CAPITAL FORMATION IN AGRICULTURE IN CHITRADURGA DISTRICT OF KARNATAKA STATE AN ECONOMIC ANALYSIS

Thesis submitted to the
University of Agricultural Sciences, Dharwad
in partial fulfillment of the requirements for the
Degree of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRICULTURAL ECONOMICS

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DECEMBER, 2006

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I. INTRODUCTION

Agriculture sector still dominates the Indian economic scene by providing livelihood to majority of the population. In most of the developing countries including India, agricultural development is a precondition for economic development. The techno-socio-economic factors characterizing the importance of agriculture are many-more than 70 per cent of total labour force employed presently is in agriculture, over 40 per cent of the Gross National Product (GNP) is contributed by this sector. The value of agricultural raw material is about 20.6 per cent of total industrial products and share of agriculture in the export market is more than 50 per cent. Thus development of agriculture sector influences the development of the whole economy.

It is felt by some economists that agriculture in India needs to be capital oriented. Capital, the accumulated output, is used to increase the effectiveness of current productive activity in general and agricultural productive activity in particular. The development of agricultural sector is reflected by increase in the per capita income as well as rise in the standard of living of the farmer with equitable income distribution. Per capita income can rise only if per worker productivity rises. Further, the increase in the labour productivity means that workers should be more skilled and be assisted by other productive resources. This implies that productivity of any sector has some thing to do with development of that sector.

The two methods that have often been suggested to increase the agricultural output are a) increase in the cultivated area and b) increase in intensity of cultivation through increased investment per unit of land. As the possibilities of bringing additional area under cultivation are highly limited, the only alternative left is the intensive use of land. This process finds its vital force from capital formation. Thus, it is imperative to make a systematic study of capital formation.

Theoretically, it may be possible to get production from a combination of land and labour only. But in actual practice, even in its simplest form, agriculture does require some amount of capital. Leaving the primitive form of agricultural production behind, as we start out on the path of economic progress, the use of capital assumes greater importance.

A broad definition of capital would include, besides physical durable assets, the circulating working capital and the human resources in organizing the economic activity. However, the study of capital formation includes only those tangible assets which can be used for further production in which, it has characteristics such as facility of transferring stock into flow services, facility of transferring stock into income over time and improving productivity over time. Agricultural development has many facets- technical, organizational, financial, demographic, sociological and capital formation. The concept of agricultural development is very crucial in the context of the Indian economy, where even sub-marginal land has been brought under cultivation and labour is easily available. In order to make the best use of resources and to augment the productivity of resources through technical know-how would call for modernization of agriculture with advanced technology. This in turn calls for a constant growth of capital. The larger the portion of current output invested in capital assets by the cultivating families the greater would be the increase in production and the rate of growth.

Income, savings and investment are the three key variables of an economy while investment is the sine-qua-non of the economic development. It is savings which provide the where-withal for investment. The level of income is also an important variable as it determines savings and investment whereas past investment in capital goods, in turn, determines the present level of income. The low level of income and economic stagnation in developing countries are attributed to meagre stock of capital per head of population and low rate of capital formation.

In an under-developed and predominantly agricultural economy characterized by poor technology of production, low farm income and relatively small savings, the problem of agricultural development should be directed towards a long run objective of self sustained growth, which can very largely be viewed as a problem of the growth of farm capital. One of the serious obstacles faced by the agricultural industry in India today is now to raise the

agricultural productivity level per hectare. The inefficient use of land coupled with traditional techniques are some of the more important causes of low productivity on Indian farms and therefore, these problems need immediate attention and solution for the development of agricultural sector.

In an under-developed economy, the concept of capital has acquired a new out look. Along with the search for new techniques which are said to be scale neutral but not resources neutral, new organization, improvement of skill and efficiency of labour, a search for additions to the existing production resources has continued because of the realization that the task of developing an economy can hardly be accomplished without a judicious combination of the two, i.e., more resources and their better utilization. So the problem of capital formation in agriculture assumes importance from the fact that agricultural sector significantly contributes to the development of an economy and particularly for one of the type that India has.

In this regard, a policy for capital formation and investment is necessary to look in to (a) an assessment of capital requirement for developing the economy and the gap between available and required resources (b) the principles which will govern the process of savings and mobilization of capital for productive investment and (c) a pattern of investment which will secure maximum social productivity.

Since its establishment in March 1950, the National Planning Commission has regarded capital formation as one of the major objectives of the five-year plans for development. This emphasis on capital formation by the planners stems from two basic considerations. Firstly, periods of take off have always been characterized by an increase in the rate of capital formation, irrespective of the differences in the social and political conditions and institutions. Secondly, in all the growth models, great importance is attached to the rate of capital formation. With the dissemination of the new technology in agriculture, farmers' incomes are increasing. With the increasing income, savings should also increase. Then savings will be transferred into investment to generate long-term growth. Thus, savings is an instrument for developmental financing and means of economic growth. In the present day agriculture, it is the investment pattern, in addition to "technological know how" which determines the level of income and in turn the standard of living of the farmers. Besides on-farm investment, off-farm public investment especially in the form of construction of dams, agro-industries, etc., is also essential to ensure sustained agricultural growth. Irrigation is the major resource, which supports and sustains agricultural development. Karnataka has considerable irrigation potential with two river systems, viz., Cauvery and Krishna and vast ground water resources. The ultimate irrigation potential of the state is estimated at 54.55 lakh hectares, but the irrigation potential exploited so far is about 24.56 lakh hectares. Thus, about 55 per cent of the potential is still to be tapped.

In this context, it is very interesting to know how the capital formation has taken place in different sectors of the economy, viz., public and private sector. It is evident from the Table 1.1 which furnishes the percentage shares of public and private sectors in capital formation in Indian agriculture. During 1980-81 to 1993-94, the private sector has contributed major proportion (60-80 per cent) to the Gross Capital Formation in agriculture.

Hence, it is better to understand the concept and the process of capital formation. Capital formation refers to growth of real capital assets that can go a long way in increasing the efficiency of productive efforts over a period of time. The process of capital formation can be broadly divided into the following stages.

Stage – I Saving Process

This stage is concerned with the creation of savings, i.e., an excess of income over expenditure. The source of these savings may be individuals, business concerns and government bodies.

Stage – II Fund Available for Investment

At this stage, the savings mentioned above should be available for investment.

Table-1.1: Capital Formation in Indian Agriculture in Public and Private Sectors (%)

Year	Public	Private	Total
1980-81	35.28	64.72	100.0
1981-82	37.60	62.39	100.0
1982-83	39.12	60.87	100.0
1983-84	40.11	59.89	100.0
1984-85	39.75	60.25	100.0
1985-86	38.97	61.03	100.0
1986-87	35.90	64.10	100.0
1987-88	33.94	66.06	100.0
1988-89	32.43	67.57	100.0
1989-90	30.40	69.60	100.0
1990-91	28.07	71.96	100.0
1991-92	24.87	75.12	100.0
1992-93	22.45	77.55	100.0
1993-94	20.96	79.04	100.0

Source: C.S.O. - Various Publications.

Stage – III Acquisition of New Capital Assets

The funds, which are available for investment, are actually spent in the acquisition of new capital assets.

However, the present study seeks to answer the questions like what was the magnitude of the resources found in the form of durable physical assets? Did this pattern of composition remain the same and what are the factors which affect capital formation?

India is a vast country comprising of numerous regions with diverse agro-climatic and weather conditions. The production techniques, crop patterns, assets and resource structure show considerable variation between these regions and so would the use and productivity of capital. It is, therefore, necessary to know the region-wise information on this vital aspect.

In this context, the present study was attempted to measure the formation of capital in agriculture in Chitradurga district of Karnataka. The primary purpose of the study was to examine how farm capital has faired in Chitradurga district in Karnataka.

The specific objectives of the study are as follows.

1. To analyze the trend and magnitude of capital formation on the farms of Chitradurga district of Karnataka state;
2. To study the pattern of investment in different capital assets;
3. To account for variability in components of capital formation in both progressive and less progressive areas;
4. To analyze the factors influencing capital formation; and
5. To identify the sources of investment.

II. REVIEW OF LITERATURE

A number of studies have been undertaken to throw light on the trend and magnitude of capital formation, pattern of investment, factors influencing capital formation and sources of investment.

2.1 TREND AND MAGNITUDE OF CAPITAL FORMATION

Mody and Mandle (1979) in their study in India made an estimation of the direction and magnitude of resource flows between agriculture and non-agriculture during post-independence India. Theoretical implications of the concept of resource transfer are discussed and empirical issues are analyzed. It appears that the authors have not accounted for indirect taxation in any systematic fashion and has therefore, underestimated the resource flow from the agricultural sector. On the other hand, the empirical exercise underestimates the flow into the agricultural sector in regard to a) consumer goods and b) public capital formation in agriculture.

Elstrand (1981) examined the trends in capital formation in Norwegian agriculture between 1970 and 81. In this period capital has increasingly been substituted for labour. Farmers had a substantial income increase after 1976 as agriculture was promised income parity with other sectors for 1976-82 inflation, due to the oil industry accelerated after 1979 and general per capita investment in agriculture grew more rapidly. Farmers' investment priorities were a) increased production b) improved farm machinery and buildings c) improved farm dwellings and d) reduction of soil and air pollution by agriculture. The government policy of encouraging distribution of agricultural production to marginal areas to small farms to make the best use of scarce resources increased capital costs. Farm debt increased more rapidly than investment as a decreasing proportion was financed from farmers' own resources. As a result, the report concluded that the financial and liquidity problems of farmers in Norway are becoming more acute.

Krishna and Raychaudhuri (1981), in their study on capital formation in India, made an attempt to know the trends in rural household savings and the growth of tangible net wealth in rural India from 1950-1973. The results show that there has been an accretion of savings and capital formation in recent years.

Prakash *et al.* (1994), in their study in Mysore district of Karnataka state, made an attempt to know the trend and magnitude of capital formation in rainfed and irrigated areas of Mysore district, Karnataka, India. The data were collected from a sample of 56 irrigated and 56 unirrigated farms in Mysore (less progressive) and Nanjanagud (progressive) taluks for the period 1983-84 to 1988-89. The results revealed that the gross capital formation of farm machinery was 48.64 and 60.41 per cent per year on progressive and less progressive farms, respectively. The irrigated farms have shown an annual increase in the rate of capital formation in livestock at Rs.409 per ha, while in case of unirrigated farms, it was Rs.111 per ha. The investment on gardens by progressive group was increasing by Rs. 24.57 per ha every year.

Dhawan and Yadav (1995) argue that the opposite trends in public sector and private fixed capital formation in Indian agriculture suggested that there was lack of complementarity between these two sectors. Moreover, it has been argued that, this gap did not exist during the planning period prior to the 1980s. If these trends exist (a decrease in public investment against an increase in private investment), the reason may be the Indian farmers' investment behaviour. The paper examines possible changes in this behaviour through an analysis of survey data on Indian farmers' total expenditure and the share of fixed capital formation in farm business as a share of such expenditure. The analysis focuses on cultivator-households who accounted more than three quarters of private fixed capital formation in Indian agriculture during 1981-82.

Mani *et al.* (1996) attempted to know the trend and composition of gross domestic capital formation at the national level in India, with particular reference to the agricultural sector. The analysis employs data for the period 1950-51 to 1990-91, split into four decades. The analysis reveals that, 1) a continuous fall in public sector savings which constitute an

integral part of gross domestic capital formation 2) the share of gross capital formation in agriculture as a percentage of gross domestic capital formation has declined 3) public sector investment in agriculture has been declining and private investment is playing a major role.

Karmakar (1998) discussed the growth trends in capital formation in agriculture in both the public and private sectors in India. The role of institutional credit in gross capital formation in agriculture and the different factors, which have a bearing on the level of capital formation in agriculture, have also been examined. The impact of economic reforms on investment in the agricultural sector is also briefly discussed. Both the public and private sector investment in agriculture has been declining.

Purohit and Reddy (1999) focussed on the Indian situation, both at the state and national level. The paper considers an estimate and examination of the trends in capital formation (private and public) and its composition in Indian agriculture, establishes a link between public and private capital formation in agriculture and assesses their relative importance in agricultural growth, identifies and estimates the factors influencing public as well as private capital formation in agriculture and suggests policy options specifically in the context of liberalization, for strengthening the process of capital formation in agriculture. These trends are examined in four Indian states, Andhra Pradesh, Kerala, Rajasthan and Tamil Nadu, with data covering the period 1980-89 with the exception of Rajasthan where data covers the period 1980-93. All India data covers the period 1950-94.

Vivekananda (1999) examined the performance of agriculture in the state of Karnataka at the aggregate level using data collected from a total of 760 farming households from 19 villages in four taluks (Koppal, Kanakapura, Belur and Belthangady) over the period 1955-56 to 1993-94. Results indicate that the State does not seem to have any relative advantage in yield levels for most crops (except maize and sugarcane). The cropping pattern in the State is millet oriented and has been changing towards non-cereal crops, particularly since 1980-81. The growth rates in area, production and productivity of crops vary by zones and periods. The production of cereals depends on irrigation, high yielding variety (HYV) seeds and area expansions. Instability in area, irrigation and HYV seeds has led to instability in crop production. The net income from commercial crops is much higher than from food grain crops.

Gulati and Bathla (2002) first examined the temporal behaviour and structure of public and private gross capital formation (GCFA) in India. He then dissected different components of GCFA by digging into the concept, coverage and estimation procedures followed in the Indian System of National Accounts (ISNA). Since ISNA is largely based on the United Nations system of National Accounts, the estimation procedure for capital formation in India was compared to the international practices in accounting. The study then redefines the concept of public GCFA and re- estimates it to shed more light on its behaviour during the period 1974-99. Initially, an attempt was made to analyze the relationship between alternative concepts of public and private GCFA and their impact on growth in agriculture over the 1980s and 1990s. It is concluded that public sector investments remain important for their inducement effect on private GCFA and therefore on gross domestic product in agriculture.

2.2 PATTERN OF INVESTMENT IN DIFFERENT CAPITAL ASSETS

Chaudhari (1970) analyzed the capital investment on 120 farms in 6 villages of West Bengal. The study revealed that over 23 per cent of the gross income was invested in the irrigated region as compared to only 15 per cent in the unirrigated region. The cultivators in the unirrigated had spent 45 per cent of the investible funds in purchasing land compared to only 15 per cent in the irrigated region, while the cultivators in the irrigated region invested a sizable proportion in constructing buildings no such investment was made in unirrigated region. Similarly, the investment proportion on farm business, improved livestock and pumpset, etc., was also more for the farmers in the irrigated region.

Shaw and Agarwal (1970) studied the impact of new technology on investment pattern of farmers in central Uttar Pradesh. Their study revealed that among the progressive farmers, the highest proportion of investment was made in irrigation equipment by the medium and large farmers. The less progressive farmers had also made similar investment

but on a smaller scale. Further, investment on farm machinery and vehicles was quite high for the large farmers both among the progressive and less progressive group.

Mruthyunjaya (1972) conducted a study on patterns of income, savings and investment in Malnad region of Karnataka. He observed that farm investment exceeded the non-farm investment on large and small farms but opposite was the case with medium farms. The agricultural investment constituted nearly 59, 47, and 79 per cent of the total investment on large, medium and small farms respectively.

Rai *et al.* (1972) estimated the investment and saving pattern in irrigated and unirrigated zones of Haryana state and found that the pattern of investment in the irrigated areas turned out to be slightly different from that of the unirrigated areas. In the assured irrigated zone, the investment was mainly on the purchase of farm equipment, machinery and building construction, where as in the unirrigated zones, it was on purchase of livestock and construction of farm buildings. The investment on large farms was approximately three times higher than that on small farms in the state.

Hiremath (1973) studied investment patterns among the different groups of farmers such as large, medium and small on both irrigated and unirrigated farms in Belgaum district of Karnataka state. It was observed that large farmers of both the non-irrigated and irrigated categories made relatively larger investment on the purchase of land to increase size of operation than the other size groups, which constituted 24.71 and 19.28 per cent of the total investment. Indigenous implements, purchase of livestock, permanent improvements, in that order, constituted a major source of investment. However, on all types of farms, land, farm machinery and equipment, improvements on land, indigenous equipments, purchase of livestock formed 30.37, 39.89, 9.56, 5.44 and 5.36 per cent of total investment. On non-irrigated farms land (20.13%), farm buildings (23.51%), irrigation structure (22.95%) and livestock (9.53%) were the areas of investment.

Jagadeeshamurthy (1983), in his study on the pattern of investment in irrigated and non-irrigated farms of Hassan district of Karnataka, observed that farm assets constituted a major portion in all the categories of farms, ranging from 61 to 78 per cent followed by dwelling house. Further, he reported that the share of dwelling house was the highest in both the types of farms. He reported that higher educational standard could be the cause for such patterns of investment.

Hossain (1987) traces the extent of induced linkages and reinvestment of surplus by studying the consumption and investment behaviour of different groups of rural households in Bangladesh, from a rural survey of 639 sample households from 16 villages conducted during 1982. Engel functions were used to analyze the investment behaviour of the households. The average rate of investment was estimated at 11.6 per cent of the income. For technologically developed areas, this average rate was estimated at about 16.3 per cent, indicating higher diffusion of new technology and resulted in growth of agriculture. Investments were stimulated more proportionately than consumption. The marginal rate of investment estimated at 20.6 per cent for the less developed areas, however, had a higher income elasticity than agricultural investment.

Parameswarappa (1988) studied income, investment and employment in Hoskote Taluk of Bangalore district. He observed that a major portion of investment made was on acquisition of irrigation structures followed by livestock assets. On an average, more than 50 per cent of the total farm investment was on irrigation structure. The large farms of highly irrigated group invested more on machinery and equipment.

Narayana (1993) reported that the extent to which financial sector reforms, including those on the agenda for the next three years, was likely to promote agricultural investment in India. In the push for these reforms and the attempts to turn the sector into a handmaiden of industry and trade, little attention had been paid to encouraging private capital formation in agriculture and the role that banks play in it. Although, the strategy of broad based agricultural development was mentioned in the absence of resources for public investment in infrastructure and the turning over of the financial sector to trade and industry, the strategy would remain without substance. Although, the quickening pace of financial sector reforms

was emphasized, not even a start had been made in working out alternatives in the sphere of agricultural credit.

Guledagudda *et al.* (1997) conducted a study on jasmine cultivation in Karnataka. They studied the pattern of investment on jasmine cultivation where in a multistage sampling procedure was adopted for the selection of taluks (2), villages (6) and respondents (120). Investment pattern, cost and returns were enumerated and standard project evaluation techniques employed to judge the feasibility and viability of jasmine growing. The results revealed that, per acre establishment cost of jasmine garden was Rs.8346, of which a major proportion was spent on labour, followed by plant cuttings. The total cost per acre (Rs.47370) constituted variable cost (Rs.30792), fixed cost (Rs.4579) and marketing cost (Rs.11998). Average net returns over variable, fixed and marketing costs worked out to Rs.52303, Rs.47724 and Rs.35726, respectively. Financial tests (@ 14% discount rate) revealed that, jasmine had maximum net present value (Rs.182741) benefit cost ratio (1.73).

Maheswaran and Subramanian (1998) conducted a study in the Salem district of Tamil Nadu based on 100 sheep farmers spread across 20 villages. Most of the respondents (69%) interviewed were of the lowest socio economic status. The majority of the sheep farmers (79%) used family members as labour, while only 18 per cent used hired labour and the remaining 3 per cent of the farmers were involved in profit sharing methods.

Purohit and Reddy (1999) attempted to determine the pattern of investment in agriculture both at state and national level. The data were collected from various publications of CSO at the state level, *viz.,* Andhra Pradesh, Kerala, Rajasthan and Tamil Nadu. The results indicated that in the states of Andhra Pradesh and Kerala, the Gross Fixed Capital Formation in Agriculture (GFCFA) has grown at a faster rate than State Domestic Product in Agriculture (SDPA). The reverse had been the case for the states of Rajasthan and Tamil Nadu; in the former, the GFCFA had declined at 3 per cent per annum. This difference in growth rates of GFCFA and SDPA was reflected in their ratio also. As such, therefore, the GFCFA as per cent of SDPA had increased from 6 to 9 per cent in Andhra Pradesh and 9 to 10 per cent in Kerala. The same had declined, however, from 10 to 4 per cent in Rajasthan and 11 to 6 per cent in Tamil Nadu.

Kumar and Prabharan (2000) studied the investment pattern on fixed assets in rural dairy farming in Villupuram district of Tamil Nadu. A four-stage stratified random sampling technique with division, block, village and farm households as the first, second, third and fourth stages respectively, was used for data collection. Investment on fixed assets such as animals, buildings (cattle shed and stores) and dairy equipment (chaff cutters, milk cans and measuring sets) were evaluated. The overall total investment per indigenous cow was Rs.4518 of which 87.87 per cent was on animals, 8.67 per cent on buildings and 3.46 per cent on dairy equipment and machinery. Similar results were obtained for crossbreed cows wherein the overall investment per cow was Rs.7438 of which 90.47 per cent was on animals, 7.08 per cent on dairy building and 2.45 per cent on dairy equipment and machinery.

2.3 FACTORS INFLUENCING THE CAPITAL FORMATION

Chauhan and Agarwal (1969) considered factors such as size of farms, rights on land, age of the head of family and size of the family to influence capital formation in Rajasthan State. They attempted regression analysis to find out the relationship of these factors with capital formation. The regression coefficients were found to be 49.02, 1.52 and 165.27 for age of the head of family, size of family and size of operational holding (The units are in years, numbers and acres). The coefficient of multiple determination R^2 was found to be 0.26. The age of the head of family and size of holding were found to be the significant factors.

Desai (1969), in his study on capital formation in Gujarat state, considered factors such as size of holding, family size, net household income, extent of commercialization and progressiveness. He used correlation analysis for finding the association of these variables with capital formation. The correlation coefficients were found to be 0.35, -0.05, 0.52 and 0.31 for land, family size, net household income and extent of commercialization respectively for progressive area. For the less progressive area, the coefficients were found to be 0.70, -0.80, 0.70 and 0.33 in that order. However, size of holding and net household income were found to

be significant factors affecting capital formation. The owned funds constituted a major source for capital formation.

Singh (1970) in their study on capital formation in agriculture in Haryana state, considered size of farms as an influencing factor. They used the expenditure approach to measure capital formation. Farm capital goods were grouped into six categories, viz., farm implements, farm irrigation equipment, farm buildings, farm livestock, improvement on farmland and farm land purchases. The results revealed that there was a very high statistically significant correlation between size of farm and capital formation.

Rai and his co workers (1972) studied capital formation in the state of Haryana considering irrigation as one of the influencing factors. They made an attempt to know the pattern of investment in irrigated and unirrigated farms. They found that irrigated farmers had more investment on farm equipment and machinery and building construction, where as the farmers in unirrigated region were found to invest largely on purchase of livestock and construction of farm buildings.

Singh and Mishra (1974) considered size of holdings and irrigation as the factors influencing capital formation in agriculture in Bihar. The study revealed that the per farm investment showed an increasing trend with increase in size of holding. The per acre capital formation of traditional equipment was negatively correlated but per acre expenditure on improved implements was positively correlated with size of holding.

Jagadeeshamurthy (1983), in his study on investment in Hassan district of Karnataka, considered present worth of farm assets, disposable income, production expenditure, borrowings, size of holding, size of family, and consumption expenditure as factors influencing capital formation. Using regression analysis, he fitted equations for each variable separately against capital investment in low (0-15%), medium (15-40%) and high (40-100%) irrigation intensity farms. Except present worth of assets, all other coefficients were found to be significant in low irrigated farms. In medium irrigated farms, except present worth of farm assets and disposable income, all others were significant. The regression coefficients were 0.54, 0.96, 657.81, 1058.10 and 0.79 for the variables-production expenditure, borrowing, size of holdings, family size and consumption expenditure in rupees on medium irrigated farms. Borrowings, size of holdings and size of family, the coefficients of which were 0.55, 368.76, and 718.31 respectively were found to be significant on high irrigated farms.

In a study on capital formation in the United States by Graca (1984), two vector auto regressive models of quarterly US tractor sales were conceptualized and estimated. The first model included the inflation rate as an explicit variable. Additional variables in the model included tractor sales, real income and real annual cost of tractors. The second model also included four variables, namely, tractor sales, real income, an index of real cash flow and an index of implicit real rental price of tractors taking income taxes into account. The second model was conceptualized in order to estimate the specific effects of inflation through the variables affected by tax laws and through the effects of farm cash flows.

Rahman *et al.* (1986), in their study on capital formation in Bangladesh, revealed that the agrarian economy of Bangladesh was suffering from the vicious circle of poverty. The greatest problem was scarcity of capital for farms. The paper focuses on the nature of farm investment and extent to which lack of capital was a limiting factor in individual farm development. Some measures were suggested for increasing both monetized and non-monetized capital formation on farms.

Srivastava (1986) considered urbanization as one of the important variables influencing capital formation in Ranchi of Bihar state. In addition to this, capital inventory per ha, net income, irrigated area, non-farm income and gross area sown were also considered as influencing factors. These have been considered separately for each zone *viz.,* I zone up to 10 km from Ranchi, II zone 10 to 20 km from Ranchi and III zone 20 km and above. He observed that net capital formation was Rs.2267.63, Rs.1502.75 and Rs.653.70 in zone I, zone II and zone III, respectively, indicating that urbanization had an impact on capital formation. Using regression analysis, he found that gross area sown, net farm income and irrigated area were the significant factors affecting capital formation in the I zone, the value of coefficients being 0.4143, 0.9268 and 0.4598 and R^2 was 0.84. In the II zone, gross area

sown and net income were the significant factors. The values of these coefficients were 0.5545 and 1.3288 respectively. In the III zone, net income per ha was the only factor found to be significant with the coefficient being 0.28. The value of R^2 was 0.68.

Prakash *et al.* (1994) used principal component analysis to analyse the factors affecting capital formation in rainfed and irrigated areas of Mysore district, Karnataka, India. Data were collected from a sample of 56 irrigated and 56 unirrigated farms in Mysore (less progressive) and Nanjanagud (progressive) taluks for the period 1983-84 to 1988-89. The results reveal variations across groups. For irrigated farms, size of holding, education and savings were important determinants of capital formation. Net income, education and age had an effect on capital formation on unirrigated farms. Credit was not found to be a significant factor. The results suggest that educated farmers better perceived the importance of farm assets.

Karmakar (1998), in a study on capital formation in agriculture in both public and private sector in India, observed that the private investment in agriculture was determined by three factors, namely, i) public investment or complementarity between public and private investment ii) technology and iii) terms of trade. It was concluded that the falling role of public investment in agriculture was due to the falling sectoral allocation in the national plans, increase in recurring expenditure and partly due to under-use of irrigation project.

Bartels (1999) observed that human capital theory explained income differences between different professional groups by differences in investment in education and training. The extent to which this theory could account for the income differentials between the farming and other economic sectors was investigated using 1980-1993 data on education level and household income in German farming and other economic reforms. The results indicated that differences in farm size and structure were a more important determinant of farm income than education and that heavy investment in education could not be justified for the income that could be achieved from a small farm.

Purohit and Reddy (1999) focussed on the Indian situation, both at the National and State level, namely Andhra Pradesh, Kerala, Rajasthan and Tamil Nadu, using the data collected from CSO. They considered the factors that might have led to a decline in public sector capital formation. Thus at all India level, presuming complementarity between public and private sectors, the falling GFCFA in public sector could be explained in terms of a) a decline in the proportion of expenditure on agriculture and allied sectors in the aggregate (plan and non-plan) expenditure of the centre and the states, and b) a fast growth of agriculture subsidies or rising proportion of expenditure on revenue account.

Garnett (2000), following an introduction to London food system, reviewed the urban food production in London focusing on agricultural activities, urban agricultural production and people and organizations involved in urban agriculture. The role of urban agriculture in sustainable development was reviewed with particular reference to its relationship with health, environment, farm and household economies. Reference was also made to education and training and to community development. Factors affecting urban agriculture were considered and the projects for development of urban agriculture in London were discussed.

In a study on the north south divide by Hirano (2002), the economic frame work and general characteristics of agriculture in Africa were considered. The external and internal factors, which influence African agriculture, cereal production, including the possible level of production and production ability of the labour force were discussed. Finally the level of yields and the income from them and the poverty trap were considered.

2.4 SOURCES OF INVESTMENT

Bansal (1965) in his study on the capital formation in agriculture, made an attempt to know the source of finance in Meerut and Bulandhshahr districts of Uttar Pradesh. He studied the source of finance in different size group of holdings and their utilization. The study revealed that purchase of transport equipment and implements and machinery was done through borrowed funds. A major portion of the owned funds was on livestock followed by farm machinery, irrigation appliances and transport equipment. But these assets constituted 59.07, 19.28, 6.61 and 6.41 per cent of the total investment made through borrowings.

Goswamy and Saikia (1972) in their study on capital formation in Assam revealed that owned funds constituted the major source of funds for acquisition and improvement of assets. The lower and higher income groups depended on owned funds and the middle income group alone borrowed for investment at interest rates between 20 and 25 per cent per annum.

Singh and Mishra (1974) in their study on capital formation, made an attempt to the source of finance for investment in Purnea district of Bihar state. They observed that a large part of capital formation of the farmers was financed by borrowings. The proportion of borrowings was 76.30 per cent, 52.20 per cent and 46.80 per cent for medium, big and small farmers respectively. A considerable part of the sample farmers (40.50%) borrowed from non-institutional sources.

Alagh and Sharma (1990) dealt with the process of estimating public sector resource flow to the agricultural sector. Six country case studies empirically highlight the concepts developed and importance of including parastatals and state government in the estimates. The major recommendations arising from the concepts and empirical analysis are that a) gross public sector flows to agriculture may be measured; b) public sector flows to agriculture include agricultural service, agricultural inputs and agro-processing facilities; c) capital flows should be measured and capital formation components of public expenditure estimated separately d) net external flows need to be measured via the commodity trade routed in government and intra-public sector; f) when comparing public sector resource flows to agricultural GDP, public sector flows for agro-processing should be ignored; but those for supply of inputs should be included and its public sector flows should be the aggregate of general government and public enterprise flows.

