CHAPTER II

Review of Literature
2.1 Introduction

An attempt has been in this chapter to the present the review of past studies related to them of the present study to gain conceptual understanding and methodology to be adopted in the study.

On the basis of the past research and in consonance with the objectives of the present study, the work done on different aspects in reviewed in the ensuing sections.

2.2 Agricultural Growth

Minhans and Valdyanathan (1965) point out in their study that out of the 3.57 per cent compound rate of growth of aggregate crop output in India during the period from 1951-54 to 1958-61, approximately 45 per cent was attributed to area growth, 46 per cent to yield increases, a little over 8 per cent to crop pattern changes and less than 1 per cent to interaction between yield and crop pattern changes.

George (1967) estimated annual growth rates, which were in the order of 2.98, 3.61 and 3.91 per cent for food grains, non food grains and all food crops respectively, at all-India level, for the period 1949-50 to 1964-65.

Bansil (1972) calculated compound growth rates at All-India level, for the period 1964-65 to 1970-71, and he concluded that rice had registered a positive growth in Tamil Nadu followed by Punjab. The annual compound growth rate of food grains production during the period 1964-65 to 1970-71 was 3.5 per cent at All-India level and that of wheat 14 per cent as against 3 per cent and 4 per cent during the period 1949-50 to 1970-71. Pulses, cotton and jute registered a negative growth during the period of study.

Parthasarthy and Suryanarayana (1976) had computed regional growth rates of major crops in terms of area, production and productivity in selected districts of Andhra Pradesh. They calculated linear growth rates and used standard deviation and coefficient of variation to study the stability or variability of area, production and productivity of crops selected.

Raheja et al. (1977) studied the regional variations in the adoption of high yielding varieties and their productivity with the help of sample surveys for the assessment of the success of high-yielding varieties programme during 1973-74. They covered 88
districts spread over 15 states of the country surveying two major cereals viz., rice and wheat. For rice crop, it was observed that the extent of adoption of HYV in different regions had no direct bearing on their yield rate, but owing to lack of assured water supply and resource endowments of the cultivators. The regional variations were not marked compared to wheat.

Narain (1977) found that at All-India level changes in the cropping pattern and the location shifts of area under individual crops accounted for 70 per cent of the increase in productivity in the first period (1952-53 to 1960-61) and for 40 per cent in the second period (1961-62 to 1971-72). But while the price increase accounted for 30 per cent increase in the productivity in the first period and for 60 per cent increase in the second period.

Patil and Jha (1978) undertook a detailed study of the productivity changes in agriculture of different districts of Maharashtra for two different periods: 1951-52 to 1960-61 and 1961-62 to 1971-72 and reported that the overall performance during the fifties was fairly satisfactory as compared to sixties. In spite of rapid growth in the use of modern inputs, productivity went down and agricultural output stagnated. The study concluded that unless an appropriate technology is made available to the farmers, the growth in the use of modern inputs like fertilizer and machines would not bring about rapid output growth.

Reddy (1978) studied the phenomenon of deceleration in agricultural production at All-India level during the periods from 1950-51 to 1960-61 and from 1950-51 to 1964-65. He observed that there was constant rate of growth in agricultural production for the entire period from 1950-51 to 1973-74.

Singh et al (1978) in their study of food grains production in Punjab, identified the relative contribution of different factors to food grain production at the state level. They found that in pre-green revolution period, acreage contribution was 45.7 per cent and yield contribution was 17.4 per cent to the total production. In the post-green revolution period, however, the rates seem to have been reversed with yield effect contributing 50.7 per cent and acreage nearly 12.3 per cent to the total production.
Mohammad et al. (1979) undertook the regional variations in agricultural productivity in Bihar between two points of time (1961-64 and 1971-73). Annual compound growth rates computed for area, output and yield were found to be 0.61 per cent, -0.71 per cent, and 0.11 per cent respectively indicating deep decline in productivity except in a few districts.

Alagh and Sharma (1980) estimated the growth rates of food grains output in Andhra Pradesh as 0.39 per cent, 3.46 per cent and 1.69 per cent for the period I (1960-61 to 1969-70), period II (1969-70 to 1978-79) and period III (1960-61 to 1978-79) respectively.

Rath (1980) estimated the annual compound growth rates some crops at All-India level which were 1.01 percent, 2.5 per cent, 1.48 percent for rice, -0.05 per cent, 1.18 per cent, 1.23 per cent for jowar, 0.6 per cent, 0.71 per cent for maize and 0.26 per cent, 1.64 per cent, 1.38 per cent for ragi for area, production and productivity respectively for the period 1949-50 to 1977-78.

Rao et al (1980) calculated the crop output growth rates in Karnataka for rice, Jowar, bajra, ragi, wheat and maize as 3.22 per cent, 2.75 per cent, 4.75 per cent, 0.83 per cent, 7.55 per cent and 17.44 per cent respectively for the period 1955-56 to 1975-76.

Venkataramanan and prahladachar (1980) estimated the compound growth rates of rice in terms of area, yield and output as 1.6 per cent, 1.7 per cent, 3.4 per cent, for jowar as 0.3 per cent, 0.7 per cent, for bajra as -0.4 per cent, 0.2 per cent, -0.2 per cent, for ragi as -0.4 per cent, 0.4 per cent and nil respectively for Andhra Pradesh for the period 1950 to 1975.

Singh (1981) estimated the compound growth rates of rice in terms of production, area and productivity as 2.3 per cent, 0.81 per cent, 1.48 per cent and for wheat as 7.29 per cent, 3.2 per cent, 3.97 per cent at All-India level for the period 1959-60 to 1978-79.

Deshpande and Chandrasekhar (1982) in their study found that technological change failed to make any positive impact on the growth of pulses in Karnataka. They also found that the pure price effect (45.12 per cent) and price yield interaction effect (37.76 per cent) account for a major share in the growth of production. The area
(-1.5 per cent) and crop pattern (-0.16 per cent) effects had negatively contributed to the growth in production, while the yield effect (18.6 per cent) accounted for the third largest share in the growth in production.

Gangwar and Pandey (1982) found in their study that the trend values for yield were no significant for all the pulse crops in Haryana. The coefficient of variation in area, production and yield were estimated to be 24 per cent, 41 per cent and 30 per cent in gram, 49 per cent, 44 per cent and 19 per cent in moong, 23 per cent and 14 per cent in urad respectively.

Nadkarni and Deshpande (1982) in their inter-district as well as time series analyses in Karnataka for the period 1955-56 to 1975-76 showed that the drought-prone districts not only shared in the growth of food grain production but also did better than the other districts. Crops such as, jowar, bajra, ragi, minor millets, gram and red gram shared the growth in productivity. The growth push to productivity was mainly through the extension of improved practices within traditional technology and through the extension of irrigation.

Reddy and Reddy (1983) calculated growth rates for area, production and productivity for the period 1956-57 to 1977-78, which were 0.79 per cent, 6.65 per cent, 4.68 per cent for rice, 0.5 per cent, 0.65 per cent, 0.22 per cent for jowar and 0.89 per cent, 0.47 per cent, 2.32 per cent for bajra in Telangana districts.

Sawanth (1983) concluded that in terms of overall performance during the entire post-green revolution period, Punjab, Maharashtra, Haryana, Andhra Pradesh, Gujarat and Karnataka did relatively much better than the remaining states. Only the performance of Punjab and Andhra Pradesh was consistently good and substantive.

Saraswat (1984) estimated that the compound growth rate of area of oilseeds as negative at -0.93 percent, whereas the growth rate for cereals increased at an average rate of 0.46 per cent per annum.

Parthasarathy (1984) in his study, found out of 21 districts in Andhra Pradesh, only 4 recorded growth rates exceeding 3 per cent, suggesting that there were severe constraints to sustained high growth rates over the period. Among the regions, the performance of Telangana was the best in terms of growth rates for all crops.
Parthasarathy (1985) found that the growth rate for all crops was around 2 per cent in Andhra Pradesh for the period 1955-56 to 1978-79 and also concluded that the sixties were marked by lower growth rates in agriculture as compared to 1970’s.

