minimum 20 year to maximum 70 years. This shows that in groundnut growing the higher percentage of groundnut growers found to medium age group.

Regarding literacy position of sample groundnut growers it is noticed that the higher number of groundnut growers found to literate among the entire adopter group. The literacy position among the groundnut growers revealed that the literacy position was increased with level of adoption. On other word it can be say that the literate farmers adopted higher extent of improved groundnut production technology.

b) Size of family and work force:

Size of family and work force determines and provides family labour for earning of family income through their activities. Table 4.2 presents the detail of size of family and work force available in the family of groundnut growers.

Fig:1: Distribution of the respondents according to their age:

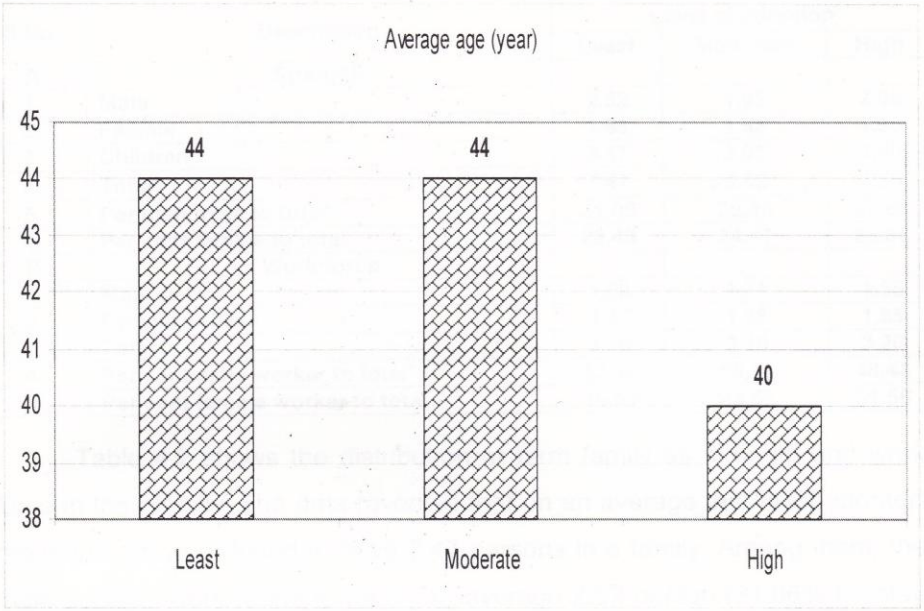


Fig:2: Distribution of the respondents according to their Education:

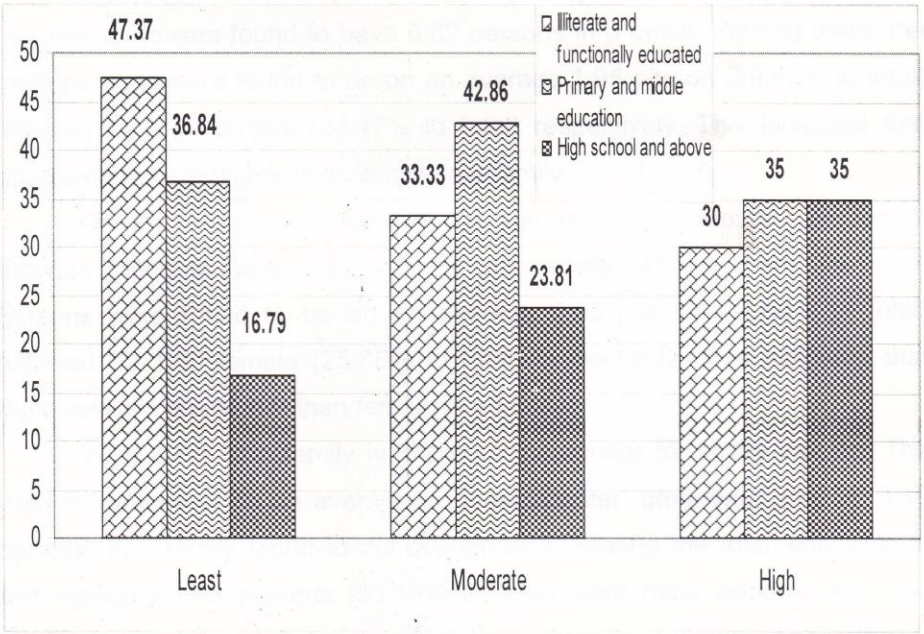


Table: 4.2 Distribution of groundnut growers according to size of family and work force.

(Average number of person per farm)

S.No.	Description	Level of adoption		
		Least	Moderate	High
A	Strength			
1.	Male	2.32	1.95	2.05
2.	Female	1.68	1.62	1.90
3.	Children	3.47	3.05	3.40
4.	Total	7.47	6.62	7.35
5.	Per cent male to total	31.06	29.46	27.89
6.	Per cent female to total	22.49	24.47	25.85
B	Work force			
1.	Male worker	1.68	1.71	1.55
2.	Female worker	1.47	1.38	1.65
3.	Total	3.16	3.10	3.20
4.	Per cent male worker to total	53.16	55.16	48.44
5.	Per cent female worker to total	46.52	44.52	51.56

Table 4.2 shows the distribution of farm family as strength and work force in their family. The data revealed that on an average the "least adopter" groundnut growers found to have 7.47 persons in a family. Among them, the male persons were found to be on an average 2.32 person (31.06% to total) followed by 1.68 female (22.49% to total) respectively. This indicated that male persons are higher than female in a family.

The data revealed that on an average the "moderate adopter" groundnut growers found to have 6.62 persons in a family. Among them, the male persons were found to be on an average 1.95 person (29.46% to total) followed by 1.62 female (24.47% to total) respectively. This indicated that male persons are higher than female in a family.

On the other hand, on an average the "high adopter" groundnut growers found to have 7.35 persons in a family. Among them, the male persons were found to be on an average 2.05 person (27.89% to total) followed by 1.90 female (25.85% to total) respectively. This indicated that male persons are higher than female in a family.

Work force in a family is important parameter for family income. The data revealed that on an average in "least adopter" groundnut growers 3.16 persons in a family found to active members. Among the total workforce in this category 1.68 persons (53.16% to total) were male workers and 1.47 persons (46.52% to total) were female workers in a family. These family workers are performing so many activities including farming for earning of family income.

Fig:3: Distribution of Groundnut growers according to size of family

(Average number of person per farm)

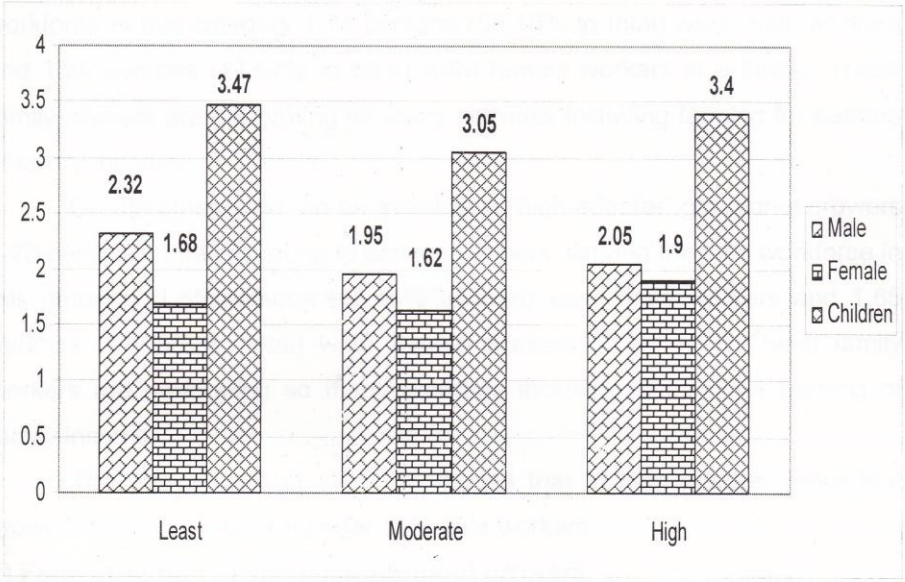
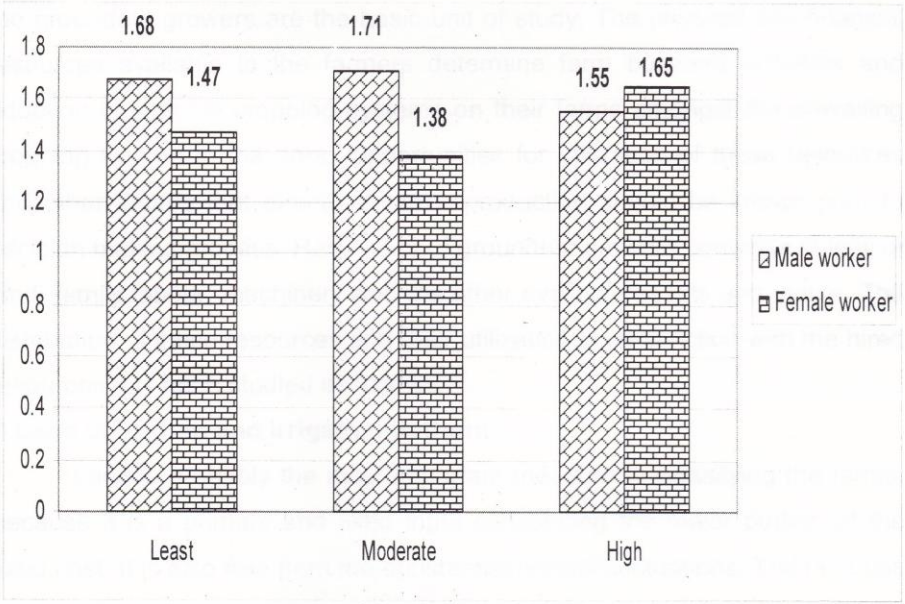


Fig:4: Distribution of groundnut growers according to work force

(Average number of person per farm)



The data revealed that on an average in "moderate adopter" groundnut growers 3.10 persons in a family found to active members. Among the total workforce in this category 1.71 persons (55.16% to total) were male workers and 1.38 persons (44.52% to total) were female workers in a family. These family workers are performing so many activities including farming for earning of family income.