Prakash *et al.* (1994) in their study on capital formation in Mysore district of Karnataka state, made an attempt to know the sources of capital formation in agriculture. They observed that the total amount of capital formed through owned funds constituted 98.07 per cent and 97.20 per cent on progressive and non-progressive farms, respectively.

Dhawan and Yadav (1995), in their study on private fixed capital formation in India, revealed that Indian farmers allocate a rather small proportion of their total capital funds (self-owned plus borrowed ones from institutional and non-institutional sources) towards fixed capital formation in agriculture. However, it is not possible to exchange the thesis of complementarity between public and private investments in agriculture for one of a substitution thesis.

Banerjee (1996) opines that Indian agriculture needs to undergo radical change involving diversification of agricultural production. In the light of this, the paper explores a new strategy of capital formation in Indian agriculture. The financial structure requires merger of rural branches of commercial banks with the regional rural banks. Infested of weak multiple agencies, there should be a combined agency which would be strong enough to meet the growing requirements of rapid capital formation under the new perception of diversified agricultural development.

Mani *et al.* (1996), in their study on gross domestic capital formation at the national level in India made an attempt to know the reasons for lowest capital formation in Indian agriculture. They observed that co-operatives were emerging as the major source of capital formation, even though institutional finance for agriculture had increased sensationally over time. The share of long term finance in total institutional credit was very low (15 to 20%) and the per hectare investment availability was much lower than the prescribed norms.

Karmakar (1998), in a study on capital formation in India, made an attempt to understand the role of institutional credit in gross capital formation in agriculture. It was concluded that the falling role of public investment in agriculture was due to the falling sectoral allocation in the national plans, increase in recurring expenditure and partly due to under use of irrigation projects. The decline in capital formation in agriculture could partly be offset through increased flow of institutional credit.

Vivekanand (1999), in a study in Karnataka state, observed that there was a direct relationship between size of holdings and the percentage of households availing loan facilities. About 15.6 per cent of farmers received crop loans from institutions. Institutional finance played a significant role in capital formation in agriculture. The total institutional finance allocated for irrigation, implements and land development was 47.1, 39.3 and 13 per cent, respectively.

III. METHODOLOGY

To fulfil the objectives, the study was conducted in Chitradurga district, which was found to represent all the characters to serve the purpose of the study and was familiar to the researcher. A brief description of the methodology followed in sampling, data collection and analysis of data is presented in this chapter, under appropriate sub heads.

3.1 DESCRIPTION OF THE STUDY AREA

The present study was carried out in Chitradurga district of Karnataka. Chitradurga district is situated between the geographical co-ordinates $13^0$34' and $15^0$02' N latitude and $75^0$37' and $77^0$01' E longitude. The district is surrounded by Davanagere and Bellary districts in the North and on the east by Ananthapur district of Andhra Pradesh. On the southeast and southwest, it is bounded by Tumkur and Chikamagalur districts and on the south and northwest by Shimoga and Dharwad districts.

3.1.1 Climate, rainfall and soil types

There are three distinguishably different weather seasons in the district. The southwest monsoon spreads over from June to September, winter during the months of December to February and summer spreads over March to May. The district has average annual rainfall of 486.57 mm.

The important soil types are red, red loamy and deep medium black soils. Red loamy soils are predominant in the district followed by deep medium black soils and red soils.

3.1.2 Crops and cropping pattern

The important crops in Chitradurga districts are ragi, paddy, jowar, maize and bajra. In addition to these, pulse crops like redgram, greengram, horsegram are also grown. The important commercial crops grown in the district are groundnut, sunflower, cotton, tobacco and mulberry. Vegetable crops like cauliflower, chilli, knol-khol, beans, leafy vegetables, tomato, brinjal, etc. and plantation crops like coconut, arecanut and banana are also grown to a considerable extent (Table 3.1).

3.1.3 Population and literacy

Table 3.1 represents some basic statistics on geographical area, population and literacy of Chitradurga district. Out of total population of 1517896 (2001 census) in Chitradurga district, about 81.93 per cent live in rural areas and 18.07 per cent in urban areas. The literacy level in Chitradurga district is 64.88 per cent.

3.2 SELECTION OF TALUKS

To estimate and compare the capital formation in progressive and less progressive areas, two taluks - one representing the progressive area and other representing the less progressive area were chosen for the study.

The following variables were considered in deciding on the progressiveness of taluks: (a) percentage area under irrigation, (b) percentage area under commercial crops, (c) fertilizer use per ha, (d) co-operative credit per ha and e) cropping intensity. The data pertained to average of three years, viz., 2000, 2001 and 2002, is presented in Table-3.2.

For each variable considered above, the scores were assigned for each taluk in the district. The scores were given in the ascending order, depending on the magnitude of each variable, considered separately for each taluk. The minimum score starts from 1 and maximum score of 6 were given for six taluks of Chitradurga district on the same rationality used above. The scores were then aggregated for each taluk and the taluk with the highest aggregate score was ranked number one and so on. The taluk with the first rank and that with last rank were chosen. Thus, Chitradurga and Hosadurga taluks were chosen for the study to represent progressive and less progressive regions, respectively.

Table 3.1 : General aspects about Chitradurga district (2002-03)

Sl. No.	Particulars	Chitradurga district
1	Total geographical area (ha)	770702
2	Population (Nos) as per 2001 census	1517896
3	Literacy (%)as per 2001 census	64.88
4	Annual Rainfall (mm)	486.57
5	Total cropped area (ha)	489849
6	Net irrigated area (ha)	70500
7	**Area under different crops**	
A.	***Agriculture crops (ha)***	
a	Paddy	12459
b	Ragi	63658
c	Jowar	28493
d	Bajra	3350
e	Maize	47877
f	Wheat	1531
i	Redgram	6899
j	Groundnut	149664
k	Sunflower	43535
l	Cotton	7533
m	Mulberry	24166
B.	***Horticulture crops***	
a	Fruits	3159
b	Vegetables	16269

Source : District statistical office, Chitradurga, 2002-03

Table 3.2: Features of progressiveness of taluks in Chitradurga district

Sl. No.	Features of taluks	Percentage area under irrigation	Percentage area under commercial crops	Fertilizer use/ hectare	Cooperative credit/ha	Cropping intensity (%)	Total scores	Ranking of taluks
1	Challakeri	17.51 (3)	83.08 (6)	35.14 (1)	137.36 (1)	124.13 (4)	15	4
2	Chitradurga	18.78 (5)	39.90 (2)	62.47 (5)	601.86 (6)	124.51 (5)	23	1
3	Hiriyur	21.92 (6)	72.44 (4)	57.53 (3)	265.11 (3)	125.18 (6)	22	2
4	Holalkere	15.24 (2)	35.83 (1)	63.25 (6)	472.67 (5)	103.74 (1)	15	4
5	Hosdurga	7.69 (1)	40.36 (3)	41.74 (2)	281.30 (4)	110.10 (3)	13	6
6	Molakalmur	18.46 (4)	74.89 (5)	60.86 (4)	229.38 (2)	109.72 (2)	17	3
	Total	**16.46**	**59.30**	**50.91**	**321.79**	**117.71**	**-**	**-**

Note : 1. Figures in parenthesis denote score assigned to the taluks, the scores were assigned in the ascending order.
2. The ranking of the taluks was done in descending order looking the total scores of the taluk

3.3 BRIEF DESCRIPTION OF THE TALUKS SELECTED FOR THE STUDY

The geographical areas of the Chitradurga and Hosadurga taluks were 1,23,502 and 1,12,574 ha, consisting of 4 hoblies in each taluk and 165 villages (Chitradurga) and 198 villages (Hosadurga), respectively.

Chitradurga and Hosadurga taluks receive an average rainfall of 590.2 and 463.4 mm, respectively. The rainfall during 2003-04 was 387.30 and 371.30 mm in that order (As against the district average of 329.60 mm).

Important aspects of the agricultural economy of the taluks considered in the study are presented in Table 3.3. Of the total gross cropped area (4,89,849 ha) in the district, Chitradurga and Hosadurga taluks account for 19.55 and 16.14 per cent, respectively. The gross area irrigated by different sources was 19.70 and 7.88 per cent of the district total in Chitradurga and Hosadurga taluks. The percentage area under commercial crops was about 39.90 and 40.36 per cent in these taluks, respectively as against 59.30 per cent for the district. The cropping intensity was 124.51 and 110.10 per cent in Chitradurga and Hosadurga taluks, respectively. The fertilizer use per ha was 62.47 and 41.74 kgs, co-operative credit per ha was Rs. 601.86 and Rs. 281.30 in that order as against district average of 50.91 kg of fertilizer use per ha and Rs. 321.79 per ha of co-operative credit, respectively.

Crops like maize, jowar, sunflower, ragi and groundnut occupied more area accounting for 54.14, 26.59, 21.49, 20.24 and 5.62 per cent of the total gross cropped area of the district in Chitradurga as against 0.35, 18.70, 6.09, 38.10 and 1.17 per cent in Hosadurga taluk. Hosadurga taluk had more area under ragi, paddy and cotton than that of Chitradurga during 2002-03.

3.4 SAMPLING DESIGN

The two taluks viz., Chitradurga and Hosadurga were ultimately selected based on the criteria explained earlier. In addition to progressive and less progressive category, the study required post classification into irrigated and rainfed as also small, medium and large farmers to meet the objectives. Hence, the total sample was required into progressive, less progressive farms, irrigated and rainfed farms and also small, medium and large farms.

The classification of farms into small, medium and large was done based on size of holding. Large farms were those which had size of holdings above 5 ha, medium farms were those which had size of land holding 2 to 5 ha and small farms had 2 ha and below.

The preliminary survey of the two taluks was made in the beginning with the help of Agricultural Assistants of State Department of Agriculture. The sampling design consisted of multi-stage random sampling. The first stage consisted of selection of taluks. The second stage consisted of selection of villages from the selected taluks to cover both irrigated and rainfed farms. From each taluk, 10 villages were selected randomly and from each village, nine farmers (3 each from small, medium and large size categories) were randomly selected to form a total of 20 sample villages. Hence, in all a sample of 180 farmers were selected for the study. The distribution of villages selected are presented in Table 3.4 and Table 3.5.

The final stage of sampling consisted of selecting the sample farmers. The list of the farmers of the selected villages was obtained from Agricultural Assistants and the village accountants of the respective villages. The sample farmers were selected based on random sampling method from each village selected. A sample of 90 farmers comprising of 30 small farmers, 30 medium and 30 large farmers were selected to constitute a sample size of 90 from each taluk. Thus, total of 180 farmers were selected for the study.

3.5 COLLECTION OF DATA

Secondary data on various parameters for the period from 1966 to 1997 were collected for achieving the first objective of the study. The data were sourced from the Directorate of Economics and Statistics, Bangalore. For computing the annual compound growth rates of Gross Fixed Capital formation by Type of Industry of Use and by Type of

Table 3.3 : Agricultural economy of Chitradurga and Hosdurga taluk as well as Chitradurga district

SL. No.	Particulats	Chitradurga taluk		Hosdurga taluk		Chitradurga district
1	Total geographical area (ha)	123502	(16.02)	112574	(14.60)	770702
2	Gross cropped area (ha)	95772	(19.55)	79068	(16.14)	489849
3	Gross area irrigated (ha)	13892	(19.70)	5562	(7.88)	70500
4	Area under commercial crops (%)	39.90		40.36		59.30
5	Fertilizer use per ha (kg)	62.47		41.74		50.91
6	Cooperative credit per ha (Rs.)	601.86		281.30		321.79
7	Area under different crops (ha)					
a	Ragi	12890	(20.24)	24258	(38.10)	63658
b	Paddy	101	(0.81)	820	(6.58)	12459
c	Jowar	7578	(26.59)	5329	(18.70)	28493
d	Maize	25922	(54.14)	171	(0.35)	47877
e	Groundnut	8422	(5.62)	1758	(1.17)	149664
f	Sunflower	9357	(21.49)	2654	(6.09)	43535
g	Cotton	539	(7.15)	988	(13.11)	7533

Note : Figures in parenthesis indicate percentage to the respective total.

Table 3.4: Number of sample farmers in the selected villages

Sl. No.	Sample villages	Number of sample respondents								Total
		Progressive area				Less progressive area				
		Small	Medium	Large	Total	Small	Medium	Large	Total	
A	**Chitradurga taluk**									
1	Barama Sagar	3	3	3	9	-	-	-	-	9
2	Bhemasamudra	3	3	3	9	-	-	-	-	9
3	Hampanur	3	3	3	9	-	-	-	-	9
4	Laxmisagar	3	3	3	9	-	-	-	-	9
5	Mallapur	3	3	3	9	-	-	-	-	9
6	Manangi	3	3	3	9	-	-	-	-	9
7	Maragata	3	3	3	9	-	-	-	-	9
8	Medhehally	3	3	3	9	-	-	-	-	9
9	Pillekeranahally	3	3	3	9	-	-	-	-	9
10	Thamatagallu	3	3	3	9	-	-	-	-	9
	Total	**30**	**30**	**30**	**90**	**-**	**-**	**-**	**-**	**90**
B	**Hosdurga taluk**									
1	Belgur	-	-	-	-	3	3	3	9	9
2	Kabbala	-	-	-	-	3	3	3	9	9
3	Kainodu	-	-	-	-	3	3	3	9	9
4	Kellodu	-	-	-	-	3	3	3	9	9
5	Kolkere	-	-	-	-	3	3	3	9	9
6	Madhure	-	-	-	-	3	3	3	9	9
7	Mettinahole	-	-	-	-	3	3	3	9	9
8	S. Nilkere	-	-	-	-	3	3	3	9	9
9	Samasandra	-	-	-	-	3	3	3	9	9
10	Sriramapura	-	-	-	-	3	3	3	9	9
	Total	**-**	**-**	**-**	**-**	**30**	**30**	**30**	**90**	**90**
	Grand total	**30**	**30**	**30**	**90**	**30**	**30**	**30**	**90**	**180**

Table 3.5: Number of sample farmers in the selected villages

Sl. No.	Sample villages	Number of sample respondents								Total
		Irrigated farms				Rainfed farms				
		Small	Medium	Large	Total	Small	Medium	Large	Total	
A	**Chitradurga taluk**									
1	Barama Sagar	2	1	2	5	1	2	1	4	9
2	Bhemasamudra	1	1	3	5	2	2	0	4	9
3	Hampanur	2	1	2	5	1	2	1	4	9
4	Laxmisagar	2	2	2	6	1	1	1	3	9
5	Mallapur	2	1	2	5	1	2	1	4	9
6	Manangi	2	2	3	7	1	1	0	2	9
7	Maragata	2	2	3	7	1	1	0	2	9
8	Medhehally	1	2	2	5	2	1	1	4	9
9	Pillekeranahally	1	1	3	5	2	2	0	4	9
10	Thamatagallu	1	2	2	5	2	1	1	4	9
	Total	**16**	**15**	**24**	**55**	**14**	**15**	**6**	**35**	**90**
B	**Hosdurga taluk**									
1	Belgur	1	1	2	4	2	2	1	5	9
2	Kabbala	1	1	1	3	2	2	2	6	9
3	Kainodu	2	3	2	7	1	0	1	2	9
4	Kellodu	1	1	2	4	2	2	1	5	9
5	Kolkere	2	1	1	4	1	2	2	5	9
6	Madhure	1	2	3	6	2	1	0	3	9
7	Mettinahole	0	2	1	3	3	1	2	6	9
8	S. Nilkere	2	1	3	6	1	2	0	3	9
9	Samasandra	2	1	1	4	1	2	2	5	9
10	Sriramapura	1	2	1	4	2	1	2	5	9
	Total	**13**	**15**	**17**	**45**	**17**	**15**	**13**	**45**	**90**
	Grand total	**29**	**30**	**41**	**100**	**31**	**30**	**19**	**80**	**180**

Institution, the secondary data on required parameters were collected for the period from 1980-81 to 1993-94, while for computing the annual compound growth rate of livestock, poultry and agricultural implements, the data collected were for the period from 1966 to 1997.

Primary data from the respondents were collected by personal interview method from farmer respondents with the help of pre-tested schedule. The respondents were clearly explained about the purpose of the study for getting better co-operation from them and also to increase the accuracy of the data. The data collected consisted of the following aspects. General information regarding the educational level of the respondents, size of family, distance from the taluk headquarters, social participation, size of the holding, operational holding, source of irrigation etc. Detailed information regarding the year of investment and cost of acquisition of assets, source of capital, expected life span, annual maintenance charges of different assets like farm buildings, farm machinery and equipment, improvements on land, investment on gardens, irrigation structures and equipments, livestock and other farm animals was collected. In addition, information on cropping pattern, income from farm and off-farm occupations, farm and off-farm expenditure, expenditure on non-agricultural investment like marriage and other social functions, consumption on health, comforts/luxuries. Amount of borrowings from different institutional and non-institutional sources, preference for various credit sources and constraints in acquiring capital assets was also collected.

3.6 ANALYTICAL TOOLS USED IN THE STUDY

3.6.1 Exponential Model

Exponential Model or Semi-Log Model, as specified below, was employed to estimate the compound annual growth in fixed capital formation in agriculture in Karnataka.

$$Y = a * b^t$$

Where,

Y	=	Private Fixed Capital Formation in Agriculture (Value in Rupees),
t	=	Time in Years

3.6.2 Multiple Linear Regression Model

Multiple Linear Regression Model, as explained below, was used for identifying the factors influencing private fixed capital formation in agriculture.

$$K_i = b_0 + \Sigma b_j X_{ij} + u_i \qquad (j = 1 \text{ to } 11)$$

Where,

K_i	=	Private Fixed Capital Formation in Agriculture (Value in Rupees),
X_1	=	Size of holding (ha),
X_2	=	Area irrigated (ha),
X_3	=	Proportion of area under commercial crops (%),
X_4	=	Fertilizer use (Kg/ha),
X_5	=	Annual income of the family (Rs.),
X_6	=	Borrowed amount (Rs.),
X_7	=	Family size (Number),
X_8	=	Age of the farmer (years),
X_9	=	Education (Schooling stages),

X_{10}	=	Distance from the town (km),
b0 & b1	=	Intercept and Slope Coefficients of the Regression Model, respectively,
u_i	=	Random Disturbance Term.

3.7 CONCEPTS EMPLOYED IN THE STUDY

Different concepts used in the study are defined here.

3.7.1 Education or literacy level of the family

It is likely that persons in the family having higher education will largely influence the family decision. For this purpose, information on the education level of the head of family was taken into consideration. It was quantified by giving scores to the education level of the head of family. The scores assigned were '0' for illiterate, '1' for primary school, '2' for secondary school, '3' for high school and '4' for college and above.

3.7.2 Cost and return concepts

The various costs were classified into variable and fixed costs. Variable costs were defined to include costs incurred on seeds, fertilizers, plant protection chemicals, labour charges including both family and hired labour, repair and maintenance charges, interest on working capital and marketing charges. Fixed costs were defined to include land revenue, irrigation charges, electricity etc.

The measurement of various cost concepts are as follows.

3.7.2.1 Variable cost components

a. Seed

The cost of seed was computed at the local market price for the farm-produced and purchased seed.

b. Farm yard manure (FYM)

Farmyard manure produced on the farm was evaluated at the village prices prevailing at the time of sowing. FYM, if purchased, was evaluated at actual prices paid by farmers.

c. Fertilizers and plant protection chemicals

The actual prices paid for fertilizers and plant protection chemicals by the farmers were considered.

d. Labour

The hired labour wages were computed taking the wages paid by the respondents for men, women and bullock pairs. The cost of family labour was imputed taking hired wage rates.

3.7.2.2 Fixed cost components

a. Land revenue

The land revenue actually paid by the farmer was considered.

b. Irrigation charges

The irrigation charges for borewell/open well irrigation were computed based on the charges fixed by the irrigation department on per acre basis. In case of well irrigation, the electricity charges (fixed based on horse power of the meter) paid by the farmer were taken into consideration.

3.7.3 Capital formation

It is defined as investment made in agriculture on items such as purchase of land, improvements on lands, investment made on gardens, livestock, farm machinery and equipment, farm building etc. over a period of time.

The methodology followed is in accordance with the broad guidelines provided by the Central Statistical Organization (CSO), Government of India. The estimates of Gross Fixed Capital Formation [GFCF) of public and private sectors of Karnataka are presented by i) type of assets ii) type of institutions and iii) type of industry of use at current prices for the years 1980-81 to 1993-94.

Gross Capital Formation

It is the addition to stock of existing assets and replacement of assets during the period under consideration. The gross capital formation includes both appreciation and depreciation in the value of assets. In the present study, it refers to the additions made to existing assets like improvements on land, purchase of irrigation equipments, investment in gardens, etc.

Net Capital Formation

It is the gross capital formation minus depreciation. This indicates the present worth of assets held by the farmers.

The investments that were included in this study are defined below.

a. Investment made on land: This comprises of the cost of purchase of new land.

b. Investment in farm buildings: This includes investment made on construction of cowshed, poultry house, etc.

c. Investment made in farm machinery and equipment: This encompasses expenditure incurred for the purchase of bullock cart, iron plough, poultry equipment, etc.

d. Investment made in gardens: This includes cost incurred for establishment of gardens like banana, coconut, sapota, mango, flowers as well as establishment of hedges border trees and fencing trees.

e. Irrigation equipment and structure: This includes investment made for digging of wells, purchase of pumpsets, borewells, making of irrigation channels, etc.

f. Maintenance charges: These include expenditure incurred for the repair, maintenance and upkeep of farm machinery, equipment, etc. The items under this head include oiling and sharpening of equipments, repair and deepening of wells, repairing and whitewashing of farm buildings.

g. Improvement made on land: It includes item of investment, such as bunding, land levelling, land shaping, etc.

3.8 DEFINITION OF THE FACTORS USED IN THE REGRESSION ANALYSIS

In the present study, a total of 10 factors were first considered as factors affecting capital formation. They were, size of holding, family size, percentage area under commercial crops, cropping intensity, percentage area under irrigation, irrigation intensity, education, net income, disposable income, savings (which includes past savings), urbanization (distance from taluk centre). But later on, they were tested for multicollinearity and their influence on capital formation through correlation analysis. Based on these two measures, only ten factors were retained for regression analysis as explanatory variables. They were defined below.

a. Size of holding

It is the area of the holding owned by the respondent expressed in acres. It is true that size of holding has an influence on capital formation. The rationality behind this is that higher the holding, larger the amount of capital assets he needs for carrying out agricultural operations and hence it was considered.

b. Area irrigated

It is the actual area irrigated (net irrigated area) expressed in acres. The area irrigated has a greater influence on stability and enhancement of income for the farmer. Again, irrigated area calls for additional investment in irrigation structures, land improvements, increased use of inputs, etc. Hence, this factor was considered in the study.

c. Education level of the respondent

It is likely that the respondents with higher level of education will be better exposed to modern methods of cultivation and new technology which will in turn influence the use of capital on farms. Hence, the respondent's education was taken as an influencing factor on capital formation.

d. Area under commercial crops

It is the ratio of area under cash crops such as cotton, chilli, groundnut, sunflower, plantations, etc. to the gross cropped area expressed as percentage. The commercial crops have a higher demand in internal and international market. The returns from these crops are likely to be higher, which is a result of higher investment and hence it was included as an explanatory variable.

e. Fertilizer use per hectare

Using of chemical fertilizers on the farm in turn influence the production as well as returns and thus influence the future investment on the farm.

f. Credit/borrowed amount

It is the total amount of credit borrowed for various agricultural purposes, which includes short-term, medium term and long-term credits. Since, the availability of owned funds is very limited, he depends more on external finance for his agricultural operations and farm investment. These in turn influence the decision regarding the crop as well as investment decisions.

g. Income of the family

Though, the income may be higher among farmers, it is the income net of consumption expenditure that determines the actual amount available for investment. Hence, annual income was considered in the study.

h. Distance from town/urbanization

This is measured by the distance (in kms) from the village to the nearest taluk/urban centre. Farther the village from the urban centres, less urbanized is the village. Urbanization has a perceptible influence on farmers' knowledge, technical know-how and exposure to new/modern aspects of life. All these will in turn influence the decisions on the farm regarding crop selection, export, marketing, farm investment, etc.

i. Family size

Family size includes number of family members (inclusive of both adults and children) in the farm family. The family size affects the consumption expenditure as well as income of the family. If more members are available from the family side itself, they can make their economic conditions better and hence it was considered as a variable.

j. Age

In this study, the age of the head of family (measured in years) was considered while some view that with age farmers gain experience in farm business, some others observe that younger farmers are better adopters and are more progressive in thinking. Thus, age will certainly have an influence on the investment decision of the farm.

3.9 SOURCES OF FINANCE AND CONSTRAINTS IN ACQUIRING CAPITAL ASSETS

The farmer was having more than one source to avail finance for acquiring capital. Apart from own capital, he could borrow from institutional and non-institutional sources. Though non-institutional agencies were officially out of the picture as per various acts of government, farmers do borrow from these sources even now. Hence, it was decided to know the source of preference by the farmer for acquiring finance for capital formation. Percentages were assigned to different agencies as preferred by the farmer.

Three choices were given in case of institutional sources, viz., commercial banks, regional rural banks and co-operatives. In the same way among non-institutional sources five choice were given, viz., traders, moneylenders, private finance, friend and relatives and commission agents. Further, percentages were assigned to different agencies as preferred by the farmer.

It was also essential to know the problems faced by the farmer in acquiring needed capital assets. With this in view, the respondents were asked to indicate the various problems faced by them so as to identify the constraints in acquiring capital assets. In this case, choices were given viz., non-availability of finance/credit, overdue of credit in the bank, very high interest rate, insufficient cultural severity, very small holding, lack of education, family problems, Hence, percentages were assigned to different constraints indicated by the farmers.

IV. RESULTS

The results of the analysis carried out in the present study for different groups of farms, namely, progressive, less progressive, irrigated and rainfed farms, each in respect of small, medium and large farmers are presented in this chapter under the following sections, consistent with the objectives of the study.

4.1 TREND AND MAGNITUDE OF CAPITAL FORMATION

4.1.1 Trends in Fixed Capital Formation by Type of Industry of Use and by Type of Institution in Karnataka

The trends in fixed capital formation by type of industry of use and by type of institution in Karnataka were analysed using the data available for the period from 1980-81 to 1993-94 (data beyond 1993-94 were not available). The type of industry of use included (i) agriculture and allied activities, (ii) forestry and logging, (iii) fishing and (iv) mining and quarrying under primary sector; (i) manufacturing, (ii) construction and (iii) electricity, gas and water supply under secondary sector; and (i) transport, storage and communication, (ii) trade, hotel and restaurant, (iii) banking and insurance, (iv) real estate, owner of dwell and business, (v) public administration and (vi) other services under tertiary sector. The type of institution included both public and private sectors (Table 4.1).

The total fixed capital formation across all types of industry of use and both the types of institution increased from Rs.1010.96 crores in 1980-81 to Rs.5874.01 crores in 1993-94, almost six fold (581 per cent) in one and half decades. The corresponding figures for total public and private sectors were 517 per cent and 674 per cent, respectively. The sector-wise growth in fixed capital formation indicates that it was highest (651.95 per cent) for tertiary sector, followed by secondary sector (612.89 per cent) and primary sector (455.09 per cent).

The share of each of the sectors in the State total fixed capital formation was worked out and it was observed that tertiary sector appropriated maximum share (42.96 per cent), followed by secondary share (33.81 per cent) and primary sector (23.23 per cent).

Coming to intra-sectoral analysis, in the primary sector, the share of agriculture and allied activities in the total fixed capital formation at sectoral level was the highest (84.37 per cent), followed by mining (7.72 per cent), fishing (4.93 per cent) and forestry and logging (2.99 per cent). In the secondary sector, it was manufacturing sub-sector which accounted for the highest capital formation (64.14 per cent), followed by electricity, gas and water supply (34.56 per cent) and least in construction (1.29 per cent). In the case of tertiary sector, about 32 per cent of the total fixed capital formation in the sector was accounted for by the real estate, owner of dwell and business (32.17 per cent), closely followed by transport, storage and communication (30.76 per cent), public administration (15.93 per cent), bank and insurance (7.52 per cent), trade, hotel and restaurant (7.20 per cent) and other services (6.43 per cent).

As far as public and private institutions were concerned, at the state level across all sectors, both public and private institutions contributed equally in the total fixed capital formation, with public (52.72 per cent) having little edge over the private (47.28 per cent). In primary and tertiary sectors, public institutions scored over private ones in terms of fixed capital formation, while it was the other way round in the case of secondary sector (42.27 per cent versus 57.73 per cent).

4.1.2 Compound Annual Growth Rate of Gross Fixed Capital Formation by Type of Industry of Use and by Type of Institution

The compound annual growth rates in the Gross Fixed Capital Formation by type of industry of use and type of institution were estimated using the Exponential Model or Semi-Log Model. The selected model was a good fit as indicated by their R^2 values (Table 4.2).

