Chapter-II

REVIEW OF LITERATURE

The outcome of research inquires, accomplished through systematic thinking, factual observations and past experiences, becomes a sound base of knowledge for the future research to be undertaken, because such inquires are always undertaken on the basis of past acquired and accumulated knowledge in the concerned field. As such, before initiating any study, an insight into the related studies is of utmost importance, because the primary function of review of literature is to reveal the nature and ascertain the level of theoretical and empirical framework already applied in related studies for setting the guidelines in developing scientific methodology and new dimensions for future research. To accomplish this task, therefore, the research work already conducted relating to agricultural investment have been critically reviewed in the ensuing section.

Agricultural investment is an expenditure to generate capital, which consists of both tangible goods (like tools and implements, irrigation structures, etc.) and intangible goods (like research and education, skill development, etc.). Investment in agriculture comes from two sources i.e. public sector and private sector. The public investment comes from government sector while, the private investment comes from farm households and corporate sector.

Plethora of the studies on micro-level analysis of agricultural investment are available in literature where in many studies revealed that farmers invested higher proportion of total farm investment on purchase of land and its improvement as this investment was considered to be a gainful expenditure (Waghmare and Marali, 1971,
Goswami and Saikia, 1972, Sinha and Kumar, 1996). While few other researchers found that livestock and farm buildings form the major items of household investment (Kalla, 1978, Sharma, 1987). It was also found by researchers that comparatively higher investment on progressive farms was made on irrigation structures and modern farm equipments while, in back ward areas the investment was mainly on livestock and traditional farm assets (Desai, 1969, Shah, 1972, Singh and Patel, 1972, Garg et al., 1996, Bhuvaneshwari and Alagumani, 1996). Since the major emphasis of the present study is to analyse the behaviour of agricultural investment at macro-level, therefore, the studies that examined the behaviour and determinants of agricultural investment and its impact on agricultural growth and development within and outside the country, have been reviewed and presented in the ensuing sections under the following four sub-headings:

- Trend, composition and magnitude of agricultural investment
- Impact of investment on agricultural growth and rural development
- Relationship between public and private investment
- Problems and constraints in agricultural investment

2.1 TREND, COMPOSITION AND MAGNITUDE OF AGRICULTURAL INVESTMENT

Gonzalez (1987) found that whilst agriculture contributed 22 per cent to gross domestic product in 1983 to 1986, its share of investment was 7.5 per cent to 10 per cent, indicating low priority given to the sector. Agricultural investment runs at 1.3 per cent to 2 per cent of agricultural gross domestic product, whilst in the economy as a whole it reached 3.2 per cent to 4.8 per cent over the same period. The rate of increase of the investment budget also showed discrimination against agriculture, with 28.3 per cent annual growth rate in agricultural investment, as compared with 40 per cent for the whole economy.
Shetty (1990) analysed the time series data of agricultural investment in India and found that since 1960-61 to 1987-88 gross capital formation in agriculture at 1980-81 prices, which was steadily rising during the decade of the 1960’s became relatively subdued during the first half of the 1970’s, thereafter it got momentum during the second half of the decade till 1979-80. Since then, it has been persistently declining in absolute terms. Thus, over the decade of 1960’s, gross capital formation in agriculture (at 1980-81 prices) rose at compound rate of 6.3 per cent per annum and over the next decade of 1970’s, it rose at the rate of 5.9 per cent per annum. But, during subsequent seven years (1981-88), it declined at an annual growth rate of 2.6 per cent.

Kumar (1992) in a study on falling agricultural investment in Indian agriculture and its consequences revealed that neglect of agriculture, an important sector was likely to have an adverse impact on economy of India. Such neglect had been observed as a result of fall in agricultural investment during eighties. The study pin-pointed that if the present trends of investment policy were continued in the country, then large-scale imports to meet the domestic demand may become imperative despite high imports food prices that would adversely hit the poor most of the country.

Mallick (1993) analysed the trends in capital formation in Indian agriculture and factors underlying these trends using time series data from 1950-51 to 1989-90.
He observed that there has been a noticeable deceleration in gross capital formation in the 1980’s. To large extent, public and private investments were complementary, rather than substitutes for each other and thus, falling public investment may be affecting private capital formation. He stated that there is considerable scope for improving the impact of public expenditure in the sector by reducing subsidies, by focusing expenditure on smaller array of programmes and services, urgent priority areas, increase cost recovery, control recurrent expenditure and strengthen sectoral management and budgeting.

