CHAPTER I

INTRODUCTION
CHAPTER I
INTRODUCTION

1.1: Introduction:

Even after the five decades of independence, agriculture continues to be the main-stay of the Indian economy. It accounts for about one fourth of the gross domestic product (GDP) and is the source of livelihood for nearly two thirds of the population. The green revolution has been regarded as the cornerstone of India’s agricultural development. The adoption of new technology, increased public and private investments and institutional innovations have augmented production and productivity gains. The post-green revolution period has witnessed an impressive structural change taking in Indian agriculture. The Indian agriculture has been progressively acquiring the small farm character, with 40 percent of the land now being operated by small and marginal farmers. The output mix in Indian agriculture has undergone a significant shift from food grains to non-food grains and within food grain from coarse cereals to finer cereals.

Technological change manifests itself in the use of new inputs and knowledge leading to an upward shift of the production function in the long run. Technological advancement has two general properties. i) It refers to the shift in the way resources are used so that either a larger output is obtained with a given total input of resources or the same output is produced with a smaller amount of inputs. ii) A technological change effecting individual input
is referred to as input saving or input augmenting. Land augmenting technological change would reduce the quantum of land required per unit of output without increasing the quantity of other inputs. Neoclassical economists refer technological change as change in the combination of inputs used to produce the same level of output.¹

Technological change in agriculture is the use of modern inputs such as fertilizers, HYV seeds, tractors, pump sets, thresher and combine harvesters. Techniques refer to the actual mix of input factor and it is a function of both technology and the relative prices of input factors. Thus, technological change may lead to changes in techniques but some of the changes in techniques may be entirely due to the change-taking place in the relative prices of inputs.²

In the mid sixties, there was a major break through in food production which has enabled the country to increase the production of food grains at an average rate of 2.6% per annum. The country has been able to tide over the food grains imports. Food grains production increased from 52 million tonnes in 1950-51 to 193 million tonnes in 1998-99. Overall performance of Indian agriculture in the last five decades has no doubt, been remarkable. However, the progress shown in the production of different crops and regions has been neither consistent nor symmetrical. The new farm technology has brought in regional disparities, for instance, the regions like the Punjab plains have witnessed a tremendous upsurge in crop production, while the other region especially the dry tracts did not witness increase in productivity. The impact of
green revolution has not been uniform—Rice, wheat registered a spectacular production performance, while in the case of coarse grains, pulses and oilseeds such a phenomenon was not forthcoming. These regional and structural imbalances have led to regional socio-economic conflicts. Further more, there has been a persistent stagnation in agricultural production since 1980's casting doubt as to whether the new farm technology could sustain its momentum in the years to come.³

However introduction of modern technology started a new era in Indian agricultural. It led to increase in agriculture production and productivity. Changes in farm employment, alteration of investment pattern, shift from traditional agriculture to modern agriculture.⁴ In India the introduction of agricultural technology has not only resulted in significant increase in agricultural production and productivity but also generated many new problems. It has promoted inequality among different regions of the country. Serious imbalance in cropping pattern, increasing the income inequalities, cost of production of crops increased considerably, new technology has given stimulus to capitalistic farming, displacement of labour increased, instability in production accelerated. Only significant break through in the production of paddy and wheat oilseeds, pulses, and coarse cereals, are left out.

New technology has influenced the employment potential in the farm sector in India. The multiple cropping and intensive agricultural activities are more labour demanding. However, the very same practice has made it
necessary to machanise certain operations. This has led to displacement of both human and animal power to a certain degree. In many areas the Green Revolution has been responsible for accelerating the pace of mechanization and tractorisation which is causing displacements of labor and increasing unemployment. 

1.2: Technological Change in Agriculture Some Theoretical Issues:

Technology means the knowledge, the skills and all the available techniques applied in production to increase the output. "For analytical purpose it is convenient to use the term technology to refer to the body or stock of techniques, procedures or ways of conducting economic activity. The level of technology can be conceptualized in terms of an aggregate production function whose parameters reflect all of the technical production possibilities currently available."  