Pal (1986) studied instability in agriculture production in India. He found that increase in area and yield contributed to increase in production of rice, wheat, maize, rape seed, mustard and non- food grams whereas, the decrease in area reduced total pulses production during the period 1967-68 to 1983-84.

Khanna (1987) estimated compound growth rates in terms of area, production and yield for food grain crops as 0.69 per cent, 2.64 per cent and 1.73 per cent per annum at All-India level during the period 1949-50 to 1985-86.

Mahendradev (1987) in his study, found that the growth rate declined in most of the states in the decade of 1970’s as compared to the previous decade. The first half of 1980’s, however, witnessed a recovery in the rates of growth of food grain production in some states which registered higher growth.

Bandyopadhyya (1989) has explored a certain hypothesis regarding growth pattern and instability at the district level in the production of rice in West Bengal in Punjab-Haryana over the period 1950-50 to 1984-85. He divided the study period into two periods viz., pre-green revolution period (1950-51 to 1966-67) and post-green revolution period (1967-68 to 1984-85). Results revealed that in Punjab, Haryana there had been an outward shift of frontier wheat production frontier during the post-green revolution period, and there were different signs of diminishing from year to year and fluctuations in production. In contrast in West Bengal, the rate of growth of production of rice declined, particularly in three northern districts of the states. More disturbing is the widening year-to-year fluctuation in the production of rice in the post- green revolution period. The gravity fed irrigation network, dependent on South West monsoon in West Bengal, shows that there are serious constraints to growth and stability of rice production in the state.

Jain and Singh (1991) calculated the growth rate of different pulses in Punjab and India. They further attempted to explain the differences in output in terms of risk and other factors affecting production. Data were collected from all the districts in the state for the period 1950-51 to 1983-84. It is found that the decline in mean area
accounts for most of the fall in pulses supply. They suggested that there is a need to
direct policy to stabilize yields.

Panda (1992) studied the instability and erratic growth in agriculture in Orissa, India.
Time series data on three principal crops (cereals, pulses and oilseeds) is used to
measure growth performance of the agricultural sector in four topographically distinct
regions of Orissa state, India. Growth performance is defined in terms of change in
area under cultivation of each crop group, production and yield. At state level area
under cereals is shown to have declined while, area under pulses and oilseeds has
grown in terms of production growth. Cereals have shown an increase although at a
slower rate than pulses, with oilseeds production experiencing the fastest growth
across the regions. This is true in terms of yield in performance: although oilseeds are
subject to the greatest yield instability with pulses cultivation demonstrating the
lowest (crop-wise) variability. The higher production growth for pulses and oilseeds
compared to cereals suggest the need for greater increase to bring more area under
pulses and oilseeds. Programmers should also concentrate on raising the yield of
oilseeds in the fertile central table region and extension services and new techniques
and technologies should be introduced to combat the problem of yield instability.

Sinha and Thakur (1993) in their economic analysis of growth performance of major
food grains in Bihar, India, observed that the area, Production and Productivity
variability in the period before new technology. It clearly indicates that new
production technology leads to stable as compared to pre-green revolution period.

Sarma and Sarma (1996) analysed the growth of cereals (rice, wheat, barley and
maize) in various agro climatic zones of Uttar Pradesh was undertaken from 1979-80
to 1988-89. Results revealed that in terms of compound growth rate production and
productivity showed an increasing trend whereas the compound growth rate per unit
area decreased over the period understudy in Bhabar and Tarai, Western plain, Bundel
khand, North and Eastern plain zones. Yield stability was highest in Bundelkhand,
Narth and Eastern plain zones, Vindhyan, Eastern plain, Bhabar and Tarai zones with
a coefficient of variation is greater than 60 per cent. Though the productivity of cereal
crop increased over 10 years, this increase did not increase the area under cereal
production. This was attributed to a shift in the preparation of land under lucrative
commercial crop, which gave higher cash returns than cereal crops. The growth in
yield was linear in hill, Bhabar and Tarai, western plain and Budael khand zones and exponential in Vindhyan zone. In Mid-western plain, S and W. Semi-arid, central plain N and E. plain and eastern plain zones the growth in yield was quadratic.

Rajan et al (1996) studied the growth in area, production and yield of pulses along with the production stability of major pulse crops in north Bihar, India, during the post green revolution period. The analysis is conducted for two periods: early period of green revolution (1974-84) and later period of green revolution (1984-94). The major findings are that the compound growth rates of area under total pulses were positive in both agro-climatic zones studied despite negative growth rates in area under major pulses crops. No relationship was found between growth and instability in pulse production, rather, the instability in area, production and yield of pulse crop are attributed to change in the agro-physical environment.

Shah and Shah (1997) studied food grain production in India. They (1) evaluated the growth rate of area, production, and yield of food grains crops in India over the period 1975-76 to 1990-91: (2) studied the magnitude of instability of these variables for each crop and (3) examined the relative contribution of effect of basis components (area, yield and their interaction) to food grain production. The increase in food grains production over the period has been substantial but has brought in its wake uneven development across regions and crops. While rice and wheat output has grown considerably, there has been a considerable decline in the output of pulses and coarse cereals. Comparison of various demand estimates with estimated food grains production projection for the year 2000 indicate that India will have a surplus of food grains, but a deficit in pulses. They stated that task attaining self-sufficiency in pulse production looks difficult without expansion and irrigation.

Prashar and Bahl (1998) studied growth and instability in agriculture in Himachal Pradesh by selecting four districts viz., Kangra, Mandi, Shimla and Chamba respectively various agro-climatic zones of Himachal Pradesh. Time series data from 1980-81 to 1989-90 of area, production and yield of major crops were employed. It was noted that the area under maize had increased significantly in the state. However, the productivity level was not significant. To increase the productivity of this crop, they concluded that along with the extension of area, it is desirable to use modern technology viz., HYV seeds, fertilizers, plant production chemicals, irrigation etc.
Barley and pulses showed a negative growth rate in area, which implies that farmers are shifting acreage toward high value cash crops like fruits and off-season vegetables. Thus, this diversification in the cropping pattern of different zones of the states on a sustained basis will benefit the farmers in the long run.

Singh and Ranjan (1998) have studied the growth performance of principal food grain crops in North Bihar, India, over the period 1970-71 to 1994-95. This study has revealed that, production recorded positive growth rates during the post-green revolution period. Wheat was the only crop, which recorded positive growth rate in area, production and yield across the zones over different sub-periods. There has not been a substantial increase in area under rice during the period studied. Moreover, a declining trend in rice area has been observed during the early 1990’s. The study indicated that wheat, maize and pigeon witnessed a continuous decline in instability over the period under study. The decline has been due mainly to adoption of technology in crop production.

Kumar (1999) conducted a study on spatial variability in yields of cereal crops across the districts of Andhra Pradesh, India. As measured by co-efficient of variations across the districts, the pattern of growth and spatial variable observed, yield of all five crops is either positive or stagnant. The five crops recorded falling yields in all district. Yield disparities across districts for rice and jowar were low and remained unchanged overtime. Yield disparity for maize is also low but shows an increase over time. Yield disparities for ragi and bajra increased over time.

Mears (1999) studied land tenure system. He divides the land tenure systems inherited by states during British rule into three groups, which have strong regional trends: the zanindari (Northern and Eastern India), rytwari (Southern India), and Mohalwari (Western India) systems. The Zamindari system was essentially a permanent settlement system under which land ownership right were given to feudal lords, who, in turn, gave money to the British government. The rytwari system allowed individual cultivators land rights provided they made payments to the British. Finally, the mahalwari system treated each village as a collectible unit. Small farmers would proportionally contribute to the revenue that their village needed to generate.
The zamindari system resulted in an inefficient land ownership structure involving landlords, tenants, sub-tenants, sharecroppers, and systems. Except for a few outliers, Mears finds that states that inherited the ryotwari and mahalwary schemes show relatively greater agricultural growth. Unsurprisingly, some of the poorest states in India over the last few decades are successors of zamindari system, its legacy often remains. Many individuals who were previously in its lower rungs still do not have the opportunity to own or operate land. Mears concludes that states need to deregulate and reduce transaction cost in land-lease markets to ensure a more equitable property distribution.