**Dolgiev (1995) in a study of investment in agriculture in Russia, observed that annual investment in agriculture needs to be increased from 11 million roubles in 1994 to 110 million roubles by the year 2000 (1991 price basis) in order to establish necessary infrastructures for storage and processing of agricultural produce, livestock production, agricultural services and rural development.**

Gandhi (1996) examined the behaviour of aggregate private investment in agriculture over the period 1952-53 to 1992-93. The results indicated substantial changes in investment in the post 1980’s period. Government investment which was almost continuously rising until the early 1980’s showed a decline which continued even beyond the mid-eighties to 1992-93. Between 1980-81 to 1986-87, private investment has fluctuated and also showed some decline. However, after 1986 private investment increased and continued to rise quite sharply to 1992-93 and compensated for the decline in government investment thus, making the growth of total investment positive.
Misra and Hazell (1996) examined the time series agricultural investment in India. They observed that in 30 years series, during the first 20 years (i.e. 1960’s to 1970’s), public and private investment both have shown increasing trend but, in the later 10 years (i.e. 1980’s), the public investment declined while as, private investment increased persistently. The correlation between public investment and terms of trade and technology were also not high enough to influence the coefficient of each other in the multi-variate regression analysis of private investment.

Khatkar and Singh (1996) while studying the pattern of capital formation in Indian agriculture from period-I (1965-66 to 1979-80) to period-II (1980-81 to 1992-93), observed that the declining growth rate of public sector investment (-4.36%) was higher than the positive growth rate in private sector investment (3.25%) in period-II. The priority areas of private sector investment in a majority of the states were agricultural implements (about 46%), irrigation (about 30%) and land improvement (about 15%). They further observed that there was an urgent need to increase more investment in agriculture both in public and private sector to earn more foreign exchange owing to globalization of agriculture and to sustain the pace of agricultural growth for feeding the ever increasing population.

Singh et al. (1996) in a spatio-temporal analysis of capital formation on Punjab farms found that investment on fixed farm assets (except on draft animals) has continuously grown on almost all farm situations in the state both at current and constant prices over the period from 1971-72 through 1991-92. They pointed out that the relatively low increase in investment on farm machinery and equipments on the large farms indicates the saturation stage of mechanization, which led to decline in investment on draft animals on all the farm size categories.
Banerjee (1996) attempted to explore a new strategy of capital formation in Indian agriculture. He observed that there has been substantial public investment in agriculture in the seventies but, this has declined in the eighties and consequently private investment also showed some decline. He suggested that public investment in agriculture, long confined largely to high-tech irrigation projects have now to be diversified in high value short gestation projects. Infrastructure, technology, energy, marketing and communication sub-system are important areas, which call for extensive public investment for diversified agricultural production.

Tripathi (1996) while studying capital formation in different subsistence hill farming systems of Uttar Pradesh, observed that the investment on farm buildings increased at an annual rate of 14.4 per cent in high-hills, 14.2 per cent in mid-hills and 10.3 per cent in valley farming systems from 1984-85 to 1994-95. The capital investment on irrigation structures increased at an annual rate of 30.5 per cent in mid-hills and 15.3 per cent in valley situation during same period. Investment on livestock increased at 8.7, 15.5 and 19 per cent per year during corresponding period in high-hills, mid-hills and valley farming situations, respectively. The regression analysis indicated sufficient scope to increase fixed capital investment in the mountain farming system of Uttar Pradesh.

Pal et al. (1996) studied capital formation in Indian agriculture and found that capital formation in Indian agriculture has been declining since 1980. The retrogression in the public investment was mainly responsible for such decline. Though, public investment has been declining, private investment has not followed such pattern. They further observed that public initiatives was not always a determining factor of private investment as it takes place in alternative farms.
Janaiah (1996) analyzed the trend in capital formation in Indian agriculture. He observed that ratio of capital formation in public sector to private sector widened from 1:1.9 (1965-66) to 1:3.75 (1994-95), implying a declining trend in the share of public investment in agriculture. On the whole, the growth in public investment declined at a faster rate than in private investment over the period. He further pointed out that the existence of complementary relationship between investment flow and output level was a warning signal to increase investment in agriculture on one hand and to generate more agricultural output by using peasant resources efficiently and judiciously on the other hand.

Dinger (1996) examined the trend and determinants of capital formation in Indian agriculture. It was observed that the trend in public sector investment declined after 1980-81 while, the trend in private investment showed an increase for the whole period. The percentage share of public sector in total investment declined from 38.73 per cent in 1980-81 to 26.98 per cent in 1990-91, whereas, the percentage share of private investment increased from 61.27 per cent to 73.02 per cent during the same periods. It was concluded that without adequate investment on capital, agriculture cannot make substantial contribution to economic development of the country.

