Chapter – V

DISCUSSION

Logical interpretation of the results emerged out of the present investigation and their consistency with the past studies is of paramount value to put forth policy options. This chapter has been devoted to describe the results in a logical and conclusive manner. In consonance with the objectives, the discussion of the results of the study has been arranged under the following seven headings:

- General socio-economic profile of sample households
- Pattern of investment under different farming systems
- Structural changes in agricultural investment
- Capital use efficiency in agriculture
- Economic development, agricultural growth and incidence of poverty
- Determinants and impact of agricultural investment
- Problems and constraints thwarting investment in agriculture

5.1 GENERAL SOCIO-ECONOMIC PROFILE OF SAMPLE HOUSEHOLDS

5.1.1 General Information of the Study Area

In view of considerable variation in socio-economic features of farming community across different farming systems, it is obvious that these factors have a...
great bearing on the status of resource endowment, which determines their production system and investment behaviour.

It was observed that FTFS revenue villages have comparatively higher geographical area and consequently less population density. However, the proportion of area available for cultivation was found higher under FFS in comparison to VFS and FTFS. The lower proportion of cultivated area under FTFS in comparison to other farming system was due to hilly terrains and more undulating topography. It was observed that under all the farming systems, small farmers were dominating though, the proportion of large farmers was higher under FTFS. The dominance of small sized holdings in mountain was also reported by (Chauhan and Mehta, 2002, Jodha, 1992).

The non-workers under all the farming systems out numbered the working population as majority of population either belongs to young age group (below 15 years) or old age group (above 60 years). Thus, majority of members were either minor or too old to be able to work as labourers or cultivators. The pattern of working population indicated that around 50 per cent of workers were engaged in agriculture or related activities.

5.1.2 Land Holding and Utilization

Farming is a land based activity and, as such, size and type of operational holding plays a crucial role in making decisions regarding enterprise/crop mix. The average size of the holdings under FTFS (2.01 ha) was relatively higher than VFS (1.51 ha) and FFS (1.29 ha). It was interesting to note that there was dominance of small farmers under all the farming systems. This may be due to increasing tendency of nuclear family structure that give rise to sub-division of holdings over a period of time. Sharma et al. (1999) also confirmed the sub-division of holdings
caused by inheritance laws and tenancy reforms. However, the proportion of the operational holding was relatively higher under FFS as compared to VFS and FTFS. This finding was similar to some past studies (Sharma et al., 1997). They reported that the percentage of cultivated area to total owned area was higher under cereal dominated agriculture. About 92 per cent of the operational area under VFS was irrigated, which was higher in comparison to FFS (41.86%) and FTFS (36.36%). It indicated that VFS has comparatively higher endowment of water resources. Sharma et al. (2003) also recorded that the percentage of irrigated area was more under vegetable growing pockets of Himachal Pradesh. In other words, the irrigation facilities have promoted vegetable cultivation under this farming system.

### 5.1.3 Family Structure and Literacy Level

The educational status and structure of farm families are the indicators of human capital formation and production potential of an area. An educated family is better equipped to avail numerous opportunities/facilities made available to them. It was found that the average size of family was slightly higher under FTFS, which was in consonance with relatively higher proportion of joint family structure under this farming system. About 64 and 59 per cent of the families under FFS and VFS have nuclear structure, respectively. The tendency of newly married couple to live apart from their parents explains higher percentage of nuclear families in these farming systems. Further, the literacy rate was found more on VFS farms (86.50%) followed by FTFS (83.60%) and FFS farms (82.25%). This might be due to more thrust on human resource development under VFS farms.

### 5.1.4 Capital Formation in Farm Implements and Machinery

Farm tools and machinery form the capital stock used for farm operations and determine the efficiency and extent of mechanization of farming. It was observed
that the proportion of capital formation in the form of transport equipments was relatively higher under all the farming systems, though only few farmers in the study area were found to keep tractor and other power driven equipments. The low level of mechanization on all the farming systems might be due to the marginal holdings, undulating topography and non-availability of small machinery suitable under hilly conditions. Thakur and Sharma (1984) also pointed out low level of mechanization of mountain agriculture due to lack of innovation in the development of hill specific small tools and machinery. The proportion of capital formation in the form of cutting/harvesting and digging/hoeing tools was higher in case of FTFS. The value of implements and machinery per farm revealed better capital formation under VFS in comparison to FFS and FTFS, which was in consonance with more implements and machinery under this farming system. Singh (1980) also reported that assured irrigation in any area was complementary with mechanization and new technology and in turn capital formation in agriculture. Needless to mention, the irrigated area was higher under VFS as compared to FFS and FTFS.

5.1.5 Capital Formation in the form of Livestock

Since time immemorial, livestock formed an integral part of farming in hills. Being highly complementary with agriculture, practically all households were found to keep some animals to maintain food security, to carry on their agricultural operations and to augment their meagre income through sale of main and by-products. It was found that the proportion of capital formation in the form of cross-bred cows and buffaloes was higher under all the farming systems as the number of cross-bred cows and buffaloes were comparatively higher in the study areas. The higher number of improved cows and buffaloes might be due to availability of better breeds and better performance of these animals in hilly areas. Bullocks were also
kept at farms for ploughing and threshing in absence of tractors and threshers. The proportion of capital formation in terms of bullock was comparatively higher under VFS followed by FFS and FTFS. However, the number of bullocks was reported to be decreasing under all the farming systems, which was due to increasing use of mechanical power. Sharma et al. (2003) also revealed substitution of bullock labour with mechanical power in Himachal Pradesh. Per farm capital formation in the form of livestock was higher in case of FTFS farms, which was in consonance with higher number of animals under this farming system. The higher number of animal under FTFS might be due to the availability of natural grasses and fodder throughout the year as the area under forests/pastures was higher under this farming system.