The overall compound annual growth in Gross Fixed Capital Formation was 13.78 per cent per annum across all types of industry of use and types of institution. Between different

Table-4.1:Trends in Fixed Capital Formation by Type of Industry of Use and by Type of Institution (Public & Private)

(In Rs.Lakhs)

SN	Industry of Use	Sector	1980-81	1993-94	% to Sub-Sectoral Total	% to Sectoral Total	% to All Sectors Total	1993-94 as % of 1980-81
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Agriculture & Allied Activities	Public	12508	68116	59.16			544.58
		Private	9100	47022	40.84			516.73
		Total	21608	115138	100.00	84.37		532.85
2	Forestry & Logging	Public	1516	4076	100.00			268.87
		Private	0	0	0.00			-
		Total	1516	4076	100.00	2.99		268.87
3	Fishing	Public	0	0	0.00			-
		Private	426	6723	100.00			1578.17
		Total	426	6723	100.00	4.93		1578.17
4	Mining & Quarrying	Public	6232	9462	89.78			151.83
		Private	207	1077	10.22			520.29
		Total	6439	10539	100.00	7.72		163.67
	Primary Sector	Public	**20256**	**81654**	**59.83**			**403.11**
		Private	**9733**	**54822**	**40.17**			**563.26**
		Total	**29989**	**136476**	**100.00**	**100.00**	**23.33**	**455.09**
1	Manufacturing	Public	11066	14594	11.46			131.88
		Private	12294	112790	88.54			917.44
		Total	23360	127384	100.00	64.14		545.31
2	Construction	Public	141	705	27.45			500.00
		Private	313	1863	72.55			595.21
		Total	454	2568	100.00	1.29		565.64
3	Electricity, Gas & Water supply	Public	8589	68643	100.00			799.20
		Private	0	0	0.00			-
		Total	8589	68643	100.00	34.56		799.20
	Secondary Sector	Public	**19796**	**83942**	**42.27**			**424.04**
		Private	**12607**	**114653**	**57.73**			**909.44**
		Total	**32403**	**198595**	**100.00**	**100.00**	**33.81**	**612.89**
1	Transport, Storage & Communication	Public	6629	76144	98.11			1148.65
		Private	228	1465	1.89			642.54
		Total	6857	77609	100.00	30.76		1131.82
2	Trade, Hotel, Restaurant	Public	498	286	1.57			57.43
		Private	2929	17885	98.43			610.62
		Total	3427	18171	100.00	7.20		530.23
3	Banking & Insurance	Public	1497	18964	100.00			1266.80
		Private	0	0	0.00			-
		Total	1497	18964	100.00	7.52		1266.80
4	Real Estate, Owner of Dwell & Business	Public	0	0	0.00			-
		Private	14606	81162	100.00			555.68
		Total	14606	81162	100.00	32.17		555.68
5	Public Administration	Public	10333	40199	100.00			389.04
		Private	0	0	0.00			-
		Total	10333	40199	100.00	15.93		389.04
6	Other Services	Public	888	8511	52.46			958.45
		Private	1096	7714	47.54			703.83
		Total	1984	16225	100.00	6.43		817.79
	Tertiary Sector	Public	**19845**	**144104**	**57.11**			**726.15**
		Private	**18859**	**108226**	**42.89**			**573.87**
		Total	**38704**	**252330**	**100.00**	**100.00**	**42.96**	**651.95**
	ALL SECTORS	Public	**59897**	**309700**	**52.72**			**517.05**
		Private	**41199**	**277701**	**47.28**			**674.05**
		Total	**101096**	**587401**	**100.00**		**100.00**	**581.03**

Table 4.2:Compound Annual Growth Rate of Gross Fixed Capital formation by Type of Industry of Use and by Type of Institution

Sl. No.	Industry of use	Sector	b	CGR	R^2
1	Agriculture and allied activities	Public	1.1220	12.20	0.6798
		Private	1.1402	14.02	0.9065
		Total	1.1307	13.07	0.8008
2	Forestry and logging	Public	1.0670	6.70	0.8608
		Private	-	-	-
		Total	1.0670	6.70	0.8608
3	Fishing	Public	-	-	0.1002
		Private	1.1473	14.73	0.6700
		Total	1.1471	14.71	0.6701
4	Mining and quarrying	Public	0.9758	-2.42	0.0009
		Private	1.1297	12.97	0.9213
		Total	1.0021	0.21	0.0156
A	**Primary sector (1+2+3+4)**	**Public**	**1.0985**	**9.85**	**0.5890**
		Private	**1.1503**	**15.03**	**0.9150**
		Total	**1.1208**	**12.08**	**0.7790**
5	Manufacturing	Public	1.0108	1.08	0.0189
		Private	1.1759	17.59	0.8726
		Total	1.1361	13.61	0.8947
6	Construction	Public	1.1944	19.44	0.3212
		Private	1.1437	14.37	0.9169
		Total	1.1653	16.53	0.7413
7	Electricity, Gas and Water Supply	Public	1.1470	14.70	0.6623
		Private	-	-	-
		Total	1.1470	14.70	0.6623
B	**Secondary sector (5+6+7)**	**Public**	**1.1085**	**10.85**	**0.6815**
		Private	**1.1752**	**17.52**	**0.8740**
		Total	**1.1409**	**14.09**	**0.8425**
8	Transport, storage and communication	Public	1.2150	21.50	0.8149
		Private	1.1552	15.52	0.9056
		Total	1.2132	21.32	0.8171
9	Trade, Hotel, Restaurant	Public	0.9529	-4.71	0.2190

Contd.....

Sl. No.	Industry of use	Sector	b	CGR	R^2
		Private	1.1422	14.22	0.9207
		Total	1.1299	12.99	0.9128
10	Banking and insurance	Public	1.2444	24.44	0.8556
		Private	-	-	-
		Total	1.2444	24.44	0.8556
11	Real estate, owner of dwell and business	Public	-	-	-
		Private	1.1340	13.40	0.9251
		Total	1.1340	13.40	0.9251
12	Public administration	Public	1.0811	8.11	0.6883
		Private	-	-	-
		Total	1.0811	8.11	0.6883
13	Other services	Public	1.1521	15.21	0.6768
		Private	1.1586	15.86	0.9064
		Total	1.1564	15.64	0.8102
C	**Tertiary sector (8+9+10+11+12+13)**	**Public**	**1.1532**	**15.32**	**0.8376**
		Private	**1.1372**	**13.72**	**0.9229**
		Total	**1.1459**	**14.59**	**0.8809**
	ALL (A+B+C)	**Public**	**1.1241**	**12.41**	**0.7736**
		Private	**1.1532**	**15.32**	**0.9170**
		Total	**1.1378**	**13.78**	**0.8610**

Note: - Negligible

types of institution, the growth in private sector (15.32 per cent per annum) surpassed the growth in public sector (12.41 per cent per annum).

Among different sectors, tertiary sector witnessed the highest growth rate (14.59 per cent) followed by secondary sector (14.09 per cent) and primary sector (12.08 per cent).

Coming to sub-sector level, in primary sector, the compound annual growth rate was the highest in fishing (14.71 per cent), followed by agriculture and allied activities (13.07 per cent) and forestry and logging (6.70 per cent), while the least was in the case of mining and quarrying (0.21 per cent). In the secondary sector, construction sub-sector witnessed the highest compound annual growth rate (16.53 per cent), followed by electricity, gas and water supply (14.70 per cent) and manufacturing (13.61 per cent). In the tertiary sector, the highest compound annual growth rate was observed in banking and insurance (24.44 per cent), transport, storage and communication (21.32 per cent), other services (15.64 per cent), real estate, owner of dwell and business (13.40 per cent), trade, hotel and restaurant (12.99 per cent) and public administration (8.11 per cent).

4.1.3 Growth of Agricultural Implements and Machineries in Karnataka

The growth in capital formation was also analysed in terms of physical units of agricultural capital assets, such as ploughs, carts, sugarcane crushers, water lifts, irrigation pumps and tractors.

The major agricultural implements and machinery put together in Karnataka were of the order of 39.06 lakhs during 1977 census which increased to 49.19 lakhs during 1997 Census, thus registering a growth of 25.92 per cent (Table-4.3).

Coming to individual components of capital stock, ploughs contributed the maximum (74 per cent during 1977 and 67 per cent during 1997) to the total stock of agricultural implements and machinery in the State, followed by carts and irrigation pumps.

Over the study period, highest growth was observed in the case of tractors (457 per cent), followed by irrigation pumps operated by electric motors (220 per cent), sugarcane crushers operated by bullocks (165 per cent), irrigation pumps operated by oil engines (29 per cent), carts (18 per cent) and ploughs (12 per cent), whereas negative growth was observed in the case of water lifts worked by Persian wheel/Rahats (-100 per cent) and sugarcane crushers operated by power (-46 per cent).

4.1.4 District-wise Stock of Agricultural Implements and Machineries in Karnataka

The district-wise stock of agricultural capital assets were also studied, the results of which are presented in Tables-4.4 and 4.5.

The total number of different agricultural capital assets in the State as per 1997 Census was 49.186 lakhs, across all types of assets and all the districts (Table-4.4). Among different agricultural capital assets included in the study, the highest proportion was accounted by wooden plough (37.12 per cent), followed by iron plough (26.36 per cent), carts (16.28 per cent), electric pumpset for irrigation (11.97 per cent), oil engines with pumpsets for irrigation (2.33 per cent), MB plough (1.73 per cent), tractor including power tiller (1.59 per cent) and power operated sprayers and dusters (1.33 per cent). Disc plough, bullock operated sugarcane crushers and power operated sugarcane crushers contributed less than one per cent each to the total stock of agricultural capital assets.

Among all the districts of the State, Tumkur had the highest proportion (8.41 per cent) of total agricultural capital assets in the State (Table-4.5), followed by Belgaum (7.61 per cent), Hassan (6.62 per cent), Bangalore Rural (6.44 per cent), Kolar (6.43 per cent), Mysore (5.95 per cent), Mandya (5.65 per cent), Shimoga (4.49 per cent) and Gulbarga (4.89 per cent) while the least was in the case of Kodagu (1.02 per cent).

Table-4.3: Growth of Agricultural Implements and Machineries in Karnataka (1977-1997)

(In Hundreds)

Sl.No.	Category	1977	1997	% Change
1	Ploughs	29000	32392	11.70
2	Carts	6770	8009	18.30
3	Sugarcane crushers			
	a) Operated by power	100	54	-46.00
	b) Worked by bullocks	100	265	165.00
4	Water lifts worked by Persian wheel/Rahats	220	0	-100.00
5	Power operated sprayers and dusters	-	654	654.00
5	Irrigation pumps			
	a) Operated by oil engines	890	1145	28.65
	b) Operated by electric motors	1840	5887	219.95
6	Tractors	140	780	457.14
	Total	**39060**	**49186**	**25.92**

Note: - Negligible

Table-4.4: District-wise Stock of Agricultural Implements and Machineries in Karnataka (1997 Census)

(In hundreds)

District	Ploughs		Carts	Sugarcane crushers		Oil engines with pumpsets for irrigation	Electric pumpset for irrigation	Tractor including power tiller	MB plough	Disc plough	Power operated sprayers and dusters	Total
	Wooden	Iron		Power operated	Bullocks operated							
Bagalkot	344	258	359	5	19	22	243	26	19	15	12	1322
Bangalore(urban)	217	155	50	0	1	4	97	17	18	9	5	573
Bangalore(rural)	1322	1120	192	1	10	27	360	48	56	15	18	3169
Belgaum	929	773	875	13	22	124	724	90	58	40	95	3743
Bellary	676	202	380	1	15	16	144	57	34	29	23	1577
Bidar	256	236	155	3	17	11	155	7	4	3	35	882
Bijapur	262	383	401	4	14	38	346	21	15	12	24	1520
Chamarajnagar	676	321	172	4	7	10	113	11	43	4	12	1373
Chikamagalur	454	480	209	0	7	54	113	29	25	6	20	1397
Chitradurga	789	226	330	0	8	7	254	21	14	7	12	1668
D.Kannada	320	139	0	0	0	326	249	3	14	0	34	1085
Davanagere	610	309	249	0	3	9	180	57	34	27	15	1493
Dharwad	300	75	254	0	12	11	25	43	23	19	13	775
Gadag	314	139	254	0	8	8	60	37	23	18	19	880
Gulbarga	683	640	656	2	18	58	153	28	20	12	134	2404
Hassan	1172	1328	362	1	11	28	237	25	61	11	21	3257
Haveri	685	175	370	0	4	6	157	31	21	12	13	1474
Kodagu	232	159	6	1	0	31	18	19	24	1	11	502
Kollar	1285	733	386	1	12	27	566	39	85	16	13	3163
Koppal	333	100	254	0	8	3	150	15	9	8	10	890
Mandya	584	1543	395	12	12	34	129	15	42	5	10	2781
Mysore	1430	946	361	2	4	14	63	14	76	6	10	2926
Raichur	562	190	345	1	13	26	117	36	21	18	47	1376
Shimoga	963	635	351	2	14	63	91	37	19	11	22	2208
Tumkur	2074	767	513	0	17	44	638	37	32	10	7	4139
Udupi	181	504	6	0	0	97	309	4	43	4	9	1157
U.Kannada	604	427	124	1	9	47	196	13	16	5	10	1452
Total	**18257**	**12963**	**8009**	**54**	**265**	**1145**	**5887**	**780**	**849**	**323**	**654**	**49186**
% to Total	**37.12**	**26.36**	**16.28**	**0.11**	**0.54**	**2.33**	**11.97**	**1.59**	**1.73**	**0.66**	**1.33**	**100.00**

Note: 0- Negligible

Source: Livestock Census 1997.

Table-4.5: District-wise Stock of Agricultural Implements and Machineries in Karnataka

(In Percentage)

District	Ploughs		Carts	Sugarcane crushers		Oil engines with pumpsets for irrigation	Electric pumpset for irrigation	Tractor including power tiller	MB plough	Disc plough	Power operated sprays and dusters	Total
	Wooden	Iron		Power operated	Bullocks operated							
Bagalkot	1.88	1.99	4.48	9.26	7.17	1.92	4.13	3.33	2.24	4.64	1.83	2.69
Bangalore(urban)	1.19	1.20	0.62	0.00	0.38	0.35	1.65	2.18	2.12	2.79	0.76	1.16
Bangalore(rural)	7.24	8.64	2.40	1.85	3.77	2.36	6.12	6.15	6.60	4.64	2.75	6.44
Belgaum	5.09	5.96	10.93	24.07	8.30	10.83	12.30	11.54	6.83	12.38	14.53	7.61
Bellary	3.70	1.56	4.74	1.85	5.66	1.40	2.45	7.31	4.00	8.98	3.52	3.21
Bidar	1.40	1.82	1.94	5.56	6.42	0.96	2.63	0.90	0.47	0.93	5.35	1.79
Bijapur	1.44	2.95	5.01	7.41	5.28	3.32	5.88	2.69	1.77	3.72	3.67	3.09
Chamarajnagar	3.70	2.48	2.15	7.41	2.64	0.87	1.92	1.41	5.06	1.24	1.83	2.79
Chikamagalur	2.49	3.70	2.61	0.00	2.64	4.72	1.92	3.72	2.94	1.86	3.06	2.84
Chitradurga	4.32	1.74	4.12	0.00	3.02	0.61	4.31	2.69	1.65	2.17	1.83	3.39
Dakshina Kannada	1.75	1.07	0.00	0.00	0.00	28.47	4.23	0.38	1.65	0.00	5.20	2.21
Davanagere	3.34	2.38	3.11	0.00	1.13	0.79	3.06	7.31	4.00	8.36	2.29	3.04
Dharwad	1.64	0.58	3.17	0.00	4.53	0.96	0.42	5.51	2.71	5.88	1.99	1.58
Gadag	1.72	1.07	3.17	0.00	3.02	0.70	1.02	4.74	2.71	5.57	2.91	1.79
Gulbarga	3.74	4.94	8.19	3.70	6.79	5.07	2.60	3.59	2.36	3.72	20.49	4.89
Hassan	6.42	10.24	4.52	1.85	4.15	2.45	4.03	3.21	7.18	3.41	3.21	6.62
Haveri	3.75	1.35	4.62	0.00	1.51	0.52	2.67	3.97	2.47	3.72	1.99	3.00
Kodagu	1.27	1.23	0.07	1.85	0.00	2.71	0.31	2.44	2.83	0.31	1.68	1.02
Kollar	7.04	5.65	4.82	1.85	4.53	2.36	9.61	5.00	10.01	4.95	1.99	6.43
Koppal	1.82	0.77	3.17	0.00	3.02	0.26	2.55	1.92	1.06	2.48	1.53	1.81
Mandya	3.20	11.90	4.93	22.22	4.53	2.97	2.19	1.92	4.95	1.55	1.53	5.65
Mysore	7.83	7.30	4.51	3.70	1.51	1.22	1.07	1.79	8.95	1.86	1.53	5.95
Raichur	3.08	1.47	4.31	1.85	4.91	2.27	1.99	4.62	2.47	5.57	7.19	2.80
Shimoga	5.27	4.90	4.38	3.70	5.28	5.50	1.55	4.74	2.24	3.41	3.36	4.49
Tumkur	11.36	5.92	6.41	0.00	6.42	3.84	10.84	4.74	3.77	3.10	1.07	8.41
Udupi	0.99	3.89	0.07	0.00	0.00	8.47	5.25	0.51	5.06	1.24	1.38	2.35
Uttara Kannada	3.31	3.29	1.55	1.85	3.40	4.10	3.33	1.67	1.88	1.55	1.53	2.95
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Livestock Census 1997.

Table-4.6: Pattern and Growth of Agricultural Implements and Machineries in Chitradurga District

(in hundreds)

Particulars	Chitradurga District		
	1990	1997	% Change
Ploughs			
a. Wooden	1083	1399	29.18
b. Iron	515	535	3.88
Carts	439	579	31.89
Sugarcane crushers			
a. Power operated	-	-	-
b. Bullock operated	2	11	450.00
Oil engines with pumpsets for irrigation	12	16	33.33
Electric pumpsets for irrigation	179	434	142.46
Tractor including power tillers	36	78	116.67
MB plough	17	48	182.35
Disc plough	8	34	325.00
Power operated sprayers & dusters	34	27	-20.59
Total	**2325**	**3161**	**35.96**
% to the State Total	**4.33**	**6.43**	

Note: - Negligible

4.1.5 Pattern and Growth of Agricultural Implements and Machineries in Chitradurga District

Chitradurga possessed nearly 4.33 per cent (2.33 lakhs in number) and 6.43 per cent (3.16 lakhs in number) of the State's total agricultural capital assets during 1990 (53.69 lakhs) and 1997 (49.19 lakhs), respectively (Table-4.6). Interestingly, while there was negative growth (-8.38 per cent) in the State's total agricultural capital stock, Chitradurga district witnessed a significant positive growth (35.96 per cent).

The growth in the stock of different agricultural capital assets in Chitradurga district during the seven-year study period varied from the highest of 450 per cent to the lowest of –20.59 per cent. Sugarcane crushers worked by bullocks witnessed the highest growth of 450 per cent, followed by disc plough (325 per cent), MB plough (182 per cent), electric pumpsets for irrigation (142 per cent), tractor including power tillers (117 per cent), oil engines with pumpsets for irrigation (33 per cent), carts (32 per cent), wooden ploughs (29 per cent) and iron plough (4 per cent), while negative growth was observed in power operated sprayers and dusters (-21 per cent).

4.1.6 Growth Rate of Livestock and Poultry in Karnataka

The growth rates of livestock and poultry in Karnataka were estimated using the data from 1966 to 1997 with the help of the Exponential or Semi-Log Model and presented in Table-4.7.

During this period, the total livestock increased from 2.05 crores during 1966 to 3.07 crores during 1997 registering a compound annual growth rate of 1.20 per cent over the entire study period. On the other hand, poultry sector has witnessed a compound annual growth rate of 3 per cent over the study period, due to an increase in the number of birds from 0.83 crores to 2.14 crores during 1997.

Amongst different components of livestock, pigs registered the highest growth (1.81 per cent), followed by goat (1.5 per cent), sheep (1.33 per cent), buffaloes (1.3 per cent) and cattle (0.32 per cent), while negative growth was observed in the case of camels (-7.19 per cent), horse and ponies (-3.96 per cent), donkeys (-1.66 per cent) and mules (-1.00 per cent). Amongst various components of poultry, highest growth rate was observed in the case of fowls (3.01 per cent), followed by ducks (2.30 per cent) and other poultry (1.90 per cent).

4.1.7 District-wise Stock of Livestock and Poultry in Karnataka

The district-wise stocks of livestock and poultry were estimated, the results of which are presented in Table-4.8 and the percentages to the state totals are presented in Table-4.9.

The total number of livestock and poultry in the State as per 1997 Census was 3.07 crores and 2.14 crores, respectively, across all the districts (Table-4.8). Of this total stock of 5.2 crores animals, livestock accounted for 58.92 per cent while poultry accounted for the remaining 41.08 per cent.

Among different livestock components, cattle accounted for the highest proportion (20.79 per cent) of the 5.2 crore animal stock in the State, followed by sheep (15.36 per cent), goat (9.36 per cent), buffaloes (8.38 per cent) and dogs (4.11 per cent). Pigs, donkeys, horse and ponies, mules, camels and other livestock accounted for less than one per cent of the total livestock in the State. In the poultry sector, fowls accounted for the highest proportion (40.91 per cent), followed by ducks (0.15 per cent) and other poultry (0.02 per cent).

The shares of each of the districts in the State total in respect of each of the livestock and poultry components were worked out (Table-4.9). Among all the districts of the State, Belgaum accounted for the highest proportion of livestock (8.58 per cent), followed by Tumkur (7.38 per cent), Gulbarga (7.25 per cent), Bangalore-Rural (6.71 per cent), Kolar (5.65 per cent), Bellary (5.39 per cent), Chitradurga (4.87 per cent), Raichur (4.02 per cent), Hassan (3.99 per cent), Mandya (3.90 per cent), Bagalkot (3.84 per cent), Bijapur (3.63 per cent), Mysore (3.51 per cent), Shimoga (3.40 per cent) and Davanagere (3.33 per cent), while least was in the case of Kodagu (0.94 per cent).

Table-4.7: Growth Rate of Livestock and Poultry in Karnataka

(in hundreds)

Year	Cattle	Buffaloes	Sheep	Goat	Horse & ponies	Mules	Donkeys	Camels	Pigs	Dogs	Others	Total Livestock (2-12)	Ducks	Fowls	Other poultry	Total Poultry (14-16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1966	96856	29460	47480	27837	649	6	487	10	2071	NC	0	204856	629	81666	472	82767
1972	100187	32159	46624	37260	337	9	453	14	2611	NC	0	219654	409	101188	34	101631
1977	102220	32781	45365	33881	270	9	507	5	2964	NC	0	218002	382	96528	50	96960
1983	113002	36480	47917	45469	236	25	482	4	3189	NC	0	246804	1897	118857	211	120965
1990	101755	40372	47273	38888	197	5	356	1	3040	17794	0	249681	919	155308	709	156936
1997	108310	43672	80031	48748	158	5	284	2	4054	21388	228	306881	780	213082	126	213978
b	1.0032	1.0130	1.0133	1.0150	0.9604	0.9900	0.9834	0.9281	1.0181	-	-	1.0120	1.0230	1.0301	1.0190	1.0300
CGR	0.32	1.30	1.33	1.50	-3.96	-1.00	-1.66	-7.19	1.81	-	-	1.20	2.30	3.01	1.90	3.00
R Square	0.4036	0.9837	0.4815	0.7164	0.7313	0.0025	0.7020	0.6954	0.8627	1.0000	0.4732	0.8687	0.1110	0.8890	0.0094	0.8930

Note: NC = Not Counted
- = Negligible

Table-4.8: District-wise Stock of Livestock and Poultry in Karnataka

(In hundreds)

District	Cattle	Buffaloes	Sheep	Goat	Horse & ponies	Mules	Donkeys	Camels	Pigs	Dogs	Others	Total Livestock (2-12)	Ducks	Fowls	Other Poultry	Total Poultry (14-16)	Grand Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Bagalkot	2717	1982	3781	2673	7	-	9	0	205	422	1	11797	88	5742	3	5833	17630
Bangalore(urban)	1851	274	1247	413	4	-	1	0	72	1253	12	5127	69	14235	1	14305	19432
Bangalore(rural)	7542	1953	6232	3447	1	-	14	0	97	1288	8	20582	3	23607	13	23623	44205
Belgaum	4994	6512	8762	4421	79	1	6	1	410	1132	6	26324	6	9544	12	9562	35886
Bellary	4258	1860	5291	3705	3	-	27	-	394	1012	2	16552	24	16077	-	16101	32653
Bidar	2764	1607	789	1273	3	3	27	1	155	351	0	6973	2	6585	0	6587	13560
Bijapur	2525	1521	2542	3578	17	0	4	0	330	613	0	11129	15	4264	0	4279	15408
Chamarajnagar	3168	450	1251	1196	2	0	1	0	12	301	3	6384	3	2029	0	2032	8416
Chikamagalur	3905	1149	744	434	-	0	2	0	127	675	4	7040	11	4034	0	4045	11085
Chitradurga	3190	1728	7164	2181	1	0	51	0	79	543	0	14938	1	6031	-	6032	20970
Dakshina Kannada	3551	572	3	223	-	0	-	0	184	1705	7	6245	12	10769	11	10792	17037
Davanagere	3799	2216	2413	1212	1	0	1	-	52	522	4	10220	1	8160	0	8161	18381
Dharwad	2216	896	507	715	4	0	1	0	54	357	1	4751	-	3043	-	3043	7794
Gadag	2118	929	2063	1228	5	-	2	0	60	290	2	6697	-	1913	0	1903	8600
Gulbarga	8233	2179	4882	5732	13	-	17	0	284	918	1	22259	11	7103	0	7114	29373
Hassan	6140	2076	1956	1122	2	0	10	0	93	827	5	12231	13	7143	-	7156	19387
Haveri	3368	1280	2482	1474	5	0	4	0	30	457	1	9101	2	5283	0	5285	14386
Kodagu	1383	435	8	71	-	0	-	0	422	574	5	2898	4	3333	23	3360	6258
Kollar	5318	1476	7252	1578	1	0	7	0	290	1269	138	17329	19	9945	-	9964	27293
Koppal	2602	901	1919	1367	2	0	4	-	97	374	1	7267	5	7596	5	7606	14873
Mandya	3426	1919	3630	2333	1	0	4	0	115	540	2	11970	4	9268	58	9330	21300
Mysore	5660	845	2154	1378	2	-	3	0	34	696	3	10775	3	10491	-	10494	21269
Raichur	4019	1523	3787	2375	1	-	4	-	148	473	1	12331	4	2775	-	2779	15110
Shimoga	5771	2245	186	1008	1	-	4	0	31	1173	4	10423	474	9218	-	9692	20115
Tumkur	5982	2688	8959	3425	3	1	80	-	193	1304	12	22648	4	7997	0	8001	30649
Udupi	3864	864	2	15	-	0	0	0	26	1316	2	6089	2	9699	-	9701	15790
Uttara Kannada	3946	1592	25	171	-	-	1	0	60	1003	3	6801	-	7198	-	7198	13999
Total	**108310**	**43672**	**80031**	**48748**	**158**	**5**	**284**	**2**	**4054**	**21388**	**228**	**306881**	**780**	**213082**	**126**	**213978**	**520859**
% to G.Total	**20.79**	**8.38**	**15.36**	**9.36**	**0.03**	**0.00**	**0.05**	**0.00**	**0.78**	**4.11**	**0.04**	**58.92**	**0.15**	**40.91**	**0.02**	**41.08**	**100.00**

Note : - Negligible

Source: Livestock Census 1997.

Table-4.9: District-wise Stock of Livestock and Poultry in Karnataka (In Percentage)

(In Percentage)

District	Cattle	Buffaloes	Sheep	Goat	Horse & ponies	Mules	Donkeys	Camels	Pigs	Dogs	Others	Total (2-12)	Ducks	Fowls	Other poultry	Total (14-16)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Bagalkot	2.51	4.54	4.72	5.48	4.43	-	3.17	0.00	5.06	1.97	0.44	3.84	11.28	2.69	2.38	2.73
Bangalore(urban)	1.71	0.63	1.56	0.85	2.53	-	0.35	0.00	1.78	5.86	5.26	1.67	8.85	6.68	0.79	6.69
Bangalore(rural)	6.96	4.47	7.79	7.07	0.63	-	4.93	0.00	2.39	6.02	3.51	6.71	0.38	11.08	10.32	11.04
Belgaum	4.61	14.91	10.95	9.07	50.00	20.00	2.11	50.00	10.11	5.29	2.63	8.58	0.77	4.48	9.52	4.47
Bellary	3.93	4.26	6.61	7.60	1.90	-	9.51	-	9.72	4.73	0.88	5.39	3.08	7.54	-	7.52
Bidar	2.55	3.68	0.99	2.61	1.90	60.00	9.51	50.00	3.82	1.64	0.00	2.27	0.26	3.09	0.00	3.08
Bijapur	2.33	3.48	3.18	7.34	10.76	0.00	1.41	0.00	8.14	2.87	0.00	3.63	1.92	2.00	0.00	2.00
Chamarajnagar	2.92	1.03	1.56	2.45	1.27	0.00	0.35	0.00	0.30	1.41	1.32	2.08	0.38	0.95	0.00	0.95
Chikamagalur	3.61	2.63	0.93	0.89	-	0.00	0.70	0.00	3.13	3.16	1.75	2.29	1.41	1.89	0.00	1.89
Chitradurga	2.95	3.96	8.95	4.47	0.63	0.00	17.96	0.00	1.95	2.54	0.00	4.87	0.13	2.83	-	2.82
D.Kannada	3.28	1.31	0.00	0.46	-	0.00		0.00	4.54	7.97	3.07	2.03	1.54	5.05	8.73	5.04
Davanagere	3.51	5.07	3.02	2.49	0.63	0.00	0.35	-	1.28	2.44	1.75	3.33	0.13	3.83	0.00	3.81
Dharwad	2.05	2.05	0.63	1.47	2.53	0.00	0.35	0.00	1.33	1.67	0.44	1.55	-	1.43	-	1.42
Gadag	1.96	2.13	2.58	2.52	3.16	-	0.70	0.00	1.48	1.36	0.88	2.18	-	0.90	0.00	0.89
Gulbarga	7.60	4.99	6.10	11.76	8.23	-	5.99	0.00	7.01	4.29	0.44	7.25	1.41	3.33	0.00	3.32
Hassan	5.67	4.75	2.44	2.30	1.27	0.00	3.52	0.00	2.29	3.87	2.19	3.99	1.67	3.35	-	3.34
Haveri	3.11	2.93	3.10	3.02	3.16	0.00	1.41	0.00	0.74	2.14	0.44	2.97	0.26	2.48	0.00	2.47
Kodagu	1.28	1.00	0.01	0.15	-	0.00		0.00	10.41	2.68	2.19	0.94	0.51	1.56	18.25	1.57
Kolar	4.91	3.38	9.06	3.24	0.63	0.00	2.46	0.00	7.15	5.93	60.53	5.65	2.44	4.67	-	4.66
Koppal	2.40	2.06	2.40	2.80	1.27	0.00	1.41	-	2.39	1.75	0.44	2.37	0.64	3.56	3.97	3.55
Mandya	3.16	4.39	4.54	4.79	0.63	0.00	1.41	0.00	2.84	2.52	0.88	3.90	0.51	4.35	46.03	4.36
Mysore	5.23	1.93	2.69	2.83	1.27	-	1.06	0.00	0.84	3.25	1.32	3.51	0.38	4.92	-	4.90
Raichur	3.71	3.49	4.73	4.87	0.63	-	1.41	-	3.65	2.21	0.44	4.02	0.51	1.30	-	1.30
Shimoga	5.33	5.14	0.23	2.07	0.63	-	1.41	0.00	0.76	5.48	1.75	3.40	60.77	4.33	-	4.53
Tumkur	5.52	6.15	11.19	7.03	1.90	20.00	28.17	-	4.76	6.10	5.26	7.38	0.51	3.75	0.00	3.74
Udupi	3.57	1.98	0.00	0.03	-	0.00	0.00	0.00	0.64	6.15	0.88	1.98	0.26	4.55	-	4.53
U.Kannada	3.64	3.65	0.03	0.35	-	-	0.35	0.00	1.48	4.69	1.32	2.22	-	3.38	-	3.36
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Note : - Negligible

Source: Livestock Census 1997.