Specifically technology may be defined in terms of the proportions in which land, labour and capital are combined in to the production of a unit of output. The different technology is required for different areas to get more production with same cost or same production with less cost. The improvement in technology means reducing cost of production. It is a function of the technological change and is a stock concept; technology has a major role to play in the economic development of a country."
1.2.1: Technological Change:

"When the same amount of output can produce by fewer factor inputs, or equivalently when the same amount of inputs can produce greater amount of output. "Production of greater output with the expenditure of a given quantity of resources". In other words technological change leads to higher output per unit of input. Technological change is defined in terms of production function and defined it as a change in one or more of the parameters of the aggregate production techniques to the existing stock. This indicates upward shift in the production function. (Ruttan)

1.2.2: Technological Change in Agriculture:

Heady (1952) stated that a shift in the total production and total input is not always neutral, the combination of inputs required to obtain a given output may change along with a shift in the total input-output relationship. More often technological change takes place when with changing resource base, a completely new inputs come into use and changes the total input-output relation. We had witnessed the introduction of pesticides. A package of HYVs of seeds, fertilizers, pesticides together with assured water supply ushered in the given revolution.  

C. H. Hanumantha Rao defined the technological change in agriculture as the use of new or modern inputs such as fertilizers, HYVs, tractors, pump sets threshers and harvest combines. A technique refers to the actual mix of
input factor, and it is a function of both technology and the relative prices of input factors. Thus, technological change may lead to changes in techniques but some of the changes in techniques may be entirely due to the change-taking place in the relative prices of inputs.  

1.2.3: Induced Technological Change:  

Hiyami and Ruttan have presented on 'Induced Innovation model to explain the growth in agricultural productivity. The model attempts to make more explicit the process by which technical and institutional changes are induced through the response of farmers, agribusiness, entrepreneurs, scientists, and public administrators, to resource endowment and to changes in the supply and demand factors and products.

According to the theory of induced technical innovation progress in agricultural technology is largely an endogenous phenomenon. As formulated by Hayami and Ruttan, the theory states that the high price associated with a scarce factors of production induces farmers to choose technologies that conserve the scarce factor. A rise in the price of labour induces substitution of machinery for labour. Mechanization relaxes labor constraints. But the advance in technology is itself a function of institutional innovations.

The induced innovation provides an explanation for the direction of the technical change. The basic idea behind it is that the direction is influenced by relative factor prices that stimulate the search for new methods of production.
which will use more of the cheaper factor of production and substitute it for the more expensive one. "Relative factor and product prices exert a pervasive impact on the direction of both the innovative and production activities of the farmers and of the firms that supply the inputs used in agriculture production". Thus, development in agriculture can be visualized through inducement mechanism. In the developing countries the stress on efficient pricing system in both commodity and factor markets and on the efficient functioning of public sector financial institutions, is an eye opener to the policy makers in the field of agricultural development of the countries.13

1.2.4: Type of Technological Change:

Technological Changes are classified in different ways. Hicks explain two general types of technological change. That is Neutral Technological Change and Non-Neutral Technological Change.

Technological Change is to be neutral when it raises the marginal productivities of labour and capital in the same proportion. In other words a technical change is neutral if the ratio of the marginal product of capital to that of labour remains unchanged at a constant capital-labour ratio.14

Non-Neutral Technological Change means either capital saving or labour saving. Non-neutral technological change alters the production function. Technological Change is said to be labour saving if it reduces the amount of labour needed to produce a given amount of output with given
amount of capital. The production function is altered in such a way that marginal product of capital rises relatively to the marginal product of labour. “A technical change that reduces the amount of capital needed to produce a given amount of output with a given amount of labour raises the marginal product of labour relatively to that of capital.

E. O. Heady classified the technological innovations into three types namely Biological innovations, mechanical innovations, and Biomechanical innovations. Biological innovations are HYV seeds, fertilizers, pesticides, etc. Biological technological is mainly land augmenting in character. Land-augmenting or labour saving technologies may broadly be classified into two types; this which raises the yield of any particular crop per unit of land and those which increase total output per unit of land from all the crops grown over a rotational period for the time say, a year through the increasing cropping intensity. Mechanical innovations mainly substituted capital for labour. Mechanical innovations include the use of agricultural machineries, implements, tractors and threshers, cane crushers, harvesting combines and specialized machinery for various activities are being used.

Mechanization is induced by the secular tendency for the biological sources of energy to become costlier as compared to mechanical sources. This is due in part to the labour saving bias of technological change as increasing ease with which capital can be substituted for labour in agriculture. Further, with the rise in incomes of farmers, the desire to reduce the drudgery of manual
work asserts itself. Farm mechanization can give the farmers greater leisure. "Labour in the scene of effective energy or efficiency units can not be abundant when food is in short supply and the cost of labour can rise despite, and indeed owing to, the growth of population". This biological-mechanical innovation is both land augmenting and labour saving in character.