Namboodiri (1996) in his study on the magnitude of investment in Indian agriculture, observed that there has been a significant decline in the share of investment in agriculture to gross capital formation. It declined from 26 per cent during early 1950’s to roughly 10 per cent during the early 1990’s. The ratio of capital formation in agriculture to agricultural gross domestic product has also set a declining trend since the early 1980’s. Government expenditure in agriculture has dropped from over 43 per cent until the early eighties to 25 per cent during early nineties and this decline in public capital formation in real terms could be attributed to both
declined government expenditure in agriculture and the expenditures in favour of special programmes.

Mukharjee (1996) found that investment in agriculture at constant prices revealed 3 distinct types of trend i.e. a rising trend between 1960-61 and 1978-79, falling trend between 1979-80 and 1986-87 and finally and upward trend, which lasts upto 1993-94. Since, 1986-87 till early nineties capital formation in agriculture follows the rising trend whereas aggregate investment reflects a declining tendency. The relative share of agricultural investment declined from 16 per cent during 1960-61 to 7.50 per cent during 1990-91, which later showed slight improvement up to 9.27 per cent in 1993-94.

Dhawan and Yadav (1997) studied the trends and determinants of public investment in Indian agriculture and observed that though nominal public investment in agriculture has tended to rise year after year but in real terms, it has tended to diminish in absolute magnitude since the beginning of the 1980’s. Thus between 1980-81 and 1991-92, the value of net fixed capital formation on government accounts in agriculture (at 1980-81 prices) fell from Rs 1528 crores to Rs 581 crores, indicating a reduction of the order of 62 per cent as compared to 3 per cent reduction realized by gross fixed capital formation on government accounts in agriculture in the same period.

Singh (1997) in his rapperteur’s report stated that both the public and private investments in agriculture in real terms have been increasing up to 1980-81 and the complementarity between the two was confirmed. But later during 1980-92, public investment declined in real terms and the private investment, though fluctuating some what up to 1986, increased rather quite sharply thereafter.
Pal and Singh (1997) developed and analyzed a data base of investment on agricultural research, extension and education, containing state wise data since 1960-61 in India. They observed that India was spending 0.42 per cent and 0.20 per cent of agriculture gross domestic product on research (excluding education) and extension, respectively. These intensities are very low in comparison to those in developed nations. Most of the investments were made by government; the share of private investment was only 15 per cent in research and 8 per cent in extension. There was positive association between research and extension investments. Rural literacy and demand for agricultural commodities has significant positive effect on research and extension investment.

Pardey and Beintema (2001) stated that globally public expenditure for agricultural R&D almost doubled from 1976 and 1996 (at 1993 international prices), and developing countries now contributed the greater share (56% of total). The intensity of public spending on R&D was much higher in developed countries than poor and developing countries. Private sector spent an estimated 11.5 billion dollars on agricultural R&D in 1995, which covers only a small subset of the needs of poor and mostly complements, rather than substitute for continued public and other non-profit research.

Chand (2001) in a state level analysis of trends and issues of public and private investment in Indian agriculture observed that there was a widespread decline in public sector capital expenditure in agriculture in all the states. The decline was not confined to investment in irrigation projects only but, it was rather sharper in other heads related to agricultural development. The author suggested that the declining trend in public sector agricultural investment should be reversed by increasing allocation in all the major states to check the adverse impact on
agricultural output. There was also a need to improve the efficiency of public investment in agriculture so that they serve the intended purpose.

Anonymous (2001) examined the investment gap in African agriculture. It was concluded that aid and public investment in agriculture have generally declined. It has remained stagnant in absolute terms, fallen sharply in per capita terms since 1980’s. The declining trend in public investment also affects private investment. Improving the environment for private investment was of critical importance through a combination of regulatory reforms. Improving public spending on infrastructure may pay in terms of boosting agricultural growth and rural development.

Anonymous (2003) in the “Indian Agricultural Policy: Vision 2020”, stated that the public investment in agriculture has been declining and was the main reason behind the declining agricultural productivity and low capital formation in agricultural sector. Private investment in agriculture has also been slow and must be stimulated through appropriate policies. Accelerated investment is needed to facilitate agricultural growth and rural development.

Chadha and Sharma (2005) in their study, “Liberalizing Indian agriculture”, observed that broad trends in agricultural investment revealed a decline in the gross capital formation (GCF) in agriculture since the 1980’s. They attributed the decline in overall investment in the sector to a decline in the rate of public investment vis-à-vis that of private investment in agriculture. However, growth in the rate of private gross capital formation has been inadequate to stem the fall in aggregate gross capital formation in Indian agriculture. The share of agriculture in total gross capital formation fell from 14.3 per cent in 1970-71 to 7.5 per cent in 1999-2000 and further to 5.6 per cent in 2002-03. They concluded that several measures are required to
improve growth outcome including increase in the level of investment in agricultural sector.