Coming to poultry, Bangalore-Rural stood first sharing 11.04 per cent of the State's stock of poultry birds, followed by Bellary (7.52 per cent), Bangalore-Urban (6.69 per cent), Dakshina Kannada (5.04 per cent), Mysore (4.90 per cent), Kolar (4.66 per cent), Belgaum (4.47 per cent), Udupi (4.53 per cent), Shimoga (4.53 per cent) and Mandya (4.36 per cent), while least was in the case of Gadag (0.89 per cent).

4.1.8 Growth of Livestock and Poultry in Chitradurga District and Karnataka State

Chitradurga possessed nearly 4.78 per cent (19.43 lakhs in number) and 7.56 per cent (39.35 lakhs in number) of the State's total livestock and poultry together during 1990 (406.6 lakhs) and 1997 (520.9 lakhs), respectively (Table-4.10). Between 1990 and 1997, there was an increase of 78.74 per cent in the case of livestock as against 164.60 per cent in the case of poultry, thus resulting in 102.50 per cent growth in livestock and poultry together.

Amongst different components of livestock and poultry, the percentage increase was the highest in the case of sheep (165.95 per cent), followed by fowls (165.60 per cent), horse and ponies (100.00 per cent), pigs (87.14 per cent), cattle (53.40 per cent), buffaloes (50.30 per cent), donkeys (48.57 per cent), goat (39.86 per cent) and dogs (39.76 per cent), while there was decrease in the case of other poultry (-100.00 per cent) and ducks (-83.33 per cent).

4.2 PATTERN OF INVESTMENT IN DIFFERENT CAPITAL ASSETS

4.2.1 Socio-economic Characteristic Features of Progressive and Less Progressive Areas

The knowledge of the socio-economic characteristics of sample farmers would help us gain a better understanding of the implications of the present study. Hence details in this regard were collected from the sample farmers and presented in the Table-4.11.

Size of Holding

The average size of holding in the progressive area was 3.51 ha. The average holding size was 6.17 ha in the case of large farmers, 2.99 ha in medium farmers and 1.37 ha in small farmers. On the other hand, the average size of holding in less progressive area was 3.75 ha, with the holding size of large, medium and small farmers being 6.66 ha, 3.27 ha and 1.32 ha, respectively.

Average Irrigated Area

The average irrigated area of the farmers in both the progressive and less progressive areas was 0.07 ha. The average irrigated area was almost equal between progress and less progressive areas in all the farm size categories. Across the farm size categories, the average irrigated area ranged from 0.06 ha to 0.10 ha. Thus the proportion of irrigated area to the holding size was very low in both progressive and less progressive areas.

Area under Commercial Crops

The average area under commercial crops in both the progressive and less progressive areas was almost same (33 per cent). The large farms of less progressive area had 54.04 per cent of their total gross cropped area under commercial crops, followed by medium and small farms (32.39 and 13.58 per cent) while the large farms of progressive area possessed 51.88 per cent of gross cropped area under commercial crops followed by medium and small farms (32.39 and 16.11 per cent, respectively).

Fertilizer Use

The average value of fertilizers used per ha in the progressive area was relatively higher (Rs.871) than that in the less progressive area (Rs.657). However, variations existed from group to group; it was Rs.922, Rs.907 and Rs.782 per ha for large, medium and small

Table-4.10: Growth of Livestock and Poultry in Chitradurga District

(In hundreds)

Particulars	Chitradurga District		
	1990	1997	% Change
LIVESTOCK			
1. Cattle	4556	6989	53.40
2. Buffaloes	2624	3944	50.30
3. Sheep	3601	9577	165.95
4. Goat	2426	3393	39.86
5. Horse and ponies	1	2	100.00
6. Mules	-	-	-
7. Donkeys	35	52	48.57
8. Camels	-	-	-
9. Pigs	70	131	87.14
10. Dogs	762	1065	39.76
Total (1-10)	**14075**	**25158**	**78.74**
POULTRY			
11. Ducks	12	2	-83.33
12. Fowls	5343	14191	165.60
13. Other poultry	3	0	-100.00
Total (11-13)	**5358**	**14193**	**164.60**
Grand Total (1-13)	**19433**	**39351**	**102.50**
% to State Total	**4.78**	**7.56**	

Note: - Negligible

Table-4.11: General Socio-Economic Characteristic Features of Sample Farmers of Progressive and Less Progressive Areas

Variable / Category	Size of holding (ha)	Area irrigated (ha)	Area under commercial crops (%)	Fertilizer use (Rs/ha)	Annual income of the family (Rs.)	Amount borrowed per farm (Rs.)	Family size (No.)	Age (years)	Literacy level (No/farm)	Distance from town (km)
Progressive area										
Small	1.37	0.10	16.11	782	18150	49604	5.60	51.20	3.40	13.55
Medium	2.99	0.07	32.39	907	35034	87845	6.80	51.77	4.60	13.55
Large	6.17	0.06	51.88	922	70900	177509	7.43	55.97	5.00	13.55
Average	**3.51**	**0.07**	**33.46**	**871**	**41361**	**104985**	**6.61**	**52.98**	**4.33**	**13.55**
Less progressive area										
Small	1.32	0.09	13.58	614	13250	21695	5.37	50.67	2.80	17.20
Medium	3.27	0.06	32.39	772	33800	100172	6.93	53.17	4.17	17.20
Large	6.66	0.06	54.04	585	58767	127929	7.13	55.37	4.27	17.20
Average	**3.75**	**0.07**	**33.33**	**657**	**35272**	**83265**	**6.48**	**53.07**	**3.74**	**17.20**

farms, respectively, in the progressive area, while in the case of less progressive area, it was Rs.772, Rs.614 and Rs.585 for medium, small and large farms, respectively.

Annual Income of the Family

The average annual income of the family for the entire progressive area was higher (Rs.41,361) as compared to less progressive area (Rs.35,272). It was Rs.70,900, Rs.35,034 and Rs.18,150 for large, medium and small farms, respectively in the progressive area as against Rs.58,767, Rs.33,800 and Rs.13,250 for large, medium and small farms, respectively, in the less progressive area.

Amount Borrowed

Similarly, the average amount of borrowing per farm in the progressive area was Rs.1,04,985 as against Rs.83,265 in the less progressive area. The amount borrowed by large, medium and small farmers in the progressive area correspondingly was in the order of Rs.1,77,509, Rs.87,845 and Rs.49,604 as compared to Rs.1,27,929, Rs.1,00,172 and Rs.21,695 for large, medium and small farms, respectively.

Family Size

The average size of family in the less progressive area was 6.48 arrived at by 7.13 for large farms, 6.93 for medium farms and 5.37 for small farms. On the other hand, the average size of family in the progressive area was 6.61 as a result of 7.43, 6.80 and 5.60 for large, medium and small farmers, respectively.

Age of the Respondent

The average age of the respondents in both the progressive and less progressive areas was same at about 53 years. Their age ranged from 51 to 56 years across all the farm size categories in both the study areas.

Literacy

The average number of literates per farm in the progressive area was higher (4.33) than that in the less progressive area (3.74). In both the progressive and less progressive areas, the literacy level was the highest in the case of large farmers (5.00 and 4.27, respectively), followed by medium farmers (4.60 and 4.17, respectively) and small farmers (3.40 and 2.80, respectively).

Distance from Town

The average distance from town for the farmers of progressive area was 13.25 km as compared to 17.20 km for the farmers of less progressive area.

4.2.2 Socio-economic Characteristic Features of Irrigated and Rainfed Farms

The average characteristic features of irrigated and rainfed farms in terms of the variables as used in the previous section are furnished in Table-4.12 and explained here under.

Size of Holding

The average size of holding in the case of irrigated farms was much higher (4.19 ha) than that of rainfed farms (2.91 ha). The average holding size was 6.70 ha for large farms, 3.47 ha for medium farms and 1.38 ha for small farms in the case of irrigated farms, whereas in the rainfed farms, the large, medium and small farmers possessed 5.77 ha, 2.79 ha and 1.27 ha of holdings, respectively.

Average Irrigated Area

The average irrigated area of the irrigated farms together was 0.42 ha. Farm size category-wise, it was 0.68 ha in the case of small farms followed by 0.38 ha for large farms and 0.23 ha for medium farms.

Table-4.12: General Socio-Economic Characteristic Features of Sample Farmers of Irrigated and Rainfed Farms

Variable / Category	Size of holding (ha)	Area irrigated (ha)	Area under commercial crops (%)	Fertilizer use (Rs./ha)	Annual income of the family (Rs.)	Amount borrowed per farm (Rs.)	Family size (No.)	Age (years)	Literacy level (No./farm)	Distance from town (km)
Irrigated farms										
Small	1.38	0.68	21.86	807	1932	63798	5.76	50.83	3.21	16.36
Medium	3.47	0.23	28.09	1057	40367	138684	7.37	53.43	4.63	14.38
Large	6.70	0.38	49.83	869	72854	194043	7.76	56.63	4.98	14.30
Average	**4.19**	**0.42**	**33.26**	**911**	**44177**	**132175**	**6.96**	**53.63**	**4.27**	**15.02**
Rainfed farms										
Small	1.27	-	14.31	554	12323	25797	5.23	51.03	3.00	14.45
Medium	2.79	-	35.32	527	28467	61434	6.37	51.50	4.13	16.37
Large	5.77	-	50.36	727	47527	69895	6.26	53.58	3.89	17.68
Average	**2.91**	**-**	**33.33**	**603**	**29439**	**52375**	**5.95**	**52.04**	**3.68**	**16.17**

Area under Commercial Crops

The average proportionate area under commercial crops was almost same in both rainfed and irrigated areas (33.33%). The large farms of rainfed area had the highest proportion (50.36 per cent) of total gross cropped area under commercial crops, followed by medium (35.32 per cent) and small farms (14.31 per cent). Similarly in the case of irrigated area, it was the highest (49.83 per cent) on large farms followed by medium (28.09 per cent) and small farms (21.86 per cent).

Fertilizer Use

The average value of fertilizers used in the irrigated area was Rs.911 per ha, which was much higher compared to rainfed area (Rs.603). However, variations existed from group to group. It was Rs.1057, Rs.869 and Rs.807 per ha for medium, large and small farms, respectively, in the irrigated area. While in the case of rainfed area, the variation was from Rs.554 per ha (small farms) to Rs.727 (large farms).

Annual Income of the Family

The average annual income of family on irrigated farms was relatively higher (Rs.44,177) than that on rainfed farms (Rs.29,439). It was Rs.72,854, Rs.40,367 and Rs.1,932 for large, medium and small farms, respectively, under irrigated conditions as against Rs.47,527, Rs.28,467 and Rs.12,323 for large, medium and small farms, respectively, under rainfed conditions.

Amount Borrowed

The average amount of borrowing by the irrigated farmers was Rs.1,32,175 per farm. The amounts borrowed by large, medium and small farmers of irrigated area were in the order of Rs.1,94,043, Rs.1,38,684 and Rs.63,798 per farm, respectively. On the other hand, in the case of rainfed farms, the average amount borrowed was Rs.52,375 per farm. Large farmers borrowed highest amount (Rs.69,895), followed by medium (Rs.61,434) and small farmers (Rs.25,797) under rainfed situation.

Family Size

The average size of family on irrigated farms was higher (6.96) as compared to rainfed farms (5.95). It ranged from 7.76 for large farmers to 5.76 for small farmers of irrigated area, while it varied from 6.37 for medium farmers to 5.23 for small farmers of rainfed area.

Age of the Respondent

The average age of the respondents of irrigated farms was slightly higher (53.63 years) than that of rainfed farms (52.04 years). It was 56.63 years in the case of large farms, 53.43 years for medium farmers and 50.83 years for small farmers. In rainfed farms, the age of the respondents ranged from 53.58 years for large farmers to 51.03 years for small farmers, respectively.

Literacy

The average number of literates per family on the irrigated farms was higher (4.27 per farm) as compared to rainfed farms (3.68 per farm). It was 4.98, 4.63 and 3.21 per farm for large, medium and small farms, respectively, of irrigated area. In the rainfed area, the literacy level was highest for medium farmers (4.13) followed by large farms (3.89) and small farms (3.00).

Distance from Town

The average distance from town for rainfed farms was 16.17 km, as against 15.02 km for irrigated farms. Across the farm size categories, the distance from town ranged from 14.30 to 16.36 km for irrigated farms and from 14.45 to 17.68 km for rainfed farms.

4.2.3 Pattern of Agricultural Investment on Different Capital Assets

It is pertinent to know the investment behaviour of different groups of farmers, since it is a reflection on the rationality of decisions taken by the farmers. Hence, the pattern of agricultural investment is analysed and presented in Table-4.13.

The overall agricultural investment per farm on all the capital assets by sample respondents was Rs.1,85,626 in the study area. As expected the investment on agricultural capital assets by large farmers was the highest (Rs.3,22,118) followed by medium and small farmers (Rs.1,66,045 and Rs.68,715, respectively). Across different capital assets, the overall agricultural investment by sample farmers on improvements on land (Rs.133088) was the highest constituting 25.54 per cent of the total investment, followed by farm machinery and equipment (21.68 per cent), land (19.58 per cent), irrigation structure and equipment (19.37 per cent) and farm buildings (13.80 per cent).

This order of investment across different capital assets varies with the farm size category. In the case large farms, major investment was on farm machinery and equipment at Rs.93,025 per farm (28.87%) followed by improvements on land (22.64 per cent), irrigation structure and equipments (19.21 per cent) and land (17.61 per cent), while the lowest investment was at Rs.37,517 which was on farm buildings (11.64 per cent).

Medium farmers invested maximum (Rs.50,337) on improvements on land constituting 30.31 per cent of their total investment on agricultural capital assets, followed by purchase of land (Rs.36,784; 22.15 per cent), irrigation structure and equipment (Rs.31,517; 18.98 per cent), farm buildings (Rs.28597; 17.22 per cent) and farm machinery and equipment (Rs.18,810; 11.32 per cent).

The order of investment on small farms was similar to that on medium farms. The highest investment was on improvements on land (Rs.18,984) constituting 27.62 per cent of total capital formation, followed by purchase of land (25.58 per cent), irrigation structure and equipment (21.07 per cent), farm buildings (15.69 per cent) and farm machinery and equipment (13.01 per cent).

4.2.4 Pattern of Non-Agricultural Investment on Different Capital Assets

The overall non-agricultural investment on different capital assets by the sample farmers was Rs.87,544 (Table-4.14). As in the case of agricultural capital investment, investment by the large farmers in non-agricultural capital assets was the highest (Rs.1,20,601) followed by medium (Rs.95,364) and small farmers (Rs.46,668).

In general, across all farm size categories, the non-agricultural investment by the sample farmers was the highest on marriage and other social functions (Rs.29,672) constituting 33.89 per cent of total investment in non-agricultural capital assets, followed by consumption (Rs.25,205; 28.79 per cent), health (Rs.18,528; 21.16 per cent) and the remaining about 15 per cent on comforts/luxuries in the order of motorbike, television and bicycle. The pattern of investment was almost similar in each of the farm size categories except in the case of small and large categories wherein there was no investment on motorbike and bicycle, respectively.

In all the farm size categories, more than 75 per cent of the investment on non-agricultural capital assets was on marriage and other social functions, consumption and health. Such investment was highest in the case of small farmers (96.69 per cent), followed medium (86.94 per cent) and large farmers (76.41 per cent). Conversely, large farmers invested maximum on comforts/luxuries (23.59 per cent), followed by medium (13.06 per cent) and small farmers (3.31 per cent).

4.2.5 Pattern of Investment in other Enterprises

Table-4.15 presents the pattern of investment on other enterprises, namely, horticulture and livestock. The overall average investment on horticulture and livestock enterprises by the sample farmers was Rs.22,321, contributed mainly by animal component (Rs.19,681 for about 7 animals) and remaining by horticulture component (Rs.2,641 for about

Table-4.13: Pattern of Investment in Different Capital Assets

(Rs/farm)

Particulars	Small	Medium	Large	Overall
Land	15517 (25.58)	36784 (22.15)	56750 (17.61)	36350 (19.58)
Farm buildings	10784 (15.69)	28597 (17.22)	37517 (11.64)	25633 (13.80)
Farm machinery and equipments	8946 (13.01)	18810 (11.32)	93025 (28.87)	40260 (21.68)
Improvements on land	18984 (27.62)	50337 (30.31)	72934 (22.64)	44363 (25.54)
Irrigation structure and equipment	14484 (21.07)	31517 (18.98)	61892 (19.21)	36170 (19.37)
Total	**68715 (100.00)**	**166045 (100.00)**	**322118 (100.00)**	**185626 (100.00)**

Note: Figures in parentheses are percentage to the respective column totals.

Table-4.14: Pattern of Non-Agricultural Investment on Different Capital Assets

(Rs/farm)

Particulars	Small	Medium	Large	Overall
Marriage and other social functions	17850 (38.24)	32750 (34.34)	38417 (31.85)	29672 (33.89)
Consumption	15197 (32.56)	28867 (30.27)	31550 (26.16)	25205 (28.79)
Health	12084 (25.89)	21300 (22.33)	22200 (18.40)	18528 (21.16)
Comforts/luxuries				
a. Bicycle	632 (1.35)	575 (0.60)	-	402 (0.45)
b. Television	905 (1.93)	4742 (4.97)	6884 (5.70)	4177 (4.77)
c. Motorbike	-	7130 (7.47)	21550 (17.86)	9560 (10.92)
Total	**46668 (100.00)**	**95364 (100.00)**	**120601 (100.00)**	**87544 (100.00)**

Note: Figures in parentheses are percentage to the respective column totals.

Table-4.15: Pattern of Investment in Other Enterprises

(Rs/farm)

Particulars	Small	Medium	Large	Overall
A. Horticulture				
a. Coconut	367 (3.00)	1504 (12.42)	3734 (36.42)	1868 (51.82)
b. Sapota	-	367 (2.33)	600 (5.17)	322 (7.5)
c. Mango	-	300 (2.33)	1050 (7.00)	450 (9.33)
Total	**367 (3.00)**	**2171 (17.08)**	**5384 (48.59)**	**2641 (22.88)**
Per Tree	**122.33**	**127.11**	**110.80**	**115.43**
B. Livestock				
a. Cow	1619 (0.50)	4405 (1.17)	5594 (1.60)	3873 (3.27)
b. Buffalo	3750 (1.10)	6205 (1.85)	6437 (1.62)	5464 (4.57)
c. Calf	184 (0.11)	00.00 (2.32)	00.00 (2.48)	61 (6.02)
d. Bullock	6950 (1.20)	9817 (1.43)	11514 (1.67)	9426 (4.3)
e. Sheep	495 (0.77)	604 (1.40)	593 (0.30)	564 (2.39)
f. Goat	314 (0.85)	564 (1.12)	-	293 (1.97)
Total	**13312 (5.64)**	**21595 (9.29)**	**24138 (7.67)**	**19681 (7.16)**
Per Animal	**2360.28**	**2324.54**	**3147.07**	**2748.74**
Grand total	**13679**	**23766**	**29519**	**22321**

Note: Figures in parentheses denote number of trees in horticulture component and number of animals in livestock component.

23 trees). Thus, the investment on livestock component was higher than that on horticulture component. Similar pattern of investment was observed in each of the farm size categories.

The investment on livestock sector was highest at Rs.24,138 per farm (for 8 animals) in the case of large farmers, followed by medium farmers (Rs.21,595 for 9 animals) and small farmers (Rs.13,312 for 6 animals). The investment per animal was highest in the case of large farmers (Rs.3,147), followed by small (Rs.2,360) and medium farmers (Rs.2,325), with an overall average investment of Rs.2,749 per animal.

Within the livestock sector, highest investment per farm was on bullock (Rs.9,426 for 4 animals), followed by buffalo (Rs.5,464 for 5 animals), cow (Rs.3,873 for 3 animals), sheep (Rs.564 for 2 animals), goat (Rs.293 for 2 animals) and calf (Rs.61 for 6 animals). This pattern of investment was also observed in each farm size category, except that there was no investment by large farmers on goat.

The investment on horticulture sector was highest at Rs.5,384 per farm (for 49 trees) in the case of large farmers, followed by medium farmers (Rs.2,171 for 17 trees) and small farmers (Rs.367 for 3 trees). Thus, the investment per tree was highest in the case of medium farmers (Rs.127.11), followed by small (Rs.122.33) and large farmers (Rs.110.80), with an overall average investment of Rs.115.43 per tree.

Now within the horticulture sector, the highest investment per farm was on coconut (Rs.1868 for 52 trees), followed by mango (Rs.450 for 9 trees) and sapota (Rs.322 for 8 trees). This pattern of investment was also observed in the case of large farmers. However, in the case of medium farmers, the investment priorities were coconut, sapota and mango, in that order. Small farmers invested only on coconut and not on sapota and mango, among all horticulture crops.

4.2.6 Pattern of Agricultural Investment on Non-Durable Capital Assets

The pattern of investment on non-durable agricultural capital assets, such as seeds, farm yard manure, fertilizers, hired labour, plant protection chemicals, hired machinery, etc. is presented in Table-4.16.

The average investment on non-durable agricultural capital assets by sample farmers was Rs.4,551 per ha. It was highest in the case of large farmers (Rs.4,834) followed by medium and small farmers (Rs.4,737 and Rs.4,083, respectively).

Among different non-durable capital assets, the average investment by the sample farmers was highest on hired labour (Rs.908 per ha) constituting 19.95 per cent of the total investment on non-durable agricultural capital assets, followed by fertilizers (Rs.907; 19.93 per cent), farm yard manure (Rs.868; 19.07 per cent), seeds (Rs.746; 16.39 per cent), hired machinery (Rs.725; 15.93 per cent), plant protection chemicals (Rs.340; 7.47 per cent) and others (Rs.57; 1.26 per cent). Nearly similar pattern of investment was observed in both small and large farm size categories, of course, with varying proportions. However, in the case of medium farmers, the highest investment priority was for farm yard manure followed by fertilizers, hired labour, seeds, hired machinery, plant protection chemicals and others. Nevertheless, nearly 60 per cent of the total investment on non-durable agricultural capital assets went to hired labour, fertilizers and farm yard manures in all the farm size categories.

4.3 VARIABILITY IN COMPONENTS OF CAPITAL FORMATION

4.3.1 Pattern of Agricultural Investment on Different Capital Assets in Progressive and Less Progressive Areas

The investments made by different categories of the sampled farmers in progressive area (Chitradurga Taluka) and less progressive area (Hosadurga Taluka) have been estimated to analyse the differences, if any, and to identify the factors responsible for such differences (Table-4.17).

Table-4.16: Pattern of Investment on Non-Durable Capital Assets

(Rs/ha)

Particulars	Small	Medium	Large	Overall
Seeds	671 (16.44)	796 (16.81)	771 (15.96)	746 (16.39)
Farm yard manure	719 (17.60)	991 (20.92)	895 (18.52)	868 (19.07)
Fertilizers	836 (20.47)	923 (19.49)	962 (19.89)	907 (19.93)
Hired labour	908 (22.22)	839 (17.73)	976 (20.19)	908 (19.95)
Plant protection chemicals (PPC)	208 (5.09)	456 (9.63)	357 (7.38)	340 (7.47)
Hired machinery	672 (16.45)	689 (14.56)	815 (16.85)	725 (15.93)
Others	70 (1.73)	41 (0.86)	58 (1.21)	57 (1.26)
Total	**4083 (100.00)**	**4737 (100.00)**	**4834 (100.00**	**4551 (100.00)**

Note: Figures in parentheses are percentages to the respective column totals.

Table-4.17: Pattern of agricultural investment on different capital assets in progressive and less progressive areas

(Rs/farm)

Particulars	Progressive area				Less progressive area			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Land	18000 (21.47)	39967 (22.69)	54734 (14.37)	37567 (17.58)	13034 (24.31)	33600 (21.55)	58767 (22.44)	35134 (22.36)
Farm buildings	12700 (15.15)	27427 (15.57)	40334 (10.59)	26820 (12.55)	8867 (16.53)	29767 (19.09)	34700 (13.25)	24445 (15.55)
Farm machinery and equipments	10914 (13.02)	24762 (14.05)	110739 (29.08)	48805 (22.85)	6978 (13.01)	12615 (8.09)	73722 (28.15)	31105 (19.79)
Improvements made on land	22067 (26.32)	50467 (28.65)	87367 (22.94)	53300 (24.95)	15900 (29.65)	50207 (32.21)	58500 (22.33)	41536 (26.43)
Irrigation structure and equipment	20134 (24.02)	33500 (19.02)	87600 (23.00)	47078 (22.04)	8834 (16.47)	29667 (19.03)	36184 (13.81)	24895 (15.84)
Total	**83815 (100.0)**	**176123 (100.0)**	**380774 (100.0)**	**213571 (100.0)**	**53613 (100.0)**	**155856 (100.0)**	**261873 (100.0)**	**157114 (100.0)**

Note: Figures in parentheses are percentages to the respective column totals.

The average investment on agricultural capital assets was much higher on progressive farms (Rs.2,13,571) than on less progressive farms (Rs.1,57,114). In terms of farm size categories, the agricultural investment was the highest on large farms in both progressive and less progressive areas (Rs.3,80,774 and Rs.2,61,873, respectively), followed by medium farmers (Rs.1,76,123 and Rs.1,55,856, respectively) and small farmers (Rs.83,815 and Rs.53,613, respectively).

In progressive area, amongst all the capital assets, investment on improvements on land was the highest (Rs.53,300) constituting of 24.95 per cent of the total agricultural investment, followed by farm machinery and equipment (22.85 per cent), irrigation structure and equipment (22.04 per cent), purchase of land (17.58 per cent) and farm buildings (12.55 per cent). While in the case of less progressive area, highest investment was attracted by improvements on land (Rs.41,536 per farm) constituting 26.43 per cent of total agricultural investment followed by purchase of land (22.36 per cent), farm machinery and equipment (19.79 per cent), irrigation structure and equipment (15.84 per cent) and farm buildings (15.55 per cent).

4.3.2 Pattern of Agricultural Investment on Different Capital Assets in Irrigated and Rainfed Farms

A comparison of the pattern of agricultural investment on different capital assets in irrigated area versus rainfed area is presented in Table-4.18.

As expected, the average agricultural investment on capital assets was much higher (almost three times) on irrigated farms (Rs.2,70,036) as compared to rainfed farms (Rs.85,151). The investment by small farmers was almost three times higher on irrigated farms (Rs.1,12,857) than that on rainfed farms (Rs.39,773). As between irrigated and rainfed farms, similar pattern of investment was observed on medium farms (Rs.2,66,166 versus Rs.1,06,140, respectively) and large farms (Rs.4,12,982 versus Rs.1,26,047, respectively). It could be seen that the difference in the investments by large farmers on irrigated farms versus rainfed farms was significantly high. Further, the ratio of investments by small, medium and large farmers was 1:2.01:3.66 for irrigated farms as against 1:2.67:3.17 for rainfed farms.

On irrigated farms, amongst different capital assets, farm machinery and equipments attracted the highest investment (Rs.65,803) constituting of 24.37 per cent of total capital formation followed by improvements on land (24 per cent), irrigation structure and equipment (23.94 per cent), purchase of land (15.35 per cent) and farm buildings (12.34 per cent). This pattern of investment was almost similar to that of large farmers in the progressive area. Medium farmers gave top priority to irrigation structure and equipment (27.81 per cent) followed by improvements on land (27.18 per cent), while improvements on land (34.16 per cent) and irrigation structure and equipment (26.26 per cent) were of utmost importance for irrigated farms of small farmers. The remaining priorities were purchase of land, farm buildings and farm machinery and equipments, in that order, for both small and medium farmers.

On rainfed farms, across different capital assets, improvements on land appropriated the highest share (35.80 per cent) in the farmers' total investment, followed by purchase of land (35.19 per cent), farm buildings (18.81 per cent) and farm machinery and equipments (10.20 per cent). Similar pattern of investment was also observed in the case of small and medium farmers. But in the case of large farmers, the investment on purchase of land was highest (Rs.49,000) accounting for 38.87 per cent of the total investment followed by improvements on land (35.99 per cent), farm buildings (17.45 per cent) and farm machinery and equipments (7.67 per cent).

Thus, while farm machinery and equipments and improvements on land were the top investment priorities in irrigated farms, rainfed farmers preferred improvements on land and purchase of land while prioritising investment.

