CHAPTER - II

REVIEW OF LITERATURE

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[2.1] **Introduction** -

The impact of technological change has been studied by several social scientists particularly in agricultural economics in India and abroad. These studies are of different nature and at different levels from macro to micro, at cluster or at village level. The ultimate aim of this study is to bring out the economic impact of change in technology and its use in agricultural operations.

Moreover its impact on crop production, productivity, change in cropping pattern, intensity of cropping etc. These aspects have been studied at the household level in order to understand the village level improvements, which has been generally applied to that of district and the economy of the country.

An early beginning was made by Dr. Epstein way back in 1954-56 in Mandya district of Karnataka State. She studied two villages representing the wet and dry nature of irrigation. She visited these villages again in 1971 and analyzed the caste system class domination before she selected two villages. She concluded that the use of irrigation alone has increased the productivity of land considerably and facilitated growth of cash crops, thus raising the prices of wet land by 33 percent.

The following cited are few more cases, representing the concurrence to that of the present research work.
[2.2] **Impact of New Technology and Resource Efficiently**

Dr. C.H. Hanumantha Rao (1965) compared the yields in Telangana, between partially irrigated (86) and dry (121) farmers. Among dry farmers, greater the intensity of utilization of land the larger the elasticity of output that could be expected with respect to this factor.

Diwakar Jha's 1977 study deals with the direct and indirect benefits of irrigation under the Triveni Canal in Champaran district of Bihar under the Gandak river. Around 4000 farmers of the area were contacted. The direct benefit studies covered land ownership, land utilization, and crop pattern, rural credit, farm investments, farm implements farm assets, live stock human labour, farm inputs, etc. Indirect benefit studies are of farm output, value of land, agricultural labour, rural industries rural transport. Urban development, Urban industries etc. author categorically concluded that the use of irrigation and technology of agriculture has definitely brought prosperity to the project area cultivators.

Sachidananda (1972) in his study as social dimensions of agricultural development in Bihar has observed that the caste composition, size and type of family education, occupation, land holding size, socio-economic status, levels of living, levels of aspirations, differed significantly between the two sets of blocks one with IADP (Intensive Agriculture District programme) and other without it.

In conclusion, the following observations were made. Impact of development due to irrigation and technology is observed through the maximized
inputs of production. This leads to rise in agricultural production, higher income for farmers and more prosperity for the people at large. Though the rise was not even in different areas, it was expected to be reflected in the levels of living and the levels of aspirations. An inventory of articles of daily use in the houses is made to find out, if these is any marked difference in the two IADP blocks was evident.

Patil and Jha (1978) studied productivity changes in agriculture of different district of Maharashtra. The study concluded that during fifties, the agriculture performance was more satisfactory than sixties. Inspite of rapid growth of modern input the productivity went down and output became stagnated. This was the result of absence of appropriate technology. Only increase in modern inputs like fertilizers and improved seeds and use of machinery cannot help increase the production.

Powar et al (1991) sale et.al (1991) and Shete et al (1991). conducted a study in Maharashtra. They studied the regional variations in the performance of some serials, pulses and oilseeds, fruits and vegetable during 1956-57 to 1987-88. On the basis of their empirical study, it was found that the production of almost all cereals was unsatisfactory during the pre-green revolution period.

After the Green-Revolution major difference was noticed. The increase in the production of total Cereals was largely due to significant improvement in the productivity. This was because of high yielding variety of seeds and increase in sown area of cereals.
Patnaik (1994) conducted study in Puri district of Orrisa. He studied the adoption of high yielding variety use and productivity disparities in green revolution belt and dry land belt in Puri district. The study revealed that the large medium and small farmers in the green revolution belt have technology adoption index of 87.12 and 81.33 percent respectively while their counter parts in the dry land have adoption index of 31.17, 29.67 and 21.54 percent respectively. The productivity efficiency of rice in green belt was 119.55, 111.83 and 107.63 percent for large medium and small farmers. Against it the large medium and small farmers in dry land belt have productivity efficiency of 57.8, 51.17 and 42.62 percent respectively. Moreover the study revealed that,

1) Adoption of high yielding variety seeds and other practices is associated with increased productivity on large medium and small farms.

2) Increased productivity of green belt was more than dry belt, widening gap between two areas.

3) Farm size was neutral to productivity of both areas.

Pandy et al (1986) analyzed the economic aspects of dry farming technology in Haryana and observed that expansion of irrigation facilities and high yielding technology for wheat and rice have increase further the disparities between the assured irrigated region and dry farming region. The value of output from 1 hectare land in irrigated region was equivalent to that of 2 hectare in dry farming region during normal year and 3.86 hectares during the drought year. The
average investment in seeds, fertilizers manure and plant protection chemical was only Rs. 216 per hectare in dry farm in region against Rs. 1218 per hectare in irrigated region.