5.1.6 Production System and Economics

5.1.6.1 Cropping pattern and yield levels and cropping intensity

The study of spatial distribution of crops helps in understanding the nature of production systems patronized by the farmers. Besides, the yield levels of different farm enterprises/crops show the production potential of the system. The cropping pattern and yield levels also reveal the status of farm diversification and economic well-being.

- Food-grain based farming system (FFS)

Higher proportion of operational area under this farming system was rainfed and heavy or unevenly distributed rainfall often leads to low yield or crop damage. The sources of irrigation under this farming system were natural kulhs although, few of the farmers also have constructed water harvesting structures. But, the seasonal nature of these irrigation sources also posed a problem. In view of these constraints farmers under this farming system preferred to go for the production of cereals crops. The common crops grown under this system were maize, wheat, paddy,
potato, cauliflower, ginger, etc. It was observed that about 78 per cent of the total cropped area was under cereal crops (Fig. 5.1). Among cereal crops, maize in kharif and wheat in rabi season were the predominant crops of the study area. These crops were mostly grown under rainfed conditions. Sharma and Tiwari (1985) also recorded predominance of maize in kharif and wheat in rabi season in different districts of Himachal Pradesh. Vegetables occupied second place in area after cereals. The vegetable crops were preferably grown under irrigated conditions under this farming system. Similar findings were revealed by Sharma, (2002).

The average yield of maize was found higher in comparison to other cereals. This might be due to the fact that rainfall distribution was better during kharif season and agro-climatic conditions also were favourable for maize production. Kumar (2001) also reported higher yield of maize than other cereals under both irrigated and rainfed conditions in hills of Himachal Pradesh. The yield of vegetables was found higher in comparison to other crops under this farming system. Singh and Bhati (1992) also stated that vegetable crops give much higher yield than cereals under irrigated conditions. The cropping intensity on farms of this farming system was around 200 per cent indicating thereby that farmers were generally growing two crops in a year.

- **Vegetable based farming system (VFS)**

Higher proportion of the operational area (92%) under this farming system has assured irrigation facilities. The major sources of irrigation were tube wells, canals, kulhs, etc. The abundant supply of irrigation water along with favourable soil type and climatic conditions has prompted vegetable cultivation under this farming system. Vegetable crops predominantly grown under this farming system, alone accounted for 65 per cent of the cropped area. Singh and Bhati (1992) also revealed
that because of natural niche and other favourable conditions, Himachal Pradesh has a vast potential for the production of vegetable crops, which have high pay-off. Among vegetable crops, maximum area was allotted to cauliflower and cabbage due to their higher productivity and returns. Cereal crops were found to be grown over 26 per cent of total cropped area. Among cereals paddy was major cereal crop of kharif season and mostly grown under irrigated conditions while, wheat was major cereal
crop of rabi season grown under both irrigated and rainfed conditions. This also supports the findings of study conducted by Kapila (1985). Her findings revealed that under irrigated conditions, higher proportion of total area was under paddy during kharif season whereas, 24 per cent of the total cropped area was under wheat during rabi season. The cropping intensity of VFS (228%) was higher in comparison to other farming systems. This was mainly due to multiple cropping of vegetable crops under irrigated conditions. Panday and Gaglani (1992) also revealed that cropping intensity was higher on irrigated farms as compared to unirrigated farms.

- **Fruit based farming system (FTFS)**

Under this farming system, higher proportion of cropped area was under orchards (59.87%), followed by cereals (25%) and vegetables (8.55%). The land topography was relatively undulating and irrigated area was also less. Besides, the soil and climatic conditions were favourable for production of various temperate and
sub-tropical fruits. Pant and Gautam (1990) also reported that agro-climatic conditions of mountains are conducive to fruit production. The average yield of mango was relatively higher among fruits. Vegetable crops were mostly grown under irrigated conditions. The yield of tomato was found to be higher in comparison to other vegetable crops.

To sum up, it has been observed that average yield of crops was relatively higher on VFS farms that might be due to better irrigation facilities, fertile lands, better use of improved inputs and technology.

5.1.6.2 Financial overview of crops

The economics of different crops irrespective of commercial yardstick would be very helpful in finding out the relative profitability of different crops in order to enhance the farm income under different farming systems. It was found that under FFS farms, ginger recorded higher gross as well as net returns followed by garlic. Thakur (2000) also reported higher relative profitability of spice crops. Despite this the proportion of area under ginger was found to be low as ginger is a labour and capital intensive cash crop due which it becomes difficult for the resource poor farmers to efficiently manage a larger proportion of area under this crop. Further, the continuous attack of serious diseases like rhizome rot and poor marketing facilities prohibited the farmers from allocating more area under this crop. Among cereals, paddy was quite profitable than other cereals. Among vegetables, onion and potato gave higher net returns in comparison to other vegetable crops. Gram among pulses and mustard among oilseeds recorded higher returns. In general, the vegetable crops grown under FFS were more profitable than cereals. This clearly shows the possibilities of enhancing farm income under FFS by increasing more area under vegetable crops.
Under VFS, garlic was found quite profitable in comparison to other crops. But, recently garlic farming has received a major set back due to the increased import from China. The Chinese garlic was found to be cheap, which resulted in its higher demand in main wholesale markets of our country. Garlic could be considered as major alternative among other commercial crops in the future, provided increasing production is matched with market development. Among vegetables, tomato was found to give higher returns followed by cauliflower and potato. In this way tomato and cauliflower enjoys comparative advantage over other crops. Needless to mention, the off-season nature of these crops ensures lucrative prices and higher returns per se. The higher profitability of tomato was also reported by Kumar et al. (2002). They concluded that per hectare net profitability was highest in tomato.