Table-4.18: Pattern of Agricultural Investment on Different Capital Assets in Irrigated and Rainfed Farms

(Rs/farm)

Particulars	Irrigated farms				Rainfed farms			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Land	18552 (16.43)	37800 (16.68)	60342 (14.61)	41460 (15.35)	12678 (31.87)	35767 (33.69)	49000 (38.87)	29963 (35.19)
Farm buildings	14345 (12.71)	36127 (15.94)	44708 (10.82)	33328 (12.34)	7452 (18.73)	21067 (19.84)	22000 (17.45)	16013 (18.81)
Farm machinery and equipments	11766 (10.42)	28048 (12.37)	131650 (31.87)	65803 (24.37)	6578 (16.53)	10239 (9.64)	9678 (7.67)	8687 (10.20)
Improvements on land	38552 (34.16)	61607 (27.18)	85708 (20.75)	64802 (24.00)	13065 (32.84)	39067 (36.80)	45369 (35.99)	30488 (35.80)
Irrigation structure and equipment	29642 (26.26)	63034 (27.81)	90574 (21.93)	64642 (23.94)	-	-	-	-
Total	**112857 (100.0)**	2266 16 **(100.0)**	**412982 (100.0)**	**270036 (100.0)**	**39773 (100.0)**	**106140 (100.0)**	**126047 (100.0)**	**85151 (100.0)**

Note: Figures in parentheses are percentages to the respective column totals.

4.3.3 Pattern of Non-Agricultural Investment in Progressive and Less Progressive Areas

As against agricultural investment pattern as seen in the preceding section, the differences in the non-agricultural investments amongst different farm size categories between progressive and less progressive areas were not so severe (Table-4.19).

The average non-agricultural investment per farm was Rs.92,382 in the progressive area as against Rs.82,457 in the less progressive area. Farmers of each farm size category in progressive and less progressive areas behaved almost alike when it came to non-agricultural investment, that is to mention, Rs.46,165 versus Rs.47,170 by small farmers, Rs.95,995 versus Rs.93,984 by medium farmers and Rs.1,34,985 versus Rs.1,06,218 by large farmers.

In the progressive area, nearly 82 per cent of the non-agricultural investment was on marriage and other social functions, consumption and health, while the remaining investment was on comforts or luxuries like bicycle, television and motorbike. Amongst various non-agricultural investments, marriage and social functions was given top priority (31.95 per cent) by the sample farmers, followed by consumption (28.23 per cent), health (22.08 per cent), motorbike (10.66 per cent), television (5.65 per cent) and bicycle (0.40 per cent). Almost similar pattern of investment was observed in each of the farm size categories except that small farmers could not invest on motorbike and large farmers did not invest on bicycle. In fact, least priority was given for bicycle in both progressive and less progressive areas.

Interestingly, the non-agricultural investment priorities in less progressive area were same as observed in progressive area. More than 86 per cent of their investment was on marriage and other social functions, consumption and health while the remaining was on comforts/luxuries. This investment behaviour was also observed in each of the farm size categories, except that small farmers could not invest on motorbike while medium and large farmers did not invest on bicycle.

4.3.4 Pattern of Non-Agricultural Investment on Irrigated and Rainfed Farms

Unlike the non-agricultural investment pattern in progressive and less-progressive areas as seen in the preceding section, the differences in the non-agricultural investments between irrigated and rainfed farms were relatively higher (Table-4.20).

The average non-agricultural investment per farm was Rs.97,908 by the irrigated farmers as against Rs.74,592 made by the rainfed farmers. As expected, the investment on the non-agricultural assets by the irrigated farmers of each farm size category was slightly higher than that by the rainfed farmers, that is, Rs.49,196 versus Rs.44,305 by small farmers, Rs.1,02,636 versus Rs.88,096 by medium farmers and Rs.1,28,905 versus Rs.1,02,685 by large farmers.

In the case of cultivators of irrigated farms, nearly 82 per cent of the non-agricultural investment was on marriage and other social functions, consumption and health, while the remaining investment was on comforts or luxuries like bicycle, television and motorbike. Amongst various non-agricultural investments, marriage and social functions was given top priority (33.51 per cent) by the sample farmers, followed by consumption (28.05 per cent), health (20.01 per cent), motorbike (12.83 per cent), television (5.37 per cent) and bicycle (0.23 per cent). Almost similar prioritisation of investment was observed in each of the farm size categories except that small farmers could not invest on motorbike and large farmers did not invest on bicycle. In fact, least priority was given for bicycle by both irrigated and rainfed farmers.

Interestingly, the non-agricultural investment priorities of the irrigated farmers were same as those of rainfed farmers. Nearly 88 per cent of their investment was on marriage and other social functions, consumption and health while the remaining was on comforts/luxuries. Similar investment behaviour was also observed in each of the farm size categories, except that small farmers could not invest on motorbike while large farmers did not invest on bicycle.

Table-4.19: Pattern of Non-Agricultural Investment in Progressive and Less Progressive Areas

(Rs/farm)

Particulars	Progressive area				Less progressive area			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Marriage and other social functions	16500 (35.74)	30900 (32.18)	41167 (30.49)	29522 (31.95)	19200 (40.70)	34600 (36.81)	35667 (33.57)	29822 (36.16)
Consumption	14694 (31.82)	29234 (30.45)	34334 (24.43)	26087 (28.23)	15700 (33.28)	28500 (30.32)	28767 (30.32)	24322 (29.49)
Health	13067 (28.30)	23334 (24.30)	24800 (18.37)	20400 (22.08)	11100 (23.53)	19267 (20.50)	19600 (18.45)	16656 (20.19)
Comforts/luxuries								
a. Bicycle	719 (1.53)	400 (0.41)	-	370 (0.40)	55 (1.17)	-	-	184 (0.22)
b. Television	1194 (2.58)	6067 (6.32)	8417 (6.23)	5226 (5.65)	617 (1.30)	3417 (3.63)	5350 (5.03)	3128 (3.79)
c. Motorbike	-	6060 (6.31)	26267 (19.45)	10776 (10.66)	-	8200 (8.72)	16834 (8.72)	8345 (10.11)
Total	**46165 (100.0)**	**95995 (100.0)**	**134985 (100.0)**	**92382 (100.0)**	**47170 (100.0)**	**93984 (100.0)**	**106218 (100.0)**	**82457 (100.0)**

Note: Figures in parentheses are percentages to the respective column totals.

Table-4.20: Pattern of Non-Agricultural Investment in Irrigated and Rainfed Farms

(Rs/farm)

Particulars	Irrigated farms				Rainfed farms			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Marriage and other social functions	19587 (39.81)	33967 (33.09)	41318 (32.05)	32811 (33.51)	16226 (36.62)	31534 (35.79)	32158 (31.31)	25750 (34.52)
Consumption	15338 (31.17)	30967 (30.17)	33488 (25.97)	27468 (28.05)	15065 (34.00)	26767 (30.38)	27369 (26.65)	22375 (30.00)
Health	12207 (24.81)	21767 (21.20)	23220 (18.01)	19590 (20.01)	11968 (27.01)	20834 (23.64)	20000 (19.47)	17200 (23.06)
4.4 Comforts/luxuries								
a. Bicycle	632 (1.28)	134 (0.13)	-	223 (0.23)	633 (1.42)	1017 (1.15)	-	627 (0.84)
b. Television	1432 (2.91)	5534 (5.39)	7757 (6.01)	5256 (5.37)	413 (0.93)	3950 (4.48)	5000 (4.86)	2829 (3.79)
c. Motorbike	-	10267 (10.00)	23122 (17.93)	12560 (12.83)	-	3994 (4.53)	18158 (17.68)	5810 (7.79)
Total	**49196 (100.0)**	**102636 (100.0)**	**128905 (100.0)**	**97908 (100.0)**	**44305 (100.0)**	**88096 (100.0)**	**102685 (100.0)**	**74592 (100.0)**

Note: Figures in parentheses are percentages to the respective column totals.

4.5 Table-4.21: Pattern of Investment on Other Enterprises in Progressive and Less Progressive Areas

(Rs/farm)

Particulars	Progressive area				Less progressive area			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
A. Horticulture								
a. Coconut	734 (6.00)	634 (4.83)	1834 (14.17)	1067 (25.00)	-	2374 (20.00)	5634 (58.67)	2669 (78.67)
b. Sapota	-	734 (4.67)	1200 (14.00)	645 (18.67)	-	-	-	-
c. Mango	-	600 (4.67)	2100 (10.33)	900 (15.00)	-	-	-	-
Total	**734 (6.00)**	**1968 (14.17)**	**5134 (38.50)**	**2611 (19.56)**		**2374 (20.00)**	**5634 (58.67)**	**2669 (26.22)**
Per Tree	**122.33**	**138.88**	**133.35**	**133.49**	**-**	**118.70**	**96.03**	**101.79**
B. Livestock								
a. Cow	1987 (0.60)	4227 (1.17)	5600 (1.77)	3938 (3.54)	1250 (0.40)	4584 (1.17)	5587 (1.43)	3807 (3.00)
b. Buffalo	3700 (1.07)	4260 (1.27)	8124 (1.97)	5361 (4.31)	3800 (1.13)	8150 (2.43)	4750 (1.27)	5567 (4.83)
c. Calf	33 (1.30)	0.00 (1.93)	00.00 (3.00)	11 (6.23)	333 (1.13)	00.00 (2.70)	00.00 (1.97)	111 (5.80)
d. Bullock	8900 (1.53)	10434 (1.60)	12094 (1.80)	10476 (4.93)	5000 (0.87)	9200 (1.27)	10534 (1.47)	8245 (3.61)
e. Sheep	710 (0.71)	687 (1.73)	759 (0.47)	718 (2.91)	282 (0.77)	520 (1.07)	427 (0.13)	410 (1.97)
f. Goat	407 (1.10)	691 (0.53)	-	366 (1.63)	220 (0.60)	917 (1.70)	-	379 (2.30)
Total	**15737 (6.37)**	**20299 (8.23)**	**26577 (9.01)**	**20870 (7.85)**	**10687 (4.90)**	**23371 (10.34)**	**21298 (6.27)**	**18518 (7.11)**
Per Animal	**2470.49**	**2466.46**	**2949.72**	**2658.60**	**2181.02**	**2260.25**	**3396.81**	**2604.50**
C. Grand total	**16471**	**22267**	**31711**	**23481**	**10687**	**25745**	**26932**	**21187**

Note: Figures in parentheses denote number of trees in horticulture component and number of animals in livestock component.

4.3.5: Pattern of Investment in other Enterprises in Progressive and Less Progressive Areas

The pattern of investment in other enterprises such as horticulture and livestock in progressive and less progressive areas was also analysed and the results are presented in Table-4.21. The overall average investment on horticulture and livestock enterprises together by the sample farmers was higher in the progressive area (Rs.23,481) than that in the less progressive area (Rs.21,187). Similar pattern was observed in livestock enterprise while reverse pattern was observed in horticulture enterprise.

Amongst different farm-size categories of farmers, large farmers invested the highest (Rs.31,711) followed by medium (Rs.22,267) and small farmers (Rs.16,471) in the progressive area. Similarly in the less progressive area, highest investment was by large farmers (Rs.26,932), followed by medium (Rs.25,745) and small farmers (Rs.10,687). Similar pattern of investment was observed separately in horticulture and livestock enterprises, with the lone exception of large farmers investing lesser than medium farmers on livestock enterprise in the less progressive area.

In the progressive area, major investment by the sample farmers per farm was on livestock enterprise (Rs.20,870) from nearly eight animals, thus accounting for Rs.2658.60 per animal, while it was only RS.2,611 per farm in horticulture from about 20 trees accounting for Rs.133.49 per tree. Similarly in the less progressive area, the investment in livestock enterprise (Rs.18,518) was higher as compared to horticulture (Rs.2,669). However, the per unit investment was relatively lower in the less progressive area both in horticulture (Rs.101.79/tree from 26.22 trees) and livestock (Rs.2,604.50/animal from 7.11 animals) enterprises.

In horticulture, all the farmers except small farmers in the progressive area selected coconut, sapota and mango, whereas they chose only coconut for their farms in the less progressive area. Small farmers of progressive area grew only coconut while their counterparts in less progressive area did not grow any tree. Amongst different tree crops grown in progressive area, coconut attracted the highest investment (Rs.1,067) followed by mango and sapota, in general.

In livestock enterprise, all the farmers in both the areas invested in all the livestock components such as cow, buffalo, calf, bullock, sheep and goat, with the only exception of large farmers on goat in both the areas. Amongst different livestock components, the highest investment in progressive area was on bullock (Rs.10,476) followed by buffalo (Rs.5,361), cow (Rs.3,938), sheep (Rs.718), goat (Rs.366) and calf (Rs.11). Exactly similar prioritisation of investment was observed in less progressive area, of course, with slightly varied levels of investment.

4.3.6: Pattern of Investment in other Enterprises on Irrigated and Rainfed Farms

The pattern of investment in other enterprises (horticulture and livestock) by the irrigated and rainfed farmers (Table-4.22) indicates that the overall average investment on horticulture and livestock enterprises together by the irrigated farmers was higher (Rs.27,738) than that by the rainfed farmers (Rs.14,780). Similar pattern was observed in livestock enterprise while rainfed farmers did not invest in horticulture enterprise.

Amongst different farm-size categories of farmers, on irrigated farms, large farmers invested the highest (Rs.36,751) followed by medium (Rs.27,902) and small farmers (Rs.14,830). Similar pattern of investment was observed separately in horticulture and livestock enterprises on irrigated farms. However, on rainfed farms, highest investment was by medium farmers (Rs.19,628), followed by large (Rs.13,877) and small farmers (Rs.10,641).

On irrigated farms, major investment by the sample farmers per farm was on livestock enterprise (Rs.22,986) from about seven animals, thus accounting for about Rs.3,166 per animal, while it was only RS.4,752 per farm in horticulture from about 41 trees accounting for nearly Rs.115 per tree. On rainfed farms, entire investment was on livestock and there was

Table-4.22: Pattern of Investment on Other Enterprises in Irrigated and Rainfed Farms

(Rs/farm)

Particulars	Irrigated farms				Rainfed farms			
	Small	Medium	Large	Overall	Small	Medium	Large	Overall
A. Horticulture								
a. Coconut	759 (6.21)	3007 (24.83)	5463 (53.29)	3362 (31.10)	-	-	-	-
b. Sapota	-	734 (4.67)	1537 (10.24)	850 (5.60)	-	-	-	-
c. Mango	-	600 (4.67)	879 (7.56)	540 (4.50)	-	-	-	-
Total	**759 (6.21)**	**4341 (34.17)**	**7879 (71.09)**	**4752 (41.20)**	**-**	**-**	**-**	**-**
Per Tree	**122.22**	**127.04**	**110.83**	**115.34**	**-**	**-**	**-**	**-**
B. Dairy								
a. Cow	-	3960 (1.07)	6027 (1.73)	3659 (1.03)	1171 (0.35)	4850 (1.27)	4658 (1.32)	3379 (0.93)
b. Buffalo	4242 (1.31)	6427 (1.97)	6988 (1.68)	6023 (1.66)	3291 (0.91)	5984 (1.73)	5248 (1.47)	4766 (1.35)
c. Calf	0.00 (1.48)	0.00 (2.17)	00.00 (2.68)	0.00 (2.18)	355 (0.97)	0.00 (2.47)	0.00 (2.05)	138 (1.79)
d. Bullock	9069 (1.59)	13067 (1.87)	15044 (2.15)	12718 (1.90)	4968 (0.84)	6567 (1.00)	3895 (0.63)	5313 (0.85)
e. Sheep	564 (0.41)	-	813 (0.29)	497 (0.24)	433 (1.10)	1207 (2.80)	76 (0.21)	638 (1.53)
f. Goat	196 (0.59)	107 (0.27)	-	89 (1.25)	423 (1.10)	1020 (2.80)	-	546 (1.48)
Total	**14071 (5.38)**	**23561 (7.35)**	**28872 (8.53)**	**22986 (7.26)**	**10641 (5.27)**	**19628 (12.07)**	**13877 (5.68)**	**14780 (7.93)**
Per Animal	**2615.43**	**3205.58**	**3384.76**	**3166.12**	**2019.17**	**1626.18**	**2443.13**	**1863.81**
C. Grand total	**14830**	**27902**	**36751**	**27738**	**10641**	**19628**	**13877**	**14780**

Note: Figures in parentheses denote number of trees in horticulture component and number of animals in livestock component.

no investment on horticulture. However, the investment per animal on livestock by the irrigated farmers was relatively higher (Rs.3,166/animal) as compared to rainfed farms (Rs.1864/animal).

In horticulture, all the irrigated farmers except small farmers selected coconut, sapota and mango. Small irrigated farmers grew only coconut. Amongst different tree crops grown by the irrigated farmers, coconut attracted the highest investment (Rs.3,362) followed by sapota (Rs.850) and mango (Rs.540), in general.

In livestock enterprise, all the farmers in both irrigated and rainfed farms invested in all the livestock components such as cow, buffalo, calf, bullock, sheep and goat, with some exceptions of medium irrigated farmers on sheep, large irrigated farmers and large rainfed farmers on goat. Amongst different livestock components, the highest investment by irrigated farmers was on bullock (Rs.12,718) followed by buffalo (Rs.6,023), cow (Rs.3,659), sheep (Rs.497) and goat (Rs.89) and no investment on calf. Exactly similar prioritisation of investment was observed rainfed farms.

4.3.7: Pattern of Investment on Non-Durable Capital Assets in Progressive and Less Progressive Areas

The investment on non-durable capital assets such as seeds, farm yard manure, fertilizers, hired labour, plant protection chemicals, hired machinery, etc. in both progressive and less progressive areas was also studied and the results are presented in Table-4.23.

The overall average investment on non-durable capital assets by progressive farmers was relatively higher (Rs.5,549/ha) as compared to less progressive farmers (Rs.4,745/ha). In the progressive area, such investment was the highest in the case of large farmers (Rs.6,656/ha) followed by medium (Rs.5,380/ha) and small farmers (Rs.4,613/ha). On the other hand, it was medium farmers whose investment was the highest (Rs.4,978/ha), followed by large (Rs.4,852/ha) and small farmers (Rs.4,404/ha).

In the progressive area, amongst all the non-durable capital assets, fertilizers attracted the highest investment (29.33 per cent), followed by seeds (20.44 per cent), farm yard manure (20.29 per cent), hired labour (15.24 per cent), hired machinery (11.02 per cent) and plant protection chemicals (10.77 per cent). While similar investment priorities were observed in the case of large farmers, small and medium had different priorities in the progressive area.

Contrarily, in the less progressive area, farmers invested maximum on hired labour (20.84 per cent), followed by hired machinery (18.97 per cent), fertilizers (18.76 per cent), farm yard manure (16.92 per cent), seeds (16.82 per cent) and plant protection chemicals (6.85 per cent). Almost similar pattern of investment was observed in the case of large farmers of less progressive area, as against different priorities in the case of small and medium farmers.

4.3.8: Pattern of Investment on Non-Durable Capital Assets in Irrigated and Rainfed Farms

The investment on non-durable capital assets was also assessed for irrigated and rainfed farms, the results of which are presented in Table-4.24.

The average investment on non-durable capital assets by irrigated farmers was relatively higher (Rs.5,173/ha) as compared to rainfed farmers (Rs.4,785/ha). Interestingly, on both irrigated and rainfed farms, the investment on the assets in question was the highest by medium farmers (Rs.5,526 and Rs.5,166, respectively on irrigated and rainfed farms) followed by small farmers (Rs.5,413 and Rs.4,735, respectively) while least investment was by the large farmers (Rs.4,746 and Rs.4,263, respectively).

On irrigated farms, amongst all the non-durable capital assets, hired labour attracted the highest investment (22.95 per cent), followed by fertilizers (21.77 per cent), farm yard manure (21.77 per cent), hired machinery (15.06 per cent), plant protection chemicals (11.93

Table-4.23: Pattern of Investment on Non-Durable Capital Assets in Progressive and Less Progressive Areas

(Rs/ha)

Particulars	Progressive area				Less progressive area			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Seeds	1091 (23.65)	1010 (18.77)	1302 (19.56)	1134 (20.44)	775 (17.61)	786 (15.78)	834 (17.19)	798 (16.82)
Farm yard manure	1125 (24.39)	1121 (20.84)	1132 (17.01)	1126 (20.29)	802 (18.22)	857 (17.21)	750 (15.45)	803 (16.92)
Fertilizers	889 (19.28)	1122 (20.86)	1540 (23.14)	1184 (29.33)	812 (18.43)	995 (20.00)	863 (17.79)	890 (18.76)
Hired labour	711 (15.42)	766 (14.24)	1059 (15.92)	846 (15.24)	938 (21.30)	999 (20.07)	1028 (21.20)	989 (20.84)
Plant protection chemicals (PPC)	337 (7.30)	726 (13.50)	730 (10.97)	598 (10.77)	242 (5.49)	435 (8.75)	297 (6.12)	325 (6.85)
Hired machinery	390 (8.46)	595 (11.05)	849 (12.76)	611 (11.02)	781 (17.74)	892 (17.92)	1027 (21.16)	900 (18.97)
Others	69 (1.50)	40 (0.74)	43 (0.64)	51 (0.92)	53 (1.21)	13 (0.27)	53 (1.09)	40 (0.84)
Total	**4613 (100.0)**	**5380 (100.0)**	**6656 (100.0)**	**5549 (100.0)**	**4404 (100.0)**	**4978 (100.0)**	**4852 (100.0)**	**4745 (100.0)**

Note: Figures in parentheses are percentage to the respective column totals.

Table-4.24: Pattern of Investment on Non-Durable Capital Assets in Irrigated and Rainfed Areas

(Rs/ha)

Particulars	Irrigated farms				Rainfed farms			
	Small	**Medium**	**Large**	**Overall**	**Small**	**Medium**	**Large**	**Overall**
Seeds	465 (8.59)	460 (8.33)	465 (9.81)	464 (8.97)	1075 (22.70)	1054 (20.39)	575 (13.05)	948 (19.81)
Farm yard manure	905 (16.71)	1079 (19.53)	793 (16.71)	911 (17.61)	949 (20.03)	1089 (21.08)	727 (17.04)	948 (19.81)
Fertilizers	1234 (22.79)	1250 (22.61)	960 (20.23)	1126 (21.77)	963 (20.34)	1016 (19.66)	973 (22.84)	985 (20.59)
Hired labour	1384 (25.56)	1129 (20.43)	1091 (22.99)	1187 (22.95)	867 (18.32)	906 (17.54)	940 (22.05)	899 (18.79)
Plant protection chemicals (PPC)	389 (7.19)	879 (15.90)	587 (12.36)	617 (11.93)	164 (3.46)	184 (3.57)	81 (1.89)	152 (3.18)
Hired machinery	919 (16.97)	689 (12.47)	747 (15.74)	779 (15.06)	668 (14.11)	872 (16.88)	944 (22.14)	810 (16.93)
Others	118 (2.19)	40 (0.73)	102 (2.16)	88 (1.71)	49 (1.04)	45 (0.88)	23 (0.54)	42 (0.89)
Total	**5413 (100.00)**	**5526 (100.00)**	**4746 (100.00)**	**5173 (100.00)**	**4735 (100.00)**	**5166 (100.00)**	**4263 (100.00)**	**4785 (100.00)**

Note: Figures in parentheses are percentage to the respective column totals.

per cent) and seeds (8.97 per cent). While similar investment priorities were observed in the case of large farmers, small and medium had different priorities in the irrigated farms.

Contrastingly, in the less progressive area, farmers invested maximum on fertilizers (20.59 per cent), followed by farm yard manure (19.81 per cent), seeds (19.81 per cent), hired labour (18.79 per cent) and hired machinery (16.93 per cent) while negligible proportion of investment was on plant protection chemicals (3.18 per cent) and others (0.89 per cent). However, varied pattern of investment was observed in different categories of farmers on rainfed farms.

4.4: FACTORS AFFECTING CAPITAL FORMATION IN AGRICULTURE

There are certain factors, which influence capital formation in agriculture. These factors have been identified based on *a priori* knowledge and the review of literature pertaining to capital formation. In all, 10 factors were included in the present study, namely, size of land holding (ha), area irrigated (ha), area under commercial crops (%), fertiliser use (kg/ha), annual income of the family (Rs), borrowed amount (Rs), family size (number), age (years), literacy level (number/farm) and distance from the town (km). Multiple linear regression equation was fitted using these factors to estimate the relationship of these factors with the capital formation, the results of which are presented in Table-4.25 and Table-4.26. The overall adequacy of the model was tested through F ratio and R^2, which appeared to be fairly good in all the categories of the farms.

4.4.1: Factors Affecting Capital Formation in Agriculture in Progressive and Less Progressive Areas

In general, for both the progressive and less progressive areas and for all the farm size categories, the multiple linear regression models were significant as indicated by F ratios and were good fit as revealed by the R^2 values (Table-4.25). The F ratio was significant at 1 per cent level in all the cases, except small farmers in the less progressive area, while the R^2 was not less than 90 per cent in all the cases except small (59 per cent) and medium farmers (84 per cent) in the less progressive area.

For the progressive area, the factors that significantly affected the capital formation were borrowed amount, annual income of the family, area irrigated and size of the holding. As expected, all these factors had positive and significant impact on the capital formation. Higher the levels of these factors, higher the capital formation and vice versa. Interestingly, other factors, particularly, area under commercial crops, family size and age did not have any significant impact on capital formation.

On the other hand, for the less progressive area, borrowed amount, size of holding and annual income of the family influenced capital formation positively and significantly. Unlike in the progressive area, area irrigated did not have any significant influence on capital formation in the less progressive area.

However, the factors that influenced capital formation varied amongst farm size categories. In the progressive area, the factors that significantly influenced capital formation were borrowed amount and family size in the case of small farmers, size of holding, borrowed amount, area irrigated and age in the case of medium farmers and borrowed amount, area irrigated and literacy level in the case of large farmers. All these factors had positive influence on capital formation with the lone exception of literacy level in the case of large farmers.

In the less progressive area, the determinants of capital formation were borrowed amount in the case of small farmers, area irrigated and annual income of the family in the case of medium farmers and size of holding, borrowed amount and annual income of the family in the case of large farmers. All these factors were significant as indicated by the 't' values and had positive influence on capital formation.

Table-4.25: Factors Affecting Capital Formation in Agriculture in Progressive and Less Progressive Areas

Variable category	Size of holding (ha)	Area irrigated (ha)	Area under commercial crops (%)	Fertilizer use/ha	Annual income of the family (Rs.)	Borrowed amount (Rs.)	Family size (No.)	Age (years)	Education Level (Schooling Stages)	Distance from town (km)	R^2	'F' ratio
Progressive area												
Small	4760.47 (0.50)	-1164.90 (-0.15)	884.37 (0.34)	1.30 (0.34)	-0.62 (-0.53)	1.85*** (8.65)	9837.67** (2.29)	-661.44 (-1.10)	-476.36 (-0.07)	-145.03 (-0.26)	0.94	32.59***
Medium	29251.69*** (3.07)	34726.84** (2.69)	289.55 (0.03)	8.37 (0.54)	-0.34 (-0.15)	0.75*** (2.86)	4833.92 (0.70)	2474.27* (1.86)	1450.70 (0.12)	765.57 (0.72)	0.90	16.47***
Large	-16933.93 (-1.16)	52362.76** (2.41)	6676.57 (0.60)	-15.65 (-0.33)	1.65 (1.48)	1.50 *** (7.60)	10874.95 (0.65)	-4400.07 (-1.16)	-67366.25* (-1.84)	-1100.41 (-0.50)	0.92	23.10***
Average	**6138.77** **(2.06)**	**17622.50** **(2.27)**	**701.56** **(0.16)**	**6.99** **(0.97)**	**1.11** **(2.04)**	**1.58*** **(14.047)**	**4627.32** **(0.83)**	**497.23** **(0.49)**	**-856.40** **(-0.08)**	**310.20** **(0.41)**	**0.93**	**120.04*****
Less progressive area												
Small	-13770.61 (-0.91)	-4335.00 (-0.33)	5077.65 (1.03)	11.91 (0.68)	2.46 (0.60)	1.66*** (3.87)	5607.12 (0.77)	-443.70 (-0.33)	10778.24 (0.88)	-1668.81 (-1.23)	0.59	2.78**
Medium	6155.18 (0.82)	42879.60*** (3.49)	-1544.21 (-0.40)	0.31 (0.02)	2.08** (1.34)	0.31 (2.67)	-6739.13 (-0.91)	349.64 (0.25)	-13043.67 (-0.89)	720.85 (0.55)	0.84	10.28***
Large	17401.88*** (3.88)	-11914.64 (-0.69)	-2935.13 (0.67)	-40.38 (-1.63)	3.94* (1.85)	0.77*** (3.47)	11779.28 (0.78)	992.05 (0.24)	-4259.30 (-1.3)	-2205.26 (-0.85)	0.93	26.66***
Average	**8936.95*** **(3.07)**	**10594.26** **(1.18)**	**-3467.26** **(-1.31)**	**-9.83** **(-0.92)**	**2.56** **(2.44)**	**0.71*** **(6.38)**	**4902.45** **(0.80)**	**60.03** **(0.04)**	**798.37** **(0.06)**	**-196.97** **(-0.17)**	**0.88**	**59.29*****

Note: Figures in parentheses denote calculated 't' values;
***, **, * = Significant at 1, 5, 10 per cent level of probability, respectively.