1.2.5: Nature of Technological Change:

Technological change in agriculture is most often embodied in capital inputs, for example land drainage and enclosure, irrigation, machines and building. Even the new verities associated with the green revolution have typically required substantial and complementary investments in irrigation, drainage, roads and markets, in addition to the investment in agricultural research and extension which led to their creation and dissemination in the first place. When these entire capital output ratio for agricultural growth can be surprisingly high.

A distinguishing feature of agricultural technology is that a large part of the capital cost is borne by the government rather than the farmer. Most agricultural research and extension is universally provided as a public good, and investments in canal irrigation and rural infrastructure are typically funded by governments at little or no cost to the farmer for this reason there can be important discrepancies between the cost of new technologies to farmers and the cost to society. There are rendered scale neutral to the farmer whereas
only the richer and larger scale farmers would benefit in the full costs had to be borne by the farmer.

That governments of many hues and colours are willing to subsidize technological change in agriculture in these ways reflects difficulties inherent in privatizing agricultural research and development (R&D) activities (a) which are too costly for individual farmers to bear, (b) which do not easily render a profit to the inventor because of difficulties in patenting otherwise protecting the new technology, (c) which are costly to advertise and disseminate, particularly in developing countries, and (d) which can take many years to develop. There are, of course, some important exceptions. Private companies develop and sell a wide range of farm machinery and agrochemicals. Some plant and livestock breeding is also successfully carried out in the hybrids, which cannot be reproduced by farmers. However, these activities are largely confined to the industrialised countries, they are not always appropriate to the needs and conditions of farmers in developing countries. Most technological change in agriculture is biased towards saving labor (e.g., machines or land e.g., improved varieties). For economic efficiency, it is desired that the factor-saving bias of new technologies reflect the relative scarcity of factors in agriculture. Hayami and Ruttan (1971) provide evidence that this has in fact happened and that research in both the private and the public sector does respond to long-term trends in relative factor prices.16
1.3: Review of Literature:

A number of studies have been undertaken to analyse the impact of new technology on overall agricultural growth of production and productivity, labour employment and income distribution.

1.3.1: Impact of Technology on growth of Agricultural Production and Productivity:

Baldev Singh (1980) study on agricultural development in Gujarat during 1960-61 and 1970-71 has revealed that the modern technology is primarily responsible for changes in agricultural productivity and it is the traditional technology variant which is mainly associated with changes in resource structure. The modern technology is preserve of progressive large capitalist farmers development of indigenous technology to suit the smooth adoption and absorption of modern technology by the small and medium farmers.

Joshi P.K. and Haque T. (1980) attempted to examine in the light of the existing growth rates of inputs and outputs and the level of inter-regional disparities, the long-term prospects of balanced agricultural growth in India. Study revealed that in states like Assam, Himachal Pradesh, Kerala, Orissa and Uttar Pradesh the growth rates of agricultural output in the green revolution period were much lower as compared to the pre-green revolution period.
Ranade C.G. (1980) attempted to analyse the impact of cropping pattern along with fertilizers use and irrigation and the effect of these factors upon agriculture output per hectare across 54 agro climatic regions covering 16 major states for the pre and post green revolution period. His study concluded that the growth of productivity during fifties was mainly due to the first two factors, that is cropping pattern effect and locational shift effect, during the sixties the major factor influencing growth of productivity was pure yield effect, which was result of technological change.

Reena Jain (1990) attempted to analyse the yields and yield variability of wheat and rice for 44 districts in the state of Utter Pradesh for two periods; the pre-HYVs period and the HYV period. They concluded the yields and yield variability of wheat and rice have become more positively correlated across districts over time with the introduction of the HYVs. The study suggests the HYVs of wheat and genetic uniformity which they have introduced in the different regions have been a factor in making agriculture of the different regions more uniform in terms of yield increase.