**Arup Kumar Chatopadhyaya and Purnendu Sekhar Das (2000)** worked out annual growth rate of total rice, total cereals, total food grains, total non food grains and all crops combined are 2.55, 2.71, 2.52, 4.35 and 2.68, per cent respectively at West Bengal during the period 1957-58 to 1994-95.

**Bhatnagar and Sexena (2000)** in their study of the estimation of area and production of wheat in Haryana, India by 2002 utilized the data on area, production and productivity of wheat in Haryana for the period 1966-67 to 1998-99. They divided the study period into three periods viz., first decade (1966-67 to 1975-76), second decade (1976-77 to 1985-86) and third decade (1986-87 to 1995-96). They employed linear growth rates and then classified these linear growth rates into frequency distribution tables by using stages' formula. Their research revealed that growth performance of production of wheat is better than its growth in area and yield. Area and production decreased in third decade (1986-87 to 1995-96) but it not affected the average yield of wheat. They estimated area, Production and Productivity of wheat for 2001-02 as 2.5 m.ha, 11.7mt and 4420 kg/ha respectively.

**Rama Rao (2000)** in a study of the growth and efficiency in crop production in Andhra Pradesh, India had collected data for the period 1980-81 to 1996-97. Further this time period was divided into two sub periods viz., Period I (1980-81 to 1989-90) and Period II (19990-91 to 1996-97). He employed exponential time trend equation for estimation of growth rates in area, production and productivity of three crops viz., rice, cotton and ground-nut. Results revealed that at state level, production and productivity of rice increased at an annual rate of 1.96 and 2.51 per cent respectively, with area showing no significant growth. The production growth was observed to be a
result of productivity growth in a majority of districts. With regard to groundnut, growth in area varied from -7.81 per cent (in East Godavari) to 9.71 per cent (In Adilabad), with state average growth rate of 3.66 per cent. In case of production and productivity also, positive trends were observed. But productivity growth rates were not as high as the production growth rate.

Munish Alagh (2007) in a study of food grains (Rice, Wheat, Coarse Cereals, Jowar, Bajra, Maize, Pulses and Gram) Non-food grains (Groundnut, Mustard, Cotton, Jute Mesta, Sugarcane and Potato) trends in India, by using compound growth rates in the periods of (1950-51 to 2003-04): He divided the study period into three periods viz., period I (1950-51 to 1974-75), period II (1975-75 to 2003-04) and over all period III (1950-51 to 2003-04). Growth rate of production went up since the eighties for the agricultural sector as a whole. Output was rising at 3.04 per cent compound rate annually compared to 2.18 per cent compound rate annually earlier. There was no contribution of area in the second phase, yield being the only source of growth.

As they examine below, from the early fifties to the mid seventies, food grains growth was 2.69 per cent annually and went down to 2.25 per cent annually in the second phase. Area grows, which was 0.86 per cent annual in the first phase went down to a negative figure of -2.15 per cent annually in second phase. Area allocation for non-food grains was the same as for food grains in the first phase, but in the second phase, area under food grains had fallen and that under non food grains was rising.

Monoj et al. (2007) studied the trends in Indian Agriculture before and after the introduction of the economic reforms, and advent of WTO regime. They used employing the Cobb-Douglas production function using the OLS specification to investigate the determinates of agricultural gross domestic product for the period 1970-71 to 2002-03, during pre and post economic reforms to document the impact of policy change (post-1992) and India’s membership of the WTO (post-1995). Their findings reveal that Indian agriculture sector has witnessed decreasing return to scale after the introduction of economic reforms. These observations point to the trends in food grains production of major crops for pre and post economic reform period. Compound Annual Growth Rate of production of rice crop declined from 2.42 between the eighties and further declined to 0.08 per cent in nineties. Production of wheat also declined from 4.36 to 1.37 for the period 1970-71 to 2000-03. The CAGR
of coarse cereals and pulses is negative in the decade of 1970's, however has slightly picked up in 1980's due to the constitution of Oil Seed Mission and its sustained efforts: again it suffered with rate of decay in the decade of 1990s. Consequently, total food grain production growth declined from 3.00 per cent in the 1980-90 decade to 0.67 per cent during the post-reform period. If this declining trend continues, food security would be a great challenge in the near future for India.

In 1950-51 the area under food grains crop cultivation was 74 per cent of the cultivable land, which declined by 2 per cent to 72 per cent in 2002-03. This shift in cropping pattern was taking place due to remunerative price being offered to commercial crop and better market access given to growers. The trends in cropping pattern after the introduction of new economic policy, shows that the area under cultivation of the rice and wheat crop decelerated from 0.66 and 2.02 in 1970's to -0.08 and 0.51 in the decade 1990's. Area devoted for the coarse cereals and pulses also decreased during the same duration. The total area under major crops also decreased from 0.19 to -0.28 per cent. Declining trend in all these crops created shortage of food in the present day and put pressure on price of daily food stuffs, resulting in increased cost of living of masses.

Mohmmad Taher Ahmadi Shadmehr (2008) conducted a study on the trends in area, production and yield of Iran's agricultural production especially food grains: the decomposition of output growth of main crops and systematically document the pre and post revolutionary and pre and post-reform trends in agricultural growth in Iran. Compound Growth Rates of area, production and yield were estimated by fitting semi-log trend equation using data for 1970-71 to 1999-2000. Decomposition of output growth of main crops was examined by fitting components analysis model using data for the period 1970-71 to 1999-00. The performance of agricultural sector was shifting better during the pre-revolutionary period (1970-78) than during of post-revolutionary period (1979-00). Production yield per hectare of food grains grew during the 1970-78 at a higher rate than that during the 1979-2000. During the post revolutionary period, the total agricultural crop during the pre-economic reform period grew at a higher rate than that of post-economic period, but the growth in yield during the post-economic reform period was much better than that during 1979-89.
The main source of growth of agricultural production during the period 1970-2000 has been the growth in yield per hectare and expansion in irrigated area.

2.3 Rural Poverty

Ahluwalia (1978) studied the trends in the incidence of rural poverty in Andhra Pradesh from 1957-58 to 1973-74 using the poverty line of Rs.15 per capita per month at 1960-61 prices. He adjusted it for various years with Consumer Price Indices for Agricultural Labourers of Andhra Pradesh (CPIAL). His estimates revealed that the early sixties were marked by a falling phase in the trickle down mechanism and concluded that the incidence of poverty was negatively associated with agricultural growth, and that one per cent increase in per capita agricultural production resulted in 0.48 per cent decline in the incidence of poverty in Andhra Pradesh.

Joseph (1978) observed that in India 46.33 per cent of the population was below the poverty line with low living standards which manifested in low incomes, inadequate housing, poor health, limited or no education, high infant mortality, low life and work expectations and a general sense of dependency. He was also of the opinion that rural poverty can be reduced or eliminated through employment and income generation by means of structural transformation within the agricultural Sector. Diversification of production, rural infrastructural investment and land reforms were essential to ensure a minimum landholding for farmers and for improving the tenure patterns to increase the food production and for distributing the economic benefits more widely.

Lakdawala (1978) studied certain aspects including the cause of the present uneven agricultural growth, increased intensity of land use which is the central feature of the expansion of irrigation, spread of new technology and the need for more efficient regional planning. It is concluded that though unemployment at the current wage rate may not greatly reduce poverty, the real problem of Indian economy was deployment of resources at a higher level and upgrading of capabilities. There was great potential for agricultural development particularly by means of irrigation and new technology, and the employment per hectare could be increased if farm mechanization was regulated and land reforms were implemented.
Asthana and Shukla (1980) in their enquiry into the concept of weaker sections with reference to Rural Development schemes, noticed that the term weaker sections of the society relates to socially and economically handicapped classes of population who are deprived of full socio-economic benefits of the society like food, cloth, recreation, health, housing etc. These comprise mainly small farmers, marginal farmers, agricultural laborers, artisans and scheduled tribes.