Table-4.26: Factors Affecting Capital Formation in Agriculture in Irrigated and Rainfed Farms

Variable category	Size of holding (ha)	Area irrigated (ha)	Area under commercial crops (%)	Fertilizer use/ha	Annual income of the family (Rs.)	Borrowed amount (Rs.)	Family size (No.)	Age (years)	Education Level (Schooling Stages)	Distance from town (km)	R^2	'F' ratio
Irrigated farms												
Small	4537.03 (0.32)	-13899.48 (-1.02)	3995.76 (1.08)	-7.54 (-1.40)	-0.92 (-0.59)	1.96*** (6.46)	9987.39 (1.47)	-2059.54* (-1.90)	-515.52 (-0.05)	-967.37 (-1.02)	0.86	10.88***
Medium	19623.07* (2.02)	53965.93*** (4.13)	-5192.23 (-1.12)	15.83 (1.10)	-1.43 (-0.71)	0.34** (2.24)	6188.73 (0.61)	1099.72 (0.57)	1590.06 (0.09)	1740.35 (1.20)	0.75	5.59***
Large	13627.09** (2.36)	-18280.49 (-0.96)	-422.32 (-0.09)	22.23 (0.66)	2.23* (1.99)	1.42*** (8.45)	-10172.14 (-0.62)	-1562.69 (-0.45)	-7710.39 (-0.25)	-1500.39 (-0.61)	0.85	17.33***
Average	**11905.79*** **(3.80)**	**2125.64** **(0.21)**	**-3245.32** **(-1.13)**	**13.14** **(1.41)**	**2.02*** **(2.96)**	**1.06*** **(9.57)**	**167.37** **(0.02)**	**127.70** **(0.08)**	**971.57** **(0.07)**	**387.73** **(0.34)**	**0.87**	**60.66***
Rainfed farms												
Small	18089.51* (1.97)	-	-1486.71 (-0.64)	5.33 (1.20)	-4.12* (-1.95)	1.09*** (4.16)	2680.12 (0.69)	-619.83 (-1.03)	7411.91 (1.42)	40.13 (0.08)	0.66	4.54***
Medium	-1988.46 (-0.23)	-	1210.93 (0.33)	7.07 (0.60)	3.22** (2.11)	0.88*** (3.95)	-4887.43 (-0.98)	428.82 (0.35)	-10390.69 (-0.91)	283.02 (0.34)	0.63	3.86***
Large	1008.44 (0.12)	-	-1068.64 (-0.47)	-14.92 (-1.17)	1.07 (0.80)	1.25*** (4.83)	-5848.29 (-0.69)	-36.43 (-0.01)	4494.01 (0.21)	-204.93 (-0.15)	0.80	4.04**
Average	**-2767.24** **(-0.99)**	**-**	**837.83** **(0.62)**	**3.07** **(0.72)**	**2.77*** **(4.07)**	**1.27*** **(9.98)**	**-1470.22** **(-0.50)**	**46.49** **(0.07)**	**3418.73** **(0.62)**	**248.12** **(0.57)**	**0.85**	**43.72***

Note: Figures in parentheses denote calculated 't' values
***, **, * = Significant at 10, 5, 1 per cent level of probability, respectively.

4.4.2: Factors Affecting Capital Formation in Agriculture in Irrigated and Rainfed Farms

Similarly in case of both irrigated and rainfed farms and for all the farm size categories, the multiple linear regression models were significant as indicated by the F ratios and were good fit as revealed by the R^2 values (Table-4.26). The F ratio was significant at 1 per cent level in all the cases, except large farmers in the case of rainfed farms, while the R^2 was not less than 75 per cent in all the cases except small (66 per cent) and medium farmers (63 per cent) in the rainfed farms.

For the irrigated farms in general, the factors that significantly affected the capital formation were borrowed amount, size of the holding and annual income of the family. As expected, all these factors had positive and significant impact on the capital formation. Higher the levels of these factors, higher the capital formation and vice versa.

However, for the rainfed farms, only two factors, namely, borrowed amount and annual income of the family influenced capital formation positively and significantly. Unlike in the irrigated farms, size of holding did not have any significant influence on capital formation in the rainfed farms.

However, the factors that influenced capital formation varied amongst farm size categories. In the irrigated farms, the factors that significantly influenced capital formation were borrowed amount and age in the case of small farmers, area irrigated, borrowed amount and size of holding in the case of medium farmers and borrowed amount, size of holding and annual income of the family in the case of large farmers.

All these factors had positive influence on capital formation with the lone exception of age in the case of small farmers. That is, higher the age, lower the capital formation and vice versa in the case of small farmers. Probably, older farmers did not favour capital formation due to their low risk bearing ability. In fact, such a relationship was expected in all the categories of farmers and in both irrigated and rainfed farms.

In the rainfed farmers, the determinants of capital formation were borrowed amount, size of holding and annual income of the family in the case of small farmers, borrowed amount and annual income of the family in the case of medium farmers and borrowed amount alone in the case of large farmers. All these factors were significant as indicated by the 't' values and had positive influence on capital formation with the lone exception of annual income of the family in the case of small farmers. This was really unexpected relationship.

4.5: SOURCES OF FINANCE FOR CAPITAL FORMATION

In addition to studying growth, pattern and determinants of capital formation in agriculture, it was worthwhile to study the sources of finance for capital formation which would bring to the fore the contribution of each of the sources of finance to capital formation. Hence, an attempt was made to assess the contribution of owned and borrowed funds to the total capital formation as well as to each capital asset.

This analysis would help the policy makers regulate the flow of credit for investment in the desired direction to achieve the expected levels of capital formation in agriculture.

4.5.1 Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

In general, capital formation in progressive area was mainly sourced by owned funds (52 per cent) than borrowed funds (48 per cent), across all capital assets (Table-4.27). Contrastingly, the share of borrowed funds (55 per cent) in the total capital formation was higher as compared to owned funds (45 per cent) in the less progressive area. Similar was the situation in the case of medium farmers of less progressive area.

Amongst different capital assets created in the progressive area, the assets that were mainly sourced from own funds were irrigation structure and equipment (62.27 per cent), farm buildings (52.65 per cent) and improvements on land (50.29 per cent) while the contribution of

borrowed funds were higher for land (53.83 per cent) and farm machinery and equipment (53.45 per cent). Similar was the pattern in different farm size categories, except in the case of small farmers for farm buildings and improvements on land.

In the less progressive area, improvements on land (61.02 per cent) and land (59.96 per cent) were mainly sponsored by borrowed funds whereas own funds mainly shared the capital investment on farm buildings (67.91 per cent), farm machinery and equipments (53.63 per cent) and irrigation structure and equipment (52.66 per cent). In this area, small and medium farmers' investment sourcing behaviour for some of the capital assets did not match the general investment sourcing behaviour of the farmers of less progressive area.

4.5.2 Capital Formation through Owned and Borrowed Funds in Irrigated and Rainfed Farms

On irrigated farms, in general, capital formation was mainly financed by borrowed funds (52 per cent) than owned funds (48 per cent), across all capital assets (Table-4.28). Similarly, on rainfed farms, the share of borrowed funds (58 per cent) in the total capital formation was still higher as compared to owned funds (42 per cent). The investment sourcing behaviour of all categories of farmers match the common behaviour of all farmers in the rainfed farms, while on irrigated farms, small and medium farmers differed from the overall farmers' investment sourcing behaviour.

Amongst different capital assets created on irrigated farms, the assets that were mainly sourced from own funds were irrigation structure and equipment (54.46 per cent) and farm buildings (50.25 per cent) while the contribution of borrowed funds were higher for land (64.33 per cent), improvements on land (52.14 per cent) and farm machinery and equipment (50.33 per cent). Similar was the pattern in different farm size categories, except in the case of small farmers for farm buildings, improvements on land and irrigation structure and equipment; medium farmers for farm buildings; and large farmers for farm machinery and equipments and improvements on land.

On rainfed farms, all the capital assets created were mainly sponsored by borrowed funds. The highest share of borrowed funds was for improvements on land (63.35 per cent) followed by land (56.91 per cent), farm machinery and equipments (54.20 per cent) and farm buildings (52.45 per cent). On these farms, the investment sourcing behaviour of the farmers of different farm size categories was consistent with the general investment sourcing behaviour of the rainfed farmers, except large farmers for farm buildings and farm machinery and equipments.

4.5.3 Non-Agricultural Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

As done for agricultural capital assets, the farmers' investment sourcing behaviour was also analysed for non-agricultural capital assets in progressive and less progressive areas as well as irrigated and rainfed farms and the results are presented in Table-4.29 and Table-4.30.

In both the progressive and less progressive areas, the non-agricultural capital formation was mainly sourced from own funds (73.11 per cent and 70.76 per cent, respectively) than borrowed funds (26.88 per cent and 29.23 per cent, respectively) (Table-4.29). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever.

Amongst different non-agricultural capital assets, all the assets except motorbike were financed from own funds in both the areas. There was absolutely no investment out of borrowed funds on consumption in both the areas. Motorbike was mainly financed from borrowed funds in both the areas. Small farmers of both the areas could not invest on or afford a motorbike while bicycle was not preferred for investment by large farmers of both the areas and medium farmers of less progressive area.

However, the investment sourcing behaviour of small farmers of progressive area and medium farmers of less progressive area was slightly different from their common behaviour.

Table-4.27: Agricultural Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

(Rs/farm)

Particulars	Progressive area								Less progressive area							
	Small		Medium		Large		Overall		Small		Medium		Large		Overall	
	O	B	O	B	O	B	O	B	O	B	O	B	O	B	O	B
Land	7500 (41.66)	10500 (58.33)	17966 (44.95)	22000 (55.04)	26566 (48.53)	28166 (51.46)	17344 (46.17)	20222 (53.83)	6566 (50.38)	6466 (49.61)	10200 (30.35)	23400 (69.64)	25433 (43.27)	33333 (56.72)	14066 (40.03)	21066 (59.96)
Farm buildings	4533 (35.69)	8166 (64.30)	15200 (55.42)	12226 (44.57)	22633 (56.11)	17700 (43.88)	14122 (52.65)	12697 (47.34)	5266 (59.39)	3600 (40.60)	9200 (30.90)	20566 (69.09)	19300 (55.61)	15400 (44.38)	11255 (67.91)	13189 (32.08)
Farm machinery and equipments	3028 (27.74)	7884 (72.25)	9686 (38.73)	15318 (61.26)	56286 (50.10)	56041 (49.89)	23000 (46.54)	26414 (53.45)	3215 (46.08)	3761 (53.91)	5776 (45.79)	6838 (54.20)	41060 (55.69)	32661 (44.30)	16684 (53.63)	14420 (46.36)
Improvements on land	10766 (37.33)	17766 (62.26)	25766 (51.05)	24700 (48.94)	47133 (53.94)	40233 (46.05)	27889 (50.29)	27566 (49.70)	2466 (36.44)	4300 (63.55)	16873 (33.60)	33333 (66.39)	25666 (43.87)	32833 (56.12)	15002 (38.97)	23489 (61.02)
Irrigation structure and equipment	17413 (76.71)	5286 (23.28)	19900 (59.40)	13600 (40.59)	52233 (59.62)	35366 (40.37)	29849 (62.27)	18084 (37.72)	5266 (59.62)	3566 (40.37)	13633 (45.95)	16033 (54.04)	18150 (56.98)	13700 (43.01)	12350 (52.66)	11100 (47.33)
Total	**43240 (46.57)**	**49602 (53.42)**	**88518 (50.19)**	**87844 (49.80)**	**204851 (53.57)**	**177506 (46.42)**	**112204 (51.66)**	**104984 (48.33)**	**22779 (51.22)**	**21693 (48.77)**	**55682 (35.72)**	**100170 (64.27)**	**129609 (50.32)**	**127927 (49.67)**	**69357 (45.44)**	**83263 (54.55)**

Note: O =Owned; B=Borrowed.

Table-4.28: Agricultural Capital Formation through Owned and Borrowed Funds on Irrigated and Rainfed Farms

(Rs/farm)

Particulars	Irrigated farms								Rainfed farms							
	Small		Medium		Large		overall		Small		Medium		Large		Overall	
	O	B	O	B	O	B	O	B	O	B	O	B	O	B	O	B
Land	8137 (43.86)	10413 (56.13)	3466 (9.16)	34333 (90.83)	27780 (46.03)	32560 (53.96)	14789 (35.67)	26669 (64.33)	6000 (47.32)	6677 (52.67)	14200 (39.70)	21566 (60.29)	22157 (45.21)	26842 (54.78)	12912 (43.09)	17050 (56.91)
Farm buildings	7068 (49.27)	7275 (50.72)	14860 (41.13)	21266 (58.86)	24975 (55.86)	19731 (44.13)	16747 (50.25)	16579 (49.75)	2870 (38.52)	4580 (61.47)	9540 (45.28)	11526 (54.71)	12315 (55.97)	9684 44.02)	7614 (47.55)	8397 (52.45)
Farm machinery and equipments	4105 (34.89)	7660 (65.10)	11385 (40.32)	16850 (59.67)	68558 (52.07)	63091 (47.92)	32715 (49.67)	33144 (50.33)	2232 (33.94)	4344 (66.05)	4620 (45.16)	5610 (54.83)	6404 (58.31)	4578 (41.68)	4118 (45.80)	4874 (54.20)
Improvements on land	15275 (39.6	23275 (60.37)	26306 (42.70)	35300 (57.29)	45585 (53.18)	40121 (46.81)	31011 (47.86)	33789 (52.14)	2870 (21.97)	10193 (78.02)	16333 (41.80)	22733 (58.18)	16578 (36.54)	28789 (63.45)	11174 (36.65)	19312 (63.35)
Irrigation structure and equipment	14793 (49.36)	15172 (50.63)	32100 (50.92)	30933 (49.07)	52036 (57.45)	38536 (42.54)	35255 (54.46)	29480 (45.54)	-	-	-	-	-	-	-	-
Total	**49378 (43.63)**	**63795 (56.36)**	**88117 (38.85)**	**138682 (61.14)**	**218934 (53.07)**	**194039 (46.98)**	**130517 (48.31)**	**139661 (51.69)**	**13972 (35.13)**	**25794 (64.86)**	**44693 (42.11)**	**61435 (57.88)**	**57454 (45.11)**	**69893 (54.88)**	**35818 (41.92)**	**49633 (58.08)**

Note: O = Owned B = Borrowed.

Table-4.29: Non-Agricultural Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

(Rs/farm)

Particulars	Progressive area								Less progressive area							
	Small		Medium		Large		Overall		Small		Medium		Large		Overall	
	O	B	O	B	O	B	O	B	O	B	O	B	O	B	O	B
Marriage and other social functions	7634 (46.26)	8866 (53.73)	21633 (70.01)	9266 (29.98)	28266 (68.66)	12900 (31.33)	19178 (64.96)	10344 (35.03)	10633 (55.38)	8566 (44.61)	15749 (45.51)	18850 (54.48)	20666 (57.94)	15000 (42.05)	15683 (52.58)	14139 (47.41)
Consumption	14693 (100.00)	-	29233 (100.00)	-	34333 (100.00)	-	26086 (100.00)	-	15700 (100.00)	-	28500 (100.00)	-	28766 (100.00)	-	24322 (100.00)	-
Health	5743 (43.95)	7323 (56.04)	13866 (59.42)	9466 (40.57)	17166 (69.22)	7633 (30.77)	12258 (60.09)	8141 (39.90)	6300 (56.75)	4800 (43.24)	13333 (69.20)	5933 (30.79)	16666 (85.03)	2933 (14.96)	12100 (72.64)	4555 (27.35)
Comforts/ luxuries																
a. Bicycle	300 (42.25)	410 (57.74)	1000 (86.95)	150 (13.04)	-	-	433 (69.89)	187 (30.10)	326 (59.05)	226 (40.94)	-	-	-	-	109 (59.05)	75 (40.94)
b. Television	826 (69.29)	366 (30.70)	5566 (91.75)	500 (8.24)	8150 (96.82)	267 (3.17	4847 (92.77)	378 (7.22)	483 (78.40)	133 (21.59)	3050 (89.28)	366 (10.71)	4683 (87.54)	666 (12.45)	2739 (87.58)	388 (12.41)
c. Motorbike	-	-	2560 (42.24)	3500 57.75)	12200 (46.44)	14066 (53.55)	4920 (45.65)	5855 (54.34)	-	-	3366 (41.05)	4833 (58.94)	6833 (40.59)	10000 (59.40)	3400 (40.74)	4944 (59.25)
Total	**29196 (63.24)**	**16965 (36.75)**	**73858 (76.34)**	**22882 (23.65)**	**100115 (74.16)**	**34866 (25.83)**	**67723 (73.11)**	**24904 (26.88)**	**33442 (70.90)**	**13725 (29.09)**	**63998 (68.09)**	**29980 (31.90)**	**77616 (73.07)**	**285999 (26.92)**	**58351 (70.76)**	**24102 (29.23)**

Note: O=Owned; B=Borrowed.

Such contrasting features were that the borrowed funds mainly financed marriage and other social functions, health and bicycle for small farmers of the progressive area and in the less progressive area, marriage and other social functions of medium farmers were mainly sponsored by borrowed funds.

4.5.4 Non-Agricultural Capital Formation through Owned and Borrowed Funds on Irrigated and Rainfed Farms

In both the progressive and less progressive areas, the non-agricultural capital formation was mainly sourced from own funds (70.46 per cent and 68.36 per cent, respectively) than borrowed funds (29.54 per cent and 31.64 per cent, respectively) (Table-4.30). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever.

Amongst different non-agricultural capital assets, all the assets except motorbike were financed from own funds in the progressive area whereas in the less progressive area, all the assets except motorbike and marriage and other social functions were mainly sourced from borrowed funds. There was absolutely no investment out of borrowed funds on consumption in both the areas. Motorbike was mainly financed from borrowed funds in both the areas. Small farmers of both the areas could not invest on or afford a motorbike while bicycle was not preferred for investment by large farmers of both the areas and medium farmers of less progressive area.

However, there were some exceptions to the general investment sourcing behaviour of farmers in both the areas. In the progressive area, small farmers mainly invested on health from borrowed funds. In the less progressive area, medium farmers financed marriage and other social functions mainly from own funds and small farmers financed bicycle mainly from borrowed funds.

4.5.5 Preference for Sources of Funds for Capital Formation

It has been observed in the earlier sections, that borrowed source of finance has contributed substantially to the total investment by the farmers in both agricultural and non-agricultural capital assets. Now, it is pertinent to identify the various sources of borrowed finance that cater to farmers' needs and assess their contribution to borrowed finance.

The sources are classified into two categories, i.e., institutional sources and non-institutional sources. Further, the main sources under institutional sector in the study area were regional rural banks, cooperative banks and commercial banks and the non-institutional sources were traders, commission agents, money lenders, private finance (like chit funds, etc.) and friends/relatives. An attempt was made to identify various sources of finance both under institutional and non-institutional sectors for progressive and less progressive areas as well as for irrigated and rainfed farms and the results are presented in Table-4.31 and Table-4.32.

4.5.5.1 Sources of Borrowed Funds for Capital Formation in Progressive and Less Progressive Areas

Amongst various institutional and non-institutional sources of finance in the progressive area, regional rural banks (36.66 per cent) shared the highest proportion of credit flow to farmers followed by commercial banks (16.66 per cent), traders (16.66 per cent), cooperative banks (12.22 per cent), money lenders (12.22 per cent), private finance (4.44 per cent) and commission agents (1.11 per cent). They did not borrow from friends/relatives (Table-4.31). On the other hand in the less progressive area, the share of regional rural banks in the total borrowed funds was the highest (47.77 per cent), followed by cooperative banks (24.44 per cent), commercial banks (10 per cent), traders (7.77 per cent), private finance (5.55 per cent), money lenders (3.33 per cent) and friends/relatives (1.11 per cent) while they did not borrow from commission agents. Thus, the investment sourcing priorities were different between progressive and less progressive areas.

Between institutional and non-institutional sources, the proportion of total credit shared by the institutional source was much higher in the less progressive area (82.21 per

Table-4.30: Non-Agricultural Capital Formation through Owned and Borrowed Funds on Irrigated and Rainfed Farms

(Rs/farm)

Particulars	Irrigated farms								Rainfed farms							
	Small		Medium		Large		Overall		Small		Medium		Large		Overall	
	O	B	O	B	O	B	O	B	O	B	O	B	O	B	O	B
Marriage and other social functions	10482 (53.52)	9103 (46.47)	21216 (62.46)	12750 (62.46)	28731 (69.53)	12585 (30.46)	21184 (64.57)	11625 (35.43)	7870 (48.50)	8354 (51.49)	16166 (51.26)	15366 (48.73)	15263 (47.46)	16894 (52.53)	12737 (49.47)	13012 (50.53)
Consumption	14826 (100.00)	-	30966 (100.00)	-	3348 (100.00)	-	14962 (100.00)	-	15064 (100.00)	-	26766 (100.00)	-	27368 (100.00)	-	22374 (100.00)	-
Health	5862 (48.02)	6344 (51.97)	14566 (66.92)	7200 (33.07)	18048 (77.73)	5170 (22.26)	13469 (68.76)	6119 (31.24)	6170 (51.56)	5796 (48.43)	12633 (60.63)	8200 (39.36)	14473 (72.36)	5526 (27.63)	10566 (61.43)	6633 (38.57)
Comforts/luxuries																
a. Bicycle	365 (57.93)	265 (42.06)	83 (62.40)	50 (37.59)	-	-	131 (58.74)	92 (41.26)	264 (41.83)	367 (58.16)	916 (90.15)	100 (9.84)	-	-	446 (71.25)	180 (28.75)
b. Television	982 (68.67)	448 (31.32)	5033 (90.96)	500 (9.03)	7170 (92.45)	585 (7.54)	4734 (90.10)	520 (9.90)	348 (83.85)	67 (16.14)	3583 (90.73)	366 (9.26)	4789 (95.79)	210 (4.20)	2616 (92.47)	213 (7.53)
c. Motorbike	-	-	4933 (48.05)	5333 (51.94)	10268 (44.40)	12853 (55.59)	5690 (45.30)	6870 (54.70)	-	-	993 (24.86)	3000 (75.13)	7894 (43.47)	10263 (56.52)	2247 (38.68)	3562 (61.32)
Total	**32515 (66.80)**	**16160 (33.19)**	**76797 (74.82)**	**25833 (25.17)**	**67565 (68.41)**	**31193 (31.58)**	**60170 (70.46)**	**25226 (29.54)**	**29713 (67.07)**	**14584 (32.92)**	**61057 (69.31)**	**27032 (30.68)**	**69787 (67.96)**	**32893 (32.03)**	**50986 (68.36)**	**23600 (31.64)**

Note: O=Owned; B=Borrowed.

Table-4.31: Sources of Borrowed Funds for Capital Formation in Progressive and Less Progressive Areas

(Percentage)

Categories	Institutional Sources			Non-institutional Sources				
	Regional Rural Banks	**Cooperative Banks**	**Commercial Banks**	**Traders**	**Commission Agents**	**Money Lenders**	**Private Finance**	**Friends/ Relatives**
4.6 Progressive area								
Small	13.33	3.33	3.33	46.67	-	33.33	-	-
Medium	60.00	13.33	6.67	3.33	3.33	3.33	10.00	-
Large	36.67	20.00	40.00	-	-	-	3.33	-
Average	36.66	12.22	16.66	16.66	1.11	12.22	4.44	
4.7 Less progressive area								
Small	43.33	13.33	6.67	20.00	-	3.33	13.33	-
Medium	60.00	20.00	10.00	-	-	6.67	3.33	-
Large	40.00	40.00	13.33	3.33	-	-	-	3.33
Average	**47.77**	**24.44**	**10.00**	**7.77**		**3.33**	**5.55**	**1.11**

cent) than in the progressive area (65.54 per cent). The non-institutional source shared the remaining 17.79 per cent and 34.46 per cent of total credit requirement in the less progressive and progressive areas, respectively.

Further, the investment sourcing priorities varied across different farm size categories in both the areas. In the progressive area, small farmers preferred traders to all others, followed by money lenders, regional rural banks, cooperative banks and commercial banks; medium farmers mostly preferred regional rural banks, followed by cooperative banks, private finance, commercial banks, money lenders and commission agents; and large farmers preferred commercial banks the most, followed by regional rural banks, cooperative banks and private finance.

In the less progressive area, the investment sourcing priorities of small farmers were regional rural banks followed by traders, cooperative banks, private finance, commercial banks and money lenders; that of medium farmers were regional rural banks, cooperative banks, commercial banks, money lenders and private finance; and that of large farmers were regional rural banks, cooperative banks, commercial banks traders and friends/relatives.

4.5.5.2: Sources of Borrowed Funds for Capital Formation in Irrigated and Rainfed Farms

Similarly the sources of borrowed finance for irrigated and rainfed farms were identified and assessed, the results of which are presented in Table-4.32.

Amongst various institutional and non-institutional sources of finance, for irrigated farms, regional rural banks (48.38 per cent) shared the highest proportion of credit flow to farmers followed by cooperative banks (19.39 per cent), traders (12.26 per cent), commercial banks (10.35 per cent), money lenders (5.70 per cent), private finance (3.06 per cent) and friends/relatives (0.81 per cent). They did not borrow from commission agents. On the other hand, for rainfed farms, the share of regional rural banks in the total borrowed funds was the highest (34.11 per cent), followed by cooperative banks (19.55 per cent), commercial banks (17.08 per cent), traders (12.93 per cent), money lenders (9.75 per cent), private finance (5.44 per cent) and commission agents (1.11 per cent) while they did not borrow from friends/relatives. Thus, the investment sourcing priorities were different between rainfed and irrigated areas, the major two being regional rural banks and cooperative banks.

Between institutional and non-institutional sources, the proportion of total credit shared by the institutional source was relatively higher for irrigated farms (78.12 per cent) than for rainfed farms (70.74 per cent). The non-institutional source shared the remaining 21.88 per cent and 29.26 per cent of total credit requirement for irrigated and rainfed farms, respectively.

Further, the investment sourcing priorities varied across different farm size categories for both irrigated and rainfed farms. For the irrigated farms, small farmers preferred regional rural banks to all other sources, followed by traders, cooperative banks, money lenders and private finance; medium farmers mostly preferred regional rural banks, followed by cooperative banks, commercial banks, money lenders, traders and private finance; and large farmers preferred regional rural banks, followed by cooperative banks, commercial banks, traders, private finance and friends/relatives.

For the rainfed farms, the investment sourcing priorities of small farmers were traders followed by money lenders, regional rural banks, commercial banks, private finance and cooperative banks; that of medium farmers were regional rural banks, followed by cooperative banks, commercial banks, money lenders, private finance, traders and commission agents; and that of large farmers were cooperative banks, commercial banks traders and regional rural banks.

Table-4.32: Sources of Borrowed Funds for Capital Formation in Irrigated and Rainfed Areas

(In Percentage)

Categories	Institutional Sources			Non-institutional Sources				
	Regional Rural Banks	**Cooperative Banks**	**Commercial Banks**	**Traders**	**Commission Agents**	**Money Lenders**	**Private Finance**	**Friends/ Relatives**
4.8 Irrigated farms								
Small	37.93	13.79	-	31.03	-	13.79	3.43	-
Medium	63.33	20.00	6.67	3.33	-	3.33	3.33	-
Large	43.90	24.39	24.39	2.43	-	-	2.43	2.43
Average	**48.38**	**19.39**	**10.35**	**12.26**	**-**	**5.70**	**3.06**	**0.81**
4.9 Rainfed farms								
Small	19.35	3.23	9.68	35.48	-	22.58	9.67	-
Medium	56.67	13.33	10.00	3.33	3.33	6.67	6.67	-
Large	26.32	42.11	31.58	-	-		-	-
Average	**34.11**	**19.55**	**17.08**	**12.93**	**1.11**	**9.75**	**5.44**	**-**

Table-4.33: Constraints in Acquisition of Capital Assets in Progressive and Less Progressive Areas

(In Percentage)

Constraints	Progressive Area				Less Progressive Area			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Non-availability of finance	30.00	33.33	40.00	34.44	33.33	40.00	43.33	38.88
Over dues of credit	16.66	30.00	26.66	24.44	13.33	20.00	23.33	18.88
Insufficient collateral security	20.00	6.66	-	8.88	16.66	10.00	-	8.88
Very small holding	16.66	-	-	5.55	23.33	-	-	7.77
Lack of education	6.66	23.33	13.33	14.44	10.00	13.33	20.00	14.44
Family problems	10.00	6.66	20.00	12.22	3.33	16.66	13.33	11.11

Table-4.34: Constraints in Acquisition of Capital Assets in Irrigated and Rainfed Areas

(In Percentage)

Constraints	Irrigated Farms				Rainfed Farms			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Non-availability of finance	34.48	36.66	34.14	35.09	41.93	46.66	36.84	41.81
Over dues of credit	24.13	33.33	29.26	28.90	12.90	20.00	26.31	19.73
Insufficient collateral security	10.34	3.33	-	4.55	19.35	-	-	6.45
Very small holding	6.89	-	-	2.29	6.45	6.66	-	4.37
Lack of education	10.34	16.66	19.51	15.52	12.90	10.00	21.05	14.65
Family problems	13.79	10.00	17.07	13.62	6.45	16.66	15.78	12.96

4.5.6: Constraints in Acquisition of Capital Assets

4.5.6.1: Constraints in Acquisition of Capital Assets in Progressive and Less Progressive Areas

There will always be some constraints in any economic activity. The capital formation process is no exception to this. Hence an attempt was made in the present study to know the problems faced by the farmers in acquisition of the capital assets. They could be social, economic or of any other nature. In this regard, the most serious constraint faced by each of the farmers was elicited from the sample respondents and percentage of farmers facing each constraint was estimated (Table-4.33).

The progressive farmers expressed that non-availability of finance was the biggest constraint (34.44 per cent) followed by overdue of credit (24.44 per cent), lack of education (14.44 per cent), family problems (12.22 per cent), insufficient collateral security (8.88 per cent) and very small holdings (5.55 per cent). Similar was the constraint prioritisation by the farmers of the less progressive area.

In the progressive area, the major constraints in acquisition of capital assets faced by large farmers were non-availability of finance (40 per cent), overdue of credit (26.66 per cent), family problems (20 per cent) and lack of education (13.33 per cent); those by medium farmers were non-availability of finance (33.33 per cent), overdue of credit (30 per cent), lack of education (23.33 per cent), insufficient collateral security (6.66 per cent) and family problems (6.66 per cent); and those by small farmers were non-availability of finance (30 per cent), insufficient collateral security (20 per cent), overdue of credit (16.66 per cent), very small holding (16.66 per cent), family problems (10 per cent) and lack of education (6.66 per cent).

Almost similar was the severity of constraints in the less progressive area. Non-availability of finance (43.33 per cent), overdue of credit (23.33 per cent), lack of education (20 per cent) and family problems (16.66 per cent) were the major constraints in acquisition of capital assets by the large farmers, whereas non-availability of finance (40 per cent), overdue of credit (20 per cent), family problems (16.66 per cent), lack of education (13.33 per cent) and insufficient collateral security (10 per cent) were the constraints faced by the medium farmers, in that order. The most serious constraints faced by the small farmers were non-availability of finance (33.33 per cent), very small holding (23.33 per cent), insufficient collateral security (16.66 per cent), overdue of credit (13.33 per cent), lack of education (10 per cent) and family problems (3.33 per cent).