Siddhu D.S and Derek Byrale (1991) in their study on the major sources of growth in wheat productivity in post-green revolution period following the widespread adoption of HYV technology in Punjab state, and also show how increased yields and changing practices reflected in change in costs of production and total factor productivity in wheat. Study found that the green revolution has been consolidated through further intensification in the use of
modern land saving inputs, fertilizer and herbicides. However, the use of labour saving technologies, tractors, has expounded even more rapidly in this period. They found that the most important source of productivity gains in wheat production would have to be achieved by more efficient use of inputs such as fertilizer and water.

Ratna Reddy (1993) analysed the agrarian structure and changing production relations in the context of new technology by taking up an intensive study of paddy cultivation in Andhra Pradesh with the help of cost of cultivation data. He concluded that the inverse relationship between farm size and land productivity has weakened with the advent of new technology, small farmers use more labour per unit of land, the use of non labour inputs like material inputs and tractor is expected to be higher on large farms, net returns per unit of land are expected to increase as the farm size goes up. Study suggested the possibility of enhancing productive employment in agriculture, which is believed to be the key to, accelerated development and abolition of mass poverty in most of the less developed countries.

Keresur V. Pandey R.K and Mruthyunjaya (1995) attempted to examine the nature of technological change in sorghum production through the measurement of productivity difference between modern varietal technology (MT) and traditional varietal technology (TT) an econometric study of Dharwad farms in Karnataka. They concluded that the total difference in the productivity per hectare between MT and TT sorghum was to about 45%, the
major component of this productivity gap was the difference in modern variatal technology contributing nearly 35%, the remaining 10% was shared by different inputs in terms of difference in their use levels between the modern and traditional sorghum production technologies.

Asha Maheswari (1996) estimated the agricultural growth pattern Karnataka. The yield increased brought about by HYV seeds were not really revolutionary. In period I (1955-56 to 1966-67) gross irrigated area rose by 3.10% while in period II (1967-68 to 1979-79) it is increased by 1.70% respectively per annum. Then the fertilizer use per hectare went up from 2.22 Kg in period I to 19.08 Kg in period II and 47.38 Kg in period III (1980-81 to 1989-90). Thus in period I, irrigation was responsible for growth of output, while in period II, it was due to the HYV seeds and chemical fertilizers in period III, was present clearly for food grains. It revealed that the instability has increased after new technology was introduced but it is less in period III than in period II or I. The above findings pointed to the importance of water management in a semi-dry area like Karnataka in maintaining growth in the agricultural productivity.

Ramesh Chand and Pratap S. Birthal (1997) attempted to examine empirically pesticide use in Indian agriculture in relation to growth in area, production and technological change. They found that in the pre-green revolution period and the first decade of green revolution (1965-75) the growth in pesticide use was faster than the output growth. However, in the post green
revolution period the growth in output is found to be much faster than the growth in pesticide use.

Janaiah. A (2000) analysed the economic impact of crop management on productivity and profitability of hybrid and inbred varieties of rice. Their study revealed that the yield response functions indicated that marginal efficiency of key inputs like organic manure, fertilizer, plant protection, labour etc was higher for hybrids than for local variety. He found that an average yield gain of hybrid over the best-inbred rice variety under farmer’s field conditions across states was 12%, hybrid was found to be higher yielding by 31.5% with more adoptability under highly intensive management situations while it was only 2% under less managed conditions. This study suggested further research on the development of an integrated crop and resource management strategy and management incentive, for realization of yield potential of currently available hybrid rice technology.

Badal P.S and Singh R.P (2001) attempted to examine the impact of technological change on maize production and productivity. The study estimated structural break between production functions for traditional (TTs) and HYVs technologies of maize based on primary data in three district of Bihar. It revealed that shift in production function of HYV technology was due to change in slope as well as shift in the intercept, implying there by the existence of neutral as well as non-neutral technological change, the total differences in the productivity per hectare between TTs and HYVs of maize
were estimated to be 69% in Kharif season and 80% in Rabi season. They found that in kharif season maize production increased their income by 30% and in Rabi season maize production increased their income by 45% was due to technological change. This showed that the local maize growers just shifted from local varieties of maize to HYVs.

Bhupat M. Dasai (2002) concluded that the priori-claims of better terms of trade and trade opportunities as ‘strategies’ that are alternatives to technical change, which optimized Indian agriculture’s growth since around the mid 1960’s. This is demonstrated the new orthodoxy of price ‘fundamentalism’ and international trade that has been invoked by the new economic policies for agricultural growth is a non-starter.