Singh and Prasad (1980) argued that the annual average per family income of Rs. 4000 at current prices as the most reasonable criterion. As such, families under this income may be treated as poor. As regards the criteria of land and assets, families with landholding of 2.5 acres and below are considered to be poor.

Joshi (1982) observed that the rural poor in India comprise small farmers, marginal farmers, agricultural labourers, rural artisans and persons engaged in traditional occupations. Actually, all the unemployed and even some persons were poor because of their low productivity and low wages. Some backward and all scheduled castes and scheduled tribe people were living below the poverty line.

Khemani and Raju (1985) observed that the people whose income and consumption were found to be reduced were the poor masses in the developing countries. For them, the priority remained that their level of living needed to be raised. Prasad (1985) indicated, by analyzing the report of “task Force on projections of minimum needs and effective consumption demand” set by the Planning Commission, that the poverty line was defined as the mid-point of the monthly per capita expenditure class having a daily calorie intake of 2400 per person in rural areas and 2100 in urban areas.

Hanumappa (1986) fallowed that among different categories of the poor, those who possessed some land had an edge over the landless. Further, between small and marginal farmers, the former category was able to derive a comparatively higher benefit than the latter. He concluded that decentralized system of planning with the active participation of voluntary organizations might be in a position to operationalise the schemes much more effectively. Whatever may be the approach that these agencies opt for, they have to keep in mind that how quickly they can assure the poor the desired level of economic security and viability.
Hirway (1986) tried to find whether growth with equity can be achieved with two sets of strategies. As five year plans indicate, one set of strategies focuses mainly on bringing about growth, and the other aims at bringing about equity, with special emphasis on eradication of absolute poverty. The author argued that when planning focuses on growth, the equity aspect tends to be neglected. The experiences of Anti-poverty programmes in the last one and a half decade have shown that there was no significant reduction of poverty levels. The problems were noninvolvement of the needy poor in these programmes and, even if some of the poor are able to cross the poverty line, they again fall back below the poverty line due season or a small calamity.

Indrakant (1986) estimated the incidence of poverty in Andhra Pradesh from 1961-62 to 1973-74. He constructed the cost of living indices for rural agricultural labourers and urban non manual employees from 1960-61 to 1980-81 and used two poverty lines viz., Rs.15 and Rs.18 per capita per month for rural areas, and Rs.18 and Rs. 21 for urban areas at 1960-61 prices. The results revealed a decline on the in the incidence of poverty to some extent both in rural and urban areas, but this decline was accompanied by some fluctuations. The incidence of rural poverty worked out to 51 per cent in terms of households and 56 per cent in terms of persons, and the corresponding figures urban areas were 41 and 48 per cent.

SBI Institute of Rural Development (1986) Institute of Rural Development stated that poverty lines have been laid down differently by different experts. Most of these are related to a minimum expenditure, largely on food. The minimum caloric requirements have been taken at 2250 per capita per day for an average Indian or Rs. 6400 per family per annum is taken as criterion for defining poverty line.

Mahendradev (1988) is of the view that a rise in labour productivity in agriculture seems to be an essential condition for poverty reduction among the agricultural labour house holds in many states till the target group programmes made significant on the majority of the rural poor or till the unorganized poor organize and demand the redistribution of assets.
Radhakrishna et al (1988) came up with estimates of poverty across occupational groups in each of the 21 districts of Andhra Pradesh for the year 1977-78, using the NSS data of the 32nd round (state sample). Their poverty lines were Rs. 50 in rural areas. In rural Andhra Pradesh, 2.18 crore persons fall below poverty line. In terms of households it is estimated that 44 lakhs in rural areas are below the poverty line. The incidence of poverty was 49 per cent in Coastal Andhra and around 60 per cent in Rayalaseema and Telangana.

They further computed the incidence of poverty across rural and urban classes for developed and backward regions, using Rs.101.80 per capita per month as the poverty line for rural areas, as given by the Planning Commission for the year 1983-84, based on the State sample of 38th round of NSSO. The poor have been further classified into two groups viz., very poor and moderately poor, by treating the households whose per capita expenditure is less than 75 per cent of the poverty line, i.e. Rs. 76.35, as very poor.

In the rural areas of the developed region which comprises East Godavari, West Godavari and Krishna districts, only 19 per cent of households were very poor and 29 per cent are moderately poor. In the backward region (Anantapur, Kurnool and Mahabubnagar) as many as 50 per cent of the households were poor and 30 per cent are moderately poor. Of the very poor, agricultural labour households accounted for 67 per cent in the developed region. In the backward region, very poor agricultural labourers accounted for only 47 per cent. In the developed region, the incidence of poverty among the cultivator class was very low, whereas, in the backward region, a sizeable proportion of the poor were in the cultivator class. These cultivators accounted for 24 per cent of the very poor and 41 per cent of the moderately poor households in the backward region.

Hashim (1989) found that poverty was unevenly distributed, and there were certain areas and regions where it is firmly entrenched. His argument was that the concentration of poverty in those particular regions is due to deficiencies in infrastructure and under developed productive systems in agriculture, industry and other sources. He emphasized that the next plan should develop strategies to root out these deficiencies in order to develop productive system in agriculture, industry and other sources. He emphasized that the next plan should develop strategies to root out
these deficiencies in order to bring about a better and balanced regional spread of
growth.

Prasad (1989) revealed that the inter-related tasks of removing poverty, 
unemployment and backwardness could not be accomplished within the traditional 
frame work of Indian Planning. Attainment of these objectives was possible only by 
dislodging mere overall growth rate from the list of objectives and making it an 
instrument for the attainment of other objectives. An emphasis on creating a situation 
of full employment should form the most important component of the strategy for 
 alleviation of poverty. This would be possible only by raising the labour intensity of 
the mix of technology adopted for the development of projects.

Sing and Sing (1989) found that there was an increase in the income of all the 
recipients, including farmers and agricultural labourers, particularly in more 
developed districts of the state. This evidence supports the intervention of government 
in rural development and highlights the benefits of the community participation in 
rural India.

Thimmaiah (1989) suggested that reduction of absolute poverty should be the single 
most important objective of the development strategy of Eighth Plan. Though poverty 
was associated with employment, development programmes would have to be 
designed in such a way as to generate wage employment as well as self employment 
opportunities with guaranteed minimum income.

Rao (1991) critically reviewed the changing scene of employment generation and 
poverty in rural India since the beginning of economic planning and brought out the 
likely trends in rural employment and poverty as well as the policy perspectives in the 
next few decades. He opined that rural employment and poverty cannot be studied in 
isolation without an analysis of the growth in agriculture, since, two thirds of the work 
force in India is employed in agriculture and much of the rural, non-agricultural 
employment was influenced by the changes in agricultural outputs and incomes.

Donaldson (1992) has attempted to assess the World Bank’s twenty years experience 
with rural development. He examined the factors that significantly affected the 
success or failure of the project. In particular, factors like the importance of 
agricultural technology research, institution building, administered agricultural prices,
marketing systems and the government’s level of commitment to alleviate poverty affect the programme. He felt that, by and large, there has been some loss of efficiency associated with rural development and lending strategy.

Parthasarathy (1995) argued that Andhra Pradesh presents a unique case of poverty reduction, its performance between 1970 and 1988 being the highest among all the major states. This trend is not surprising for the 1970’s period of rapid agricultural growth, but is perplexing for the latter part of the 1980s when growth had slackened. These trends point to the significance of public intervention for poverty alleviation, in particular the Rs. 2 a kilo rice scheme. However, the most effective measure that could be taken to reduce poverty is land reforms, without which other schemes cannot have much impact.