On the other hand, on an average in "high adopter" groundnut growers 3.20 person in a family found to active members. Among the total workforce in this category 1.55 persons (48.44% to total) were male workers and 1.65 persons (51.56% to total) were female workers in a family. These family workers are performing so many activities including farming for earning of family income.

The above facts of study concluded that in high adopter groundnut growers there are higher number of female workers.

c) Farm structure of sample groundnut growers:

The farm structure determines the operational, organizational and managerial constituents of the farm business activity. It also reflects the sources of family income and other business activities. Operational holdings of the groundnut growers are the basic unit of study. The physical and financial resources available to the farmers determine farm business activities and adoption of suitable cropping systems on their farms amongst the prevailing cropping system in the area. Opportunities for utilization of these resources and other factors that affect the crops production should be known prior to decision making process. Resources of groundnut growers comprise chiefly of land, family labour, machinery and the other available assets and inputs. The distribution of these resources and their utilization in conjunction with the hired resources has been studied as follows:

i) Land utilization and irrigation pattern:

Land is probably the most important measure in classifying the farms, because it is a primary and fixed input constituting the major portion of the fixed cost. It is also free from the substantial annual fluctuations. The land use pattern of sample groundnut growers is presented in table 4.3.

Table: 4.3 Land utilization and irrigation pattern of sample groundnut growers.

(Hectare Per farm)

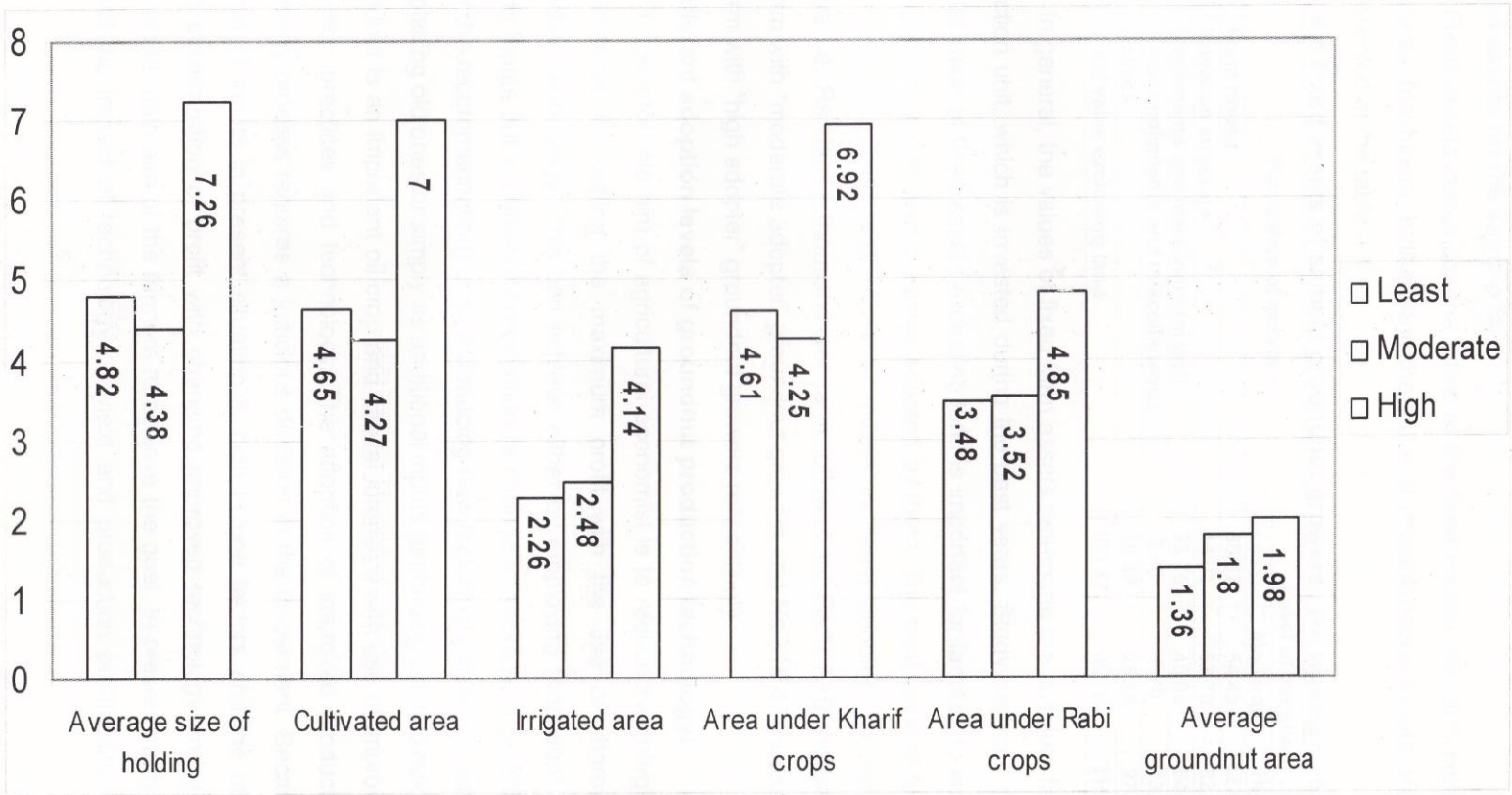
S.No.	Land use pattern	Level of adoption		
		Least	Moderate	High
1.	Average size of holding	4.82	4.38	7.26
2.	Area under other use	0.18	0.11	0.26
3.	Cultivated area	4.65	4.27	7.00
4.	Irrigated area	2.26	2.48	4.14
5.	Percentage irrigated area to cultivated area	48.60	58.08	59.14
6.	Area under Kharif crops	4.61	4.25	6.92
7.	Area under Rabi crops	3.48	3.52	4.85
8.	Gross cropped area	8.09	7.77	11.77
9.	Average groundnut area	1.36	1.80	1.98
10.	Percentage groundnut area to kharif area	29.50	42.35	28.61

As observed from the data, the average size of farm holding was found to 4.82 hectares with "least adopter" groundnut growers per farm, among them 0.18 hectare was found to uncultivated (under other use) and remaining 4.65 hectares per farm was under cultivation. The average size of farm holding was found to 4.38 hectares with "moderate adopter" groundnut growers per farm, among them 0.11 hectare was found to uncultivated (under other use) and remaining 4.27 hectares per farm was under cultivation. On the other hand, the average size of farm holding was found to 7.26 hectares with "high adopter" groundnut growers per farm, among them 0.26 hectare was found to uncultivated (under other use) and remaining 7.00 hectares per farm was under cultivation.

Groundnut is a kharif crop growing in rainy season but due to uncertainty of rain and long spell in rainy days irrigation is compulsory for higher production and adoption of yield attributing inputs. The irrigated area as a percentage of cultivated area was found to on an average 48.60 per cent in "least adopter" groundnut grower's farms followed by 58.08 per cent at "moderate adopters" farm and 59.14 per cent at "high adopter" farms, which showed that level of adoption of improved groundnut production technology also increase with increase in irrigation availability in the area.

Study revealed that the average area under groundnut with "least adopter" farmers was found to 1.36 hectare per farm (29.50% to kharif area) followed by 1.80 hectare (42.35% to kharif area) with "moderate adopter" farmers and 1.98 hectare per farm (28.61% to kharif area) with high adopter farmers. These figures showed that moderate adopter groundnut growers cultivated in higher area under groundnut to kharif area.

Fig:5: Land utilization and irrigation pattern of sample groundnut growers



ii) Fixed assets on the sample farm:

Fixed assets comprises the value of the fixed capital like farm house, implements, machinery, bullock and the value of miscellaneous assets which are presented in the table 4.4.

Table: 4.4 Fixed assets of sample groundnut growers. (Rs. thousand per farm)

S.No.	Particulars of assets	Level of adoption		
		Least	Moderate	High
1.	Farm house	66.52	54.43	127.11
2.	Irrigation structure	44.01	53.70	82.63
3.	Implements and machinery (major)	33.76	45.08	64.51
4.	Minor implements and miscellaneous	9.50	8.70	13.34
5.	Bullock	26.38	25.19	27.90
6.	Total value excluding land	180.17	187.10	315.47

In general, the values of fixed farm assets determine the absolute farm production unit, which is invested during the past years. Study depicted that the total value of fixed assets excluding land is important for farmers to know the level of improved farm practices adopted by them. The total value of fixed assets excluding land was found to lowest in "least adopter" groundnut growers i.e. Rs.180.17 thousand per farm followed by Rs.187.10 thousand per farm with "moderate adopter" groundnut growers and Rs.315.47 thousand per farm with "high adopter" groundnut growers respectively.

4.2 Different adoption levels of groundnut production technology:

In general, the aim of agricultural economist is to reduce the marginal cost of input for getting the maximum profit with the use of improved production technology. This can achieve either by employing (adoption) the existing inputs but in different composition (a change in package of practices as per the recommendation) or by introducing new factors of production either for replacing old ones or simply as additional inputs (technological innovation). Groundnut is an important oil crop and capital intensive with use of improved production practices and technology. The adoption of improved production technology process requires a judicious decision in the investment. Because the cost of inputs in present situation is high in one factors and the other factor, maximization of profit with changing improved technology and yield effect is the main aim of the farmers to achieve the goal. In present study, to find out the impact of technology on yield and production profitability, the

different level of improved groundnut production technology was assessed at field level.

Table 4.5 represents the main components of technological process or technological status at farm level of groundnut production in study area.

Table: 4.5 Technological status at farm level of groundnut production.