4.5.6.2: Constraints in Acquisition of Capital Assets in Irrigated and Rainfed Farms

The constraints prioritised on both irrigated and rainfed farms were similar in order, the most serious constraint being non-availability of finance (35.09 and 41.81 per cent, respectively), followed by overdue of credit (28.90 and 19.73 per cent), lack of education (15.52 and 14.65 per cent), family problems (13.62 and 12.96 per cent), insufficient collateral security (4.55 and 6.45 per cent) and very small holding (2.29 and 4.37 per cent) (Table 4.34).

Among the irrigated farms, the major constraint in acquisition of capital assets by the large and medium farmers was the non-availability of finance (34.14 and 36.66 per cent), followed by overdue of credit (29.26 and 33.33 per cent), lack of education (19.51 and 16.66 per cent) and family problems (17.07 and 10 per cent), while the small farmers seriously faced the problem of non-availability of finance (34.48 per cent), followed by overdue of credit (24.13 per cent), family problems (13.79 per cent), lack of education (10.34 per cent), insufficient collateral security (10.34 per cent) and very small holding (6.89 per cent).

In the case of rainfed farms, the most serious constraint faced by all the categories of farmers was the non-availability of finance, as expressed by 41.93 per cent, 46.66 per cent and 36.84 per cent of small, medium and large farmers, respectively. The other major constraints in acquisition capita assets by the small farmers were insufficient collateral security (19.35 per cent), overdue of credit (12.90 per cent), lack of education (12.90 per cent), very small holding (6.45 per cent) and family problems (6.45 per cent); those by the

medium farmers were overdue of credit (20 per cent), family problems (16.66 per cent), lack of education (10 per cent) and very small holding (6.66 per cent); and those by large farmers were overdue of credit (26.31 per cent), lack of education (21.05 per cent) and family problems (15.78 per cent).

V. DISCUSSION

This chapter discusses the results presented in the previous chapter in terms of exploration of the plausible reasons for the phenomena observed, comparison of the present findings with earlier studies and establishing the interrelationships, if any, thereof.

5.1 TREND AND MAGNITUDE OF CAPITAL FORMATION

5.1.1 Trends in Fixed Capital Formation by Type of Industry of Use and by Type of Institution

The trends in fixed capital formation by type of industry of use and by type of institution were analysed using the data available for the period from 1980-81 to 1993-94 (data beyond 1993-94 were not available). The types of industry of use included (i) agriculture and allied activities, (ii) forestry and logging, (iii) fishing and (iv) mining and quarrying under primary sector; (i) manufacturing, (ii) construction and (iii) electricity, gas and water supply under secondary sector; and (i) transport, storage and communication, (ii) trade, hotel and restaurant, (iii) banking and insurance, (iv) real estate, owner of dwell and business, (v) public administration and (vi) other services under tertiary sector. The type of institution included public and private sectors.

The total fixed capital formation across all types of industry of use and both the types of institution increased by almost six times (581 per cent) in one and half decades. The corresponding growth in total public sector was lower (517 per cent) than that in private sector (674 per cent). Such an impressive growth in capital formation could be due to the supportive policy environment of both the central and state governments. Further, the relatively better performance of private sector was the outcome of LPG (Liberalisation, Privatisation and Globalisation) policies of the government initiated in the early 1990s.

Amongst the three broad sectors, tertiary sector witnessed the highest growth in fixed capital formation followed by secondary sector and primary sector. This phenomenon was quite expected as the tertiary or service sector has its roots spread across all the three sectors, while the secondary or manufacturing sector has some weak linkages with primary and tertiary sectors and similarly primary sector has still weaker linkages with secondary and tertiary sectors.

This pattern, observed temporally, was also witnessed spatially at a point of time. In the State total fixed capital formation, the tertiary sector appropriated maximum share (42.96 per cent), followed by secondary share (33.81 per cent) and primary sector (23.23 per cent).

The contribution to the total fixed capital formation was the highest by ‘agriculture and allied activities’ in the primary sector, by the manufacturing sub-sector in the secondary sector and by the real estate, owner of dwell and business in the tertiary sector.

As far as public and private institutions were concerned, at the state level across all sectors, both public and private institutions contributed almost equally to the total fixed capital formation. Public institutions scored over private ones in primary and tertiary sectors in terms of fixed capital formation, while in the case of secondary sector, the performance of secondary sector was relatively better.

5.1.2 Compound Annual Growth Rate of Gross Fixed Capital Formation by Type of Industry of Use and by Type of Institution

The overall compound annual rate of growth in Gross Fixed Capital Formation was 13.78 per cent per annum across all types of industry of use and types of institution. Between different types of institution, the growth in private sector surpassed that in public sector. Among different sectors, tertiary sector witnessed the highest growth rate followed by secondary sector and primary sector. The reasons for such events have been clearly brought out in the previous section.

Coming to sub-sector level, in primary sector, the compound annual growth rate was the highest in fishing (14.71 per cent) followed by agriculture and allied activities (13.07 per

cent). The results are contrary to percentage changes based on extreme values (as seen in previous section), wherein agriculture and allied activities witnessed highest growth. Since percentage change depends only on extreme value as against growth rate which uses all the observations, growth rate is more meaningful.

5.1.3 Growth of Agricultural Implements and Machineries in Karnataka

The growth in capital formation was also analysed in terms of physical units of agricultural capital assets, such as ploughs, carts, sugarcane crushers, water lifts, irrigation pumps and tractors. The major agricultural implements and machinery put together in Karnataka increased from 39.06 lakhs in 1977 to 49.19 lakhs in 1997, thus registering a growth of 25.92 per cent over a period of two decades.

As far as the individual components of capital stock (in physical units) were concerned, ploughs contributed the maximum to the total stock of agricultural implements and machinery in the State, followed by carts and irrigation pumps. Temporally speaking, highest growth was observed in the case of tractors, followed by irrigation pumps operated by electric motors, sugarcane crushers operated by bullocks, irrigation pumps operated by oil engines, carts and ploughs, whereas it was negative in the case of water lifts worked by Persian wheel/Rahats and sugarcane crushers operated by power. In spite of the lower growth with respect to ploughs, carts and irrigation pumps, their contribution to the total stock of agricultural implements and machinery in the State was relatively much higher indicating their all time importance in agriculture.

5.1.4 District-wise Stock of Agricultural Implements and Machineries in Karnataka

At the State level, as per 1997 census, among different agricultural capital assets included in the study, the highest proportion was accounted by wooden plough, followed by iron plough, carts, electric pumpset for irrigation, oil engines with pumpsets for irrigation, MB plough, tractor including power tiller and power operated sprayers and dusters. Disc plough, bullock operated sugarcane crushers and power operated sugarcane crushers contributed less than one per cent each to the total stock of agricultural capital assets. Thus, ploughs, carts and irrigation pumpsets occupied prime position in Karnataka's agriculture.

Tumkur, among all the districts of the State, had the highest proportion (8.41 per cent) of total agricultural capital assets in the State, followed by Belgaum, Hassan, Bangalore Rural, Kolar, Mysore, Mandya, Gulbarga and Shimoga, in that order, while the least was in the case of Kodagu. A perusal of this pattern reveals that all the top ranking districts except Belgaum and Gulbarga belong to Southern Karnataka. This could be due to the socio-political bias than techno-economic factors.

5.1.5 Pattern and Growth of Agricultural Implements and Machineries in Chitradurga District

Of the State's total agricultural capital assets during 1990 (53.69 lakhs) and 1997 (49.19 lakhs), Chitradurga possessed nearly 4.33 per cent and 6.43 per cent, respectively. Interestingly, while there was negative growth in the State's total agricultural capital stock, Chitradurga district witnessed a significant positive growth, probably due to good agricultural years on account of favourable climate during the period in question.

The growth in the stock of different agricultural capital assets in Chitradurga district during the seven-year study period revealed that the sugarcane crushers worked by bullocks witnessed the highest growth of 450 per cent, followed by disc plough, MB plough, electric pumpsets for irrigation and tractor including power tillers. On the other hand, oil engines with pumpsets for irrigation, carts, wooden ploughs and iron plough registered less than 35 per cent growth. There was negative growth in power operated sprayers and dusters, probably, owing to rising fuel prices and relatively cheaper labour.

5.1.6 Growth Rate of Livestock and Poultry in Karnataka

During 1966-97, the total livestock increased from 2.05 crores to 3.07 crores registering a compound annual growth rate of 2.30 per cent over the entire study period. On the other hand, poultry sector witnessed a compound annual growth rate of 3 per cent over the study period, due to an increase in the number of birds from 0.83 crores to 2.14 crores. However, the growth in poultry sector was less than expected.

Amongst different components of livestock, pigs registered the highest growth, followed by goat, sheep, buffaloes and cattle, while negative growth was observed in the case of camels, horse and ponies, donkeys and mules. This could be due to reduction in the use of camels, horses, ponies, donkeys and mules for transport purposes owing to increased mechanisation in transport sector. Amongst various components of poultry, highest growth rate was observed in the case of fowls, which could be quite naturally due to ever increasing demand for chicken based foods.

5.1.7 District-wise Stock of Livestock and Poultry in Karnataka

Of the total stock of 5.2 crores animals in the State, livestock accounted for nearly three-fifths while poultry accounted for the remaining two-fifths.

Among different livestock components, cattle accounted for the highest proportion (nearly one-fifth) of the total animal stock in the State, followed by sheep, goat, buffaloes and dogs. Pigs, donkeys, horse and ponies, mules, camels and other livestock accounted for less than one per cent of the total livestock in the State. Poultry constituted mostly of fowls. Thus, bullocks still dominate the Indian agriculture in terms of carrying out the farming operations. Cows and buffaloes, though constitute a big chunk, yield a very poor quantity of milk per animal per day.

Among all the districts of the State, Belgaum accounted for the highest proportion of livestock (8.58 per cent) followed by Tumkur, Gulbarga, Bangalore-Rural, Kolar, Bellary, Chitradurga, Raichur, Hassan, Mandya, Bagalkot, Bijapur, Mysore, Shimoga and Davanagere, while least was in the case of Kodagu. In general, livestock population is higher in those districts wherever dryland farming is mostly practiced.

Coming to poultry, Bangalore-Rural stood first sharing 11.04 per cent of the State's stock of poultry birds, followed by Bellary, Bangalore-Urban, Dakshina Kannada, Mysore, Kolar, Belgaum, Udupi, Shimoga and Mandya, while least was in the case of Gadag. Suitability of climate for poultry rearing and demand for eggs and chicken were the important factors that determined the poultry population in different districts.

5.1.8 Growth of Livestock and Poultry in Chitradurga District and Karnataka State

The share of Chitradurga in the State's total livestock and poultry together was 4.8 per cent during 1990 and 7.6 per cent during 1997. Between 1990 and 1997, there was an increase of about 79 per cent in the case of livestock as against 165 per cent in the case of poultry, thus resulting in 103 per cent growth in livestock and poultry together. The growth registered in poultry sector was more than in livestock sector, obviously due to the rapidly growing demand for poultry products in the economic liberalisation era of the early nineties.

Amongst different components of livestock and poultry, the percentage increase was the highest in the case of sheep, followed by fowls, horses and ponies, pigs, cattle, buffaloes, donkeys, goat and dogs. The growth in cattle and buffaloes was little over 50 per cent.

5.2 PATTERN OF INVESTMENT IN DIFFERENT CAPITAL ASSETS

5.2.1 Socio-Economic Characteristic Features of Progressive and Less Progressive Areas

The knowledge of the socio-economic characteristics of sample farmers would help us gain a better understanding of the ground realities. Hence, the data were collected in this regard and analysed (Table-4.11).

Size of Holding

The average size of holding was lower in the progressive area (3.51 ha) than in the less progressive area (3.75 ha), in general. This was true for each farm size category except in the case of small farmers. Though the farm size was relatively smaller in the progressive area, the intensification of farming has contributed to its progressiveness.

Average Irrigated Area

The average irrigated area was almost equal between progressive and less progressive areas in all the farm size categories. Across the farm size categories, the average irrigated area was higher in small farms followed by medium and large farms.

Area under Commercial Crops

The percentage of area under commercial crops was higher on larger farms in both the progressive and less progressive areas.

Fertilizer Use

The value of fertilizers used per ha in the progressive area was relatively higher than that in the less progressive area as many of these farmers grew irrigated and commercial crops as compared to the farms of less progressive area. However, variations existed among farm size categories.

Annual Income of the Family

The annual income of the family for the entire progressive area was higher (Rs.41,361) as compared to less progressive area (Rs.35,272) as the farms of progressive area used higher quantities of fertilisers and also that these farms diversified in other activities like dairy, poultry and other non-agricultural activities.

Amount Borrowed

Similarly, the average amount of borrowing per farm in the progressive area was much higher than that in the less progressive area, in general. This could be due to the higher credit worthiness of the farmers and higher investment potential on the farms of progressive area.

Family Size

The average size of family in the less progressive area was slightly smaller (6.48) than that in the progressive area (6.61), which, probably, could be due to the higher incomes of farmers in progressive area supportive of larger families.

Literacy

The average number of literates per farm family in the progressive area was higher (4.33) than that in the less progressive area (3.74). This phenomenon could probably due to the higher incomes and education levels of the farmers of progressive area. Hence, literacy level was positively associated with the progressiveness of the region. Similarly, the literacy level was positively associated with the farm size, owing to the aforesaid reasons.

Distance from Town

The farmers of progressive area were located at about 13 km from the town as compared to 17 km for the farmers of less progressive area. The relatively shorter distance to town has favoured the farmers of progressive area to commercialise their agriculture.

5.2.2 Socio-Economic Characteristic Features of Irrigated and Rainfed Farms

The knowledge of the socio-economic characteristics of sample farmers, post-classified into rainfed and irrigated farmers, would help us gain a better understanding of the ground realities. Hence, the data were collected in this regard and analysed (Table-4.12).

Size of Holding

The average size of holding in the case of irrigated farms was much higher (4.19 ha) than that of rainfed farms (2.91 ha). This was true even in different farm size categories. The irrigated farmers had higher investment capability, who probably, have invested relatively more in different capital assets including land.

Average Irrigated Area

The average irrigated area of the irrigated farms together was 0.42 ha. Farm size category-wise, it was much higher in the case of small farms followed by large farms and medium farms. This could be due to fragmented holdings of large farmers and hiring of water by small farmers from large farmers.

Area under Commercial Crops

The average proportionate area under commercial crops was almost same in both rainfed and irrigated areas (33.33 per cent). In both irrigated and rainfed areas, the large farms had the highest proportion of total gross cropped area under commercial crops, followed by medium and small farms. Proportionate area under commercial crops was positively related to farm size. Since the commercial crops are capital intensive, only larger farmers could go for commercial crops.

Fertilizer Use

The average value of fertilizers used in the irrigated area was much higher (Rs.911/ha) compared to rainfed area (Rs.603/ha), since irrigated crops required relatively higher quantities of fertilisers.

Annual Income of the Family

The average annual income of the family of irrigated farmers was relatively much higher (50 per cent) as compared to that of rainfed farmers. This could be due larger area under commercial crops and relatively higher productivities of crops in the case of irrigated farmers.

Amount Borrowed

The average amount of borrowing by the irrigated farmers was two and a half times that of rainfed farmers. This was because of relatively high input-intensive cultivation of crops on irrigated farms, which required relatively higher amount of investment. This called for relatively higher borrowings in the case of irrigated farmers. Further, the amount borrowed varied positively with the farm size, as expected, reiterating that larger farms invested relatively more due to their higher capital needs.

Family Size

The average size of family of irrigated farmers was higher (6.96) as compared to rainfed farmers (5.95), which, probably, could be due to the higher incomes of irrigated farmers supportive of larger families.

Literacy

The average number of literates per family on the irrigated farms was higher (4.27 per farm) as compared to rainfed farms (3.68 per farm). This phenomenon could probably due to the higher incomes and education levels of the irrigated farmers. Similarly, the literacy level was positively associated with the farm size in general, owing to the aforesaid reasons.

5.2.3 Pattern of Agricultural Investment on Different Capital Assets

The pattern of agricultural investment is analysed and presented in Table-4.13. The overall agricultural investment per farm on all the capital assets by the sample respondents was as high as Rs.1,85,626 in the study area.

As expected, the investment on agricultural capital assets increased as the farm size increased. Across different capital assets, the overall agricultural investment by sample farmers on improvements on land was the highest constituting 25.54 per cent of the total investment, followed by farm machinery and equipment, land, irrigation structure and equipment and farm buildings. This shows that farmers of the study area invested the most on highly productive capital assets followed by relatively less productive ones.

Amongst different farm size categories, large farmers invested mostly on farm machinery and equipment and improvements on land. As per the wisdom of large farmers, such investments were relatively more productive than those on other capital assets. On the other hand, the small and medium farmers invested maximum on improvements on land followed by purchase of land and other capital assets.

Thus, it could be observed that the large farmers gave much importance to farm machinery and equipment and improvements on land over other capital assets, as against small and medium farmers, who attached top priority for improvements on land followed by purchase of land. This highlights the rational intention of small and medium farmers to improve the farm productivity and increase their farm size.

5.2.4 Pattern of Non-Agricultural Investment on Different Capital Assets

As in the case of agricultural capital investment, investment by the large farmers in non-agricultural capital assets was the highest followed by medium and small farmers (Table-4.14).

In general across all farm size categories, the non-agricultural investment by the sample farmers was the highest on marriage and other social functions, followed by consumption, health and comforts/luxuries. The pattern of investment was almost similar in each of the farm size categories except in the case of small and large categories wherein there was no investment on motorbike and bicycle, respectively. In all the farm size categories, more than 75 per cent of the investment on non-agricultural capital assets was on marriage and other social functions, consumption and health. In absolute terms, the investment on non-agricultural capital assets increased with the increase in the farm size. This could be due to the higher social status and higher income of large farmers as compared to medium and small farmers.

5.2.5 Pattern of Investment in other Enterprises

The overall average investment on horticulture and livestock enterprises by the sample farmers was Rs.22,321 (Table-4.15), contributed mainly by animal component and remaining by horticulture component. Thus, the investment on livestock component was higher than that on horticulture component. Since the study area comprises mostly of dryland farming, farmers diversified their activities to get higher incomes. Similar pattern of investment was observed in each of the farm size categories.

The investment on livestock sector varied positively with the farm size. Within the livestock sector, highest investment per farm was on bullock, followed by buffalo, cow, sheep, goat and calf. This indicates the investment priorities of farmers on different animals.

Similarly, the investment on horticulture sector was positively associated with the farm size. Now within the horticulture sector, the highest investment per farm was on coconut,

followed by mango and sapota. This pattern of investment was also observed in the case of large farmers. However, in the case of medium farmers, the investment priorities were coconut, sapota and mango, in that order. Small farmers invested only on coconut and not on sapota and mango, among all horticulture crops. This revealed the investment priorities of farmers on different components of horticulture.

5.2.6 Pattern of Agricultural Investment on Non-Durable Capital Assets

The average investment on non-durable agricultural capital assets by sample farmers was Rs.4,551 per ha (Table-4.16). The agricultural investment on non-durable capital assets was positively related to the farm size.

Among different non-durable capital assets, the average investment by the sample farmers was highest on hired labour, followed by fertilizers, farm yard manure, seeds, hired machinery, plant protection chemicals and others. Nearly 60 per cent of the total investment on non-durable agricultural capital assets went to hired labour, fertilizers and farm yard manures in all the farm size categories. The higher usage of hired labour could be due to higher labour requirement of intensification and diversification of farming.

5.3 VARIABILITY IN COMPONENTS OF CAPITAL FORMATION

5.3.1 Pattern of Agricultural Investment on Different Capital Assets in Progressive and Less Progressive Areas

The investments made by different categories of the sampled farmers in progressive area (Chitradurga Taluka) and less progressive area (Hosadurga Taluka) have been estimated to analyse the differences, if any, and to identify the factors responsible for such differences (Table-4.17).

The average investment on agricultural capital assets was much higher on progressive farms (Rs.2,13,571) than on less progressive farms (Rs.1,57,114). This was due to relatively higher investments by the farmers of progressive area on improvements on land, farm machinery and equipment, and irrigation structure and equipment.

Further, the investment on agricultural capital assets was positively correlated with the farm size. Larger farmers with larger resource endowments could invest more on agricultural capital assets as compared to smaller farmers.

In progressive area, amongst all the capital assets, investment on improvements on land was the highest, followed by farm machinery and equipment, irrigation structure and equipment, purchase of land and farm buildings. While in the case of less progressive area, highest investment was attracted by improvements on land, followed by purchase of land, farm machinery and equipment, irrigation structure and equipment and farm buildings. This indicates the investment priorities of the farmers of the study area. The farmers of progressive area gave top priority for land improvement and farm mechanisation, while their counterparts in less progressive area mostly invested in land as an asset.

5.3.2 Pattern of Agricultural Investment on Different Capital Assets in Irrigated and Rainfed Farms

As expected, the average agricultural investment on capital assets was much higher (more than three times) on irrigated farms as compared to rainfed farms (Table-4.18). Almost similar pattern was observed in different farm size categories. This could be due to more of input-intensive and mechanised farming on irrigated farms as against rainfed farming. Chaudhari (1970) in West Bengal, Hiremath (1973) and Jagadeeshamurthy (1983) in Karnataka and Rai *et al.* (1972) in Haryana have shown that the pattern of investment differs significantly between irrigated and unirrigated (rainfed) farms as has been the case with the present study. This phenomenon was partially reflected in the relatively higher borrowings by irrigated farmers.

Further, the ratio of investments by small, medium and large farmers was 1:2.01:3.66 for irrigated farms as against 1:2.67:3.17 for rainfed farms. That is, as the farm size increased, the investment on agricultural capital assets increased. However, the increase in investment was not commensurate with the increase in the size of holding. Mruthyunjaya (1972) also noticed that agricultural investment per ha was more on small farms than on large farms.

In case of irrigated farms, there was no big difference in the pattern of investment among the large, medium and small farmers. It was only the farm size causing difference in the magnitude of capital formation. In general, the socio-economic status of the farmer, type of crops, intensity of cultivation and availability of finance determined the pattern of investment.

Thus, while farm machinery and equipments and improvements on land were the top investment priorities in irrigated farms, rainfed farmers preferred improvements on land and purchase of land while prioritising investment.

5.3.3 Pattern of Non-Agricultural Investment in Progressive and Less Progressive Areas

The differences in the non-agricultural investments between progressive and less progressive areas were not so severe, as against agricultural investment pattern discussed earlier (Table-4.19).

The average non-agricultural investment per farm was relatively higher in the progressive area (Rs.92,382) than in the less progressive area (Rs.82,457). In absolute terms, farmers of each farm size category in both progressive and less progressive areas behaved almost alike when it came to non-agricultural investment. However, such an investment positively varied with the farm size, probably, owing to farm income and socio-economic status of the farmers.

In both the progressive and less progressive areas, more than four-fifths of the non-agricultural investment was on marriage and other social functions, consumption and health, while the remaining investment was on comforts or luxuries like bicycle, television and motorbike. Almost similar pattern of investment was observed in each of the farm size categories except that small farmers could not invest on motorbike but were satisfied with a bicycle while large farmers did not invest on bicycle since they could buy a motorbike.

5.3.4 Pattern of Non-Agricultural Investment on Irrigated and Rainfed Farms

The differences in the non-agricultural investments between irrigated and rainfed farms were relatively higher, unlike in the case of progressive and less-progressive areas as seen in the preceding section (Table-4.20).

As expected, the investment on the non-agricultural assets by the irrigated farmers was slightly higher than that by the rainfed farmers. This was true in each farm size category. Again, social status and farm income of the farmer have played a major role in deciding the magnitude of such an investment.

In the case of both irrigated and rainfed farmers, more than four-fifths of the non-agricultural investment was on marriage and other social functions, consumption and health, while the remaining investment was on comforts or luxuries like bicycle, television and motorbike.

Almost similar prioritisation of investment was observed in each of the farm size categories except that small farmers could not invest on motorbike and large farmers did not invest on bicycle. In fact, least priority was given for bicycle by both irrigated and rainfed farmers.

5.3.5 Pattern of Investment in Other Enterprises in Progressive and Less Progressive Areas

The overall average investment on horticulture and livestock enterprises together by the sample farmers was higher in the progressive area (Rs.23,481) than that in the less progressive area (Rs.21,187). Similar pattern was observed in livestock enterprise while there was no significant difference in the case of horticulture enterprise. This shows that farmers of both progressive and less progressive areas have equally diversified their agricultural activities.

In both progressive and less progressive areas, the investment on other enterprises increased as the farm size increased. Similar pattern of investment was observed separately in horticulture and livestock enterprises, in general. That is, the extent of diversification was directly associated with the farm size. This could be due to relatively higher incomes, better credit worthiness and higher number of literates in the family in the case of larger farmers.

In both the progressive and less progressive areas, major investment by the sample farmers per farm was on livestock enterprise than on horticulture. This was because livestock and not horticulture formed the essential component of farming, particularly, bullocks for cultivation and cow/buffalo for dairying.

In horticulture, all the farmers except small farmers in the progressive area selected coconut, sapota and mango, whereas the farmers of less progressive area chose only coconut for their farms. In less progressive area, coconuts were generally planted on bunds while in progressive area, coconut, sapota and mango were cultivated in orchards.

5.3.6 Pattern of Investment in Other Enterprises on Irrigated and Rainfed Farms

The average investment per farm on horticulture and livestock enterprises together and individually by the irrigated farmers was nearly double than that by the rainfed farmers (Table-4.22). This was mainly because horticulture component was practised by irrigated farmers only.

The investment in livestock and horticulture enterprises together and individually on irrigated farms varied positively with the farm size. However, on rainfed farms, highest investment was by medium farmers, followed by large and small farmers.

On irrigated farms, major investment by the sample farmers per farm was on livestock enterprise than on horticulture. On rainfed farms, entire investment was on livestock and there was no investment on horticulture. Amongst different tree crops grown by the irrigated farmers, coconut attracted the highest investment followed by sapota and mango, in general. Coconut was generally grown all along the bunds, whereas sapota and mango were cultivated in orchards by the irrigated medium and large farmers. Amongst different livestock components, the highest investment by both irrigated and rainfed farmers separately was on bullock, followed by buffalo and cow. Their preference of investment on bullock was for draught purpose while that on buffalo and cow was for milk purpose.

5.3.7 Pattern of Investment on Non-Durable Capital Assets in Progressive and Less Progressive Areas

The overall average investment on non-durable capital assets by progressive farmers was relatively higher as compared to less progressive farmers (Table-4.23). This reflected in their farm incomes, as presented in Table-4.11.

In general, investment on non-durable capital assets varied positively with the farm size in both progressive and less progressive areas. Small farmers could not afford to invest more on non-durable capital assets as against medium and large farmers.

In the progressive area, amongst all the non-durable capital assets, fertilizers attracted the highest investment, followed by seeds, farm yard manure, hired labour, hired machinery and plant protection chemicals. Contrarily, in the less progressive area, farmers invested maximum on hired labour, followed by hired machinery and fertilizers.

While similar investment priorities were observed in the case of large farmers, small and medium had different priorities in both the progressive and less progressive areas.

5.3.8 Pattern of Investment on Non-Durable Capital Assets in Irrigated and Rainfed Farms

The average investment on non-durable capital assets by irrigated farmers was relatively higher as compared to rainfed farmers (Table-4.24). This was because of intensive cultivation on irrigated farms.

Interestingly, on both irrigated and rainfed farms, the investment on the non-durable capital assets was the highest by medium farmers followed by small farmers and large farmers. Probably, specialised cropping system followed by the large farmers has resulted in the lowest investment by them.

On irrigated farms, amongst all the non-durable capital assets, hired labour attracted the highest investment, followed by fertilizers and farm yard manure. While similar investment priorities were observed in the case of large farmers, small and medium had different priorities in the irrigated farms. Contrastingly, in the less progressive area, farmers invested maximum on fertilizers, followed by farm yard manure and seeds. The relatively higher investment on hired labour by irrigated farmers could be due to intensive cropping followed by them.

5.4 FACTORS AFFECTING CAPITAL FORMATION IN AGRICULTURE

5.4.1 Factors Affecting Capital Formation in Agriculture in Progressive and Less Progressive Areas

The factors that significantly affected the capital formation in progressive area were borrowed amount, annual income of the family, area irrigated and size of the holding (Table-4.25). The area irrigated and size of family were found to be significant according to Srivastava (1986) in Bihar and by Jagadeeshamurthy (1983) in the Malnad region of Karnataka. Similarly, in the case of less progressive area, all the aforesaid factors except area irrigated influenced capital formation positively and significantly. Singh and Misra (1974) in their study in Bihar state found that size of holding and irrigation significantly affected capital formation.

As expected, all these factors had positive and significant impact on the capital formation. As indicated by the significance of the ‘t’ value, borrowed amount was the most important factor that contributed to capital formation in the progressive area. This phenomenon pointed towards proper utilisation of credit by the farmers.

Amongst farm size categories, in the progressive area, the factors that significantly influenced capital formation were borrowed amount and family size in the case of small farmers, size of holding, borrowed amount, area irrigated and age in the case of medium farmers and borrowed amount, area irrigated and literacy level in the case of large farmers. All these factors had positive influence on capital formation with the lone exception of literacy level in the case of large farmers. This could be because the average age of the large farmers in this area was relatively higher and that they resisted capital formation, or because of too many literates in the family, decision could not be taken on capital formation, a situation alien to “too many cooks spoil the broth”. Chauhan and Agarwal (1969) also noticed that size of the family and age of head of the family were significantly affecting the capital formation in Rajasthan state, which was in conformity with the present study in the case of medium farmers of progressive area.

In the less progressive area, the significant determinants of capital formation were borrowed amount in the case of small farmers, area irrigated and annual income of the family in the case of medium farmers and size of holding, borrowed amount and annual income of the family in the case of large farmers.

Thus, in both progressive and less progressive areas, capital formation was significantly and positively influenced by three factors, namely, borrowed amount, size of holding and annual income of the family. Thus, any effort to promote capital formation in the study area should aim at easy credit flow to farmers, consolidation of holdings or at least prevention of sub-division and fragmentation of holdings and enhancing the annual income of the farm families through transfer of improved farm technologies, among others.