Braun *et al.* (2005) in a strategic paper, stated that since early 1980’s public investment in Indian agriculture has experienced a secular decline. With shrinking public investment the growth impetus for agriculture has also been declining. Private investment in agriculture has been rising, yet it has not fully compensated for the loss from the falling public investment. The first among various strategic decisions must be to raise the level of public investment in agriculture and rural infrastructure. This move would also help unleash private sector investment, which complements public investment.

**2.2 IMPACT OF INVESTMENT ON AGRICULTURAL GROWTH AND RURAL DEVELOPMENT**

Rao (1977) explored the relationship between agricultural growth and rural poverty in India. He observed that there was a strong complementary relationship between agricultural growth and employment generation in Indian agriculture because of the existence of large under-utilized resources. He further suggested that the public investment should be increased in the rural sector in projects which can be directly undertaken by the government and which exploit complementarity between public and private investment.

Rao and Stern (1978) in the world development report stated that unless economic growth in the developing countries can be substantially accelerated, the non inevitable increase in population will mean that the numbers of the absolute poor will remain high even at the end of the century. Poverty alleviation depends overwhelmingly on increasing agricultural productivity, particularly among small
farmers, and the output in parts of Asia can be increased rapidly by stepping up irrigation investment.

Srinivasan (1978) pointed out that the present comfortable position in food and foreign exchange in India would permit initiation of policy changes in the agricultural sector, which would help to realize a vigorous and faster growth in other sector. Attempts to raise agricultural growth as well as employment generation would have substantial impact on poverty abatement and public investment in agricultural has a major role to play.

Kim et. al. (1988) studied the investment direction on agricultural development in Korea. They observed that investment on research and development for agriculture would create new technologies and it would raise the productivity of agriculture. Hence, in this way investment in agriculture has much importance in the growth of individual farms and national economy.

Pardey and Craig (1989) examined casual relationship between public sector agricultural research expenditure and output. The results indicated significant correlation between research expenditure and output and the impact of research expenditure on agricultural output may persist for as long as thirty years. Further it was suggested that simultaneity issues should not be ignored while modeling research and expenditure-output relationship.

Cavassa et. al. (1995) analyzed the impact of new technologies on a number of variables like soil productivity, resource allocation and family income in Ponacanchi-cusco basin in Peru. They found a clear relationship
between the investments made and the higher income realized. Researchers concluded that with investment programmes oriented towards rural development, it was possible to facilitate the growth of farm economy.

Cleaver and Donovan (1995) examined the agricultural scenario in sub-Saharan Africa over the past five years. They found that most of Africa’s poor live in rural areas and depend on agriculture for survival. Consequently, growth of agriculture and agricultural income helps the rural poor and hence alleviate poverty. However, the major problems were poor economic conditions, agricultural policy and inadequate public investment on infrastructure, rural education, agricultural research and education and rural health. It was also found that poor public investment has led to a lack of private investment in farming, input supply and processing.

Heidhues (1996) conducted a study on” Food security in developing countries” and observed that while the production potential of industrial countries was probably able to meet food demand of the growing world population, it was imperative for political, economic and social reasons that developing country should provide for their own food security. This was only achievable if investment in agricultural research and the development of innovations was considerably increased.
Rai *et al.* (1996) analysed the impact of public sector investment on revenue account in agriculture and suggested that fall in the agricultural investment need to be arrested not only to meet the food requirement of growing millions but, specially in our present efforts to make Indian agriculture globally competitive. The shift in investment resources away from agriculture to non-agriculture may not result in a faster growth in total gross domestic product on account of the higher ratio of gross domestic product from agriculture and its investment as compared to the economy as a whole.

Singh (1996) examined the relationship between investment in agricultural research and agricultural output. The study revealed that the investment in agricultural research in Gujarat state has grown at an annual growth rate of about 12 per cent and yielded a maximum return after a time lag of four years. Researcher found that the average estimated return to each rupee of investment on research ranged from Rs. 12 to Rs. 56 in different aggregate production functions with different forms of equations and combinations of explanatory variables. The higher return to farm research suggest that the investment on agricultural research was remunerative and should be increased from existing level of 0.37 per cent of agricultural state gross domestic product to about one per cent.

Alagh (1997) in his inaugural address at the 56th annual conference of the Indian society of agricultural economics raised issues concerning agricultural growth in India and explored problems of investment in the Ninth Plan. He emphasized that private and public investment need to be increased for having sustainable growth of Indian agriculture.