(Adoption index)

S.No.	Component of technology	Level of adoption (%)			
		Least	Moderate	High	Average
1.	High yielding variety seed for specific area	61.99	75.93	91.39	76.44
2.	Sowing method (recommended plant spacing and sowing depth should be followed to raise the crop)	81.38	82.78	95.00	86.39
3.	Seed treatment (Thirum @ 2.5 g/kg or Bevisteen @ 2 g/kg	22.56	68.03	91.43	60.67
4.	Inoculation with Rhyzobium and PSB cultures @ 5g/kg seed each).	61.40	81.75	87.50	76.88
5.	Fertilizer application (NPK) 30:50:40	49.28	87.01	92.73	76.34
6.	Interculture operations as per specific needs	33.33	64.55	90.56	62.81
7.	Insect-pest control as recommended (Clarsijriphos)	51.32	62.50	89.38	67.73
8.	Disease control (Bevistin)	61.65	67.35	87.14	72.05
9.	Irrigation (1-2 time)	51.05	51.90	88.00	63.65
10.	Overall technology	55.00	72.00	91.00	72.67

For effective planning to transfer of recommended improved groundnut production technology upto farm of groundnut growers, there is not required to assess the adoption pattern of production technology only, but it is also necessary to assess the level of adoption of each components of technology at farm level. The data depicted that on average groundnut growers adopted only 72.67 per cent of recommended groundnut production technology at farm level. The data indicated that 27.33 per cent recommended technology is not adopted by farmers or reach to the farm level. In other word it can be said that there are 27.33 per cent adoption gap in groundnut production technology at farm level. This adoption gap varied farm to farm and component to component of technology in groundnut production process.

In strategy making point of view, all the selected groundnut growers were divided into 3 groups as per their levels of adoption of groundnut production technology. According to this adoption scale, the "least adoption" level of technology (upto 60.00%) the overall groundnut growers adopted 55.00 per cent of recommended groundnut production technology. The "moderate adoption" level of technology (more than 60.00%-75.00%) adopted

72.00 per cent of overall recommended groundnut production technology. On the other hand, "high adoption" level of technology (above 75.00%) adopted 91.00 per cent of overall recommended groundnut production technology. The detail of components wise technological status is identified as below:

High yielding variety seed:

As per the agricultural scientists, for best results the farmers should use new pure seed every few years, particularly in case of groundnut production, to get higher yield and net income. Many researches' results indicated that about 2.00 per cent yield of groundnut reduced after 2nd year and it simultaneously reduced by 3.00 to 5.00 per cent and 5.00 to 7.00 per cent after 3rd and 4th years. Agricultural scientists suggested that for higher production it is essential that seeds used should be of proven quality and recommended as high yielding for area. It was observed during study that some of the farmers were reluctant to buy expensive quality seeds and they used seed or managed from other sources which were not reliable. The data depicted that on an average groundnut growers adopted only 76.44 per cent of "high yielding variety seed for specific area" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "high yielding variety" 91.39 per cent followed by "moderate adoption" level groundnut growers adopted 75.93 per cent and "least adoption" level groundnut growers adopted 61.99 per cent of "high yielding variety" seed on their farm as per specific area based recommendation.

Sowing method:

For proper germination and total plant population existence in per unit of area, adoption of recommended sowing method is essential to get higher yield. In groundnut cultivation the seed should be placed in soil quite proper way to keep the judicial plant population in unit area. The data depicted that on average groundnut growers adopted only 86.39 per cent of "sowing method" as per recommendation. According to adoption scale, the "high level of adopters" adopted maximum level of "sowing method" 95.00 per cent followed by "moderate adoption" level groundnut growers adopted 82.78 per cent and "least adoption" level groundnut growers adopted 81.38 per cent of "sowing method" on their farm as per specific recommendation.

Seed treatment:

Another problem that has also attracted attention is the fungicide seed treatment. The data depicted that on average groundnut growers adopted only 60.67 per cent of "seed treatment" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "seed treatment" 91.43 per cent followed by "moderate adoption" level groundnut growers adopted 68.03 per cent and "least adoption" level groundnut growers adopted 22.56 per cent of "seed treatment" on their farm as per specific recommendation.

Inoculation with cultures:

Inoculation with Rhyzobium and PSB culture is a best low cost technology source for fertility improvement at farm level. The data depicted that on average groundnut growers adopted only 76.88 per cent of "culture inoculation" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "culture inoculation" 87.50 per cent followed by "moderate adoption" level groundnut growers adopted 81.75 per cent and "least adoption" level groundnut growers adopted 61.40 per cent of "culture inoculation" on their farm as per specific recommendation.

Fertilizer application:

With the introduction of high yielding variety the use of chemical fertilizers has increased considerably. The use of chemical fertilizer was found to be a common practice amongst the groundnut growers in the area, but the lacunae lies in using inadequate doses of N.P.K. per unit of area. The data depicted that on average groundnut growers adopted only 76.34 per cent of "fertilizer application" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "fertilizer application" 92.73 per cent followed by "moderate adoption" level groundnut growers adopted 87.01 per cent and "least adoption" level groundnut growers adopted 49.28 per cent of "fertilizer application" on their farm as per specific recommendation.

Interculture operations:

Improved agronomical practices are must to reap the highest production of groundnut at farm level. Weed is the serious problem in groundnut production due to kharif crop. The data depicted that on average

groundnut growers adopted only 62.81 per cent of "interculture operations as per specific needs" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "interculture operations as per specific needs" 90.56 per cent followed by "moderate adoption" level groundnut growers adopted 64.55 per cent and "least adoption" level groundnut growers adopted 33.33 per cent of "interculture operations as per specific needs" on their farm as per specific recommendation.

Insect pest control:

Recommended plant protection measures should be used and haphazard use of insecticides and pesticides should be avoided to get the optimum yield. But the study revealed that there was low adoption of plant protection measures by the groundnut producers. The data depicted that on average groundnut growers adopted only 67.73 per cent of "insect pest control" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "insect pest control" 89.38 per cent followed by "moderate adoption" level groundnut growers adopted 62.50 per cent and "least adoption" level groundnut growers adopted 51.32 per cent of "insect pest control" on their farm as per specific recommendation.

Disease control:

Recommended disease control measures should be used for optimum yield level. The data depicted that on average groundnut growers adopted only 72.05 per cent of "disease control measures" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "disease control measures" 87.14 per cent followed by "moderate adoption" level groundnut growers adopted 67.35 per cent and "least adoption" level groundnut growers adopted 61.65 per cent of "disease control measures" on their farm as per specific recommendation.

Irrigation practices:

Groundnut is a kharif crop but irrigation facilities are must due to uncertainty of rain and long rain spiel during the whole crop period. The data depicted that on average groundnut growers adopted only 63.65 per cent of "irrigation practices" in cultivation of groundnut. According to adoption scale, the "high level of adopters" adopted maximum level of "irrigation practices" 88.00 per cent followed by "moderate adoption" level groundnut growers

adopted 51.90 per cent and "least adoption" level groundnut growers adopted 51.05 per cent of "irrigation practices", on their farm as per specific recommendation.

4.3 Extent of yield gap at different adoption levels of groundnut production technology.

The actual farm yield needs to be compared under different situations to be of more use for decision making. The most widely used term 'potential' yield is defined as the yield of groundnut which is obtainable on demonstration fields under farmers environments with the use of modern and recommended production inputs and practices giving maximum yield. In the present study potential yield is treated as the yield realized by farmers through demonstrations laid by Agricultural Scientists of K.V.K. at Khargone. The result of demonstration depicted that average yield on demonstration field with use of improved and recommended production practices was on an average 16.65 q/ha. The difference between the potential farm yield and the average farm yield in different situation of technological status may be called as the yield gaps which are considered in present study. The table 4.6 revealed quantification of yield gap between potential (demonstration farm) and actual farm situation (average farm) yield with different technological status.

In study following yield gaps were considered:

Gap I: Between demonstration farms and progressive farms.

Gap II: Between progressive farms and average farmers practices.

Gap III: Between progressive farmers' practices and least adopted farmers' practices.

Table: 4.6 Average yield of groundnut under different situation.

S.No.	Situation	Yield (Q./Ha.)	Termed as	Remarks
1.	Assured input supply (demonstration farm)	16.65	Attainable	Supply of recommended yield attributing inputs assured, improved practices and farmers management.
2.	High adoption package of practices, (progressive farm)	15.13	Technological practices	Farmers own resources with recommended use of yield attributing inputs and management with normal practices followed by progressive farmers in the area.
3.	Farm used own practices (moderate average in the area)	14.76	General farm practices	Farmers own resources with own practices and moderate use of improved inputs.
4.	Poor farm practices (traditional/least practices)	13.27	Poor farm practices	Farmers own resources with least practices and meager use of improved inputs.
5.	Average yield	14.95	Average of demonstration, progressive, moderate and least adopter farm	

It is observed that the yield obtained in demonstration field was the highest 16.65 q/ha, while the average yield of groundnut was found to be 14.95 q/ha. The higher yield can be achieved by general farm condition also as demonstration was laid on farmers' field situation but in the supply of recommended yield attributing inputs assured and high management practices is must.

It is also observed that the yield on progressive farm was found to 15.13 q/ha followed by 14.76 q/ha on moderate farm or general farm condition and 13.27 q/ha on poor farm who are least adopter of technology.

From a compression of the yields between farm level by farmers cultivation practices also found to vary and this yield variation was due to adoption of different level of improved production technology. This study has given clear cut idea that with the use of judicious recommended production technology or by reducing of adoption gap of improved production technology one can reduce the yield gap also. In nut shell, it is concluded that the yield of groundnut positively increase with the increase of level of production technology. The quantification of yield gap between potential farm and general farm in the area can be revealed in table 4.7.

Table: 4.7 Magnitude of yield gap in groundnut production with different level of technological status.

S.No.	Situation	Extent of gap		Contributing factors
		Q/Ha.	%	
1.	Attainable yield (Potential yield)	--	--	Best Management and resource used
2.	Demonstration farms and progressive farms (Feasible yield)	1.52	9.13	Resource knowledge and high adoption of improved production technology
3.	Progressive farms and moderate average farmers practices	0.37	2.45	Moderate adoption by general farmer In area
4.	Progressive farmer and least adopter farmers practices	1.86	12.29	Traditional practices Poor yield
5.	Overall average	1.25	7.96	Average yield gap

It is indicated by the data that there exists a reservoir of untapped yield potential of groundnut in the area. The yield realized on demonstration field was 16.65 q/ha. On the other hand, the overall average yield of groundnut found in the area was 14.95 q/ha including demonstration, progressive, moderate and least adopter farm. This data showed that there is 10.21 per cent yield gap is in general existed in the area and 7.96 per cent yield gap existed among the farmers field.