5.4.2 Factors Affecting Capital Formation in Agriculture in Irrigated and Rainfed Farms

For the irrigated farms in general, the factors that significantly affected the capital formation were borrowed amount, size of the holding and annual income of the family (Table-4.26). As expected, all these factors had positive and significant impact on the capital formation. Singh (1970) and Desai (1969) in their studies in Haryana and Gujarat, respectively, observed that there was a high correlation between size of farms and capital formation.

On other hand, for the rainfed farms, only two factors, namely, borrowed amount and annual income of the family influenced capital formation positively and significantly.

Hence, in both irrigated and rainfed farms, capital formation was significantly and positively influenced by two factors, namely, borrowed amount and annual income of the family. Therefore, strategies to promote capital formation in the study area should aim at easy credit flow to farmers and enhancing the annual income of the farm families through transfer of improved farm technologies, among others.

5.5 SOURCES OF FINANCE FOR CAPITAL FORMATION

5.5.1 Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

In general, capital formation in progressive area was mainly sourced by owned funds (52 per cent) than borrowed funds (48 per cent), across all capital assets (Table-4.27). Contrastingly, the share of borrowed funds (55 per cent) in the total capital formation was higher as compared to owned funds (45 per cent) in the less progressive area. This phenomenon was as expected, since incomes of the farmers in progressive area were relatively higher and hence could contribute more from own funds towards capital formation, except in the case of small farmers whose own funds could not contribute much to their capital formation as compared to borrowed funds.

Amongst different capital assets created in the progressive area, the assets that were mainly sourced from own funds were irrigation structure and equipment, farm buildings and improvements on land. Similar was the pattern in different farm size categories, in general.

In the less progressive area, improvements on land and purchase of land were mainly sponsored by borrowed funds whereas own funds mainly shared the capital investment on farm buildings, farm machinery and equipments and irrigation structure and equipment.

In this area, small and medium farmers' investment sourcing behaviour for some of the capital assets did not match the general investment sourcing behaviour of the farmers of less progressive area. Thus, while dealing with capital formation issues, the strategy for small and medium farmers should be different from that for large farmers.

5.5.2 Capital Formation through Owned and Borrowed Funds in Irrigated and Rainfed Farms

In general, capital formation was mainly financed by borrowed funds than owned funds (Table-4.28). This phenomenon was expected for rainfed farms but not for irrigated farms, since the incomes of the irrigated farmers were relatively higher and hence could have contributed more from own funds towards capital formation.

On irrigated farms, the assets that were mainly sourced from own funds were irrigation structure and equipment and farm buildings while the other capital assets were created out of borrowed funds.

Contrarily, on rainfed farms, all the capital assets created were mainly sponsored by borrowed funds. The highest share of borrowed funds was for improvements on land followed by land, farm machinery and equipments and farm buildings. The investment sourcing behaviour of the farmers of different farm size categories was consistent with the investment sourcing behaviour of the rainfed farmers, in general.

Thus, the investment sourcing behaviour of the irrigated farmers of different farm size categories was relatively more heterogeneous as compared to their counterparts in rainfed farms.

5.5.3 Non-Agricultural Capital Formation through Owned and Borrowed Funds in Progressive and Less Progressive Areas

In both the progressive and less progressive areas, the non-agricultural capital formation was mainly sourced from own funds (Table-4.29). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever. This behaviour of farmers was quite excepted because it was not advisable to invest on non-agricultural capital assets using borrowed funds, as the cost of credit was relatively much higher for non-agricultural purposes and also because the non-agricultural capital assets were not that productive as compared to agricultural capital assets.

All the non-agricultural capital assets except motorbike were financed from own funds in both the areas. There was absolutely no investment out of borrowed funds on consumption in both the areas. Such behaviour was quite expected due to the obvious reasons discussed earlier. Motorbike was mainly financed from borrowed funds in both the areas, which could be due to relatively soft and easy loans on motorbikes offered by financial institutions. Small farmers of both the areas could not invest on or afford a motorbike while bicycle was not preferred for investment by large farmers of both the areas and medium farmers of less progressive area.

5.5.4 Non-Agricultural Capital Formation through Owned and Borrowed Funds on Irrigated and Rainfed Farms

In general, the non-agricultural capital formation was mainly sourced from own funds than borrowed funds in the study area (Table-4.30). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever. As discussed earlier, this behaviour of farmers was quite excepted because it was not advisable to invest on non-agricultural capital assets using borrowed funds, as the cost of credit was relatively much higher for non-agricultural purposes and also because the non-agricultural capital assets were not that productive as compared to agricultural capital assets.

All the non-agricultural capital assets except motorbike were financed from own funds in the progressive area whereas in the less progressive area, all the assets except motorbike and marriage and other social functions were mainly sourced from borrowed funds. There was absolutely no investment out of borrowed funds on consumption in both the areas. Such behaviour was quite expected due to the obvious reasons discussed earlier. Motorbike was mainly financed from borrowed funds in both the areas, which could be due to relatively soft and easy loans on motorbikes offered by financial institutions. Small farmers of both the areas could not invest on or afford a motorbike while bicycle was not preferred for investment by large farmers of both the areas and medium farmers of less progressive area.

5.5.5 Preference for Sources of Funds for Capital Formation

5.5.5.1 Sources of Borrowed Funds for Capital Formation in Progressive and Less Progressive Areas

Between institutional and non-institutional sources of finance, institutional sources contributed in a big way for capital formation in the study area (65.54% and 82.21% in the case of progressive and less progressive areas, respectively). This could be because of easy

access to institutional credit and higher rate of interest in the case of non-institutional sources. Singh and Misra (1974) also observed that a considerable part of the sample farmers (59.50%) borrowed from institutional sources.

Amongst all the sources of finance in the progressive area, regional rural banks shared the highest proportion of credit flow to farmers followed by commercial banks, traders, cooperative banks, money lenders, private finance and commission agents (Table-4.31). On the other hand in the less progressive area, the share of regional rural banks in the total borrowed funds was the highest, followed by cooperative banks, commercial banks, traders, private finance, money lenders and friends/relatives. Thus, the investment sourcing priorities were slightly different between progressive and less progressive areas. However, in both the areas, regional rural banks were the major source of capital formation, probably, due the easy access, reasonable rate of interest and less procedural formalities.

5.5.5.2 Sources of Borrowed Funds for Capital Formation in Irrigated and Rainfed Farms

As in the case of progressive and less progressive areas, institutional sources contributed in a big way for capital formation in both the irrigated and rainfed areas (78.12 per cent and 70.74 per cent, respectively) (Table-4.32). This could be again because of easy access to institutional credit and higher rate of interest in the case of non-institutional sources.

Amongst all the sources of finance, for irrigated farms, regional rural banks shared the highest proportion of credit flow to farmers followed by cooperative banks, traders, commercial banks, money lenders, private finance and friends/relatives. On the other hand, for rainfed farms, the share of regional rural banks in the total borrowed funds was the highest, followed by cooperative banks, commercial banks, traders, money lenders, private finance and commission agents while they did not borrow from friends/relatives. Thus, the investment sourcing priorities were different between rainfed and irrigated areas, the major two being regional rural banks and cooperative banks. This could be due to the easy access, lower rate of interest and less procedural formalities as compared to commercial banks.

Further, the investment sourcing priorities varied across different farm size categories for both irrigated and rainfed farms. For the irrigated farms, small farmers preferred regional rural banks, followed by traders; medium farmers mostly preferred regional rural banks, followed by cooperative banks; and large farmers preferred regional rural banks, followed by cooperative banks. For the rainfed farms, the investment sourcing priorities of small farmers were traders followed by money lenders; that of medium farmers were regional rural banks, followed by cooperative banks; and that of large farmers were cooperative banks, followed by commercial banks. It could be observed that the non-institutional sources were approached mainly by small farmers than medium and large farmers, probably, owing to their poor education about the benefits of institutional finance and/or also to the too many procedural formalities associated with institutional finance.

5.5.6 Constraints in Acquisition of Capital Assets

5.5.6.1 Constraints in Acquisition of Capital Assets in Progressive and Less Progressive Areas

The progressive farmers expressed that non-availability of finance was the biggest constraint followed by overdue of credit, lack of education, family problems, insufficient collateral security and very small holdings (Table-4.33). Similar was the constraint prioritisation by the farmers of the less progressive area. Non-availability of finance as expressed by farmers as one of the most serious constraint could also be because of lack of proper pursual or follow-up by the farmers. Overdue of credit was also a major constraint, because of non-repayment of loans owing to drought for the previous three years.

In both the progressive and less progressive areas, the major constraints in acquisition of capital assets faced by large farmers were non-availability of finance and overdue of credit; those by medium farmers were non-availability of finance and overdue of credit; and those by small farmers were non-availability of finance, very small holding, insufficient collateral security and overdue of credit. The reasons for the emergent of non-availability of finance and overdue of credit have been discussed earlier. When there was

drought for the previous three years, Government may think of writing-off the loans lent to farmers for farming purposes.

5.5.6.2 Constraints in Acquisition of Capital Assets in Irrigated and Rainfed Farms

The constraints prioritised in both irrigated and rainfed farms were similar in order, the most serious constraint being non-availability of finance, followed by overdue of credit, lack of education, family problems, insufficient collateral security and very small holding.

Among the irrigated farms, the major constraint in acquisition of capital assets by all types of farmers were non-availability of finance and overdue of credit. In the case of rainfed farms, the most serious constraint faced by all the categories of farmers was the non-availability of finance. The other major constraints faced by the small farmers were insufficient collateral security and overdue of credit; those by the medium farmers were overdue of credit and family problems; and those by large farmers were overdue of credit and lack of education.

As discussed earlier, the non-availability of finance could be a pseudo reason expressed by farmers. But the actual reasons could be non-pursual or follow up of loan application/disbursal on the one hand and lack of adequate education about availing institutional finance on the other. However, overdue problem is most serious in the study area. This was because of non-repayment of loans by the farmers owing to drought during previous three years.

VI. SUMMARY AND POLICY IMPLICATIONS

Agriculture still dominates the Indian economic scene by providing livelihood to a majority of the population. In most of the developing countries including India agricultural development is a pre-condition for economic development. The development of any sector is reflected by the productivity in that sector. In order to make the best use of resources and augment the productivity of the resources, modernization of agriculture is essential which in turn calls for a constant growth in capital formation in agriculture. India is a vast country comprising of numerous regions with diverse agro-climatic and weather conditions. The production techniques, cropping patterns, assets and resource structure show considerable variation between these regions and so do the use and productivity of capital.

The present study endeavours to investigate into the pattern of investment, trend and magnitude in capital formation, the factors causing variability in capital formation and the sources of investment among different groups of farms such as progressive and less progressive, irrigated and rainfed and large, medium and small farms, in the Chitradurga district of Karnataka State.

Two taluks, *viz.,* Chitradurga and Hosadurga were selected to serve the purpose of covering progressive and less progressive regions. One hundred and eighty households distributed across 20 villages were randomly selected from the two chosen taluks. Post-classification of farmers into rainfed and irrigated farmers was done, which resulted in 100 irrigated and 80 rainfed farms. The required data were collected from the selected households though personal interview with the help of a well-structured and pre-tested schedule.

Semi-Log Model was employed to know the trend and magnitude of capital formation in Karnataka. Percentages and tabular analysis were used to study the variation in agricultural implements, machineries, livestock and poultry. Multiple linear regression model was used for identifying the factors influencing capital formation. The important outcomes of the study are briefed hereunder.

The total fixed capital formation across all types of industry of use and both the types of institution increased by almost six times (581 per cent) in one and half decades. The corresponding figures for total public and private sectors were 517 per cent and 674 per cent, respectively. The sector-wise growth in fixed capital formation indicates that it was highest (651.95 per cent) for tertiary sector, followed by secondary sector (612.89 per cent) and primary sector (455.09 per cent). Cross-sectional analysis indicates that the tertiary sector appropriated maximum share (42.96 per cent), followed by secondary share (33.81 per cent) and primary sector (23.23 per cent).

Within the primary sector, the share of agriculture and allied activities in the total fixed capital formation at sectoral level was the highest (84.37 per cent), followed by mining (7.72 per cent), fishing (4.93 per cent) and forestry and logging (2.99 per cent).

The overall compound annual growth in Gross Fixed Capital Formation was 13.78 per cent per annum across all types of industry of use and types of institution. Between different types of institution, the growth in private sector (15.32 per cent per annum) surpassed that in public sector (12.41 per cent per annum). Among different sectors, tertiary sector witnessed the highest growth rate (14.59 per cent) followed by secondary sector (14.09 per cent) and primary sector (12.08 per cent).

The major agricultural implements and machinery put together in Karnataka were of the order of 39.06 lakhs during 1977 census, which increased to 49.19 lakhs during 1997 Census, thus registering a growth of 25.92 per cent. Coming to individual components of capital stock, ploughs contributed the maximum (74 per cent during 1977 and 67 per cent during 1997) to the total stock of agricultural implements and machinery in the State, followed by carts and irrigation pumps.

Chitradurga possessed nearly 4.33 per cent and 6.43 per cent of the State's total agricultural capital assets during 1990 and 1997, respectively. Interestingly, while there was negative growth (-8.38 per cent) in the State's total agricultural capital stock, Chitradurga district witnessed a significant positive growth (35.96 per cent).

During the period from 1966 to 1997, the total livestock increased from 2.05 crores during 1966 to 3.07 crores during 1997 registering a compound annual growth rate of 2.30 per cent over the entire study period. On the other hand, poultry sector has witnessed a compound annual growth rate of 3 per cent over the study period, due to an increase in the number of birds from 0.83 crores to 2.14 crores during 1997.

The total number of livestock and poultry in the State as per 1997 Census was 3.07 crores and 2.14 crores, respectively, across all the districts. Of this total stock of 5.2 crores animals, livestock accounted for 58.92 per cent while poultry accounted for the remaining 41.08 per cent.

Among different livestock components, cattle accounted for the highest proportion (20.79 per cent) of the 5.2 crore animal stock in the State, followed by sheep (15.36 per cent), goat (9.36 per cent) and buffaloes (8.38 per cent). Among all the districts of the State, Belgaum accounted for the highest proportion of livestock (8.58 per cent) while the least was in the case of Kodagu (0.94 per cent). In the case of poultry, Bangalore-Rural stood first sharing 11.04 per cent of the State's stock of poultry birds, while least was in the case of Gadag (0.89 per cent).

Chitradurga possessed nearly 4.78 per cent and 7.56 per cent of the State's total livestock and poultry together during 1990 (406.6 lakhs) and 1997 (520.9 lakhs), respectively. Between 1990 and 1997, there was an increase of 78.74 per cent in the case of livestock as against 164.60 per cent in the case of poultry, thus resulting in 102.50 per cent growth in livestock and poultry together.

The overall agricultural investment per farm on all the capital assets by sample respondents was Rs.1,85,626 in the study area. As expected the investment on agricultural capital assets by large farmers was the highest (Rs.3,22,118) followed by medium and small farmers (Rs.1,66,045 and Rs.68,715, respectively). Across different capital assets, the overall agricultural investment by sample farmers on improvements on land (Rs.133088) was the highest constituting 25.54 per cent of the total investment, followed by farm machinery and equipment (21.68 per cent), land (19.58 per cent), irrigation structure and equipment (19.37 per cent) and farm buildings (13.80 per cent).

Large farmers gave much importance to farm machinery and equipment and improvements on land over other capital assets, as against small and medium farmers, who attached top priority for improvements on land followed by purchase of land.

The investment by the large farmers in non-agricultural capital assets was the highest (Rs.1,20,601) followed by medium (Rs.95,364) and small farmers (Rs.46,668). In general across all farm size categories, the non-agricultural investment by the sample farmers was the highest on marriage and other social functions (Rs.29,672) constituting 33.89 per cent of total investment in non-agricultural capital assets, followed by consumption (Rs.25,205; 28.79 per cent), health (Rs.18,528; 21.16 per cent) and the remaining about 15 per cent on comforts/luxuries in the order of motorbike, television and bicycle.

The investment on livestock component was higher than that on horticulture component. Similar pattern of investment was observed in each of the farm size categories. Within the livestock sector, highest investment per farm was on bullock (Rs.9,426), followed by buffalo (Rs.5,464), cow (Rs.3,873), sheep (Rs.564), goat (Rs.293) and calf (Rs.61). This pattern of investment was also observed in each farm size category, except that there was no investment by large farmers on goat. The investment on horticulture sector was highest at Rs.5,384 per farm in the case of large farmers, followed by medium farmers (Rs.2,171) and small farmers (Rs.367). Thus, the investment per tree was highest in the case of medium farmers (Rs.127.11), followed by small (Rs.122.33) and large farmers (Rs.110.80), with an overall average investment of Rs.115.43 per tree.

The average investment on non-durable agricultural capital assets by sample farmers was Rs.4,551 per ha. It was highest in the case of large farmers (Rs.4,834) followed by medium and small farmers (Rs.4,737 and Rs.4,083, respectively). Among different non-durable capital assets, the average investment by the sample farmers was highest on hired labour (Rs.908 per ha, 19.95 per cent). Nearly 60 per cent of the total investment on non-

durable agricultural capital assets went to hired labour, fertilizers and farm yard manures in all the farm size categories.

The average investment on agricultural capital assets was much higher on progressive farms (Rs.2,13,571) than on less progressive farms (Rs.1,57,114). In terms of farm size categories, the agricultural investment was the highest on large farms in both progressive and less progressive areas (Rs.3,80,774 and Rs.2,61,873, respectively), followed by medium farmers (Rs.1,76,123 and Rs.1,55,856, respectively) and small farmers (Rs.83,815 and Rs.53,613, respectively).

As expected, the average agricultural investment on capital assets was much higher (almost three times) on irrigated farms (Rs.2,70,036) as compared to rainfed farms (Rs.85,151). Further, the ratio of investments by small, medium and large farmers was 1:2.01:3.66 for irrigated farms as against 1:2.67:3.17 for rainfed farms. While farm machinery and equipments and improvements on land were the top investment priorities in irrigated farms, rainfed farmers preferred improvements on land and purchase of land while prioritising investment.

The differences in the non-agricultural investments amongst different farm size categories between progressive and less progressive areas were not so severe. The average non-agricultural investment per farm was Rs.92,382 in the progressive area as against Rs.82,457 in the less progressive area. Farmers of each farm size category in progressive and less progressive areas behaved almost alike when it came to non-agricultural investment. In the progressive area, nearly 82 per cent of the non-agricultural investment was on marriage and other social functions, consumption and health. Almost similar pattern of investment was observed in each of the farm size categories except that small farmers could not invest on motorbike and large farmers did not invest on bicycle. In fact, least priority was given for bicycle in both progressive and less progressive areas. Interestingly, the non-agricultural investment priorities in less progressive area were same as observed in progressive area.

The differences in the non-agricultural investments between irrigated and rainfed farms were relatively higher. The average non-agricultural investment per farm was Rs.97,908 by the irrigated farmers as against Rs.74,592 on the rainfed farmers. As expected, the investment on the non-agricultural assets by the irrigated farmers of each farm size category was slightly higher than that by the rainfed farmers. In the case of cultivators of irrigated farms, nearly 82 per cent of the non-agricultural investment was on marriage and other social functions, consumption and health, while the remaining investment was on comforts or luxuries like bicycle, television and motorbike. Interestingly, the non-agricultural investment priorities of the irrigated farmers were same as those of rainfed farmers.

The overall average investment on horticulture and livestock enterprises together by the sample farmers was higher in the progressive area (Rs.23,481) than that in the less progressive area (Rs.21,187). Similar pattern was observed in livestock enterprise while reverse pattern was observed in horticulture enterprise. In horticulture, all the farmers except small farmers in the progressive area selected coconut, sapota and mango, whereas they chose only coconut for their farms in the less progressive area. Amongst different tree crops grown in progressive area, coconut attracted the highest investment (Rs.1,067) followed by mango and sapota, in general. In livestock enterprise, all the farmers in both the areas invested in all the livestock components such as cow, buffalo, calf, bullock, sheep and goat, with the only exception of large farmers on goat in both the areas.

The overall average investment on horticulture and livestock enterprises together by the irrigated farmers was higher (Rs.27,738) than that by the rainfed farmers (Rs.14,780). Similar pattern was observed in livestock enterprise while rainfed farmers did not invest in horticulture enterprise.

The overall average investment on non-durable capital assets by progressive farmers was relatively higher (Rs.5,549/ha) as compared to less progressive farmers (Rs.4,745/ha). In the progressive area, such investment was the highest in the case of large farmers (Rs.6,656/ha) followed by medium (Rs.5,380/ha) and small farmers (Rs.4,613/ha). On the other hand, it was medium farmers whose investment was the highest (Rs.4,978/ha), followed by large (Rs.4,852/ha) and small farmers (Rs.4,404/ha) in the less progressive area.

The average investment on non-durable capital assets by irrigated farmers was relatively higher (Rs.5,176/ha) as compared to less rainfed farmers (Rs.4,785/ha). Interestingly, on both irrigated and rainfed farms, the investment on the assets in question was higher on small and medium farms than on the large farms. Probably, operation of economies of scale could be the reason for such an investment pattern.

For the progressive area, the factors that significantly affected the capital formation were borrowed amount, annual income of the family, area irrigated and size of the holding. As expected, all these factors had positive and significant impact on the capital formation. Surprisingly, other factors, particularly, area under commercial crops, family size and age did not have any significant impact on capital formation. On the other hand, for the less progressive area, borrowed amount, size of holding and annual income of the family influenced capital formation positively and significantly. Unlike in the progressive area, area irrigated did not have any significant influence on capital formation in the less progressive area.

Thus, in both progressive and less progressive areas, capital formation was significantly and positively influenced by three factors, namely, borrowed amount, size of holding and annual income of the family. Thus, any effort to promote capital formation in the study area should aim at easy credit flow to farmers, consolidation of holdings or at least prevention of sub-division and fragmentation of holdings and enhancing the annual income of the farm families through transfer of improved farm technologies, among others.

For the irrigated farms in general, the factors that significantly affected the capital formation were borrowed amount, size of the holding and annual income of the family. As expected, all these factors had positive and significant impact on the capital formation. However, for the rainfed farms, only two factors, namely, borrowed amount and annual income of the family influenced capital formation positively and significantly. Unlike in the irrigated farms, size of holding did not have any significant influence on capital formation in the rainfed farms.

Thus, in both irrigated and rainfed farms, capital formation was significantly and positively influenced by two factors, namely, borrowed amount and annual income of the family. Hence, strategies to promote capital formation in the study area should aim at easy credit flow to farmers and enhancing the annual income of the farm families through transfer of improved farm technologies, among others.

In general, capital formation in progressive area was mainly sourced by owned funds (52 per cent) than borrowed funds (48 per cent), across all capital assets. Contrastingly, the share of borrowed funds (55 per cent) in the total capital formation was higher as compared to owned funds (45 per cent) in the less progressive area. This phenomenon was as expected, since incomes of the farmers in progressive area were relatively higher and hence could contribute more from own funds towards capital formation, except in the case of small farmers whose own funds could not contribute much to their capital formation as compared to borrowed funds.

Capital formation on irrigated farms, in general, was mainly financed by borrowed funds (52 per cent) than owned funds (48 per cent), across all capital assets. Similarly, on rainfed farms, the share of borrowed funds (58 per cent) in the total capital formation was still higher as compared to owned funds (42 per cent) in the less progressive area. This phenomenon was expected for rainfed farms but not for irrigated farms, since the incomes of the irrigated farmers were relatively higher and hence could have contributed more from own funds towards capital formation.

In both the progressive and less progressive areas, the non-agricultural capital formation was mainly sourced from own funds (73.11 per cent and 70.76 per cent, respectively) than borrowed funds (26.88 per cent and 29.23 per cent, respectively). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever. This behaviour of farmers was quite excepted because it was not advisable to invest on non-agricultural capital assets using borrowed funds, as the cost of credit was relatively much higher for non-agricultural purposes and also because the non-agricultural capital assets were not that productive as compared to agricultural capital assets.

In both the progressive and less progressive areas, the non-agricultural capital formation was mainly sourced from own funds (70.46 per cent and 68.36 per cent, respectively) than borrowed funds (29.54 per cent and 31.64 per cent, respectively). Each of the farm size categories in both the areas behaved similarly, without any exception whatsoever.

Amongst various institutional and non-institutional sources of finance in the progressive area, regional rural banks (36.66 per cent) shared the highest proportion of credit flow to farmers followed by commercial banks (16.66 per cent), traders (16.66 per cent), cooperative banks (12.22 per cent), money lenders (12.22 per cent), private finance (4.44 per cent) and commission agents (1.11 per cent). On the other hand in the less progressive area, the share of regional rural banks in the total borrowed funds was the highest (47.77 per cent), followed by cooperative banks (24.44 per cent), commercial banks (10 per cent), traders (7.77 per cent), private finance (5.55 per cent), money lenders (3.33 per cent) and friends/relatives (1.11 per cent). Thus, the investment sourcing priorities were different between progressive and less progressive areas.

Between institutional and non-institutional sources, the proportion of total credit shared by the institutional source was much higher in the less progressive area (82.21 per cent) than in the progressive area (65.54 per cent). The non-institutional source shared the remaining 17.79 per cent and 34.46 per cent of total credit requirement in the less progressive and progressive areas, respectively.

Amongst various institutional and non-institutional sources of finance, for irrigated farms, regional rural banks (48.38 per cent) shared the highest proportion of credit flow to farmers followed by cooperative banks (19.39 per cent), traders (12.26 per cent), commercial banks (10.35 per cent), money lenders (5.70 per cent), private finance (3.06 per cent) and friends/relatives (0.81 per cent). On the other hand, for rainfed farms, the share of regional rural banks in the total borrowed funds was the highest (34.11 per cent), followed by cooperative banks (19.55 per cent), commercial banks (17.08 per cent), traders (12.93 per cent), money lenders (9.75 per cent), private finance (5.44 per cent) and commission agents (1.11 per cent). Thus, the investment sourcing priorities were different between rainfed and irrigated areas, the major two being regional rural banks and cooperative banks.

Between institutional and non-institutional sources, the proportion of total credit shared by the institutional source was relatively higher for irrigated farms (78.12 per cent) than for rainfed farms (70.74 per cent). The non-institutional source shared the remaining 21.88 per cent and 29.26 per cent of total credit requirement for irrigated and rainfed farms, respectively.

As regards constraints faced in capital formation, the progressive farmers expressed that non-availability of finance was the biggest constraint (34.44 per cent) followed by overdue of credit (24.44 per cent), lack of education (14.44 per cent), family problems (12.22 per cent), insufficient collateral security (8.88 per cent) and very small holdings (5.55 per cent). Similar was the constraint prioritisation by the farmers of the less progressive area.

The constraints prioritised in both irrigated and rainfed farms were similar in order, the most serious constraint being non-availability of finance (35.09 and 41.81 per cent, respectively), followed by overdue of credit (28.90 and 19.73 per cent), lack of education (15.52 and 14.65 per cent), family problems (13.62 and 12.96 per cent), insufficient collateral security (4.55 and 6.45 per cent) and very small holding (2.29 and 4.37 per cent).

Conclusions

From the study the following conclusions could be drawn.

1. In Karnataka out of total gross fixed capital formation agriculture, the contribution of tertiary sector was highest followed by secondary and primary sector.
2. The progressiveness of an area has contributed more to the capital formation in agricultural sectors.
3. The capital formation has taken place more in dairy enterprises than horticultural enterprises in all farm-size groups.

4. The capital formation has taken place more in productive assets such as improvements made on land, farm machinery and equipments, farm buildings, irrigation structure and equipment.

5. The capital formation has taken place more in non-agricultural capital assets than agricultural non-durable capital assets on all farms, in general.

6. The area irrigated, credit or borrowed fund, extent of commercialization and family size enhance the rate of capital formation compared to other variables like age and education of the farmers and urbanization.

Policy Implications

- Progressiveness of agriculture contributes to the faster capital formation. The policy makers need to concentrate their efforts to increase the area under irrigation, liberalizing credit directed towards formation of productive assets, commercialization of agriculture and better extension efforts so that capital formation in agriculture takes place at a faster rate leading to the speedy development of agriculture.

- The efforts, so far, on small farms by way of increased credit has borne fruits with increased capital formation on these farms. This calls for sustenance of these efforts coupled with strengthened extension facilities further boosting the lot of small farms and the rural economy, in general.

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CAPITAL FORMATION IN AGRICULTURE IN CHITRADURGA DISTRICT OF KARNATAKA STATE – AN ECONOMIC ANALYSIS

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ABSTRACT

Indian agricultural development is a pre-condition for economic development. In order to make the best use of resources, modernization of agriculture is essential which calls for a constant growth in capital formation in agriculture. The study endeavours to investigate into the pattern of investment, trend and magnitude of capital formation, the factors causing variability therein and the sources of investment on capital assets, among progressive and less progressive farms of Chitradurga district. Chitradurga and Hosadurga taluks, representing progressive and less progressive regions, respectively, were selected for the study. In all, 180 farm households from 20 villages spread across two taluks were randomly chosen. Semi-Log Model was employed to know the trend in capital formation and multiple linear regression model was used for identifying factors influencing capital formation.

The overall compound annual growth rate in Gross Fixed Capital Formation was 13.78 per cent per annum across all types of industry of use and types of institution in Karnataka. The growth in private sector (15.32 % pa) surpassed that in public sector (12.41% pa). Chitradurga possessed nearly 6.5 per cent of the State's total agricultural capital assets during 1997. The investment on agricultural capital assets by large farmers was the highest (Rs.3,22,118) followed by medium (Rs.1,66,045) and small farmers (Rs.68,715). Both in progressive and less progressive areas, capital formation was significantly and positively influenced by borrowed amount, size of holding and annual income of the family. Between institutional and non-institutional sources, the proportion of total credit shared by the institutional source was much higher in the less progressive area (82.21%) than in the progressive area (65.54%).

Thus, any effort to promote capital formation in the study area should aim at liberalised credit flow to farmers, increasing area under irrigation, prevention of sub-division and fragmentation of holdings if not consolidation of holdings, and strengthening extension efforts to enhance the annual income of the farm families through transfer of improved farm technologies, among others.