Himanshu (2007) analysed poverty and inequality All-India and States in the period 1983-2005. He observed that annual rate of reduction in this period was lower than in the 1970’s and 1980’s. More importantly the bulk of this decline occurred in 1999-2005, confirming the earlier consensus that the 1999’s were indeed for poverty reduction. He measured poverty and inequality for 1983 to 1987-88, 1983 to1993-94, 1993-94 to 2004-05, 1987-88 to 2004-05 and 1983to 2004-05 for rural and urban areas. These show a setback in poverty reduction after the 1980’s, The pace of reduction of the all-India rural head count ratio, which had on an average, 1.1 percentage points per annum (ppa) during 1973 to 1983 and was 1.6 ppa in 1983-88, fell sharply to only 0.3 ppa during 1987-93 before recovering to 0.7 ppa during 1993-2005. Corresponding figures for all-India urban are 0.7 ppa during 1973-83, 1.1 ppa during 1983-88, 1.0 ppa during 1987-93 and 0.6 ppa during 1993-2005. Taking both rural and urban together, the pace of poverty reduction fell from 1.1 per cent point per annum during 1973-88 to only 0.6 percentage point annum during 1987-2005 and 0.7 per cent per annum during 1993-2005.

2.4 Interrelationship between Agricultural Development and Rural Poverty:

A Review of Indian Empirical Evidence

Ahuwalia (1978) has come up with a regression model on rural poverty, which seeks to explain it in terms of agricultural performance and the time variable which is taken as proxy for other factors that may influence the extent of poverty. Ahluwalia
specified relationship, which examines the impact of agricultural performance on rural poverty.

This equation was estimated using all India data covering the period 1956-57 to 1973-74 (with a few missing observations). Three alternative measures of poverty have been used. They are i) POV I is the head count ratio obtained by applying the all India poverty cut-off point (Rs.15 capita per month at 1961-61 prices) to the consumer expenditure distribution data for rural India. ii) POV II is a weighted sum of the head count ratios in individual states obtained from the NSS distribution for individual states and the state specific poverty cut-off points iii) POV III is the Sen’s index of poverty. With regard to the explanatory variable NDPARP, two alternative measures were used viz., the current year value and an average of the current and previous year’s values. Ahluwalia’s result is presented below.

\[
\text{POV}_T = 136.125 - 0.505 \text{ NDPARP}^* - 0.141 T
\]

\[
(4.84) \quad (3.20) \quad (0.64)
\]

\[
R^2 = 0.50 \quad F = 5.5
\]

Where, NDPARP*: An average of current and previous year’s values of Net domestic product at constant prices in agriculture per rural person.

POV: An index of rural poverty.

T: Time and the error term are omitted.

*Indicates that the coefficient is significantly different from zero with the sign shown at the 5 per cent level for a two-tail test.

(Figures in parentheses are t- values)

Two inferences were drawn from the above result. Firstly, incidence of rural poverty is inversely related to NDPARP and secondly, there is no residual time trend in poverty after allowing for changes in NDPARP. According to Ahluwalia, the inverse relationship between rural poverty and agricultural performance suggests that there is some trickle down of benefits from increases in agricultural production.

Ahluwalia observed that on the basis of state-wise regression analysis, agricultural performance has the expected negative impact on poverty in only seven states viz., Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttar Pradesh. Ahluwalia, observed that the most disquieting feature of his
results is the evidence from Punjab and Haryana. It does not support the hypotheses that improved agricultural performance would lead to the reduction in the incidence of poverty in this region. Punjab and Haryana experienced an impressive growth in agricultural output per person. Neither there was evidence of downturn in the incidence of poverty, nor was there significantly negative coefficient on output per head variable in his regression.

Giffin and Ghose (1979) have used the incidence of poverty provided by Ahluwalia whose time series data start from 1957-58 to 1973-74. They thoroughly examined Ahluwalia’s data and observed that inclusion of two observations namely 1957-58 and 1959-60 tend to obscure rising incidence of rural poverty that occurred in many states of India from about 1960. Accordingly, their estimates of trends in poverty are based on Ahluwalia’s data for somewhat shorter period of 14 years extending from 1960-61 to 1973-74 (Giffin and Ghose 1977, Saith 1981).

Estimates of the trend rate of growth of agricultural output per capita and of the trend rate of growth of food production per capita over the period 1956-57 to 1973-74 are presented in the following table. There was a tendency for per capita agricultural output to decline in 5 states and in 6 states there was a tendency for per capita food production to decline. Growth experience varied widely. For instance, per capita food production rose by 5.5 per cent in Maharashtra. Giffin and Ghose feel that wide range of experience is a great advantage when it comes to testing the trickle down modified doctrine.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient of regression</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) RP₁ and AG</td>
<td>-0.69</td>
<td>0.006</td>
</tr>
<tr>
<td>(2) RP₁ and FG</td>
<td>-0.62</td>
<td>0.009</td>
</tr>
<tr>
<td>(3) RP₂ and AG</td>
<td>0.04</td>
<td>0.001</td>
</tr>
<tr>
<td>(4) RP₂ and FG</td>
<td>0.07</td>
<td>0.004</td>
</tr>
</tbody>
</table>

RP₁: Percentage change in Poverty from 1960-64 to 1970-74.
RP₂: Percentage annual trend rate of growth of rural Poverty
AG: Rate of growth of total agricultural production per capita.
FG: Growth of food production per capita.
If the trickle down hypothesis were correct, one would expect an inverse association between some measure of the trend in rural poverty and the trend rate of growth of output. The regression equations have been estimated to find out whether this inverse association exists.

When the percentage change in poverty from 1960-64 to 1970-74 was run as dependent variable, there was an inverse association with the trend rate of growth of output irrespective of using either the rate of growth of per capita agricultural production or as the growth of per capita food production. In both the cases, the regression equation explained less than 1 per cent of the variation in rural poverty and the coefficient of regression was not significant.

When the dependent variable was defined as the percentage annual trend rate of growth of rural poverty, the regression coefficient became positive when either per capita agricultural growth trend (AG) or per capita food production trend (FG) was used as the independent variable. In other words, the nature of the association was the opposite of what the trickle down modified hypothesis would lead one to expect. The explanatory power of equations was very low. This statistical exercise shows that there is no evidence that agricultural growth tends to reduce the incidence of rural poverty. The correlation between the two is approximately zero.

Dharam Narain (1980) expanded the equation of Ahluwalia in which rural poverty is function of agricultural income per head of the rural population in real terms (NSARP) and time (T). Dharm Narain expanded this specification to include consumer price index for agricultural labourers (CPIAL) and the index number of wholesale prices of food grains (FPI) as explanatory variables reflecting the prices faced by the rural poor as consumers. Narain used only current agricultural income per head and in his formulation; all variables (including time) are entered in logarithmic. The following equations were estimated.

\[
\text{ln POV}_t = 4.592 - 0.631 \text{ ln NDPARP}_t + 0.499 \text{ ln FPI}_t - 0.025 \text{ ln T} \\
(-4.837) \quad (8.022) \quad (-7.029)
\]
\[
R^2 = 0.93
\]

\[
\text{ln POV}_t = 6.072 - 0.841 \text{ ln NDPAR}_t + 0.499 \text{ ln FPI}_t - 0.025 \text{ ln T} \\
(-4.837) \quad (8.022) \quad (-7.029)
\]
\[
R^2 = 0.91
\]

(Figures in parentheses are t values)
When price is included as an independent variable, the explanatory power of the equations increased substantially and coefficient of time became significant with a negative sign. Dharm Narin argued that agricultural performance and time are not enough to explain temporal variations in rural poverty and it is equally necessary to consider changes in the nominal prices of goods consumed by the poor. There was a definite downward trend in the incidence of rural poverty between 1956-57 and 1970-71 after adjusting for changes in agricultural performance and the nominal price of the consumption basket of the poor.

Saith (1981) considered deviations from trend values of prices and agricultural production as explanatory variables and specified the equation (Since per capita agricultural production remained constant during the reference period, Saith did not consider agricultural production as a separate variable) and added CIAL to the equation, substituted the index of agricultural production (IAP).