Under FTFS, dry fruits recorded higher returns followed by mango and orange. It was due to remunerative prices of dry fruits within and out side the state. However, the farmers were growing dry fruits on limited scale because of natural niche for raising this fruit crop across this farming system. Moreover, newly laid dry fruit orchards takes several years to come into bearing and requires higher initial expenditure. The lower returns from apple in comparison to dry fruits and orange might be due to higher price fluctuations in the market. Moreover, the frequent road blockade due to natural clamities in apple growing pockets of this farming system made the farmers to dispose-off bulk of their apple produce at lower prices. Paddy recorded higher returns among cereals while, tomato recorded higher returns among vegetable crops.

5.1.7 Economics of Livestock
The study revealed that under all the farming systems, the cost of production per animal was higher for cross-breed cows followed by buffaloes and local cows. The cost of production for sheep/goats was quite low in comparison to cows and buffaloes due to low feed and fodder requirements as these animals were allowed to graze for most part of the year. However, due to higher yield the gross and net returns were more in case of cross-bred cows and buffaloes under all the farming systems. This was the major reason behind more popularity of cross-bred cows in the state. Therefore, farm income can certainly be enhanced further by replacing indigenous cows with cross-bred animals. Singh and Raman (1994) also reported that cross-bred animals were found more profitable in mountains.

It was interesting to note that cross-bred cows and buffaloes were found to yield higher returns in case of FTFS followed by VFS and FFS. Since, the area under permanent pastures and forests was higher under FTFS and there was availability of grasses in most part of the year, which in turn reduce cost of production and improve returns.

5.2 PATTERN OF INVESTMENT UNDER DIFFERENT FARMING SYSTEMS

Investment can be regarded as an indicator of agricultural development. Investment in agriculture is made both by private sector as well as by government sector. However, the magnitude and share of investment on different items appeared to be different under different farming systems at different time periods. The pattern of investment has been examined in detail in the ensuing section.

5.2.1 Public Agriculture Investment

The public investment plays a catalytic role in agricultural development. It was observed that the public investment on irrigation structure was relatively higher
under VFS situation. The government has designed micro-irrigation structure by tapping the available sources of water. Consequently, the irrigated area has increased that encouraged the farmers to adopt commercialized farming by growing vegetable crops. The share of private investment in such endeavours has been quite low. The proportion of public investment on rural infrastructure and rural development (including rural employment, rural housing, community development, etc.) was relatively higher under FTFS and lower in case of VFS. The higher investment on rural infrastructure under FTFS might be due to the fact that government was making efforts for building essential infrastructure on hilly terrains of this farming system and more investment was made on construction of link roads. The proportion of investment on miscellaneous items was around 7 per cent under FFS which was higher than under VFS and FTFS. It indicated that government laid higher emphasis on improvement of livestock and development of forestry under this farming system. The total and per hectare village level public investment was found to be higher under VFS followed by FTFS and FFS.

5.2.2 Private Agricultural Investment

It was found that major proportion of total private farm investment during 2004-05 was on livestock and farm buildings in all the farming systems. The higher investment on these two items was also reported by other studies (Kalla, 1978; Goswami and Saika, 1971, Sharma, 1987). The proportion of investment on irrigation structures was relatively higher under FFS indicating thereby that farmers in this farming system were more concerned about having their own source of irrigation. However, in absolute terms the investment on irrigation was higher under VFS in comparison to other farming systems. This is in consonance with the higher proportion of irrigated area under VFS. Desai (1969) and Shah (1972) also revealed
that in progressive farms with available water supply for irrigation, the investment on irrigation system was higher in comparison to investment on other items. The proportion of investment on livestock was relatively higher under FTFS. This was in consonance with the higher number of animals under this farming system. Since, FTFS was dominated by fruit crops, therefore, investment on orchards and plantations and miscellaneous items (including fencing of newly laid orchards, storage containers, etc.) was found higher under this farming system. The investment on land improvement was mainly to prepare land for cultivation and this investment was found higher on FFS farms. However, due to unfavourable conditions for growing fruit crops farmers showed least interest towards plantations under FFS.

Per farm total capital stock revealed higher capital formation under VFS, which was mostly due to higher investment on irrigation structure under this farming system. Moreover, investment made during 2004-05 as per cent of present value of total capital stock on farm was over 12 per cent under FTFS. In other words, it could be inferred that capital was accumulating at an annual growth rate of around 12 per cent in this farming system, which was higher than the investment growth in other farming systems.

To sum up, the per farm investment during 2004-05 was Rs 9145, 9049 and 7633 in case of FTFS, VFS and FFS, respectively, which indicates higher investment under FTFS. However, per farm total capital stock under different farming systems revealed higher capital formation under VFS. Per hectare investment made during 2004-05 also revealed the same pattern. These results lend support to the observation of Singh and Patil (1971) and Shiyani and Vekariya (1996). They reported that per hectare investment was higher on the irrigated farms
than on partially irrigated farms. In this way, water is an important determinant of capital formation in agriculture.

5.3 STRUCTURAL CHANGES IN AGRICULTURAL INVESTMENT

The real public investment in agriculture steadily grew up to early 1980’s for building basic infrastructure for agricultural development. After this, it suffered a minor set back and the growing tempo of public investment could not be maintained during 1985-86. This may be due to the shift of emphasis to other economic sectors like administrative services, health and social welfare, information and publicity, etc. This decline in public agricultural investment was also observed in different studies at country level. Researchers have attributed this decline to the shift of emphasis in the Seventh Five Year Plan away from agriculture, particularly towards industrial research and development and communication and sharp protest of environmentalists against construction of irrigation projects, etc. (Mishra and Chand, 1995; Gulati and Sharma, 1997). During 1990’s this decline in public investment has been arrested and it increased from Rs 2279 lakhs (1985-86) to Rs 3381 lakhs (1995-96). The public investment again showed decline during 2001-02.