The contributing factors as derived in the study show that nearly 9.13 per cent yield gap was found between progressive farmers and demonstration farm yield. This showed that the progressive farmers can be increased 9.13 per cent yield merely by improved management practices and with use of judicious groundnut improved yield attributing inputs like demonstrations' fields. The study also revealed that with the use of improved production inputs; the general moderate adopter farmers in the area can get additional average yield by 2.45 per cent as the progressive farms which are feasible in the area as actual yield gap. Traditional farmers (least adopter) also can increase their yield upto 12.29 per cent with the use of improved management practices as progressive farmers are practicing in the area.

From comparison of the groundnut yield realized by different situation of technical status in the area, it may be concluded that small and poor farmers with use of traditional production practices recorded the lowest yield. On the other hand, the demonstration yield which can be attainable by general farmers recorded the highest yield. The study also revealed that the yield of groundnut found to increase with the higher use of technological level.

The yield gap was of the range from 0.37 q/ha to 1.86 q/ha in groundnut cultivation which can be realized by farmers through the use of proper management of resources and adoption of improved practices on their farms.

4.4 Profitability of groundnut production at different adoption levels of production technology:

To estimation of profitability realized by groundnut production, different monetary aspects was determine as input utilization pattern, cost of cultivation and return realized from groundnut production which are discussed as below.

i) Input utilization pattern:

The resource use pattern of groundnut growers indicates the degree of resource management, their choice and decision-making in selection among different alternative resources to get maximum profit. Besides the above, it also indicates the adoption level of technology by the farmers in groundnut cultivation. Labour utilization (Human, bullock, and machine), seed, manures and fertilizers, plant protection measures, irrigation and other cost were the basic resources used in groundnut production process. Hence, in present study, these factors were considered in adoption of improved groundnut technology. The details regarding utilization pattern of resources in groundnut production with different level of technological utilization pattern are presented in table 4.8.

Table: 4.8 Input utilization patterns in groundnut production by different technological status.

Input utilization	Level of Adoption (per farm)			Level of Adoption (per hectare)		
	Least	Moderate	High	Least	Moderate	High
Area under groundnut	**1.36**	**1.80**	**1.98**	**1.00**	**1.00**	**1.00**
Human labour (days)						
Hired	13	29	34	10	16	17
Family	75	94	104	55	52	52
Total	**89**	**123**	**138**	**65**	**68**	**70**
Bullock pair (days)	**11**	**13**	**13**	**8**	**7**	**7**
Machinery (hours)	**7**	**8**	**12**	**5**	**5**	**6**
Seed (Kg.)	**138**	**183**	**198**	**102**	**101**	**100**
Manure+ Fertilizer (Rs.)	**2222**	**3937**	**4853**	**1634**	**2187**	**2451**
Plant protection (Rs.)	**969**	**1950**	**2373**	**713**	**1084**	**1198**
Irrigation charges (Rs.)	**883**	**1280**	**1522**	**649**	**711**	**769**
Other (Rs.)	**276**	**409**	**692**	**203**	**227**	**349**

Many studies recommended a best way for analysis to measure the level of utilization of package of practices for groundnut cultivation, i.e. expenditure on particular components of technology utilized on a unit area. The expenditure incurred on particular component of technology shows its quality as well as quantity. Therefore, this expenditure method of analysis of input utilization was adopted to analyze the cost of production per unit of area of groundnut at different levels of input utilization.

The table 4.8 depicted that among the total human labour required for cultivation of a hectare of groundnut on different technological status, the higher number was accounted by family labour followed by hired labour. The study also showed that the hired labour was increase with increasing technological adoption level in groundnut cultivation.

The per hectare basis total labour requirement found to be maximum (70 days/hectare) in case of "high adoption level" followed by (68 days/hectare) in case of "moderate adoption level" and (65 days/hectare) in case of "least adoption level". All the farmers used bullock labour as well as machine hours for cultivation of groundnut per hectare but the extent of utilization found to higher of bullock labour.

The expenditure on seed and seed treatment, manure + fertilizer, plant protection measure and irrigation charges required for a hectare of groundnut cultivation with different technological status found to increase with increase in adoption level of technology.

ii) Cost of cultivation:

The most important objective of present study is to analyze the comparative economics of improved groundnut production technology with different technological status. The economics of production may be analyzed with the help of cost and return concepts. In the study, these two concepts are used to find out the economic level of groundnut production through different technological status. The cost of cultivation incurred in groundnut production with different technological status is presented in table 4.9.

Table: 4.9 Cost of cultivation of groundnut in different level of technology. (Rs/ha)

S.No.	Cost particulars	Level of Adoption		
		Least	Moderate	High
1.	Hired human labour	1500	2400	2550
2.	Bullock labour	2800	2450	2450
3.	Machine power	2500	2500	3000
4.	Seed + treatment	10962	12000	13502
5.	Manure + Fertilizer	1634	2187	2451
6.	Plant protection	713	1084	1198
7.	Irrigation charges	649	711	769
8.	Other costs	203	227	349
9.	Interest on working capital	437	491	547
10.	Depreciation	1246	1424	1448
11.	Land revenue	132	145	145
	Cost-A_1	**22776**	**25619**	**28410**
12.	Interest on fixed capital	125	142	145
	Cost-B_1	**22901**	**25761**	**28555**
13.	Rental value of land	4000	4000	4000
	Cost-B_2	**26901**	**29761**	**32555**
14.	Imputed value of family labour	8250	7800	7800
	Cost-C_1	**31151**	**33561**	**36355**
	Cost-C_2	**35151**	**37561**	**40355**
	Cost-C_3	**38666**	**41317**	**44390**

On the basis of different cost concepts, the cost of cultivation of groundnut for different level of technology was analyzed. The data on cost of cultivation per hectare on sample holding determine that on an average the cost was found to highest in case of high adoption level of technology due to higher use of yield attributing inputs and its practices. On the other hand, the cost of cultivation per hectare decreases with lower technological adoption level.

The cost A_1 which is the actual farm investment made by groundnut growers is more important in analysis of cost of cultivation. The study revealed that the average cost A_1 on "high adoption technological level" of farms accounted to Rs.28410 per hectare followed by Rs.25619 and Rs.22776 on "moderate" and "least adoption technological level" farms respectively. The study indicated that the cost A_1 found to increases with increasing the level of technological adoption. This increasing trend was due to higher use of yield attributing inputs and practices by progressive farms. Cost A_2 was not considered in the study because groundnut growers cultivated their own land.

In case of cost B_1 and cost B_2, these cost of cultivation found to higher in high adoption level farms and decreasing with low level of technological use.

The total cost estimates i.e. cost C_1, C_2 and C_3 based on the imputed values of family labour would give an unrealistic and even misleading picture of costs. It is attributable to the fact that groundnut growers try to minimize only out of pocket expenses of cultivation and that by and large, they make maximum use of resources they own, but it is also not justifiable to take into account only paid out costs. To determine the cost structure cost C_1, C_2 and C_3 were also analyzed in the present study.

It is revealed that the average Cost C_3 of groundnut cultivation was found to highest on the farm adopted "high adoption level" of production technology accounted Rs.44390 per hectare followed by "moderate adoption level" farms Rs.41317 and "least adoption level" level farms Rs.38666 per hectare respectively. This shows that cost C_3 was found increase with increasing adoption level of technology and it was due to higher use of yield attributing inputs and its practices with increasing level of technology.

iii) Returns:

The returns from groundnut production with use of different level of technology were analyzed. The returns were mainly concerned with realized by groundnut growers in terms of rupees per hectare in the form of gross returns, net profit, family labour income, farm business income and B.C.ratio. For this purpose, the profitability of groundnut per hectare at different adoption level of improved production technology was analyzed and is presented in table 4.10.

Table: 4.10 Returns and profitability of groundnut production through different technological status.

(Rs/ha)

S.No.	Cost particulars	Level of Adoption		
		Least	Moderate	High
1.	Cost-C_3	38666	41317	44390
2.	Gross income (Rs.)	54410	64345	68713
3.	Net income	15744	23028	24323
4.	Family labour income	27509	34584	36158
5.	Farm business income	31634	38726	40303
6.	B.C. Ratio	1.41	1.56	1.55

The market price of groundnut per quintal received by different farmers found to vary. It was due to size of marketing cost, time of selling and quality of produce which made differences on total gross return, accordingly. The gross income on "high adoption level" of farms was found to be highest accounting Rs.68713 per hectare due to higher farm yield and market price. The gross income was accounted Rs.64345 per hectare on "moderate adoption level" farm and Rs.54410 on "least adoption level" farms respectively.

The net income is real profit for which farmers are interested to realize as highest as possible. The study reveals that the highest net income Rs.24323 per hectare was realized by groundnut growers when they adopted "high adoption level" of groundnut production technology. On the other hand, the "moderate adoption level" and "least adoption level" of technological status groundnut growers realized Rs.23028 and Rs.15744 per hectare as net profit from groundnut cultivation.

The other measurement of farm profit like family labour income was found to be highest in case of "high adoption level" technological farm, accounted Rs.36158 followed by Rs.34584 and Rs.27509 by farmers of "moderate adoption level" and "least adoption level" technological status.

Farm business income is also important profitability measurement and it is depicted that the farm business income was found to be highest in case of "high adoption level" technological farms which was accounted Rs.40303 followed by Rs.38726 and Rs.31634 by the farmers of "moderate adoption level" and "least adoption level" of technological status.

The benefit over per rupee investment found i.e. 1.55 on "high level of adoption" farms followed by 1.56 and 1.41 in case of "moderate" and "least adoption" of technological status farms respectively. This showed that highest return on per rupee investment was found in case of moderated adoption level of technology.

It is concluded that the highest profit from groundnut production per unit of area was realized with use of high level of recommended production technology on judicious level and management. The study also revealed that the "high technological adoption" level of progressive farmers realized highest net income, family labour income and farm business income. On the other

hand, the "moderate adoption level" farmers realized medium of net income, family labour income, farm business income and highest return over per rupee investment. Although the "least technological adopters' farmers" are incapable to realize economic return from their production process and they get lowest net income, family labour income, farm business income and B.C.ratio.

4.5 Constraints responsible for the existing yield gap in groundnut production:

The adoption of improved production practices and technology are must for getting higher yield and income in crop production process. It was observed during investigation that in general groundnut growers are not utilizing judicious level of recommended groundnut production technology, which is one of the major constraints regarding yield gap. This yield gap could be due to various and other reasons also which have to be identified to make strategy for improvement in groundnut production and to reap the optimum profit. The various constraints confronted by groundnut growers in the study area regarding existing yield gap and non adoption of improved groundnut production technology, the same are presented in table 4.11.