1) $\text{Pov}_t = 45.03 + 0.20 \text{DCPIAL} - 0.38 \text{DIAP} + 0.36 \text{T}$

\[
\begin{align*}
(18.39) & \quad (2.65) & \quad (-2.20) & \quad (1.47) \\
R^2 = 0.63 & \quad F = 5.20
\end{align*}
\]

(Figures in parentheses are t-ratios)

where, DIAP: percentage deviation of the all India index of agricultural production
DCPIAL: percentage deviation of consumer price index for agricultural labour around its trend value.

T: Time trend.

When the time series of data for 10 years from 1960-61 to 1970-71 were used, estimated equations turned out to be as follows.

2) $\text{Pov}_t = 44.86 + 0.15 \text{DCPIAL} - 0.45 \text{DIA} + 0.37 \text{T}$

\[
\begin{align*}
(7.10) & \quad (0.80) & \quad (-2.04) & \quad (0.72) \\
R^2 = 0.64 & \quad F = 3.5
\end{align*}
\]

(Figures in parentheses are t ratios)

In terms of explaining the fluctuations in the level of poverty, price deviations are considerably more important than production deviations around their respective trend values. The coefficient of t value is not significant. The percentage of the rural population in poverty increases by one half of a percentage point each year independently of the influence of DIAP and DCIAL. This result contrasts sharply with Ahluwalia's optimistic one. Other results indicate production improvement.
Rao and Misra (1981) examine the relationship between rural poverty and (i) per capita net domestic product and (ii) per capita primary income for the period from 1960-61 to 1973-74. From the results it is evident that significant reduction in poverty could not take place in spite of an increase in per capita Net Domestic Product. Though the sign of the relationship is of expected nature, neither the coefficient nor the $R^2$ is significant. When the relationship between poverty level and income accruing to a rural person from primary sector are examined, it has not only improved in coefficient estimates. It also provides empirical support to the contention that structurally based growth can help in reducing poverty incidence.

1) $POV = 51.1957 - 0.0149 \text{ PNDP}$
   \begin{align*}
   (1.3690) & & (0.1311) \\
   R^2 = 0.0018
   
   2) POV = 95.0232 - 0.2639 \text{ PPRI}$
   \begin{align*}
   (3.4478) & & (1.7709) \\
   R^2 = 0.2387
   
   \end{align*}

where, $POV$: Percentage of persons below the poverty line.
$PNDP$: Per Capita Net Domestic Product.
$PPRI$: per-capita primary income.

The inverse relation between poverty and primary sector income are examined on the basis of individual state level data. There is clear evidence for inverse relation in six states viz., Bihar, Jammu and Kashmir, Karnataka, Madhya Pradesh, Uttar Pradesh and West Bengal. The evidence is not conclusive in case of eight out of the remaining states.

Sinha (1981) also felt that other factors like cost of living index contributed to an increase in poverty incidence even though the increase in agricultural productivity had the partial effect of reducing it. The consumption of farm products of big farmers is met out of their own production. During the season, small and marginal farmer and agricultural labourers have also adequate quantities raised on their farms or obtained as kind wages. In the lean season, they depend on market purchases. The purchasing power of the underprivileged classes is thus eroded in the years when there is a rise in the cost of living unless there are compensating variations in money earnings. Therefore, Sinha introduced -consumer price index for agricultural labourers as an
additional variable in his empirical analysis. His significant negative impact on the incidence of rural poverty in only six states, the coefficient on CIPAL is significant in 10 out of 14 states. He felt that there is an increasing cash component in rural wages, which is not sufficiently protected from erosion by rising cost of living in several states.

Considering a reference period from 1963-64 to 1973-74, which begins just before the Green Revolution and extends into the phase of Green Revolution, Mundle (1983) analyzed the correlation between the incidence of poverty and agricultural production (per capita food grain production) for each of the fifteen states. In six out of the fifteen states considered, there is a statistically significant negative correlation between these two variables. In Uttar Pradesh, Tamil Nadu, Bihar Punjab and Haryana the correlation is quite high (significant at 1 per cent or 5 per cent levels), while in West Bengal and Karnataka, the correlation is moderate (significant at 10 per cent level). In four states viz., Jammu and Kashmir, Orissa, Madhya Pradesh and Kerala, the sign of correlation is negative but it is not statistically significant. In five states viz., Gujarat, Andhra Pradesh, Assam, Rajasthan and Maharashtra the sign of the correlation coefficient is positive. However, the coefficient is not statistically significant in any one of these states. Hence, the statistical picture is consistent with the hypothesis that increasing agricultural production tends to reduce the incidence of poverty.

Mundle also presented the coefficient of correlation between the incidence of rural poverty and relative rise in agricultural production in thirteen out of fifteen states; agricultural prices seem to have no significant effect on the incidence of rural poverty. He felt that it is difficult to believe that agricultural prices leave the rural poor unaffected.

Mathur (1985) attempted a reconciliation of the differences in the results obtained by Ahluwalia (1978) and Saith (1981). He estimated equations, which are comparable to Ahluwalia's and Saith's specification. Further, he showed that their equations are special cases of a general formulation.
He estimated equation for three different time periods. The first period includes all the thirteen observations from 1956-57 to 1973-74 (all the observations on which Ahluwalia’s analysis has been based). The second period excluded the observation for 1973-74 which according to Saith was unreliable. The third period included observations from 1960-61 to 1970-71 which, according to Saith, is the most appropriate period. Mathur’s estimated equation is given below.

\[ \text{POV}_t = 50.62 - 0.2711\text{IAPP}_t + 0.18\text{CPIAL}_t - 0.08 T \]

\[ (5.40) \quad (2.98) \quad (3.51) \quad (-0.10) \]

\[ R^2 = 0.94 \]

(Figures in parentheses are \( t \)-values).

Where, IAPP: Index of agricultural production per rural person.

NDPAP: Net domestic product in agriculture per rural person.

CPIAL: Consumer price index for agricultural labour.

The dependent variable is the head count ratio, and the period covered is 1960–61 to 1970–71. Mathur’s results show that (i) whenever the coefficient of IAP is statistically significant, it is negative; (ii) whenever the coefficient of CPIAL is significant, it is positive and (iii) the coefficient of \( T \) is either not significantly different from zero or negative when it is statistically significant.

He finds that agricultural growth tends to reduce rural poverty irrespective of the fact that whether this growth is measured by gross output or by value added. This result is similar to both Ahluwalia’s and Smith’s. He found that if the growth is measured by Ahluwalis’s value added indicator, then there is another set of factors which tends to reduce rural poverty systematically over time. If growth is measured by Saith’s gross output indicator; the additional effect is not present. This could be taken to mean that the value – added indicator underestimates the effects of agricultural growth. Inflationary resources tend to increase rural poverty which is consistent with Saith’s hypothesis. Mathur concludes that the aggregate all India data support Ahluwalia’s contentions that agricultural growth reduces rural poverty.

Sen (1986) observed that an interesting feature of Dharm Narain’s formulation relates, not to time, but to the use of price index. If Dharm Narain had used the index money income, there would have been nothing special about it since price correction
would then have been essential. According to Sen, Dharma Narain used real income—
already discounted for price changes and it is significant that the price index is
brought once again. Sen felt that he was concerned not with prosperity but with
poverty itself. However, with a given relative distribution, the mean income would
also be a guide to the level of poverty Dharma Narain was interested in causation and it
is the causal role of price changes that he has chosen to emphasize in his poverty
analysis.

Sen argued that prices contribute to rural poverty because prices received fail
to catch up with prices paid as a consumer of food. In other words; it is the relative
price of food (relative to an index of price received), which is causally linked to rural
poverty. Sen shows that a rise in the price of food worsens the food entitlement of
some groups (viz., agricultural labourers, craftsmen etc.) leaves that of peasants
unchanged and increases that of agricultural capitalists. Radhakrishna (1975, 1976)
also finds that inflationary situation is due to (i) differences in their endowments and
(ii) failure of nominal incomes of certain groups to adjust to higher food prices.