1.3.2: Impact of New Technology on Employment:

Lahari R. K (1970) analysed the impact of new technology on the rural labour market have concluded that although the new strategy has substantially reduced unemployment among agricultural labourers in several states its impact on the wage level of agricultural labours is not very clear. He found that the impact of HYV technology on wages is likely to be felt most during the sowing and harvesting seasons.

Sen. B (1969) evaluated some of the issues involved in farm mechanization and the effects of the new agricultural technology on employment of farm labour. The additional Labour Day per worker per
annum, required by new technology, would exceed the availability of farm labour, whereas in other states the problems of unemployment would still remain acute.

Uma K. Srivastav and E. O. Heady (1973) attempted to analyze the distribution of sectoral gains between labour and non-labour input factors this attains importance in view of the growing concern about rural poverty and unemployment, despite recent increases in output and returns in Indian agriculture. They concluded that the technological change in agriculture has reduced the demand for agricultural labour and caused reduction in their income.

Surjit S. and Sidhu (1974) analysed the change in production technology of wheat resulting from the introduction of Maxicon wheat verities in the Indian Punjab. Concluded that the technical efficiency has increased by almost 25 percent and unit costs of production have decline by about 16 percent, the demand per acre for labour fertilizer and capital inputs increased by about 25 percent.

Sheila Bhalla’s (1976) study revealed that the new technology has undoubtedly improved the inherent bargaining position of agricultural labourers in the green revolution areas of Haryana. She found that the composition and household origin of agricultural labour and the casual labour set appears to be much militant than the permanent agricultural labour.
Yujiro Hayami and Robert W. Hardt (1977) estimated the impact of technologically induced right ward shift in the supply function of a commodity grown and partly consumed by semi-subsistence farmers, it revealed that the differences in adoption, and marketable surplus between large and small farmers result in differential benefits but over a range of parameter value small farmers gain as much or more than large farmers when supply shifts faster than demand. They concluded that the impact of such changes on the income distribution would reflect the net effect of the new factor ownership distribution as well as the real income effect.

Bisaliah .S (1978) attempted to decompose the total change in employment per acre in to technology, wage rate and complementary inputs components in Firozpur district of Punjab. He found that the contribution of technology to total change in employment was to be 12%. This results in upward shift in profit function, other things being equal, shifts the demand curve for labour to the right and the negative employment effect of normalized wage rate is estimated to be 14.8%, this suggests the importance of output price, given the money wage rate employment is estimated to be 53.7% with fertilizer alone contributing 40%, followed by irrigation 8.6% and capital 5.0%. It is very well supported the strategy of physical planning for the production and distribution of complementary inputs in any employment generation programme.
Yoshini Kuroda’s (1988) study revealed that the technological change in post war Japanese agriculture was based towards live stock production. He found that this implies the effect on the rapid transfer of labour from agriculture to the non-agricultural sectors during the last three decades.

A study by Senthilnathan in 1991 on changing structure of factor market and employment pattern in Tamil Nadu has concluded that there is inverse relationship between demand for casual labour and family labour.

Parthasarathy, G (1991) using the 70s and 80s on landlessness, employment, real wages and inequalities to throw light on the nature of social impact associated with high yielding varieties technology. He found that casualisation has been more due to drift of worker within marginal and small owner household into wage labor than wholesale transformation of peasant owner households into proletarian households.

Ramaswamy, C, Parmasivan, P, and Keijiro Otsuka (1992) attempted to examine the factors affecting adoption rates of modern verities (MVs) and explore their effects on fertilizer use and rice cropping intensity as well as adoption of labour saving technologies across different rice production environment, it appears the adoption of MVs has helped to increase rice cropping intensity in favorable areas thus expanding the employment prospects. They concluded the MVs technology is labor using, even if they consider its possible indirect effects on the adoption of labour saving
technologies and also suggests the scene has changed up with their larger former counterparts in adopting MVs.

1.3.3: Impact of New Technology on Income Distribution:

Shah and Agarwal (1970) study compared the impact of new technology on progressive farmers and less progressive farmers of different farm size-groups. They found that income disparities were widened between the two types of farmers and between different size groups.

Bal H.S and Singh G.B (197) attempted to analyse the pattern of income distribution in rural areas. They concluded that the concentration ratio for income per household and income per capita for farm families was the highest. Household incomes were more evenly distributed among non-farm families and the distribution of income was more even for labour families than farm families.