Average yields of bajra, jowar, wheat, gram barley and mustard were only 5.5, 5.3, 24.1, 3.9, 19.1 and 9 quintals per hectare.

Regarding the degree of adoption of recommended technologies. The high yielding varieties of improved seeds of bajra, wheat and mustard spread widely, where as, only a few farmers had adopted the recommended varieties of jowar, gram and barley, as they were not convinced regarding their superiority over the local varieties.

Sodhia (1986) examined the impact of farm technology on production and acreage allocation of important crops, namely cereals, pulses and oilseeds in Sagar division of Madhya Pradesh. He found that farm technology brought an upward shift in the farm production by expansion in the net sown and multiple sown area by 7.6 and 58.9 percent. The total production of all cereals pulses and oilseeds also achieved a marked increase by 32.1 percent.

Giri et al (1966) identified area (Land) as major source of crop output growth in India for the period 1951-52 to 1962-63. Area alone accounted for about 3/4 to 4/5 of the total growth. The remaining part of the growth was contributed almost equally by increase in application of fertilizers, improved techniques and technological development.
Bhattacharya (1972) by using Cobb-Douglas production function showed that technological progress did not contribute significantly to the growth of the Indian agricultural sector between 1948-49 and 1960-61. He formed an opinion that the basic problem of economic development in a country like India has been the absence of continuous technological progress in the agricultural sector.

Singh and Gangwar (1970) in their study "An analysis of recent changes in output mix in Haryana State" found that the cropping intensity increased from 133 in 1960's to 141 in 1970's while it went down to 131 in 1965's. Among the major crop groups, the share of cereals in the total cropped area has gone up while that of pulses and oilseeds has gone down considerably.

Sharma and Kahlon in 1972 studied that the impact of technological development on the normative shifts in cropping patterns in Ludhiana district of Punjab State. The study revealed that there was little difference in the normative cropping patterns and intensity of cropping on completely mechanized farms, operated with various machinery system at the improved levels of technology. On the large sized partly mechanized farm; however these patterns differed with the variations in the machine system used. The normative shifts in all the situations indicated that less paying crops such as hybrid maize, country cotton, pulses in the khariff and country wheat, gram and barley in the rabbi season were completely eliminated from the optimum enterprise mix of partly and completely mechanized farms.
The area under these crops in the existing situation was diverted to income earning crops or cash crops such as, American cotton, sugarcane and groundnut in the kharif and Mexican wheat in rabi season in the optimum plans. The intensity of cropping in the normative plans for partly and completely mechanized farms showed a considerable increase over the existing situation.

Negi and Murthy (1972) studied resource allocation efficiency on small farms of Nainital district in U.P. They observed that technological break through in agriculture has led to the increase in farm production and modernization of farming. Land was the most important resource which has significant and positive impact on almost all crops. Fertilizer showed a significant and positive impact on high yielding variety of rice. Whereas in the case of high yielding variety of wheat, both irrigation and fertilizer have has positive and significant impact. Bullock use was in excess in all the crops. The ratio of marginal value product of factor cost indicated that land could be diverted from the local to high yielding varieties in the case of rice and wheat.

Singh et al. 1972. From their study on impact of new technology on the pattern of agricultural production in dry farming region of Haryana, Sing found that a remarkable change has taken place in the cropping pattern after the introduction of new technology. The area shift was more in case of wheat crop which was at the cost of barley and oilseeds. The high yielding varieties of wheat had reduced considerable the area under barley and oilseeds. The area under gram was not affected as there was no substitute for this crop in Baroni region. Bajra
was the only khariff season crop which had shown considerable increase in its production after the introduction of new technology.

A study made by Wickliffe and Nath (1972) based on impact of new technology on production pattern of certain crop enterprises in Eastern U.P. revealed that the net area sown increased by 8% while the gross areas sown increased by 80% during 1974-72. The new technology affected the production pattern of all crop enterprises, in general and that of wheat in particular. But the benefit of the change in production pattern was not equally distributed among the different sections of the rural population the small farmers being the least gainer among them.

Sagar (1978) conducted a study for Rajasthan to measure contribution of three technological viz. Irrigation, fertilizer and high yielding varieties in the growth of agriculture productivity during 1964-65. He observed that the share of new crop varieties in the growth of overall productivity was 15 percent while fertilizers and irrigation accounted for 30 and 18 percent of the growth respectively. The crop level analysis indicated that of the total increase in the average yield of cotton, fertilizers, contributed 63 percent, while the high yielding varieties of cotton (American) contributed 29 percent. The contribution of irrigation in the increased average yield of cotton was negative.

Bora and Mishra (1986) studied the impact of technological changes in paddy cultivation in Shibsagar district of Assam. The average productivity was
worked out to be 1213 kg and 1964 kg per acre for traditional and high yielding varieties of paddy respectively. With the introduction of the new technology, the productivity had increased by 62 percent in the area under study.