Sen felt that either the index of food prices or the labourers’ cost of living is a
good supplement to average real income in analyzing poverty. He further added that
some index of money wages and some measure of rural unemployment could be used
to supplement the picture further. The price variable adds to the explanation of
poverty even on its own as its impact is not eliminated by corresponding wage
adjustment. However, the response of wages may vary a great deal from one situation
to another.

Ahluwalia (1986) considers various alternative formulations in order to capture the
effects of agricultural performance, nature of growth of prices on rural poverty. The
following equation is estimated using the data from 1956-57 to 1977-78.

\[
POV_t = 9.63 - 1.04 \ln \text{NSPARP}_t - 0.76 \ln \text{NDPARP}_{t-1} + 0.17 \ln \text{CPAL}_t - 0.10 \ln T
\]

\[
(5.3) \quad (-3.8) \quad (-2.3) \quad (1.7) \quad (-2.2)
\]

\[R^2 = 0.74\]

(Figures in parentheses are t-values)

The estimated equation confirms that rural poverty; agricultural performance,
prices and time are related broadly as indicated in Dharma Narain’s results.
Ghose (1989) used a time series data with 18 observations covering the period from 1956-57 to 1983 for the whole of India. He analyzed the relationship between rural poverty and crop output and relative prices. His regression equation and results are presented.

\[ \ln \text{POV} = 1.81 - 0.60 \ln q + 1.08 \ln P - 0.01T \]

(1.48) (-3.11) (7.70) (-4.23)

\[ R^2 = 0.89 \quad D.W = 1.50 \quad n = 18 \]

\[ \ln \text{POV} = 1.19 - 0.80 \ln q + 1.45 \ln p^* - 0.01T \]

(0.67) (-3.25) (5.33) (-3.99)

\[ R^2 = 0.81 \quad D.W = 1.60 \quad n = 18 \]

(Figures in parentheses are t-ratios)

Where

POV: Incidence of poverty (Head Count Ratio)
q: Crop output per person
P: Relative price of food grains vis-à-vis manufactures
P*: Relative price of agricultural products vis-à-vis manufactures
n: Number of observations

Firstly, there is an inverse association between rural poverty and crop output per person. In other words, crop output is favorable to the rural poor. Secondly, relative price of food-grains vis-a-vis manufactures (p*) as an explanatory variable. Thirdly, the result suggests that the fluctuation in the relative price has a more powerful effect on rural poverty; a negative time trend is strongly suggested by the results.

Radhakrishna and Sudhakar Reddy (1988) analyzed the data based on cross-district comparison for 1977-78 for Andhra Pradesh. Improvement in agricultural productivity increases expenditure levels of both agricultural labour and cultivator classes and, correspondingly, reduces poverty level. Their results are as follows.

1) Levels of living (Rural plus Urban)

\[ \ln \text{EXP ALH} = 2.14 + 0.208 \ln \text{AGY/NSA} \]

(2.48)

\[ R^2 = 0.25 \]

\[ \ln \text{EXP ACH} = 2.12 + 0.253 \ln \text{AGY/NSA} \]

(2.71)

\[ R^2 = 0.28 \]
2) Rural poverty levels

\[ \ln \text{POV. ALH} = 6.95 - 0.356 \ln \text{AGY/NSA} \] (3)

(2.87)

\[ R^2 = 0.27 \]

\[ \ln \text{POV. ACH} = 9.21 - 0.732 \ln \text{AGY/NSA} \] (4)

(0.237)

\[ R^2 = 0.23 \]

Where EXP: Average monthly per capita expenditure.
POV: Percentage of households below the poverty line.
ACH: Number of cultivator households.
ALH: Number of agricultural labour households.
AGY: Agricultural output.
NSA: Net sown area.

Gaiha (1989) analyses temporal changes in rural poverty in India, particularly the effect of unanticipated consumer price increases on rural poverty. The analysis is based on the time series data from 1956-57 to 1977-78 at the national level. He has estimated the regression equation for the incidence of poverty (Head Count Ratio) by regressing poverty on net domestic product in agriculture per capita of rural population (NDPP), a measure of fluctuations in the consumer price index for Agricultural Labourers around the estimated trend values (FCPIAL) and time (T).

One of his regression results is presented.

\[ \text{POV} = 82.163 - 0.0939^* \text{NDPP}_t + 0.3765^* \text{FCPIAL}_t - 0.1728^{**} T \]

(6.87) (-2.82) (4.79) (-1.43)

\[ R^2 = 0.794 \]

* Significant at the 5% level

** Significant at the 10% level

The time period considered for the above equation is from 1956-57 to 1977-78. The results of the equation suggest that rural poverty and agricultural production were inversely related: positive CPIAL value over trend value aggravates rural poverty. The residual time trend was negative and significant at 10 per cent level.
Madhusudhan Ghose (1996) estimated the effect of agricultural development and some agricultural variables on rural poverty in India. He used Ordinary Least Square (OLS) method by state wise cross-section data at four points of time, 1972-73, 1977-78, 1983 and 1986-87, the result of the estimated equations are

\[ RPOV = 70.88 - 0.054^{*} \text{SDPAR} \quad : \quad R^2 = 0.466 \]

(1.008)

\[ RPOV = 94.30 - 24.328^{*} \text{AVMESH} - 9.436^{*} \text{RWAL} + 1.041^{**} \text{CDURM} \quad R^2 = 0.631 \]

(9.479) (1.066) (0.564)

Figures in parentheses are standard errors, ** and * significant at 5 and 1 per cent level respectively. Number of observation (n) = 56

Where, RPOV = Head count Index

SDPAR = State Domestic Product in Agriculture per head of rural person.
AVMESH = Average size of Marginal and Small operational Holdings.
RWAL = Real wage rate for male labourers.
CDURM = Current day status unemployment rate among rural males.

The coefficient of SDPAR turns out to be significantly negative, indicating there by inverse relationship between rural poverty and agricultural production per head of rural population. They suggest that improved agricultural performance (measure as an increasing in SDPAR) has been associated with reduction in the incidence of rural poverty and asserts the existence of trickle-down mechanism in India.

The results obtained by equations 1) with individual year data provide insight into the trickle down process.

The estimated results are:

1972-73: \[ RPOV = 89.46 - 0.09^{*} \text{SDPAR} \quad : \quad R^2 = 0.696 \]

(0.017)

1977-78: \[ RPOV = 83.11 - 0.069^{*} \text{SDPAR} \quad : \quad R^2 = 0.586 \]

(0.017)

1983: \[ RPOV = 68.33 - 0.055^{*} \text{SDPAR} \quad : \quad R^2 = 0.547 \]

(0.014)

1986-87: \[ RPOV = 52.33 - 0.031^{*} \text{SDPAR} \quad : \quad R^2 = 0.473 \]

(0.009)

Figures in parentheses are standard errors.
* Significant at 1 per cent level n = 14 in all equations.
In the above equations the rural poverty is inversely related to agricultural production for head of rural population in all the time points, the coefficient of SDPAR had declined considerably from -0.09 in 1972-73 to -0.031 in 1986-87, and the $R^2$ value has declined from 0.696 to 0.473. The result tells that the incidence of rural poverty was found to be inversely related to agricultural production per head of rural population. These assert the existence of trickle-down mechanisms in India. However, the power of the trickle-down process has been found to be very limited and at the same time weakening over time.

Turab Hussain, S.M and M.ohammad Ishfaq (1997) analyzed the relationship between aggregate agricultural productivity and poverty in Pakistan. The main empirical findings suggest that increase in agricultural productivity was alleviated poverty in Pakistan but not to the extent to which the negative forces of high population growth and increasing food prices have worsened its incidence. The below model was tested for two periods 1970 to 1996 and 1973 to 1993 respectively on the Pakistan data described. These estimated equations were obtained through ordinary least squares regression model. The estimated log linear equation were

$$\log \ POV_t = -2.28^* - 0.181^* \log \ IAGR_t + 0.50^{**} \log \ ASPI_t + 1.54^{**} \log \ POP_t - 2.06^{**} \log \ Time \ldots (1)$$

$$R^2 = 0.87 \quad F = 36.26 \quad D.W = 1.80$$

$$\log \ POV_t = -2.32^* - 0.021^* \log \ IAGR_t + 0.52 \log \ ACPI_t - 0.47^{**} \log \ Time \ldots (2)$$

$$R^2 = 0.67 \quad F = 11.88 \quad D.W = 1.76$$

$$\log \ POV_t = -0.04 - 0.331^{**} \log \ IAGR_{t-2} + 0.30 \log \ ACPI_t - 0.38 \log \ Time \ldots (3)$$

$$R^2 = 0.83 \quad F = 24.95 \quad D.W = 2.34$$

Note ** indicates significance at 1 percent level
* Indicates significance at the 5 percent level.