Table: 4.11 Production constraints identified by groundnut growers for existing yield gap.

S.No.	Constraints	Frequency N=60	%	Rank
A.	Biological constraints			
1.	Non adoption of high yielding varieties.	10	16.67	viith
2.	Weed infestation	28	46.67	vth
3.	Incidence of insect pests	32	53.33*	ivth
4.	Incidence of diseases	34	56.67*	iiird
5.	Water management	36	60.00*	iind
6.	Amount of rainfall received	48	80.00*	ist
7.	Soil fertility variation	20	33.33	vith
	Average	30	50.00	
B.	Socio economic and technological constraints			
1.	Lack of own funds	23	38.33	viith
2.	High interest rate of credit	15	25.00	viiith
3.	Traditional belief	20	33.33	ixth
4.	High cost of inputs	55	91.67*	ist
5.	Lack of technical knowledge	30	50.00*	ivth
6.	Non availability of inputs in time	28	46.67	vth
7.	Non interested to high investment	35	58.33*	iiird
8.	Lack of trained skilled labour	18	30.00	xth
9.	Lack of training and guidance	40	66.67*	iind
10.	Continued crop failure	27	45.00	vith
	Average	29	48.33	

*higher than average value

The constraints confronted by groundnut growers in yield gap was due to mainly biological constraint and non adoption of improved groundnut production technology due to socio economic and technological constraint on their farm. As partial level or non judicious level of input utilization were considered into two groups i.e. "biological constraints" and "socio economic and technological constraints". Among these constraints "biological constraints" was revealed higher value than "socio economic and technological constraints".

A. Biological constraints:

Agricultural production is related with biological science since plants being living organisms. Hence, agricultural production is not a smooth and continuous process; it bristles with a number of biological hurdles. Agricultural production depends on so many biological factors among them few are discussed as follows:

Amount of rainfall received:

Groundnut is a kharif season crop hence, higher irrigation is not required. But during long dry sepal, application of water is crucial for its success and for reaping the higher productivity. The availability of adequate moisture at crucial stage depends upon "amount of rainfall received". In past few years the rainfall was a problem as it exhibited erratic behaviour and this problem are confronted by 80.00 per cent of the total groundnut growers (rank i^{st}).

Water management:

Water management is the most important during rainy season because groundnut might be suffer in water lodging condition. Hence, drainage of water is essential. On the other hand, groundnut crop require only one to two irrigations at the time of dry spell. In this situation greater attention should be taken care for water loss. Unavailability of proper management of drainage is serious cause for yield gap. "Water management" is also one of the constraints for existing yield gap as confronted by 60.00 per cent of the total groundnut growers (rank ii^{nd}).

Incidence of diseases and insect pest:

Groundnut is found to higher susceptible from disease and low from insect pest. In case of groundnut production marginal damage was observed due to insect, pest and diseases. It has been observed that mostly farmers do not control diseases and pest and seldom practice seed treatment. "Incidence of disease" and "incidence of insect pests" were problems in existing yield gap in groundnut which was confronted by 56.67 per cent (rank iiird) and 53.33 per cent (rank ivth) of the total groundnut growers which was serious problem.

Weed infestation:

Weeds are serious problems because they are competing with plants for their existence which caused yield gap. "Weed infestation" is also one of the constraints for existing yield gap as confronted by 46.67 per cent of the total groundnut growers (rank vth).

Soil fertility variation:

To reduce the yield gap, it is imperative that the suitability of the soil for a particular crop has to be carefully determined. Depending on the size of the cultivation unit, it is necessary to draw a soil map of the area which include the soil characteristics of surface soil and sub soil with specific production package programme. On the basis of the soil fertility there may be possibility of changing the cropping pattern to the one which is more adoptable from the stand points of soil fertility. "Soil fertility variation" is also one of the constraints for existing yield gap as confronted by 33.33 per cent of the total groundnut growers (rank vith).

Non adoption of high yielding varieties:

The most outstanding achievement of modern agriculture including groundnut is the production of improved varieties of seeds. With successful evolution of high yielding varieties of groundnut, new vistas were opened for the attainment of high groundnut production has been made drastic change in groundnut production technology and enhancing the level of productivity. "Non adoption of high yielding varieties" recommended for area is also one of the constraints for existing yield gap as confronted by 16.67 per cent of the total groundnut growers (rank viith).

B. Socio economic and technological constraints:

These constraints are also having their own importance in non adoption or injudicious use of improved production technology, which caused low yield or higher yield gap. The following constraints in this category are important which described as per their rank of seriousness.

High cost of inputs:

"High cost of inputs" is the important constraint confronted by 91.67 per cent of groundnut growers in the study area (rank i^{st}). Due to change in input market behaviour, the input cost per hectare becomes heavy for the farmers particularly when yield per hectare is low. Consequently farmers are either using low inputs against recommendation or they are reluctant to buy expensive quality inputs.

Lack of training and guidance:

"Lack of training and guidance" is one of the important constraints confronted by 66.67 per cent of groundnut growers in the study area (rank ii^{nd}). Agricultural extension is an important source of transferring technology. Again, in extension activities training and guidance are a way by which the confidence of farmers can be increased regarding proper utilization of improved technology. Though, it is good in some part of the state, adequate in others while very poor in remaining including the study area. Some times production suffers due to inadequate and/or poor quality of seed, pesticides, fertilizers, rhyzobium etc.

Non interested to high investment:

"Non interested to high investment" is one of the important constraints confronted by 58.33 per cent of groundnut growers in the study area (rank iii^{rd}). Groundnut is capital intensive cash crop and it requires higher investment to fulfill the needed technology. Some of the farmers are not interested to invest additional money due to risk point of view.

Lack of technical knowledge:

"Lack of technical knowledge" is one of the important constraints confronted by 50.00 per cent of groundnut growers in the study area (rank iv^{th}). Knowledge is the part of a person's information, which is in accordance with established fact. Low knowledge is due to extension gap in the area. This extension gap is contributing to the existing yield gap. Adequate extension

staff at field level to make farmers more aware of latest technology is suggested by farmers.

Non availability of inputs in time:

"Non availability of inputs in time" is one of the important constraints confronted by 46.67* per cent of groundnut growers in the study area (rank vth). Timely supply of inputs is one of the important responsibilities of development agencies in the area, but it is commonly noticed now a days that the farmers are suffering due to lack of availability of improved seeds, fertilizers and proper insecticides and pesticides. The delay in availability of inputs causes delay in agricultural operations which in turn reduces the yield.

Continued crop failure:

"Continued crop failure" is the one of the important constraint confronted by 45.00 per cent of groundnut growers in the study area (rank vith). Groundnut production totally depends upon nature in the form of climatic condition, rainfall condition, insect pest infestation and other natural hazards. It has been observed that from many years groundnut crop was being damaged due to these uncertainties. It is also observed that to a great extent, production of groundnut dependent on weather cycle, there are periods of low production or lean periods, followed by good crops.

Lack of own funds:

In general farmers are with poor socio economic condition. "Lack of own fund" is one of the important constraints confronted by 38.33 per cent of groundnut growers in the study area (rank viith).

High interest rate of credit:

"High interest rate of credit" is the least important constraints confronted by 25.00 per cent of groundnut growers in the study area (rank viith). Short term credit is very essential especially to poor resource endowed farmers to adopt the improved production technology.

Traditional belief:

"Traditional belief" is one of the constraints confronted by 33.33 per cent of groundnut growers in the study area (rank ixth). The traditional belief can be overcome by execution of extension method "seeing and believing". More demonstrations are suggested on scientific lines so that more farmers

will be convinced to adopt the latest technology which is a prerequisite for higher productivity.

Lack of trained skilled labour:

"Lack of trained skilled labour" is last of the important constraints confronted by 30.00 per cent of groundnut growers in the study area (rank x^{th}). Generally farmers have great experience in proper utilization practices of yield attributing inputs on the farms. Some times they required hired labour for application of these inputs. In the case some times skilled labour is not available in agricultural area because the literate labour is engaged in near by cities for other works.

4.6 Suggestions for reducing yield gap in groundnut production:

The suggestions are reported on the basis of opinion survey conducted by groundnut growers. The details of suggestions are presented in table 4.12.

Table: 4.12 Suggestion confronted by groundnut growers for increasing production and reducing the yield gap.

S.No.	Suggestions	Frequency N=60	%	Rank
1.	More demonstrations	44	73.33*	iii
2.	Subsidized supply of inputs	48	80.00*	i
3.	Timely supply of inputs	38	63.33	v
4.	Availability of crop production and marketing credit at low rate	35	58.33	vi
5.	Availability of technical help in greater degree	45	75.00*	ii
6.	Organization of the marketing of produce	30	50.00	vii
7.	There should be facilities for drip irrigation system	40	66.67*	iv
8.	Recommended seed variety should be available at local level	25	41.67	viii
9.	Overall average	38	63.33	

* higher than average value

In present study the suggestions made by groundnut growers are divided into two groups as per the seriousness of the problems i.e. the suggestions contains higher frequency value than average value and remaining had lower frequency value than average value.

The suggestions contain higher frequency than average value:

"Subsidized supply of inputs" was suggested by 80.00 per cent of groundnut growers. Majority of farmers want subsidized supply of inputs. This impression is more in case of small and poor farmers. The inputs like seeds, fertilizers and pesticides are essential in production process, which are not adequately available with poor farmers.

"Availability of technical help in greater degree" was suggested by 75.00 per cent of the groundnut growers. Nature and utilization pattern of inputs best suitable for production is complex in nature, needs technical help. On general farmers are with rural background and are technically poor. In this respect to enhance the benefits of technology, the farmers should be motivated with knowledge based extension activities.

"More demonstrations" was suggested by 73.33 per cent of groundnut growers. Extension activities are the important factors for enhancing the knowledge regarding use of improved technology. Demonstration is best extension method (seeing and believing), hence, more demonstration are suggested by farmers.

"There should be facilities for drip irrigation system". There is scarcity of irrigation water and long dry spell require more irrigation. In this situation, drip irrigation found to more cash and time saving. Hence, there should be common facilities for drip irrigation system in the area, suggested by 66.67 per cent of the groundnut growers.