The private agricultural investment on other hand also showed a fluctuating pattern. It showed a decline during 1970’s. It declined from Rs 703 lakhs (1969-70) to just Rs 312 lakhs (1980-81), which indicated increased dependence of farmers on government sector during this period. There might also be a shift in emphasis of private sector towards new input technologies during period-I (1969-79), which led to the decline in private investment in agriculture. But, later the real private investment spurt towards the termination of Ninth Plan. It might be due to the fact the farmers have realized that agricultural productivity growth could not be achieved without
increasing productive capacity of farms. The government incentives might also be favouring private investment in agriculture. The persistent increase in private investment in Himachal Pradesh was consistent with studies conducted at country level (Chand, 2001).

5.3.1 Growth and intensity of Agricultural Investment

5.3.1.1 Public agricultural investment

All the items of public agricultural investment increased from period-I (1969-79) to period-III (1991-2001) with exception of few items. During period-I, per hectare investment was higher on agricultural crop husbandry followed by minor irrigation, horticulture and soil and water conservation. It was because the major emphasis of government policies during this period was on development of agriculture, irrigation and improvement of land for cultivation. Since, major thrust areas during period-II (1980-90) were the modernization of agriculture, development of irrigation, development of rural areas, etc. thus, huge amount of funds were invested on rural development schemes, irrigation, agricultural crop husbandry and soil and water conservation. During this period it was also realized that the agricultural development would not be achieved in isolation without development of infrastructure (Singh et al., 2004). Therefore, the resources were also allocated for development of physical infrastructure. During period-III, the major emphasis was on improvement of work productivity through skill development and improving quality of life, etc. Therefore, per hectare investment on agricultural research and education increased more than two-folds from second period to third period. Self-reliance and development of rural areas constantly remained a priority sector for upliftment of rural areas during third period. Per hectare investment on items like flood control,
command area development, animal husbandry, etc. also showed an increase in third period.

The public investment was about 12 per cent of agricultural gross domestic product during first period, which later rose to 18 per cent during period-II. However, its intensity has remained almost stagnant during period-III. This stagnation of public agricultural investment needs to be corrected for faster development of the agricultural sector. The investment on minor irrigation that was on the rise till second period decreased towards third period. The intensity of investment on agricultural research and education showed an increase over the years but, the intensity of investment on agricultural research has remained much lower than in developed countries (Pardey and Beintema, 2001). Increasing intensity of rural development investment witnessed higher emphasis on rural well-being while, the declining intensities of investment in some components may be due to diversion of more funds to non-farm sector.

Estimates of compound growth rates of different components of public investment revealed that during period-I, there has been an increase in public agricultural investment and it rose at an annual growth rate of about 7 per cent per annum. But, later the growth of public investment slackens and it grew at an annual growth rate of about 2 per cent during period-III. The declining trend of public investment in agriculture was also confirmed by the studies conducted at national level (Dhawan and Yadav, 1997; Misra and Hazell, 1996; Shetty, 1990, Gandhi, 1996). Investment on soil and water conservation showed fluctuating pattern, firstly it grew at an annual growth rate of about 8 per cent during period-I and then witnessed negative trend (-7.02%) during period-II. But, later it registered higher growth rate of about 10 per cent per annum during period-III. The increase of
investment over this component might be due to increased investment on construction of soil erosion structures, water harvesting structures, check dams, etc. The growth rate of investment on minor irrigation schemes was as high as 18 per cent during first period and later it recorded negative growth (-24.48%) in period-III. The investment on rural infrastructure also showed a decline, which might be due to diversion of resources towards recurring expenditures and non-farm sectors.

5.3.1.2 Private agricultural investment

It has been observed that per hectare private investment in agriculture at 1970-71 prices showed a minor decline of Rs 5 per hectare from period-I to period-II. But in period-III, private agricultural investment increased and reached to about Rs 216 per hectare. This indicates that the incentives for private investment were improved during post-reform period. Item-wise classification of private investment revealed that private investment in agriculture as a whole grew almost three times from 1991-92 to 2001-02.

The private sector agricultural investment which was about 4 per cent of agricultural domestic product (AGDP) during period-I increased to about 6 per cent of AGDP towards period-III with minor fluctuation during period-II. The increasing intensity of private agricultural investment might be due to liberal government policies and incentives in the form of power subsidies, credit, etc. that in turn enhanced private investment in agriculture.

The compound growth rates of real private investment in agriculture showed increasing trend from first period to period third. The rising trend of private investment was also advocated by number of scholars at country level (Misra and Hazell, 1997, Gandhi, 1996). There was a minor decline in growth rate of private
agricultural investment from about 9 per cent (1980-90) to 8 per cent (1991-01). This decline in growth rate of private investment might be as result of decline in public investment in view of their complementary relationship.

5.3.2 Composition of Agricultural Investment

National Sample Survey Organization-Reserve Bank of India (NSSO-RBI) estimates of state level private agricultural investment have been used in the present study, which does not include private corporate investment in agriculture. Therefore, the public investment formed the main component of total agricultural investment and its proportion remained more or less constant in all the periods.

The period-wise composition of public investment showed some fundamental changes according to new priorities in different periods. During Green-Revolution period, the major emphasis was on improvement of agricultural productivity, therefore, major proportion of public investment was allocated to crop husbandry (32%) and irrigation (20%). During period-II, development of irrigation and rural infrastructure were placed among priorities in the state policies, hence, their per cent share in public investment increased considerably. The share of rural development and agricultural research and education increased drastically towards period-III, due to the emphasis of government policies on rural development, work productivity and human capital formation.