Kahlon A.S (1970) attempted to examine the degree of concentration of income per head among the districts of the reorganized Punjab and the trend of this inequality over 1960-68, and also examined the disparity in income distribution with in district. He found a great implication in agricultural growth and income distribution and could not be over looked, the new farm technology should help the policy makers to rationalize their policy and adopt such measures as will promote complimentarity between agricultural development and broad distribution of income.
John, W. Mellor and Uma J. Lele (1973) estimated the growth linkages of the new food grain technologies, present data relating to the initial distribution of income from the new food grain technologies and the expenditure pattern of that. Their analysis suggests that the strong employment linkages with increased food grains production, if the employment linkages are weak, demand for food grains may not be sufficient to sustain levels of food grains prices profitable and to maintaining growth in food grains production.

Katar Sing (1973) attempted to focus on the income distribution effects of new agricultural technology in the IADP districts of Aligar in Uttar Pradesh. He concluded that the income inequality in the district during the period 1963-64 to 1968-69 increased. The new agricultural technology has been significantly influential in explaining the block to block and year to year differences in the mean level of farm income.

Raju V.T (1976) attempted to measure the farm income inequality in the West Godavari district from 1967-68 to 1970-71. The Study found that the income inequality indices indicate an overall decline from 1967-68 to 1970-71. More equal adoption of new farm technology by all sections has significantly reduced income inequality.

Dhawan K.C and Bansal P.K (1977) studied the economic rationale of resource mix on different categories of farms and concluded that the functional analysis of small medium and large farms brought out that resources were efficiently used on the small and medium farms, on the large farms income could rised by expanding the operational size of farm.
Lai R. C and Lavanya R. P (1986) attempted to examine the impact of co-operative credit on production and income of different size groups of farms in Allahbad district and concluded that the farmers owning large holdings are greatest beneficiaries of the co-operative credit and major part of credit utilized for productive purpose and the members of co-operative credit societies invest more on inputs and get better yield as compared to non-members. They suggested that there should be adequate financing to fulfill all the requirements of the farmers so that they do not have to borrow from sources particularly non-institutional agencies.

Naresh Chandra and Singh R.P (1992) have attempted to analyse in detail the potentialities created by new technology in under developed regions and their implications for rapid regional development. Study focused on the level and determinant of the adoption of new technology, the impact of technology on labour absorption and income distribution on tribal farms in Bihar. They found that the new strategy of agricultural development, which includes easy access to improved technology and supporting measures like liberal credit, crop insurance to cover risk motivate the farmers, and would lead to higher adoption of new technology, increase in labour employment opportunity and minimization of disparity in income distribution.

Gangawar L.S., Jagadish Lal and Verma M.R (2000) examined the level of technology adoption and its impact on socio-economic status of sugarcane growers in Uttar Pradesh. The study indicated that a majority of sugarcane farmers who adopted recommend package of practices were medium and large.
farmers. They found that the adoption of new technology was positively associated with income, attitude and risk orientation.

Kalpana Wilson (2002) attempted to analyse the adoption of new technology by small and marginal cultivators in Bihar. She found that the adoption of new technology by small and marginal cultivators, unequal distribution of land and resources, the embrace of new technology by small cultivators far from leading to greater income diffusion.

1.4: Statement of the Problem:

The introduction of modern technology has not only resulted in significant increase in agricultural production and productivity and also generated new problems. One set of empirical studies has concluded that modern technology has influenced employment potential in the sector. The multiple cropping and intensive agricultural activities are more labour demanding. Adoption of HYV technology in Punjab, Haryana an U.P has increased yields in wheat and Paddy crops. The productivity levels of Sorghum, Maize and Ragi have increased considerably. The country has achieved food self sufficiency and country can meet any kind of drought situation with the comfortable buffer stock of food grains.

Some other studies have found that new technology has increased income inequalities between resource rich large farmers and small farmers who are resource poor. The modern technology has given stimulus to capitalistic farming. It has promoted inequalities among different regions of the country,
cost of production has increased considerably in agriculture and uncertainty in crop production is more under the modern technology. There is no significant breakthrough in the production of pulses, oilseeds and coarse cereals which are consumed by poor people with the introduction of modern technology. Mechanization has increased and this has led to displacement of human labour and unemployment in the rural areas. To analyse these positive and negative effects of introduction of modern technology the present study is undertaken in Karnataka to analyse impact of technological change on production and productivity, costs and returns, employment of labour and distribution of gains in the production Jowar and Ragi, which are important crops in Karnataka.