Where, POV$_t$ = Head count index (average poverty line : EXP.100-109 Rs/ cap/month, in 1979 price and subsequent change in accordance with World Bank Report 1990 on average rural poverty reductions in Pakistan.
IAGR$_t$ = Index of Agricultural Production
ASPI$_t$ = Procurement/ support price index of Agricultural Commodities (Rs/40Kg)
ACPI$_t$ = Agricultural Consumer Price Index
POP$_t$ = Rural Population (Millión)
The above result indicates that all explanatory variables have a significant effect on poverty. In the first equation the central variable, agricultural productivity, is significant at the 5 percent level with a negative coefficient (-0.18), according to which an increase of 0.18 units in the agricultural productivity index results in a 1 percent decline in the poverty index. Hence, the central hypothesis that agricultural productivity reduces rural poverty is accepted. In the second estimates agricultural productivity is insignificant, while in the third it becomes significant with a negative coefficient (-0.34), almost twice more powerful than in the first estimates, after it is lagged for two years to provide equation three. A fall in productivity might not affect poverty levels immediately as rural poor resort to selling assets etc to meet subsistence requirement at least for short period of time.

Fan et al. (1999) examining the links between rural poverty and government spending on a variety of areas, provide a system of equations that examines poverty as a function of total factor productivity, wage, terms of trade, rain fall, non-agricultural employment, landlessness and population in the period of 1970 to 1995. Each of these explanatory variables is, in turn a dependent variable in another part of their model. The results from their analysis, determine where government investment would have the most positive effect on the poor. They find that road construction (165%) agricultural research and development (91.4%), education programmes (31.7%), rural development (27.8%) and soil and water (6.7%) have the largest impacts, due to number of poor reduced per spent one million rupee. Literacy reduces poverty though its impact on greater nonfarm employment increased wage and total factor productivity.

Srinivasan (2002) examines recent research and suggests that although liberalization has made significant strides in helping the Indian economy, it has not had an equally strong impact on poverty since reforms have hardly touched the agricultural sector.

Sumir Meghani (2003) examined rural poverty in fifteen Indian states, using poverty estimates derived from Seven National Sample Surveys (NSS) rounds conducted between 1983 and 1994. It distinguishes between farm and Non form growth, focusing on the factors that drive the former. The agricultural productivity can play a crucial role in reducing poverty, when combined with strong human development in the form of increased literacy. Pro-poor effect is strengthened. The absence of a
significant level of poverty reduction during the last decade may be reflected by a slowdown in the primary sector, especially with in India’s poorest states.

Richard Palmer-Jones and Kunal Sen (2003) estimated that the role of agro-ecological factors associated with agricultural growth and poverty outcomes in India. Using a new operationalisation of agro-ecological factors and incorporating within- State variations in poverty and other variables, they showed that agricultural growth and poverty reduction appear to depend on underlying agro-ecological conditions which are favorable to the spread of irrigation and, hence, agricultural development, which, in turn, is associated with poverty reduction. Promotion of agricultural growth, even if the effects of agricultural growth on poverty remain similar, unless conditions for irrigation are favorable it rainfall is sufficiently abundant and reliable. That suggests that considerable caution may be needed in drawing policy conclusions from empirical analysis by state alone, and without regard to their underlying factor endowments.

Rudra Prakash Pradhan (2008) examines the trends and determinants of rural poverty in Indian economy using NSS data. He finds rural poverty has substantially declined in India but varies with respect to time periods and across its states/regions. He used double-log function form for following an empirical investigation for the period 1978-88 to 1999-2000. He finds that India’s rural poverty was significantly influenced by per capita development expenditure, per capita GDP, agricultural GDP, CPIAL, real agricultural wage and irrigation, while CPIAL exert a positive causal influence on rural poverty, all others negatively influenced the same as shown below.

In the above table the estimated coefficients are in elastic form. The estimated coefficients indicate that increase per capita development expenditure does exert a strong downward pressure of rural poverty with an elasticity of 0.666. Similarly, for every one percent increase of per capita GDP, agricultural GDP, rural poverty is reduced by 0.28, 0.384, 0.43, 0.28, and 0.172 per cent respectively. Among them, the influence of per capita development expenditure is considerably high and is followed by real agricultural wage, per capita GDP, agricultural GDP, irrigation and rural literacy. This has been judged as per the values of t-statistics and their contribution to declining rural poverty, is expressed in the form of elasticity. The factors, which affecting India’s rural poverty positively are CPIAL and rural road, while the former
is statistically significant. The estimated coefficient indicates that every one percent decline (increase) of food price leads to lessening (increasing) of rural poverty by 0.363. The coefficient of determination ($R^2 = 0.774$) reflects that about 77 per cent of the systematic variation of India’s rural poverty is explained by these determinants during the period of their study. The $F$-test justified the class of models. It indicates that $R^2$ is statistically significant at 1 percent level.

<table>
<thead>
<tr>
<th>Determinants</th>
<th>estimated coefficients</th>
<th>t-statistics</th>
<th>significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.106</td>
<td>6.406</td>
<td>0</td>
</tr>
<tr>
<td>PCDEVEX</td>
<td>-0.666</td>
<td>4.265</td>
<td>0</td>
</tr>
<tr>
<td>RAW</td>
<td>-0.43</td>
<td>-2.959</td>
<td>0.005</td>
</tr>
<tr>
<td>IRR</td>
<td>-0.278</td>
<td>-2.91</td>
<td>0.006</td>
</tr>
<tr>
<td>PCGDP</td>
<td>-0.258</td>
<td>-2.161</td>
<td>0.036</td>
</tr>
<tr>
<td>AGGGDP</td>
<td>-0.384</td>
<td>-2.029</td>
<td>0.049</td>
</tr>
<tr>
<td>CPIAL</td>
<td>0.363</td>
<td>2.001</td>
<td>0.052</td>
</tr>
<tr>
<td>RROAD</td>
<td>0.0958</td>
<td>1.203</td>
<td>0.236</td>
</tr>
<tr>
<td>RLIT</td>
<td>-0.172</td>
<td>-0.861</td>
<td>0.394</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.774</td>
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</tr>
<tr>
<td>$F$</td>
<td>17.974</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Note: PCDEVEX: Per capita Development expenditure; IRR: Area under irrigation; RLIT: Rural literacy; RROAD: Rural road; AGGR: Agricultural growth; PCGDP: Per capita GDP; $R^2$: Coefficient of Determination; F-statistics.

The results show that India's rural poverty had been influenced by per capita development expenditure, real agricultural wage, per capita GDP, agricultural GDP, CPIAL and irrigation. While the impact of CPIAL on rural poverty was positive, all other variables are negative and exaggerated the same during the reference period. The implication of this result is that an increase of these factors (except CPIAL) leads to decline in the incidence of rural poverty in the Indian economy. But in view of the positive association between CPIAL and rural poverty, we can represent that an increase (decrease) of food price leads to increase (decrease) the prevalence of poverty, rural road and rural literacy reduces it. While the former has negative impact on rural poverty, the latter has positive impact on the same. But both are not at all significant statistically. Considering the positive alliance between rural road and rural poverty, we can state that an increase in the intensity of rural roads can influence the incidence of rural poverty indirectly through growing rural non-farm employment. This is because rural road and rural non-farm employment are positively coupled with each other in the Indian economy.