The period-wise composition of private investment did not show any considerable change. Although the per cent share of investment on transport equipments declined from about 43 per cent (1991-92) to 36 per cent (2001-02) but, it continued to be the main item of private investment in agriculture. The higher investment on transport equipments (which includes tractor and other power driven equipments) in both the years might be due to the fact that farmers were keen to
supplement their income by renting out these equipments besides replacing the bullock used for ploughing the land. The investment on farm buildings came next followed by investment on orchards and plantations. About 5 per cent of the private investment was spent on irrigation structures during 1991-92 which later increased to over 6 per cent during 2001-02. The increase in proportion of investment on irrigation might be due to the apprehension about role of irrigation in increasing productivity and also the adequate incentives extended to this component in terms of power subsidy and tube well subsidy. The percentage share of other items (which includes fixtures and furniture kept on farm) also showed an increase over the years.

5.3.3 Complementarity Between Public and Private Investment

It was found that private investment showed significant positive association with agricultural gross domestic product, state gross domestic product, public investment, institutional credit advanced to agricultural sector as well as terms of trade. The long term complementarity between private and public investment was in line with the studies conducted at country level (Krishnamurty, 1985; Bhatacharaya and Rao, 1988; Shetty, 1990; Rao, 1994). Some scholars attributed this association to the inducement effect of public investment on private investment (Rath, 1989; Patnaik, 1987). It indicated that agricultural growth encourages private investment in agriculture and also attracts various institutions to advance credit to the farmers, who in turn made investment over fixed capital in agriculture. Public investment also showed positive association with agricultural gross domestic product and institutional credit to agriculture. The increase in the prices of agricultural commodities in relation to non-agricultural commodities (terms of trade) also showed positive association with private investment. Public investment also showed positive association with agricultural gross domestic product and institutional credit to
agriculture. In view the complementarity between private and public investment, the public investment in agriculture should be increased to boost private sector investment in agriculture.

5.4 CAPITAL USE EFFICIENCY IN AGRICULTURE

The profitability of any enterprise depends upon how efficiently and judiciously the resources are utilized. The calculated incremental capital output ratio (ICOR) and marginal efficiency of capital (MEC) for period-I turned out to be 4.62 and 0.22, respectively. During period-II, various micro-irrigation schemes were funded which coupled with use of quality inputs and other production technologies during Green Revolution period resulted in efficient utilization of resources, thereby, improving the crop productivity. This also resulted in efficient use of capital during this period and calculated ICOR decreased to 2.73. The improvement of capital use efficiency during second period was also reported by Mishra and Chand (1995) at national level. But later during period-III, calculated ICOR again increased to 4.46 indicating less efficient utilization of resources. After economic reforms (during 1991), more production technologies like HYVs, chemicals, fertilizers, etc. were used this has led to higher demand of water for irrigation. But, irrigation facilities in the state are meagre that could irrigate only about 18 per cent of the total cropped area, which consequently resulted in less efficient utilization of capital in agriculture during third period. Moreover, harsh climatic conditions were also responsible for less efficient use of capital in agriculture.

Desired growth rate of investment indicated that if we set the same target growth rate of agricultural gross domestic product (4%) in all the periods, the conditions were favourable enough during period-II where, investment was required
to be increased at an annual growth rate of 4.78 per cent to achieve 4 per cent growth in AGDP. Instead, agricultural investment increased at lower annual growth rate of 3.55 per cent and state could achieve only 1.92 per cent annual growth rate in agricultural sector. Since period-III onwards, the agricultural investment was required to be increased at about 7.82 per cent growth rate, if we are to achieve target growth rate of 4 per cent per annum in output. In view of this, investment in agriculture particularly on low gestation irrigation projects and infrastructure should be enhanced to improve the efficiency of capital use in agriculture.

5.5 ECONOMIC DEVELOPMENT, AGRICULTURAL GROWTH AND incidence of POVERTY

5.5.1 Economic Development and Agricultural Growth

It was observed that although the agricultural gross domestic product increased in absolute terms but, its percentage share in state domestic product decreased from about 47 per cent (1969-79) to just 24 per cent (1991-2001). But, it is interesting to note that the declining share of agricultural sector in state domestic product was not accompanied with proportionate decline of the dependence on this sector (Singh, 2004, Anonymous, 2003). This is a major cause of concern for the planners of the country. It could be argued that the declining share of agricultural sector in state accounts might be due to neglect of this important sector in new economic policies.

The comparative growth performance of different economic sectors revealed that state gross domestic product and non-agricultural gross domestic product were increasing at increasing rate from period-I to period-III. The estimates of growth rates for agricultural sector revealed that its growth rate increased from 1.23 per cent (1969-79) to 3.33 per cent (1980-90). However, its growth rate slowed down towards third period, which is in consonance with decline in the production of major
crops in the state (Singh, 2004). Moreover, the shrinking net sown area in the state also resulted in declining growth of agricultural sector. Despite these structural changes, agricultural sector still remained a key sector in providing employment and livelihood opportunities to the weaker section particularly in rural areas.

5.5.2 Agricultural Growth and Pattern of Poverty

The study of average incidence of poverty in relation to growth of agricultural productivity and per capita income at 1970-71 prices revealed that the considerable improvement in the agricultural productivity and the per capita income helped the state in alleviating the poverty to a great extent. The role of agricultural development in poverty reduction was also advocated by researcher at the national level (Ravallion and Dutta, 1996, Kumari and Singh, 2002). The rural poverty declined from an average of about 27 per cent during period-I to about 20 per cent during period-III. The poverty was found much concentrated in rural areas.

Despite the remarkable increase in per capita income poverty is still existent in some pockets of the state particularly in rural areas. This might be due to inequality in distribution of productivity asset and wealth. Beteille (2003) also reported that poverty and inequality did not change at the same pace and they might change in opposite directions, which again aggravate the conditions of poverty. Since, weaker section of the state resides in rural areas and depends on agriculture for employment and living, therefore, if poverty is to be eradicated from the state then due emphasis should be laid on development of agricultural sector along with the growth of non-farm sector.