Reardon *et al.* (1997) while exploring the factors for promoting sustainable intensification and productivity growth in Sehal agriculture after macroeconomic
policy reform, observed that while partial intensification was already achieved, too little investment was occurring in land improvement and inputs. They concluded that the implementation of macroeconomic policy reforms along with substantial public and private investment on agricultural research, human capital, production and marketing are means for full intensification in agriculture.

Evenson et al. (1999) observed that private sector in India were also engaged in extensive research and development relevant to agriculture and has increased its investment rapidly over time. Several type of investment has been found associated with and contributed to the growth of total factor productivity (TFP) in agriculture. Public agricultural research investment accounts for nearly 40 per cent of TFP growth between 1956 and 1987. Investment on agricultural extension programme and improved rural market has also contributed to the growth of TFP. Irrigation investment generated TFP growth over and above the contribution to output growth that irrigation makes as conventional input. The return to public research investment increased substantially because the output from the research investment was realized more rapidly. They suggested that investment in these productivity enhancing activities should be increased substantially.

Kalaitzandonakes (1999) studied the role and interaction of the public and private sector in U.S. It was observed that the estimated average return on public investment for agricultural research and technology transfer in the U.S. was over 30 per cent, which was high by any standard of investment efficiency. Benefits for consumer have came in various forms including low priced, high quality and safe food. Government should invest much as private sector got less benefit out of it. He concluded that the structure of private-public interaction and the relevant institutional
environment in which such interaction occurred have meaningful effects on their efficiency and effectiveness.

Fan et al. (2000a) used a simultaneous model for time series and cross sectional data to analyse the differential impact of different types of public investment on growth and poverty reduction in rural China. The results revealed that expenditure on education has by far the largest impact on poverty reduction and the second largest impact on production growth. Government spending on agricultural research and extension has the largest impact on agricultural growth and third largest impact on poverty reduction. The next best investment was rural telecommunication with second and third largest impact on poverty alleviation and agricultural growth, respectively. The results also showed that there exist an opposite relation between agricultural growth and poverty.

Fan et al. (2000b) developed a simultaneous equation model to estimate the direct and indirect effect of different types of government expenditure on rural poverty and productivity growth in India. The results showed that in order to reduce rural poverty, the Indian government should give highest priority to additional investments on rural roads and agricultural research and education. These types of investment not only have much large impact on poverty than any other government investment but, also generate higher productivity growth. Other investments (including irrigation, soil and water conservation, health, rural and community development) have only modest impact on growth and poverty per additional rupee spent.

Fan and Hazell (2000) analyzed the impact of investment in irrigated and high and low-potential rainfed areas in India. The researchers observed that in order to promote economic growth and to redress poverty, policy-makers in developing countries (like India) will need to promote agricultural intensification for high and low-
potential regions. This dual strategy will be particularly challenging if government budgets for investment in agriculture and rural areas continue to remain tight and striking the right investment balance between irrigated and rainfed regions and between high and low-potential rainfed areas will be particularly important. It was further suggested that investment on rural infrastructure, agricultural technology and human capital were at least as productive in many rainfed areas as in irrigated areas and they have much large impact on poverty. Greater public investment in some low-potential areas could actually offer a “win-a-win” strategy for addressing productivity and poverty problems.

Fan et al. (2000c) developed and empirically estimated a model that quantifies the impact of government investment on productivity growth and poverty reduction for different types of agro-ecological zones in India. Results showed that improved technology and rural infrastructure have made important contribution to agricultural growth and poverty alleviation in recent decade. However, the marginal impact of investment on these items has varied widely between irrigated and rainfed areas and across different types of rainfed zones. They observed that as investment in irrigated area continue to increase, their marginal returns diminish, and it is now in many of the rainfed areas, including some of lower agriculture potential areas, where marginal return to additional government investment on infrastructure and technology were largest. They further highlighted the importance of selecting the right type of investment as well as the right regional priority if the government has to made best use of its scarce resources in achieving growth and poverty alleviation goals.

Anderson and Lorch (1999) observed that most of the world’s poor were rural-based, engaged directly or indirectly in agricultural activities. Agricultural growth is a catalyst for broad based economic growth and development in most low-income
countries. Accelerated public investments are needed to facilitate agricultural growth and poverty alleviation. Investment on agricultural research is particularly urgent for low-income developing countries, partly to increase agricultural productivity through efficient use of resources and partly to undertake further research.