[2.3] IMPACT OF NEW TECHNOLOGY ON LABOUR EMPLOYMENT

Many people have conducted research work in this area of study; to examine the impact of new technology on labour employment. Following is a brief summary of some of these study works.

1) Raju (1976) conducted study in West Godavari region of Maharashtra. He measured the impact of new technology (improved seed, fertilizer, plant protection chemicals and irrigation) on labour employment through multiple regression analysis. It was observed that the new agricultural technology has contributed significantly to increase the employment of labour. Among the different items of new technology, fertilizer contributed significantly to increase employment followed by irrigation; improved seed and plant protection chemicals.

2) Joshi and Alshi (1985) analyzed the impact of high yielding varieties on employment potential of female labour in Maharashtra, for cotton and jowar. This study revealed that - High Yielding Variety of cotton required per hectare 743 hours of female labour against 289 hours in local variety of cotton was 5.81 quintals as against only 2 quintals in local variety.

    Third, high yielding variety of jowar required 305 female labour hours per hectare as against 242 hours in local jowar.
Fourthly, the adoption of high yielding variety of cotton and jowar increased the requirement of casual hired female labour to a large extent implying thereby an increase in the employment opportunities for female labour seeking agricultural wage employment.

3) Dustan and Derek (1976) analyzed the data collected from a nationwide farm management survey conducted during 1974-75 of 500 rural households in 24 sites in Sierra Leon. They observed that labour input per acre had increased substantially in the IADP area as a result of participation in the project.

The increased labour per acre was due to improved land preparation and large harvest. In the Bolilands, labour input per acre declined by 40% as farmers substituted capital for labour in land preparation activities. The impact of two technological packages representing biological, chemical and mechanical technology in rice production in Sierra Leon has illustrated some of the inter relationship between improved technology and labour use. In situation of high land labour ratio, mechanical technology can overcome peak season labour constraints and increases the acreage cultivated.

Under these conditions mechanization is no labour displacing since the increased acreage resulting from mechanization required added labour for planting and harvesting.
The biological chemical technology increased returns to land but because of a large increase in labour requirements the returns to labour were below that for traditional swamp rice cultivation. Under the existing costs and labour endowments, both the technologies have had low economic returns. The analysis of total family labour inputs in the various systems demonstrated that peak season labour demand was increased a constraint to increase production since farm families were working at capacity during this period. Biological chemical technologies increased the male labour inputs, while mechanical technology increased female labour inputs but male labour slightly decreased.

4) Chawala et al. (1970) studied the relationship between the green revolution, mechanization and rural employment in Amritsar district of Punjab and revealed that with an increase in the gross return per acre, the outlays on casual labour also increased but more sharply than the former. The employment of family labour increased at almost the same space as that of casual labour in both the small and large holdings but it increased to a much smaller extent on the medium holdings where the use of permanent hired labour appears to have increased to a greater extent than on other holdings.

Atibudhi and Singh (1994) measured the impact of technological change in rice cultivation on employment and production relations in different farm size groups in Balasore district of Orrissa. The study
revealed that the productivity of farms using the high yielding variety technology was more than two times those using local technology, the per hectare use of labour was more by 33.4, 36 and 49.7 percent on marginal, small and large farms, respectively as compared with that of the traditional technology. The labour use in the new technology farms increased with increase in the size of holdings.

Naidu and Selvam (1988) studied the effects of new technology on employment. The data was obtained from 50 farmers in Mapkshi village, Andhra Pradesh for the crop year 1985-86. It was found that the employment opportunities have increased because the labour hectare has been increased considerably under high yielding varieties. However, it was also observed that the labour input per unit of output was lower under high yielding varieties with different techniques, suggesting that and eventual reduction of labour inputs was to be expected. High yielding variety technology in the study area has not led to a reversal in the inverse relationship between farm size and labour use. However, as indicated by recent studies, there were tendencies for a positive relationship to emerge with the spread of high yielding variety technology.

Ramasamy et al. (1992) studied the modern seed fertilizer technology and adoption of labour saving technology in rice production in Tamilnadu. There was no evidence to indicate that the modern varieties adoption caused the subsequent adoption of labour saving mechanical technologies, not to speak of direct seeding technology. On the other hand,
irrigation and other environmental factors as well as factor prices played more important roles in the adoption of these labour saving technologies. Considering the fact that, the adoption of modern varieties of rice significantly increased labour demand in the context of Tamilnadu. It was concluded that the modern variety technology is labour using, even if it is considered its possible indirect effects on the adoption of labour saving technologies.