5.6 DETERMINANTS AND IMPACT OF AGRICULTURAL INVESTMENT

5.6.1 Farming Systems and Level of Investment: Micro-Analysis
It was found that under all the farming systems, gross farm returns and dummy variable for off-farm income were the positive and significant determinants of total capital stock on farm. These variables might improve financial position of farmers, which in turn encourage them to invest more capital in the farming business. However, more expenditure on variable inputs certainly reduced the surpluses with the farmer and thus, affects the farm investment negatively. Though, the coefficient of expenditure on variable inputs was not statistically significant under VFS. Average size of the operational holding was other variable, which have positive and significant effect on level of capital stock under all the farming systems. Increase in size of the operational holding made the application of tractors and machines possible, which in turn resulted in accumulation of more capital on farm. In this way the land reform measures have a major role to play in increasing the level of capital stock on farm. The significant negative coefficient of average size of family in case of FTFS indicated that large size of the family have negative effect on capital formation in agriculture. Literacy was found to be an another determinant of total capital stock, which revealed the mutual association between human capital formation and level of total capital stock on farm.

Per hectare total capital stock on farms was found to be a positive and significant determinant of gross farm returns under all the farming systems thus, confirming the complementariry between capital stock and gross farm returns. Per cent area irrigated and cropping intensity showed positive relation with gross farm returns. Irrigation was found to be a limiting factor in agricultural development. Thus, provision of irrigation facilities leads to more use of new technology, which in turn improves agricultural productivity and returns per se. The positive coefficient of expenditure on variable inputs has contributed in the improvement of gross farm
returns. The farmers in all the farming systems can improve farm returns by using more quality inputs as per scientific recommendations. However, expenditure on variable inputs on FTFS farms has negative effect on gross farm returns as indicated by its regression coefficient. The negative effect of this variable might be due to the fact that farmers in this farming system were not using inputs as per scientific packages. It indicated that this expenditure should be rationalized to improve farm returns. Level of education also showed positive and significant relation with gross farm returns under all the farming systems. The literacy level was found to be an important determinant of gross returns as well and total capital stock on farms under all the farming systems.

5.6.2 State Agriculture and Level of Investment: Macro-Analysis

The estimates of the Hausman’s specification test confirmed simultaneity between different pairs of endogeneous variables and, therefore, the equations were estimated simultaneously using Two Stage Least Square (2SLS) estimation procedure.

- Determinants of public agricultural investment

The agricultural productivity, per hectare state gross domestic product, literacy rate and grants from Central Government have positive and significant impact on public investment. The positive and significant coefficient of agricultural productivity in public investment model might be due to strong demand for agricultural commodities, which led to the allocation of more funds to support agricultural research, extension and other productivity enhancing items of investment such as irrigation, storage, road, market, etc. These results are consistent with studies on public funding of agricultural research (Huffman and Miranowski, 1987; Evenson and McKinsey, 1991; Pal and Singh, 1997). State
income has an expected positive and significant effect on public investment. Literacy rate also improved public investment as education level cast inducement effect on public investment in agriculture. Literacy level improves the managerial capability of farmers and consequently attracts public investment. Grants from Central Government showed positive relation with public investment. It has been found that central grants improve state government’s access to the resources for agricultural development. However, the expenditure on fertilizer subsidy negatively affect the public investment by depleting the state resources for this cause. This supported the view that farm subsidies were declining the investment in agriculture (Rao, 1994; Gulati and Sharma, 1997, Fan et al., 2000b). Population growth showed negative impact on public investment. The negative effect of population growth might be due to the fact that with the increase in population, government has to divert the funds towards public health, nutrition, urban area development, and industrial development, etc.

- **Determinants of private agricultural investment**

  The analysis of Two Stage Least Square (2SLS) for private investment model indicated that the lag values of public investment, agricultural productivity, per capita income, population growth, terms of trade and literacy were the positive and significant determinants of private investment in agriculture. The positive coefficient of public investment indicated that this variable plays an inducement effect on private investment (Dhawan and Yadav, 1995, Wagle, 1994, Gulati and Bathla, 2002). In this way private investment in agriculture could be increased by exploiting its complementary relationship with public investment. The coefficient for agricultural productivity turned out to be positive and statistically significant in private investment model. Agricultural productivity enhanced private investment in agriculture by
improving surpluses available for investment. The per capita income and terms of trade showed positive relation with private investment. The favourable terms of trade facilitated the growth process by increasing the private investment in agriculture (Misra and Hazell, 1996, Misra, 1998). Per cent area under marginal holdings in the state showed negative and significant relation with private investment. This might be because, the small size of holding hinders mechanization of agriculture and investment on implements and machines, which are essential items of capital formation in agriculture. Marginal farmers also have less surpluses with them and, hence, are also unable to invest in agriculture. This result supports the findings of Roy and Pal (2002). The positive and significant coefficient of literacy was as per our expectation as education level makes a farmer innovative and aware about the possible benefits of investment. Poverty showed negative relation with private investment but, the relation was not statistically significant. Poverty limits the investing power of the farmer, which leads to decrease in private investment in agriculture.

- **Determinants of agricultural productivity**

  Except population growth and per cent deviation in rainfall, all the variables included in the model i.e. per hectare investment, literacy rate, per cent area under marginal holdings, cropping intensity, area under HYVs, per cent area irrigated have positive and significant coefficients, implying thereby that these variables have contributed in the improvement of agricultural productivity over the years. Both public and private investments were positively and significantly related with agricultural productivity. These results are consistent with studies conducted by Rao (1993), Mukherjee (1996), Anderson and Lorch (1999). The coefficient of literacy rate also turned out to be positive and significant. Thus, educated farmer can avail
the benefits of scientific practices and improved production techniques, which are instrumental in improving productivity. The key role of literacy was also reported by Duraisamy (1992) and Nadal (1972). Per cent area under marginal farms also showed positive and significant effect on agricultural productivity. Bhati (1975) reported that small farms have comparatively more cropping intensity. Sharma et al. (1992) also reported that returns were more on small farms due to better management and more input use. The number of crops taken up in a year (cropping intensity) also has positive effect on productivity of agriculture. Per cent area under irrigation has strong and positive effect on agricultural productivity. Srinivasan (1977) and Pendse et al. (1996) advocated the expansion of expenditure on irrigation projects in view of its crucial role in improving productivity. Weather is an important determinant of agricultural productivity in the state. More fluctuations in rainfall were associated with lower agricultural productivity. A significant negative coefficient of per cent deviation from normal rainfall indicated that the fluctuations in rainfall have negative effect on agricultural productivity.