Murgai et al. (2001) examined the critical issues in the long term productivity and sustainability of irrigated agriculture in the Indian and Pakistan Punjab by measuring trends in the total factor productivity (TFP) for production system in both states, since the advent of Green Revolution. The study confirmed that India has experienced much higher growth of yield of food-grains. However, the results revealed that most of India’s higher growth was due to the more rapid growth of input use while, investment (both public and private) played a central role in productivity growth. The researchers found that there was a considerable lag between investment on infrastructure and the realization of production growth in both Punjabs. The findings revealed the need for policies that promote agricultural productivity and sustainability through public investments (in education, roads and research and extension) that reduces resource degradation by decreasing or eliminating subsidies that encourage more input use.

Roy and Pal (2002) conducted a study in India to analyse the impact of agricultural investment on agricultural productivity and rural poverty. They observed that agricultural productivity growth is central to alleviating poverty and infrastructural and technological changes are, in turn central to this process. This requires not only change in institutional policies but, also enhancement of public and private investment in agricultural research, rural infrastructure including roads, marketing, storage and irrigation. They pointed out that investment is a better instrument than subsidies in agriculture and whatever subsidies to be provided it should be targeted
to the poor and backward regions. The role of human capital and agrarian reforms are critical, as these have direct and indirect effect on agricultural productivity and rural poverty. They further suggested that in view of financial austerities of government, incentives to farmers should be improved to enhance private investment in agricultural sector.

Anonymous (2002a) stated in the consultation issue paper that agriculture has performed well in the past and agricultural growth can and does reduce poverty and inequality, making specific contribution as measured by progress towards achieving the millennium development goals (MDGs). He pointed out that policies should be directed to create climate that encourage private sector investment in agriculture and agricultural services, which are of crucial importance, through a combination of regulatory reforms, institutional development and complementary physical investment.

Kydd (2002) in the study,” Agriculture and rural livelihood: Is globalization opening or blocking path out of rural poverty”, highlighted that continued investment in public sector agricultural research was required as it pave the way for agricultural growth and rural upliftment. While, the private sector investment was found to address many of needs of smaller-holders.

Anonymous (2002b) examined the declining rural poverty in India and China and revealed that to achieve further rounds of poverty reduction and agricultural growth, India and China should increase investment on rural infrastructure, roads, education and agricultural research and development. It was also pointed out that investment in less-favoured lands in India and China made a stronger contribution to poverty reduction than spending in developed areas.
Zhang and Fan (2004) developed a method for decomposing the contribution of various types of public investment to remove regional inequality and applied the method to rural China. Public investment was found to have contributed to production growth in both the agricultural and non-agricultural sector. They found that all type of investment in the least developed western region reduce regional inequality, which may have great role in reducing poverty. They concluded that additional investment on rural education and agricultural research and development in the western regions has the largest impact in reducing regional inequality.

Zhu (2004) examined the effect of public investment in irrigation and agricultural research on the agriculture output in China in crop specific manner, by taking agricultural research and irrigation as proxy. The analysis revealed that increasing public investment on agricultural research will bring about higher output. He suggested that increasing public investment on agricultural research and development, etc. should be considered with high priority in future, so that it could be utilized as a policy tools to enhance long term food security.

Fan et al. (2004a) studied the impact of different types of government expenditure on agricultural growth and rural poverty in Thailand. The results showed that despite Thailand's middle-income status, public investment in agricultural research and development, irrigation, rural education, and infrastructure still have positive marginal impact on agricultural productivity growth and poverty reduction. The poverty reducing impact of infrastructure was high than irrigation investment. They suggested that the future irrigation investment should be geared towards improving the efficiency of existing irrigation system through reforming pricing incentives and through the institutions that manage irrigation water.
Fan et al. (2004b) estimated the effect of different type of government expenditure on agricultural growth and rural poverty in Uganda. They observed that government spending on agricultural research and extension improved agriculture production significantly and has larger assessed impact on poverty reduction. Government spending on rural roads, education has substantial marginal impact on rural poverty. Additional investment in northern region (a poor region) contribute the most to reduce poverty, however, in the western region, most type of investment have highest return in terms of increasing agricultural productivity.

Kumar (2005) studied the constraints facing Indian agriculture and the path ahead in reorienting both agricultural policy and practice to the changing circumstances. He highlight the following major areas for the development of Indian agriculture: land market and agricultural labour, rural unemployment and poverty; capital formation and investment; farm input supply and availability; access to agricultural credit; and agricultural extension network.

2.3 RELATIONSHIP BETWEEN PUBLIC AND PRIVATE INVESTMENT

Wagle (1994) estimated function for private investment in Indian agriculture. The analysis revealed that with regards to investment in agricultural sector 1 per cent rise in the relative price of agricultural product strengthens investments in agriculture by 0.94 per cent in short run and 1.93 per cent in long run. Public investment also strengthens private investment. During 1961-62 to 1979-80, government investment in agriculture as percentage of gross domestic product increased, thereby strengthening private investment. The share of government investment however, declined during the 1980’s thus, explaining the slow down in private investment.