"The suggestions contain lower than average frequency value"

"Timely supply of inputs" was suggested by 63.33 per cent of the groundnut growers. This feeling is more with farmers who are incapable to purchase the inputs from market. The delay in availability of inputs causes delay in agricultural operations which in turn reduces the yield.

"Availability of crop production and marketing credit at low rate" was suggested by 58.33 per cent of the groundnut growers. This is due to the fact that farmers are in general poor and need money for their family purpose. Hence, they can not afford to do additional expenditure on production and marketing.

A good majority of the farmers (50.00%) want "organization of the marketing of produce". Proper marketing is one of the ways to assure remunerative price to farmers.

"Recommended seed variety should be available at local level" was suggested by 41.67 per cent of the groundnut growers. There are very few good varieties of groundnut available suitable for the area in respect of higher yields. Use of specific varieties must be followed scrupulously in order to increase yield, reduced cost on disease/pest control, slow down the spread of

disease/pest. Hence, these suitable varieties should be available at local level as suggested by groundnut growers.

CHAPTER- V

DISCUSSION

In this chapter detail description and interpretation was made on the basis of result's findings which was found with the analysis of collected data, tabulated and analyzed as per the stated objectives of the study. In the chapter of result the reporting was made based on statistical and economical data and tabular presentation which is communicated the data collected in research on the basis of the objective. In present chapter the importance of research findings on the basis of objectives is discussed in detail.

Groundnut, or peanut, is commonly called the poor man's nut. Today it is an important oilseed and food crop. It is found that in most of the farmers' field, the productivity levels are lower than yield found in demonstration fields as well as in the farm of progressive farmers. The result of study showed that except the low utilization of improved groundnut technology the yield of groundnut realized low mainly due to number of production constraints i.e. biological and socio economic and technological constraints including i.) cultivation of crop on marginal lands under rainfed conditions (availability of low irrigated area); ii.) occurrence of frequent drought stress due to vagaries of monsoon; iii.) higher incidence of disease and pest attacks; iv.) low input-use and v.) factors related to socio economic and technological constraints. To now the impact of main constraint i.e. improved groundnut production technology the study "Economic analysis of groundnut production under different technological status of farms" was under taken.

It is well known fact that the serious economic and political crisis which India faced in the mid-1960s triggered the big conversion of agricultural policy of the government; i.e. it emphasized technological innovation and started to introduce new agricultural technologies from abroad. And it was a fortunate coincidence for India that the mid-1960s was the time when new seed-fertilizer technologies started for adoption at farm level. From the early years of agriculture, increasing crop productivity with adoption of high yielding attributes inputs and resistance to pests and diseases have been major goals of farm families. The discovery of mineral fertilizers, crop rotations and chemical and

biological pesticides helped to increase the productivity of crop from per unit of area.

Advances in the science have considerably changed the pattern and quality of human life. Almost every aspect of human living has been influenced by the advents, inventions and innovations attained through modern scientific researches. Agriculture, one of the most important human activities since the beginning of civilization, has also progressed with the support of scientific investigation pertaining to crop improvement, production, protection, crop nutrition, weed management and water stress tolerance. Farmers have a lot of knowledge about agricultural technologies but they choose only those, which are profitable from their viewpoint. The farmers of the state Madhya Pradesh increased their production through adoption of latest agricultural technologies. But there is lacuna that in general farmers are not utilizing or adopting judicious level of improved production technology at farm level.

It has been found in various studies that the yield of crops is directly influencing with level of technology used in production. It can be said that the influence of technology development in crop production including groundnut and its adoption is augmenting regarding total production and productivity of crops is being recognized. However, wide gap prevails between the performance of technology at the progressive farmer's level and of the fields of general farmers. On the other hand, question arising that "are investment on modern technology was proportionately enhanced the output and net return? needs investigation and verification in respective of groundnut growing area. Because groundnut is a commercial oilseed crop and it is capital intensive cultivation, requires a judicious decision in the investment. It is common fact that maximization of profit with changing improved technology and resources are the main aim of the farmers and to achieve the goals of maximization with different level of technology and resources requires, scientific and intelligent decision making concerning to the status of technology. Therefore, farmers are generally confronted with the problems of determining the profitability and productivity with increasing levels of variable inputs as recommended in improved technology in the production process. Specially, it is important in the context of changing input –output prices because stable equilibrium of cost and return is liable to change due to change in price parity between input and output. Hence, it is necessary to examine the cost

structure and profitability of groundnut cultivation at different level of technology used.

With the discussion as above, in present study cost of cultivation incurred with adoption of different level of improved groundnut production technology and their respective returns realized at farm level was analyzed. Economic status that farming is treated as business proposition like industry and costs are accounted for against returns. The data on the production costs provide the basic framework to analyze the economic viability of the crop, in present study with different level of technological status. With the analysis of this problem and the awareness of the farmers about increases in the prices of inputs such as fertilizers and pesticides has made them more cost conscious. As a result they resort to enterprise budgeting before raising the crop. Detailed study of the cost components of production and distribution may help to cut down excessive costs on less productive components. Analysis can also guide decisions to increase investment on more productive components. Study of cost price structure may form the basis for minimizing costs and increasing profitability. Hence, there is a need for data collection and analyzed them as relevant to the crop production costs on a comprehensive basis.

The present study depicted that the cost of cultivation of groundnut per unit of area was increased with the high adoption level of improved production technology. The high cost of production at farm level with high adoption was due to higher use of yield attributing inputs and their practices. Study also revealed the high cost of production for groundnut is mainly due to also the heavy seed-rate adopted and the large labour force employed for its agronomical process. The expenditure on these and other cultivation operations varies largely between groundnut-growing farms. Farming expenses are conditional on the variety grown, soil and climatic conditions, cultivation practices; implements used for field operations, rate of hire charges for work bullocks, wages of labour plus other factors, which was clearly found in present study.

It also have been observed that progressive groundnut growers in study area fetching sound returns from cultivation of groundnut with judicious use of groundnut production technology have been generated by agricultural scientist. It showed that there exist potentiality of groundnut production in the area and general farmers are not getting its viable profit. Hence, it is paramount important

that study should be carried out to evaluate the superior productivity potential of the available technology packages and their profitability in groundnut under specific farm situation compared with prevailing general farmers practices in area. Hence, it may be said that all these facts were confronted by the result of present study. The data of study is true representative for groundnut cultivation and are providing feed back information for further researches.

SUMMARY, CONCLUSIONS & SUGGESTIONS

CHAPTER –VI

SUMMARY, CONCLUSION AND SUGGESTIONS

Summary:

Groundnut is called as the 'king' of oilseeds. It is one of the most important food and cash crops of our country. While being a valuable source of all the nutrients, it is a low-priced commodity. The area under groundnut in India was 4.49 million hectare with the production of 5.0 million tonnes during 1950-51 which has increased to about 7.00 million hectare with the production of more than 11.00 million tonnes in 2011-12.The sizeable increase in groundnut production over the years was possible through extension efforts with the adoption of improved groundnut production technology. In order to bring groundnut production to the forefront and to achieve even higher level of production various research and extension programmes, play the pivotal role in terms of providing viable technological inputs. Madhya Pradesh is one of the important groundnut growing states in India. It grown over an area of 207.3 thousand hectares and total production of 234.5 thousand tonnes with 1132 kg per hectare of productivity in the year 2011-12. The district is comprises groundnut growing area 9.2 thousand hectare, producing 12.6 thousand tonnes of groundnut with an average productivity 1368 kg. per hectare (2011-12).

Groundnut is one of the important oilseed cash crop growing in the farmers' field with using of varied technological status. An attempt to understand the basic problem in the adoption of recommended technology package assumes special significance. On the other hand, the use of differential technological status resulting yield gap in production process. This step needs a scientific evaluation of the extent of yield gap and the causes and constraints thereof. To get the optimum return in the benefit of farmers, it is also necessary to estimate the cost benefit ratio of groundnut production in different level of technological use. The specific objectives of study were as below:

Objectives:

1. To determine socio economic characteristics of groundnut growers in study area.
2. To estimate the different adoption levels of groundnut production technology at existing farm situation.

3. To assess the extent of yield gap at different adoption levels of groundnut production technology.
4. To estimate the profitability of groundnut production at different adoption levels of production technology.
5. To identify the constraints responsible for the existing yield gap in groundnut production.
6. To suggest ways and means for reducing yield gap in groundnut production.

Khargone district of Madhya Pradesh has been selected for the purpose of this study because groundnut is the one of the major kharif crops in the region. In present study, multi stage sampling technique was used for drawing the sample. Khargone district comprises of 9 blocks. At the first stage, Khargone block in Khargone district was selected purposively due to most suitable area for groundnut crop and well known for researcher. At the second stage, a list of major groundnut growing villages was prepared and among these 5 villages was selected randomly. At the third stage for the selection of respondents, a list of groundnut growing cultivators of each village was prepared and among them 60 groundnut grower were selected randomly for the study. Thus, the sample was confined to 60 groundnut grower form 5 villages in Khargone block of the district.

Depending upon the objectives of the study primary data was used. The primary data was collected from selected respondents using pre-tested questionnaire, through survey method. Each selected respondents were approached personally for recording relevant data. The data was collected for the Agricultural year 2014-2015.

The primary data regarding recommended groundnut production technology in respect of input use pattern, yield, cost, return and profitability, the data was collected from the office of Scientist at Research Station, Khargone. In respect of technological status at farm level, the selected groundnut growers was classified into three categories with respect to level of adoption [poor resource farmers (low), general farmers (moderate) and progressive farmers (high)]. Having identified the number of farmers under each category the indices of adoption was calculated as under

$$\text{Adoption index (\%)} = \frac{\text{Adoption score obtained by respondent}}{\text{Possible maximum score}} \times 100$$

Yield gap: The potential farm yield which is obtainable on a farmer's field with the adoption of recommended groundnut production technology. The difference between the potential farm yield and actual farm yield is termed as a yield gap. In present study to assess yield gaps on groundnut farms when compared to those of Demonstration's farms with high, medium and low adoption level of at farmer's field level.