- **Determinants of poverty**

All the exogeneous variables except terms of trade and population growth rate showed negative significant effect on poverty. The key role of agricultural productivity in reducing poverty has been identified by number of researchers (Rao, 1977; Desai and Namboodiri, 1998, Ahluwalia, 1978, Murgai et al., 2001). Agricultural development is essential in helping the poor not only by directly increasing their income but, also by releasing labour and capital that can be used in non-agricultural enterprises and by stimulating the demand for non-agricultural goods (Johnson, 2000, Lanjouw and Lanjouw, 2001). Higher agricultural productivity improves the consumption and surpluses with the farmers and consequently
improves their living conditions. Agricultural investment has both direct and indirect (mainly through gain in agricultural productivity) effect on reducing poverty. The role of public investment in alleviating the poverty through various development schemes and through improving agricultural production was also reported by Hazell and Fan (2003). Non-farm employment and agricultural labour wages have negative and significant effect on poverty. These variables improve the financial position of the farmer and shift them above the poverty line. The education is one of the effective instruments in reducing poverty. The role of education in poverty reduction was also reported by Sen (1997). The increase in investment on rural development and institutional credit flow to agriculture were also associated with the reduction in poverty ratio.

- **Determinants of non-farm employment**

  It was observed that investment on soil and water conservation, rural development and irrigation and flood control have positive and significant effect on non-farm employment. Large numbers of rural poor were able to get jobs in irrigation projects, construction of check dams and water harvesting structures, etc. Funding of various rural development schemes also generate direct non-farm employment. The role of public investment in employment generation in off-farm sectors was also observed by number of research scholars (Sen, 1997, Fan et al., 1999). The road density has positive impact on non-farm employment. The construction of main and link roads increases the connectivity of villages to nearby cities/towns and improves their access to avenues of non-farm employment. Education level also opens more opportunities and enables a person to make his way in the various sector other than agriculture. However, agricultural productivity showed week link with non-farm employment. These results are consistent with the findings of Hazell and Haggblade
(1991). They stated that there is a weak relationship between agricultural growth and the growth of rural non-farm activity in many parts of the country and it is more significant in agriculturally advanced regions such as Punjab and Haryana.

To sum up, the rural development through agricultural growth, employment generation and poverty alleviation requires more investment to be made in agricultural sector. Further, public investment should be increased to provide incentives for improving private agricultural investment.

5.7 PROBLEMS AND CONSTRAINTS THWARTING INVESTMENT

Investment in agriculture is essential for improving productive capacity on farm, which in turn increases agricultural productivity. Various mountain specificities characterizing agriculture in mountains are usually considered while making any important decision like that of investment. Besides, there were number of problems and constraints faced by the farmers that thwart investment in agriculture. These problems/constraints were categorized as resource based, socio-economic, personal/educational, institutional/political and miscellaneous problems/constraints. The extent and magnitude of these problems/constraints varied from one farming system to another (Fig. 5.2 to 5.6). These problems have been discussed under the following sub-headings:
5.7.1. Resource Based Problems/Constraints

Resource endowment of the farmers determines their financial status and their capability to invest in agriculture. Since, hill agriculture is characterized by small, slopy and scattered holdings, which often comes in the way of mechanization, construction of irrigation and water harvesting structures, etc. These characteristic also impede investment flow in the farming business. These constraints cannot be removed but, their unfavourable effect can be reduced by promoting consolidation of holdings, encouraging cooperative farming, etc. The government should increase investment on land improvement and soil and water conservation as the private investment in such endeavours were meagre. Shortage of critical inputs like irrigation and quality inputs deprived the farmers of better returns due to poor yield and poor quality of produce. The farmers showed serious concern about this problem as it upsets investment in agriculture. Kohli (2000) also brought to light this problem, which came in the way of agricultural development. About 63.33 per cent of farmers under FFS revealed this problem while, the intensity of this problem was less under VFS. Sometime few farmers were willing to invest but, the capital goods were not available in the market. This problem
was reported by other researchers to hinder farmer’s investment decision (Kivistik and Sallinen, 1993). This kind of problem was much concentrated under FTFS where the plant protection and other equipments available at cooperative stores often fall short of the demand. Lack of sense of belonging made the farmers unwilling to invest on leased-in land. In this way, land lease system decreases investment in agriculture. This problem was also reported by Pender and Kerr (1998).

5.7.2 Socio-Economic Problems/Constraints

Socio-economic status of farmers is the main determinant of investment in farming. Handsome returns not only encourage farmers to produce much but, also persuade them to invest on capital goods. Low returns were perceived by about 87 per cent of farmers under FFS, 52 per cent under FTFS and 48 per cent under VFS. Farmer’s propensity to invest depends upon his level of savings. Varadarajan and Sankari (1996) also highlighted the role of past savings in capital formation. Low savings as the main constraint in farm investment was highly reported by the farmers

Fig. 5.2: Resource based problems/constraints


Fig. 5.3: Socio-economic problems/constraints
of FFS. Non-farm liabilities of the farmer like marriage expenses, repayment of loan, festivals, litigation, etc. often put him into financial hardship. Majority of sample farmers of FTFS brought to notice this kind of problem as main reason for low investment in agriculture followed by farmers of VFS and FFS. High cost of capital goods was yet another problem, which discouraged farmer’s investment decision. Adequate supply of investment goods should be made available at lower prices at various cooperative and retail points. Expenditure once made on fixed asset cannot be withdrawn back and majority of sample farmers were afraid of irreversibility of investment. The intensity of this problem was much under FFS and less under FTFS. Farmers engaged in the subsidiary occupation paid comparatively less interest in farm business and consequently made less investment in agriculture. Liability of subsidiary occupation to effect investment in agriculture was expressed by 50 per cent of farmers under FFS, 41 per cent under FTFS and 30 per cent under VFS. Huge expenses are required to bring up large family. Farmers having large family have little or no surpluses with them to invest in farming business. This problem was reported mostly by the farmers of FTFS. Besides, lack of perspectives, poverty, land
conflicts, less earner in family and joint farms were some other socio-economic problems/ constraints that hinder investment in agriculture.