Dhawan and Yadav (1995) studied the private fixed capital formation in agriculture and observed that Indian farmers allocated a rather small proportion of
their total capital funds (owned and borrowed) towards fixed capital formation in agriculture. They found that private fixed capital formation was positively associated with public investment in canal irrigation. In view of this fact the absolute decline in real public investments in irrigation in practically all the Indian states during the 1980’s might have \textit{ceteris paribus} diminished fixed capital formation in agriculture on private accounts, which affirms the thesis of complementarity between public and private investment as bulk of total investment was on irrigation.

Jairath and Purohit (1996) established the link between public and private sector capital formation in Rajasthan and assessed their relative importance in agricultural growth. The higher degree of complementarity between public and private investment suggested that there was an urgent need to enhance public investment in the agriculture sector, which in turn will influence private capital investment in the agriculture sector. Further the improvement of private farm investment calls for change in the incentives to farmers.

Pendse \textit{et al.} (1996) studied the relationship between public and private capital formation and observed that there exists a high degree of complementarity between public and private capital formation in agriculture. This would mean that if the declining trend of public sector capital formation will not be reversed, the prospects of agriculture growth in the country were dim.

Rai \textit{et al.} (1996) examined the trends and growth in the level and composition of investment, overall and separately by public and private sectors. The study revealed that both public and private sector investment in agriculture after a modest start in 1960’s increased steadily during the 1970’s but declined thereafter, leading to an absolute fall in investment. However, the private sector investment remained
stagnant during 1980-81 to 1991-92, due to the complementarity between public and private sector investment.

Misra and Hazell (1997) while analyzing the determinants of private investment in Indian agriculture observed that in phase 1960-67 to 1980-81, public investment was an important factor in explaining the variations in private investment. But, in modernized phase (1981-82 to 1993-94), the reversal has taken place in the sense that other factors like terms of trade and technology became important factors in explaining variations in private investment and it lacks complementarity with public investment.

Dhawan (1996) while studying the trends and determinants of capital investment in agriculture pointed out that public investment in major irrigation works could stimulate private investment in agriculture through the price route. This mechanism of inducing private farm investments applied to all public expenditures and the duration of such inducement effect would obviously be more for public investment with higher gestation period.

Karmakar (1998) discussed the growth trends in capital formation in agriculture in both the public and private sector in India. He pointed out that as public investment in agriculture has been declining, the private sector has also showed declining trend. Private investment in agriculture was determined by three factors viz. complementarity between public and private investment, technology and terms of trade. The falling role of public investment in agriculture was due to the falling sectoral allocation in the National Plans, increasing in recurring expenditure, and partly due to under utilization of irrigation potential created mainly through medium and major irrigation projects. He suggested that the decline in capital formation in agriculture could partly be off-set through increased flow of institutional credit.
Gulati and Bathla (2002) studied the temporal behaviour and structure of public and private gross capital formation in agriculture (GCFA) in India. They observed that the public sector investments remained important for their inducement effect on private gross capital formation in agriculture (GCFA) and, therefore, a gross domestic product in agriculture.

2.4 PROBLEMS AND CONSTRAINTS IN AGRICULTURAL INVESTMENT

Baltas (1983) formulated a simultaneous model to describe demand for credit and investment by Greek farmers. The level of credit was shown to have strong influence on investment particularly on farm buildings. He further observed that availability of credit may enhance investment while its unavailability constraints investment in agriculture.

Pilati (1986) formulated a demand function for investment (which takes into account a sub-division of financial resources into two groups i.e. self-financing of internal liquidity and external liquidity) to define the financial bottlenecks in the process of private fixed capital formation in agriculture in four main geographical areas of Italy. From the econometric analysis, it appeared that private investment demand was strongly influenced by financial constraints, though not in uniform manner over the whole country.

Kivistik and Sallinen (1993) in their study in Estonia observed that 98 per cent of the respondents considered the problem of lack of machinery and mechanization as major constraint on the capital formation and development of farm families. They suggested that priority should be given first to investment on tractor and machinery and then farm buildings for development of farm families.

Dhawan (1996) while studying the complexities of investment behaviour in Indian agriculture found that profitability of investment, uncertainties about expected
returns, risk associated with these and investor's risk taking capacity rendered investment decision-making a truly complex process in agriculture. He suggested that the process of investment in agriculture need to be carried out in a multivariate framework.

Mani et al. (1996) studied capital formation in Indian agriculture and observed that the public investment in agriculture which accounted for about one-third of the total investment has been declining in the last four years and it was the private investment which was playing a major role. The long term finance was not found sufficient and proportional to growth in short-term and medium-term finance, which constraints the agricultural capital formation adversely.