1.5: Objectives of the Study:

The specific objectives of the study are.

1. To study the level of production, productivity and cost of production of selected crops under traditional and modern technologies in the study area.

2. To estimate the distribution of gains under traditional and modern technologies across the size groups of farmers.

3. To study the level and pattern of family and hired labour employment generation under two technologies.

4. To identify the problems and constraints in the adoption of modern technologies by the farmers.

5. To suggest appropriate policy measures based on the findings of the study.
1.6: Hypotheses:

1. There is direct relationship between farm size and productivity under the Modern technology.

2. Inequity in the distribution of gains is greater under the Modern technology than under the Traditional technology.

3. Labour employment has increased much more under the Modern technology than the Traditional technology.

4. Small farmers face greater constraints in the adoption of Modern technology than large farmers.

1.7: Importance of the Present Study:

In India since mid 1960's the traditional agricultural practices are slowly being replaced by the modern farm technology. Production of food grains, especially, the production of cereals increased considerably. The country is relatively self sufficient in food grains and is heading towards food surplus. Now it is clear that the hope of India lies in yield increasing technology. However, Modern farm technology exhibited some unwanted consequences. Therefore it is quite important to conduct a careful study about the impacts of Modern technology and to suggest measures to overcome the undesired impact of Modern farm technology.

A number of studies have been conducted at all India level as well as on regional levels to study the impact of new technology. However, India being a
vast country with different natural, social and economic characteristic specific policy formulation is necessary. The present study conducted related to two important coarse cereal crops for an in-depth analysis.

1.8: Limitation of the Present Study:

This study is based on primary data, which are collected by interview method. During the interview farmers provided information from their memory, as they did not maintain the systematic accounts of agriculture. A few farmers were reluctant to give the correct information about their income, area, leased-in-out and credit information and problems adopting the Modern technological inputs etc. Some of the respondents gave inconsistent answers to the questions. In such case researcher had to estimate the correct information. Therefore, the data may not be cent percent accurate. Moreover, information collected from the farmers is pertaining to only one year, that is 2002-03. That is why the study does not predict anything about the year-to-year changes in agriculture. Farmers do not keep the accounts of previous years and their memory is also very short.

The secondary data are collected from different departments of central and state Government. The present study is micro level study. The information is collected from the farmers of study area and this area has got specific dry land farming only. This study was concentrated in the southern part of Karnataka state covering 16 districts a few studies in the past had addressed some of agricultural problems of southern region and hardly studies were
made on the theme technological change and its impact analysis. It was felt appropriate to concentrate mainly on staple food crops for a detailed analysis. The study covers the traditional inputs used by the farmers that is bullocks labour, farmyard manure, and wooden plough etc, are also highly concentrate because comparison of Modern and Traditional technology. And in the present study an attempt is made to analyze the impact of Modern technology on area, production, and productivity, distribution of gains between different size groups, income, human labour employment, problems in adopting the Modern technology etc. Impacts on non- farm income activities are not taken in to account due to the fear of over expansion. The impact on other aspects like consumption, saving, investment, ecology and socio-economic life etc, is kept outside the preview of the study. It does not provide the complete picture of the impact of Modern technology on crop production. In spite of these limitations, it is hoped that the in-depth study of selected issues will throw some light on changing scenario of the crop production under the influence of Modern technological change.

1.9: Chapter Scheme:

The present study has been divided in to eight chapters including the present one. Chapter II deals with materials and methods. Chapter III presents the growth rate of agricultural production, productivity and use of Modern technological inputs. Chapter IV gives comparison of Cost and returns of Jowar and Ragi under traditional and modern technologies. Chapter V presents the
impact of Modern technology on farm income distribution between Modern and Traditional technology and the impact of technological change on distribution of gains between different sizes of farmers. Chapter VI: deals with the effect of Modern technology on utilization and composition of family and hired labour employment. Chapter VII brings out the problems in adopting the Modern of technology in crop cultivation. Final chapter (VIII) the summaries to overall conclusions and policy implications of major findings of the study.
REFERENCES


   Indian Journal of Agricultural Economics. April-June. 35 (2), 1980, pp 84-93.