5.7.3 Personal/Educational Problems/Constraints

With regards to personal/educational constraints, majority of farmers brought to notice lack of risk bearing capacity as main problem hindering investment in agriculture. The magnitude of this problem was high under FFS and less under VFS. Most of farmers were lacking entrepreneurial skills, which is essential for successful farm business. The intensity of this problem was almost same under all the farming systems. In this way investment can be encouraged in agriculture by providing necessary training regarding scientific management of farming business to the farmers. Education plays a crucial role in adoption of new technology and investment in farming business. While, illiteracy was found another problem reported by 21.67, 11.67 and 8.33 per cent of farmers under VFS, FFS and FTFS, respectively. More education facilities should be provided so that educated farmers can make investment on latest technology like improved agricultural implement and machinery.

5.7.4 Institution/Political Problems/Constraints
With regards to institutional/political problems most of the problems were related with credit. Majority of farmers expressed the cumbersome loaning procedure as the main institutional problem. Farmers of VFS perceived this problem more intensely followed by FFS. These results were also observed by Baltas (1983). He stated that the easy availability of credit enhances investment while, its non-availability constraints investment in agriculture. Therefore, the number of banks should be increased to make the loan easily available so as to enable farmers to increase their investment on irrigation, improved livestock and implements, etc. Moreover, loaning system should be further simplified. Efficient marketing system not only encourages farmers to increase production but, also to produce quality products and encourage capital investment in farming. But, defective marketing system hampered the capital investment in agriculture. This kind of problem was severe under FTFS followed by VFS and FFS. Irrigation is very essential for intensification of agriculture and improving productivity. Instead only 18 per cent of gross cropped area is irrigated in the state. Lack of irrigation schemes were critically expressed by 81.67, 48.33 and 20 per cent under FFS, FTFS and VFS, respectively. Prema and Thomson (1996) also identified the lack of irrigation as major constraint in capital investment. In view of this, irrigation facilities should be increased by constructing
Fig. 5.4: Personal/educational problems/constraints

1. Lack of risk bearing capacity
2. Lack of entrepreneurial skills
3. Illiteracy
4. Poor health
5. Lack of knowledge

Fig. 5.5: Institutional/political problems/constraints

1. Cumbersome loaning procedure
2. Costly credit
3. Credit not timely available
4. Defective marketing system
5. Lack of irrigation schemes
6. Poor road network
7. Unfavourable support prices
8. Low or no subsidy
9. Subsidy on selected items
10. Lack of government assistance
11. Lack of fair price shops
12. Inadequate extension staff
13. Heavy taxes and revenue.
water harvesting structures, tanks, tube wells, etc., firstly in those areas where it is much needed so that farmers could intensify their agriculture. This move will also encourage them to increase investment on fixed farm capital. Efficient and good road network is necessary to facilitate easy transport and development of markets. Poor road network increases marketing cost and in turn decrease returns to farmers. Poor road network as a constraint in agricultural investment was felt mostly by the farmers under FFS. Farmers also expressed concern about subsidies and 48 per cent of farmers under VFS reported problem of low or no subsidy over capital goods. This problem was also felt by farmers under FTFS and FFS. Subsidy on selected items was a related problem, which was reported by 45 per cent of farmers under FTFS, 43 per cent under FFS and 37 per cent of farmers under VFS. Government should increase the subsidy especially on the hill specific tools. Lack of fair-price shops increase the cost of cultivation and in turn decrease farmer’s purchasing power. This problem was found much intense under FTFS and less under FFS. Innovative farmers sometimes do not investment because they did not know about latest technology. Know how of new technology could be disseminated by extension agencies. But, 35 per cent farmer of
FTFS, 33 per cent of farmers of FFS and 25 per cent of farmers under VFS reported the inadequate extension staff. Therefore, agriculture extension services should be strengthened and streamlined for dissemination of knowledge about latest capital goods in the areas by providing more staff and training facilities to the existing staff.

5.7.5 Miscellaneous Problems/Constraints

Unfavourable weather conditions were found to hamper investment in agriculture. The magnitude of this problem was found maximum under FTFS followed by FFS and VFS. The negative role of weather on agricultural investment was also

![Bar chart showing response percentages for FFS, VFS, and FTFS for different problems/constraints.|](image.png)


Fig. 5.6: Miscellaneous problems/constraints
confirmed by Dinar and Keck (1997). Uncertainties in yields and prices were another constraint revealed mostly by farmers of FTFS and less by farmers under VFS. Crop and other insurance schemes should be started to minimize these uncertainties to encourage investment. Capital goods available in the market may not suit the hilly condition and this problem was reported by about 38, 30 and 27 per cent of farmers under FTFS, FFS and VFS, respectively. Goswami and Saikia (1970) also observed this problem and stated that the prospect of investment in hill agriculture should be widened by evolving improved agricultural implements suitable for hilly areas.

All the problems/constraints highlighted above seem to be somewhat interlinked and, therefore, require a system approach to achieve more investment in agriculture.