Prema and Thomas (1996) studied the constraints to the capital formation in farm households of Thrissur district, Kerala. They identified high consumption expenditure, non-availability of labour, high wage rate, low product price, high input price and lack of irrigation as the major constraints to capital formation in descending order of important.

Zheng (1996) while establishing a mechanism to safe guard agricultural development and ensure a steady rate of development of Chinese economy, observed that the factors that prevented steady agricultural development were the lack of sufficient investment in agriculture and lack of government policies to encourage and support such investment. Lack of foresight shown in seeking large profit, insufficient funds for research and development and national credit policies were other factors limiting investment in agriculture. He suggested that the ways in which these factors can be controlled to provide a basis for consistent development need to be explored.
Bastine and Palanisami (1996) estimated the cost of private investment in agriculture in the northern agro-climatic zone of Kerala and found that private investments in irrigation in small sized holdings are costly. Full utilization of water and pump capacity was constrained by smaller size of the farm. It was suggested that group investments should be encouraged to bring down the farm investment cost. Institutional credit has to be provided to motivate the farmers to go for irrigation investment.

Varadarajan and Sankari (1996) while studying the determinants of private capital formation in agriculture in Tamil Nadu found that the past saving, asset holding, area irrigated, productivity of land and priorities among investment opportunities are farm specific constraints of private fixed capital formation in agriculture.

Prakash and Srivastava (1996) studied the constraints and prospects of investment in agriculture and observed that the vicious circle of poverty, unfavourable environment, economic and technological backwardness, inequality in income distribution, demographic constraints, discriminatory government policies such as external trade restrictions, domestic price interventions, large subsidies, power consumed by the farmers and irrigation were some of the constraints responsible for low investment in agriculture. They suggested that the policy support for institutional credit, marketing and pricing of farm inputs and outputs were effective instruments to promote capital formation in agriculture.

Dinar and Keck (1997) attempted to identify the effect of several variables on public investment on irrigation in Columbia. They identified several variables as significantly affecting investment in general and irrigation investment in particular. Variables such as, government prices and credit policies affected the private
investment in irrigation across regions and overtime. Violence negatively affects private investment. Climate affects the investment such that in region with unfavourable climatic conditions, investment in irrigation is less attractive. They suggested that appropriate crop price and credit policies promote investment in irrigation.

Pender and Kerr (1998) investigated the constraints of farmer’s indigenous soil and water conservation investment in semi-arid tropics of India. They found that conservation investment was significantly lower on leased land and plots that were subjected to sale restrictions. Farmer’s education, caste, characteristics of plot and the presence of existing land investment were other factors that significantly effects investment on soil and water conservation. They suggested that policies should be made to promote investment in soil and water conservation.

Petrick (2004) analysed the effects of government promoted credit access on investment behaviour of credit-rationed farmers in Poland. The estimates revealed that access to subsidized credit has constrained investment behaviour of farmers. Furthermore, the magnitude of investment was negatively related to farm size. He suggested that a government policy which aimed to promote productive investment should emphasize lending in large amount without discrimination of small farmers.

It is amply clear from the review of literature that there has been a deceleration of public investment in agriculture while, the private investment has been increasing at increasing rate over the years. At the farm level, purchase of land, farm buildings, livestock and irrigation structures, etc. were the major items of private investment. The literature revealed that the agricultural investment bears direct relation with agricultural growth and rural development. It also improves the conditions of rural masses and shift the people from below the poverty line both
directly through various development schemes and indirectly through enhancing productivity of agriculture. Public investment in agriculture was found to hold complementary relation with private investment. Moreover, various problems and constraints thwarting investment in agriculture have been highlighted in different studies. Although, much work related to the present study have been carried out at national and international levels, yet scanty research of such kind pertains to Himachal Pradesh. The impact of agricultural investment on agricultural growth and rural development is very complex phenomenon as investment in agriculture affected agricultural productivity and rural poverty in multiple ways. Instead, much of the work on agricultural investment at the national level have ignored simultaneity between investments (public and private) and agricultural productivity. Moreover, previous studies were also criticized for their limited coverage of agricultural investment as these studies have completely left-out the investment on important heads of infrastructure. In the light of large number of factors influencing investment, an investigation needs to be conducted through a comprehensive framework to capture both direct and indirect impact of agricultural investment. Therefore, the present study, “Impact of investment on agricultural growth and rural development in Himachal Pradesh” has been planned to remove the above said loopholes of studies already conducted by constructing new broad series of investment in agriculture including investment on all possible heads.