Economics of cultivation:

Cost A_1 = All actual expenses in cash and kind incurred in production of groundnut by owner operator

Cost A_2 = Cost A_1 + rent paid for leased in land

Cost B_1 = Cost A_2 + interest on fixed capital (excluding land)

Cost B_2 = Cost B_1 + imputed rental value of owned land

Cost C_1 = Cost B_1 + imputed value of family labour

Cost C_2 = Cost B_2 + imputed value of family labour

Cost C_3 = Cost C_2 + 10% of Cost C_2 (As managerial cost)

Profitability aspects: For the estimation of profitability, the following income measures were used.

a) Net farm income (NFI) = Gross income – Cost C_3 (total cost)

b) Family labour income (FLI) = Gross income – Cost B_2

c) Farm business income (FBI) = Gross income –Cost A_1

d) B:C ratio (Benefit cost ratio) = Gross income/ Gross expenses

Production constraints:

The different aspects i.e. technological, production and financial constraints was considered to know the overall production constraints faced by the respondents in groundnut growing in study area.

Conclusion:-

From the foregoing results and discussion it could be concluded as under:

1. Study depicted that the higher number of groundnut growers found to literate among the entire adopter group. The literacy position among the groundnut growers revealed that the literacy position was increased with level of adoption. On other word it can be say that the literate farmers adopted higher extent of improved groundnut production technology.

2. Work force in a family is important parameter for family income. The data revealed that on an average in "least adopter" groundnut growers 3.16 persons in a family found to active members followed by on an average in "moderate adopter" groundnut growers 3.10 persons and "high adopter" groundnut growers 3.20 people in a family found to active members.
3. Average size of farm holding was found to 4.82 hectares with "least adopter" groundnut growers per farm followed by 4.38 hectares with "moderate adopter" and 7.26 hectares with "high adopter" groundnut growers per farm.
4. The irrigated area as a percentage of cultivated area was found to on an average 48.60 per cent in "least adopter" groundnut grower's farms followed by 58.08 per cent at "moderate adopters" farm and 59.14 per cent at "high adopter" farms, which showed that level of adoption of improved groundnut production technology also increase with increase in irrigation availability in the area.
5. Study revealed that the average area under groundnut with "least adopter" farmers was found to 1.36 hectare per farm (29.50% to kharif area) followed by 1.80 hectare (42.35% to kharif area) with "moderate adopter" farmers and 1.98 hectare per farm (28.61% to kharif area) with high adopter farmers.
6. The data depicted that on average groundnut growers adopted only 72.67 per cent of recommended groundnut production technology at farm level. The data indicated that 27.33 per cent recommended technology is not adopted by farmers or reach to the farm level. In other word it can be said that there are 27.33 per cent adoption gap in groundnut production technology at farm level.
7. In strategy making point of view, all the selected groundnut growers were divided into 3 groups as per their levels of adoption of groundnut production technology. According to this adoption scale, the "least adoption" level of technology (upto 60.00%) the overall groundnut growers adopted 55.00 per cent of recommended groundnut production technology. The "moderate adoption" level of technology (more than 60.00%-75.00%) adopted 72.00 per cent of overall recommended groundnut production technology. On the other hand, "high adoption" level of technology (above 75.00%) adopted 91.00 per cent of overall recommended groundnut production technology.

8. It is observed that the yield obtained in demonstration field was the highest 16.65 q/ha, while the average yield of groundnut was found to be 14.95 q/ha. It is also observed that the yield on progressive farm was found to 15.13 q/ha followed by 14.76 q/ha on moderate farm or general farm condition and 13.27 q/ha on poor farm who are least adopter of technology.
9. Study show that nearly 9.13 per cent yield gap was found between progressive farmers and demonstration farm yield. On the other hand, the yield gap between progressive farmers and moderate farmers found to be 2.45 per cent and the yield gap between progressive farmers and least adopter farmers found to be 12.95 per cent.
10. It is revealed that the average Cost C_3 of groundnut cultivation was found to highest on the farm adopted "high adoption level" of production technology accounted Rs.44390 per hectare followed by "moderate adoption level" farms Rs.41317 and "least adoption level" level farms Rs.38666 per hectare respectively. This shows that cost C_3 was found increase with increasing adoption level of technology and it was due to higher use of yield attributing inputs and its practices with increasing level of technology.
11. The net income is real profit for which farmers are interested to realize as highest as possible. The study reveals that the highest net income Rs.24323 per hectare was realized by groundnut growers when they adopted "high adoption level" of groundnut production technology. On the other hand, the "moderate adoption level" and "least adoption level" of technological status groundnut growers realized Rs.23028 and Rs.15744 per hectare as net profit from groundnut cultivation.
12. The benefit over per rupee investment found i.e. 1.55 on "high level of adoption" farms followed by 1.56 and 1.41 in case of "moderate" and "least adoption" of technological status farms respectively. This showed that highest return on per rupee investment was found in case of moderated adoption level of technology.
13. The constraints confronted by groundnut growers in yield gap was due to mainly biological constraint and non adoption of improved groundnut production technology due to socio economic and technological constraint on their farm. Among these constraints "biological constraints" was revealed higher value than "socio economic and technological constraints".

14. In "biological constraints" the main constraints were "amount of rainfall received" followed by "water management", "incidence of diseases" and "incidence of insect pests". On the other hand, in "socio economic and technological constraints" the main constraints were "high cost of inputs" followed by "lack of training and guidance", "non interested to high investment" and "lack of technical knowledge" respectively.
15. The main suggestions contains higher frequency value than average value were "subsidized supply of inputs" followed by "availability of technical help in greater degree", "more demonstrations", "there should be facilities for drip irrigation system" respectively.

Suggestion:-

To increase the extent of adoption of groundnut production technology and to get optimum yield with criteria for removal of constraints, following suggestions may be considered:

1. Study depicted that there is a wide gap in adoption of improved groundnut production technology on the farm of different farmers. Many studies suggested boost-up the yield with adoption of recommended technology. Hence, emphasis should be given on the various aspects of cultivation which have partial adoption and no adoption to increase the yield. Hence, attention should be paid on the groundnut growers to increases their adoption rate which in turn will increase the average production of the area. It is also suggested that there is an urgent need to expose the farmers about the modern and improved groundnut production technology and management practices and convince them regarding the utility and merits of improved practice to increase their productivity. Hence, an integrated approach by combining education and timely supply of required inputs could be suggested as the strategy for improving the economic standards of the farmers.
2. Study implies that there is a huge scope to increase the yield of groundnut at the farmers' field by adopting the recommended package of practices, because the progressive farmers realized higher yield in the area. This calls for intensification of efforts by the extension agencies. Moreover, frontline demonstrations needs to be popularized much among the farming communities as it plays a pivotal role in bridging the gap between the available technologies at one end and their application for increased

production on the other.

3. Lack of technical knowledge is also attributing factor for higher adoption. Costly agricultural inputs, lack of proper market, lack of training programme related with improved technology were the dominant reasons for non-adoption of groundnut production technology. Hence, an ideal strategy to provide necessary technical guidance should be developed. Issues related to availability, accessibility and affordability of the farm inputs should be addressed by both governmental and non governmental agencies through farm co-operation and farmers organization at village level.
4. It is fact that the expenditure on various level of adoption pattern of production technology and cultivation operations varies largely between different groundnut growing farms. Farming expenses are conditional on the variety grown, soil and climatic conditions, cultivation practices, implements used for field operations, rate of hire charges for work bullocks, wages of labours plus other factors. Thus, there is a wide scope of activities to reduce the cost of cultivation the groundnut crop at farm level. The state Departments of Agriculture should undertake large-scale tests with the various labour saving implements and machinery available. Further they should standardize the operations in each case with a view to reducing expenses to the minimum. Extensive use of such labour saving devices would only enable farmers to realize a better return from the crop.
5. Seed is one of the expensive inputs in the process of groundnut production. The bullock drawn seed-drills are used in most of the farmers to sow the seed. Regulation of spacing within and between the seed rows is not perfect using this method. Still this technology will go a long way in increasing productivity. At present seeders, diggers, strippers, shellers and graders are available in the market, but most of them are power operated. The economic condition of small-scale farmers in the state is so bad that they cannot afford such expensive equipment. For small landholders, power drawn equipment is not economical. Groundnut is a labour-intensive crop. New design and introduction of appropriate indigenous low-cost bullock drawn implements would increase the efficiency of operation, thereby reducing the time necessary for each operation and cost of cultivation.

6. Low productivity may be explained by noting that groundnut seed contributes highest amount among the total input cost, has a large size and low multiplication ratio compared to cereals. Consequently the production of quality seed and timely supply affects a bottleneck in popularizing the new released varieties. The situation observed today in India clearly warns that groundnut productivity can be increased substantially improving cultivation practices. These enhancements comprise integrated crop management and post-harvest practices, rather than breeding the new faster maturing varieties alone. Groundnut seed are also prone to loss of viability during storage plus losses due to very serious insect and pest damages. Timely availability of the quality seed and expense are the major constraints in the cultivation of groundnut by the small land-holders.

BIBLOGRAPHY

CHAPTER – VII

BIBLOGRAPHY

Bajpai,M.K. (1998). Adoption of dry land crop production technology. *Maharastra J.Extn.Edun.* **17**(0):103-106.

Basvaraj,H. (2000). Crop yield potentials and constraints in production of major crops in Northern Dry Zone of Karnataka. *Agric. Situ. India.* **56**(11):743-753.

Chouhan, Avinash Singh (2013). A study on adoption of groundnut production technology among the tribal farmers of Khargone district of Madhya Pradesh. *M.Sc. (Agri.) Thesis Submitted to the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior.*

Dhongade,M.P. and Dangat,S.B. (1985). Socio-economic benchmark survey of the Sina medium irrigation project command area in Maharashtra. *Report- Mahatma Phule Agricultural University, Rahuri, Maharashtra.*

Dubolia,S.R. and Jaiswal,P.K. (2000). Technological gap of groundnut cultivation among groundnut growers. *Maharashtra J. Ext. Edu.* **19**:216-217.

Gote,M.R.; Khodiar,M.B.; Sadhu,B.R. and Shekhar,Serene (2010). Cost of cultivation of groundnut. *International Research Journal.* **1**(11):74-76.