Rathod and Subrahmanyam (1992) revealed that the additional labour requirement of the high yielding varieties varied from crop to crop and it ranged from about 34 to 45 percent. A significant observation from the data was that the percentage share of the hired labour in total labour in the case of high yielding varieties was more as compared to local varieties. Through in absolute terms there was more utilization of family labour the percentage share of family labour in the total labour utilized was less as there was a reduction from 71.04 to 64.80 in the case of wheat, from 66.25 to 58.98 in the case of maize from 89.92 to 62 in the case of Bajra, from 60.15 to 57.44 in the case of jowar and from 61.02 to 54.87 in the case of paddy. This shows that the high yielding varieties not only helped in solving the under employment but also resulted in increased utilization of hired labour as against the belief that it resulted only in more utilization of family labour.

Thus, the studies on impact of new technology on labour employment indicated that the new technology is labour intensive. The
additional requirement of high yielding varieties for labour varied from
crop to crop. The mechanization is not labour displacing. Since the
increased acreage resulting from mechanization required added labour for
planting and harvesting.

Wider application of new technology has resulted in reducing the
differential in wages rates of male and female labour.

[2.4] IMPACT OF NEW TECHNOLOGY ON INCOME DISTRIBUTION

Change in agricultural technology has impact on income distribution.
Such impact can be studied in the context of intra and inter-regional income
distribution. Some of the study cases have been reviewed as under.

1) Madalgi (1970) analyzed the farm incomes per household for a period
from 1951-52 to 1967-68 for India and found that, with technological
change in agriculture the degree of inequality of income is likely to widen
due to greater capacity of big farmers to undertake improvements. The
section of the population who survives below the accepted level of living is
most important when the question of income distribution is considered. In
the sixties, the percentage of such people in rural areas doubled for India as
a whole, where as this quadrupled in Punjab and Haryana, where farming
had undergone rapid technological transformation.

2) Bardhan (1971) examined the impact of changes in farm technology on
income disparities in Ferozpur in Punjab, Mazaffarnagar in U.P., Hoogly in
West Bengal and Ahmednagar in Maharashtra, based on the data for two
years 1956-57 (preadoption period) and 1970-71 (Post adoption period),
They study revealed that the new farm technology was able to reduce
income inequality only in Mazaffarnagar district, in other district, it
resulted in increasing the inequality in income distribution among various
farm size groups.

3) Sweason (1973) in a study conducted for a Thanjawar district of Tamilnadu
observed that the new technology of rice production did not change the
distribution of income between 1965-66 and 1970-71 significantly. The
increased income generated from the introduction of high yielding variety
along with the increased use of other inputs did not go to just one group
within the agricultural population.

4) Raju (1976) examined the impact of new agricultural technology on farm
income distribution in IADP district of West Godavari. The estimates of
income inequalities indices indicated the overall decline from 1967-68 to
1970-71 in the farm income inequality in the study area. More equal
adoption of new farm technology has significantly reduced income
inequality.

5) Mathur and Singh (1986) attempted a study to determine and compare the
relative and absolute factor shares for various inputs accruing to small
medium and large categories of farmers in Union Territory of Delhi. It was
found that the maximum share accrued to land followed by capital labour
and power, factors share were not different for various size groups of
farms. Hence the existing farm technology was neutral to scale. However
differences in factor productivity among small, medium and large size forms were mainly due to differences in input use, which has led to differences in income on these farms.

6) Sinha and Sharma (1986) conducted their study in Nalanda district of Bihar State. They selected 89 sample farms for this study. It was observed that the adoption of new technology even without borrowed capital brought out increase in net incomes on all sizes of farms. The rate of increase in incomes on different size of farms was different being the highest on small farms (38.40%) followed by large farms (35.87%) and medium farms (32.49%). The absolute increase in farm incomes was Rs. 4312, Rs. 6604 and Rs. 13505 on small, medium and large farms, respectively, thereby showing increasing magnitude of farm income with the increase in the size of farm. There was an overall increase of Rs. 8141 in farm income due to new technology.

7) Tilekar et al (1986) in his study of Pune district in Maharashtra observed, that the income (over variable cost) increased with adoption of dry land technology. The magnitude of increase in net income under the optimum crop plan over the existing crop plan on the small, medium and large farms worked out to 34, 46 and 48 percent respectively. In a nutshell it can be concluded that the existing crop plans were not optimal, and therefore, there existed the potential for increasing the farm income. The dry land technology was based towards medium and large groups of farmers. It was suggested that either different dry land technologies for different groups
will have to be evolved or one which is unbiased towards any class of farmers will have to be released.

Considering all the above studies, it is observed that most of the studies indicate that the new technology was neutral to scale. While other studies show the inequalities in income distribution. Most of the studies were related to single crop and very few studies cover more crops.

Comparatively the number of such studies in Maharashtra is very small. Therefore, the present study is a modest attempt to examine the economic impact of changes in agricultural technology on over all farm production as well as labour and employment in the district of Ahmednagar. In this study, all crops are considered for assessing income of the different farms under study.
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