Hapase,B.N. (1996). A study on extent of adoption of recommended summer groundnut technology by farmers of Kheda district of Gujarat State. *M.Sc. (Agri.) Thesis, G.A.U., Anand Campus, Anand.*

Joshi,P.K. and Bantilan,M.C.S. (1998). Impact assessment of crop and resource management technology: a case of groundnut production technology. *Impact Series no.2. Patancheru 502 324, Andhra Pradesh, India.*

Kapse,P.S. and Pimprikar,Y.K. (2000). Technological gap in summer groundnut cultivation. *Maharashtra J. Ext. Edu.* **19**:56-59.

Karanjkar,S.C. and Pandya,S.C. (1985). Constraints to higher yield of soybean in Indore Region of M.P. *Zonal Agriculture Research Station Indore.* pp:16.

Kikon,W. (2010). Adoption gap in groundnut production in Northern transition zone of Karnataka. *Unpubished M.Sc. (Ag.) Thesis submitted to University of Agricultural Sciences, Dharwad.*

Maurya, Pramila (2013). A study on production and marketing of groundnut in Alirajpur district of Madhya Pradesh. *M.Sc. (Agri.) Thesis Submitted to the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior.*

Mrathyunjaya and Kumar,P. (1989). Trend and structural changes in the cost of production and profitability of crops in India. *Agril. Situ. In India.* **44**(6):451-457.

Mundinamani,S.M.;. Hiremath,K.C. and Basavaraja,H. (1989). An economic analysis of production and marketing of groundnut: a case study, *Karnataka Journal of Agricultural Sciences*. **2**(1-2):89-96.

Nagaraj,K.H. and Katteppa (2002). Adoption of improved cultivation practices of groundnut by farmers. *J. Ext. Edu.* **13**(1):3277-3282.

Narayanamoorthy,A. (2013). Profitability in crops cultivation in India: some evidence from cost of cultivation survey data. *Indian Journal of Agricultural Economics*. **68**(1):104-121.

Nautiyal,P.C. (2002). Groundnut: Post-harvest Operations. *Report, National Research Centre for Groundnut* ***(ICAR)*** *New Delhi.*

Prasad,Y.E.; Reddy,S.S.; Naidu,M.R. and Shareef,S.M. (1983). Benefit- cost appraisal and marginal analysis of rain fed groundnut in Chittor district of Andhra Pradesh. *Agricultural Situation in India.* **37**(4):639-646.

Pate,B.I.; Patel,D.B.; Patel,A.J.; Patel,J.R. and Patel,V.B. (2009). Impact of frontline demonstrations in groundnut. *J. Oilseeds Res.* **26** (Special Issue):556-557.

Reddy,N.T. and Hiremath,K.C. (1986). Problems and prospects of production and marketing of cotton in Karnataka State. A case study of farmers in Raichur district, *Agricultural Economic Research Bulletin 19, Department of Agricultural Economics, College of Agriculture, Dharwad.*

Reddy,P.Rameshkumar. and Rao,V.Shivshankara.(1998). Assessing knowledge, attitude, and adoption of farmers about improved practices in agriculture. *Maharastra J.Extn.Edun.* **17**(0):285-287.

Sikandar Kumar and Sandeep Kumar (2004). Resource use efficiency and returns from selected food grain crops of Himachal Pradesh. *Agricultural Situation in India*. pp:475-785.

Sunandini,G.P; Nagabhushanam,T.D.J. and Krishnaiah,J. (1988). Yield gaps and constraints analysis in groundnut production in Waragal district of Andhra Pradesh. *Journal of oil seed research.* **5**(2):107-118.

Tiruvenkatachari,K.; Vishwanathan,B.N. and Seetharaman,K.S. (1991). An economic analysis of groundnut production in rainfed area – A study in Tamil Nadu. *Agricultural Situation in India*. **46**(6):431.

Venkataramana,P.; Madhuprasad,V.L. and Anand,T.N. (2005). Yield gaps and constraints in kharif groundnut cultivation- a case study of Kolar district of Karnataka. *Mysore J. Agric. Sci.* **39**(2):262-267.

Venkattakumar,R. and Padmaiah,M. (2010). Adoption Behaviour of Oilseed Growers in India. *Indian Res. J. Ext. Edu.* **10**(3):75-83.

Verma,P.D.; Munshi,M.A. and Kanani,P.R. (2002). Groundnut productivity and yield gap of groundnut production. *The Andhra Agric. J.* **49**(3&4):318-321.

VijayaKumari,R.; Narender,I. and Sastry,T.V.N. (2009). Economic analysis of groundnut cultivation in Gorantlapalle watershed project of Chittoor district in Anadra Pradesh. *Oilseed Res.* **16**(1):101-107.

DEPARTMENT OF AGRICULTURAL ECONOMICS AND F.M.

R.A.K., COLLEGE OF AGRICULTURE, SEHORE (M.P.)

INTERVIEW SCHEDULE

1. Title of the Research Problem:

"Economic analysis of groundnut production under different technological status of farms in Khargone district of Madhya Pradesh".

Investigator: Mahendra Sawle

Advisor: Dr. S.N. Soni

A) GENERAL DESCRIPTION

1. Name of farmer : .....

2. Father's name/caste: .....

3. Village: ....., **Tehsil:** ....., **District:** .....

4. Occupation : .....

5. Details of family member:

S.No.	Name of family member	Age	Sex	Relation with head	Education	Occupation
1.						
2.						
3.						
4.						
5.						

6. Details of land holding and irrigation (Ha.):

i. Land owned .....ha. Total revenue paid Rs.....

ii. Land leased in .....ha. Rent paid for leased in Rs.....

iii. Land leased out.....ha Rent received for leased out Rs.....

iv Total land operated.....ha. Revenue paid Rs.....

v. Total irrigated area.....ha.

7. Land utilization pattern (ha.)

i. Total land: ..... ii. Operated area: .....

iii. Cultivated area (Kharif): ..... iv. Cultivated area (Rabi): .....

8. Farm Assets:

S.No	Particulars	Area/no.	Present value	Expected Annual Rent	Expected life at the line of construction
a	Land				
b	Farm building				
c	Irrigation structure				
d	Implement: A. Major B. Minor				
e.	Other (Specify)				
f.	Total				

9. Cropping pattern:

S.No	Season/Crop	Area	Variety	Irrigated	Unirrigated
1.	Kharif: a. b. c.				
2.	Rabi: a. b. c.				

B) TECHNOLOGICAL STATUS AT FARM LEVEL OF GROUNDNUT PRODUCTION.

(Level of adoption)

S.No.	Component of technology	Assign weight	Weight obtained
1.	High yielding variety seed for specific area	18	
2.	Sowing method (recommended plant spacing and sowing depth should be followed to raise the crop)	13	
3.	Seed treatment (Thirum @ 2.5 g/kg or Bevisteen @ 2 g/kg	07	
4.	Inoculation with Rhyzobium and PSB cultures @ 5g/kg seed each).	06	
5.	Fertilizer application (NPK) 30:50:40	11	
6.	Interculture operations as per specific needs	09	
7.	Insect-pest control as recommended (Clarsijriphos)	08	
8.	Disease control (Bevistin)	07	
9.	Irrigation (1-2 time)	10	
10.	Total	89	

Potential yield (Adoption of recommended practices) .....(q./ha.)

C) COST OF CULTIVATION

1. Production Practices (Groundnut) Low/Moderate/High:

Area: …….. Variety: …….

2. Labour use information:

S.No.	Operation	Family labour		Hired labour		Bullock labour		Machine labour	
		Days	Value	Days	Value	Days	Value	Days	Value
1.	Ploughing								
2.	Harrowing								
3.	Leveling								
4.	Fertilizer application								
5.	Sowing								
6.	Plant Protection								
7.	Weeding								
8.	Irrigation								
9.	Digging								
10.	Transportation and Other								
11.	Total								

3. Material used and cost:

S.No.	Input used	Quantity	Value	Remark
1.	Seed			
2.	Seed treatment and culture			
3	Manures/compost			
4.	Fertilizers (NPK)			
5.	Irrigation Charges			
6.	Plant protection			
7.	Other			
8.	Total			

4. Output:

S.No.	Production	Quantity	Sale value
1.	Main Product		
2.	By product		
3.	Total		

D) CONSTRAINTS

Reasons identified by the selected farmers for the yield gap:

A. Biological constraints

1) Adoption of high yielding varieties. Yes/No
2) Weed infestation Yes/No
3) Incidence of pests Yes/No
4) Incidence of diseases Yes/No
5) Water management Yes/No
6) Amount of rainfall received Yes/No
7) Soil fertility variation Yes/No

B. Socio economic and technological constraint

1) Lack of own funds Yes/No
2) Lack of credit facilities Yes/No
3) Traditional belief Yes/No
4) High cost of inputs Yes/No
5) Lack of technical knowledge Yes/No
6) Non availability of inputs in time Yes/No
7) Non interested to high investment Yes/No
8) Lack of trained skilled labour Yes/No
9) Lack of training and guidance Yes/No
10) Continued crop failure Yes/No

F) SUGGESTION FOR REDUCING THE GAP

1. More demonstrations
2. Subsidized supply of inputs
3. Timely supply of inputs
4. Availability of crop production and marketing credit at low rate
5. Availability of technical help in greater degree
6. Organization of the marketing of produce
7. There should be facilities for soil testing.
8. Recommended seed variety showed be available at local level
9. Other suggestions

VITA

Mahendra Sawle, the author of thesis was born on 03th July 1989 in Khargone district of Madhya Pradesh. He completed his High School from Government High School, Thibgone and Higher Secondary Certificate Examination Board Bhopal (M.P.). from Devi Ahilya higher Secondary School District Khargone.

He was selected through entrance examination (P.A.T.) and joined the B.M.College of Agriculture, Khandwa (M.P.) in 2010 and obtained B.Sc. (Ag.) degree in 2013 with 7.00 OGPA out of 10.00point scale.

The author continued his post graduation from R.A.K.College of Agriculture, Sehore (M.P.), to specialize in "**Department of Agriculture Economics and Farm Management**" and partial fulfillment of the requirements for the award of the same, he allotted with interesting problem as **"Economic analysis of groundnut production under different technological status of farms in Khargone district of Madhya Pradesh"** for thesis work which has been duly completed by him and presented in this thesis.

His achievement in the sports is praiseworthy. He actively participated in all the cultural activities of the college. Now, he is going to complete his master's degree programme by submission of this thesis.