Chapter – II

Concepts, Objectives and Methodology
1. Introduction

The previous chapter deals with the brief introduction of the present study. In addition the first chapter dealt with various concepts like capital and capital formation with theoretical background and causes for low capital formation. The present chapter illustrates the concepts, objectives and methodology of the present study.

A number of authors explain the concept of capital formation as follows: Hicks\(^1\) (1961) explains that capital formation as the growth of inputs not merely to maintain, in the future, the previous rate of outputs and inputs but also to make it possible to produce larger outputs. This is applicable to agriculture sector too.

Another author Nurkse\(^2\) (1960) opines that society does not apply the whole of its current productive activity to the needs and desires of immediate consumption but directs a part of it to the making of capital goods; tools and instruments, machines and transport facilities, plant and equipments - all the various forms of real capital that can go greatly to increase the efficiency of productive effort. Thus capital formation explains addition to the stock of productive equipment.

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United Nations\(^3\) (1953) explains that net capital formation is measured after allowances are made for depreciation, obsolescence and accidental damage to fixed capital. Conceptually net capital formation represents the addition to fixed capital (building, other construction and works, equipment and machinery) available for further production. Thus net capital formation is like net profits which are derived on this basis, Gross profit minus allowances allowed for depreciation, obsolescence and accidental damage to fixed capital. In this view the following concepts are discussed in the estimation of capital formation.

2. Concepts

A. Estimation of Capital Formation

Generally two methods are used to estimate the capital formation in the agricultural sector. They are discussed below.

a. Money Expenditure Approach

In this method an estimation of savings, after deducting current expenditure from the total income devoted to investment or addition to capital assets is made. Symbolically \(S=Y-C\), where \(S\) stands for savings, \(Y\) for income and \(C\) for current expenditure.

b. Net Worth Change

In net worth change approach estimation of the value of capital assets at the beginning and at the end of the year, are taken into account. The difference between the two estimations, after providing for depreciation and obsolescence gives an estimation of net capital formation during the year.

\[ S = \Delta A - \Delta L, \]  
where \( S \) refers to savings, \( \Delta A \) refers to change in assets and \( \Delta L \) refers to change in liabilities i.e., depreciation etc.,

In Indian conditions, both the methods are beset with several difficulties. Money expenditure approach would involve an enquiry into receipts, expenses and savings and their disposal seems to be involved with certain difficulties mainly because the farm and non-farm business accounts and family budgets are inter-mixed and cultivators do not have any record of their economic transactions.

The method of valuation of capital assets at two points of time is subject to difficulties arising from the necessity to list all fixed assets and make proper allowances for depreciation, obsolescence and fluctuations in valuations. This is particularly so, because the important assets like land and buildings in rural areas have only limited market and do not change hands frequently. In most of the cases, these are handed over as ancestral property from father to son. Therefore, valuation is subject to wide margin of variation based on ideas of
individual evaluators and about certain types of assets like wells. It is difficult to know even the original cost and life, it will also be a hindrance in making the adequate provision for depreciation.

Thus it is observed that both the methods have certain limitations. Under these circumstances it was considered desirable to combine the two approaches in a well designed schedule and the savings estimated through the two different methods be reconciled for internal consistency.

To use the money expenditure approach, net saving after deducting current expenditure from the total income were worked out. The savings incurred leading to the investment or additions to the assets were enquired from the farmers.

The expenditure made by the farmers on major repairs which alter the shape of the assets or make the asset more serviceable or increases the potentialities of its utilization, is included in the capital formation. In the development and constructional work, the non-monetary investment viz., family labour used or the resources used, for which the cash expenses are not made, is also included. Fluctuations in the market prices of assets did not count in capital formation. In other words, the prices of various categories of farm assets have been treated as constant at the base level period. But the
appreciation on livestock and depreciation on all capital assets have been taken into account.

B. Items of Capital formation

In the present scientific study, concerned as it is with the capital in farming, certain items have been considered for the measurement of capital formation. Such items are discussed below:

a. Land Improvements

Land improvements include reclamation of land, expenditure on bunding, fencing and on any other land improvement. Though the repair and maintenance of old bunds do not create any addition to capital assets, this operation increases the productivity of land or brings fallow land under cultivation or is done for the prevention of soil erosion. This kind of investment incurred has been treated as capital formation.

b. Purchase of Livestock

The purchase or sale of livestock will not add or diminish to the community’s wealth, but probably it is a major item of investment by the Indian farmers. The purchase of livestock may be for (i) expanding the size of farming business (ii) replacement of lost cattle by old age, sickness and mortality (iii) periodic purchases in accordance with the custom of selling of cattle after the busy or carting season and buying again at the beginning of the
next season (iv) disposing milk cattle when dry and buying them in milk immediately or later and (v) purchasing when funds are available to recover the cattle sold due to financial needs. Here purchases are to increase the size of farming and for replacement due to old age, sickness and mortality are included in the capital investment.

c. Purchase of Implements, Machines and Transport Equipments

With regard to the purchase of implements, machines and transport equipments, there is a likelihood of considerable extent of replacement except in the case of costly implements, machinery and transport equipment about which the position is more clear and their purchase is addition to the capital assets. But in the case of ordinary and simple implements, the position is not so clear. Thus, the expenditure pertaining to increase the size of business or change in the technique has been considered in the capital formation.

d. Digging and Repairing of Wells

Construction of new wells is definitely an item of capital formation. But in respect of wells in use, expenditure on repairs which is more or less for maintaining the assets, does not constitute investment. On the contrary, the amount incurred on deepening, broadening or strengthening the old wells which will increase their utilization, leads to capital formation and has been so considered.
e. Purchase of Irrigation Appliances

It includes the expenditure on persian wheels, pump sets, installation of tubewell and the construction of irrigation channels which either did not exist before or were not fully developed, or when expenditures were made to increase the efficiency of assets. Therefore, the expenditure incurred under this head constitutes the formation of capital.

C. Capital Formation in National Accounts

National Accounts Statistics (NAS) is the authentic source for the estimation of capital formation in different sectors of the economy including agriculture. Any review of the concepts and procedures for compilation of capital formation in agriculture therefore, requires a clear picture of the concepts and methodology involved in the existing procedure of estimating capital formation in NAS.

Capital formation takes place in the production units. It consists of additions to fixed assets and change in inventories. Additions to fixed assets, called fixed capital formation, are the assets produced as outputs from process of production that are themselves used repeatedly or continuously in other process of production for more than one year. Inventories consist of materials and supplies meant for intermediate input in production, work in progress and finished goods and goods for resale.
The total fixed capital used in production loses its productive capacity in course of time due to wear and tear. In other words, fixed capital gets consumed in the process of production. The extent of loss of its productive potential is known as Consumption of Fixed Capital (CFC) which is to be compensated by acquisition of an equal amount of fixed capital in the current year.

Fixed Capital Formation computed without netting for CFC is known as Gross Fixed Capital Formation (GFCF). The term Gross Capital Formation (GCF) refers to the sum of GFCF and change in inventories. If GCF less than CFC is known as Net Capital Formation (NCF). In this connection the definition of asset and the components of capital formation are as follows.

a. Assets

Assets are defined as entities over which ownership rights are enforced by institutional units, and from which economic benefits may be derived by their owners by holding them, or using them, over a period of time. Fixed asset like building, machinery and equipment, productive livestock and computer software are come under the category of produced assets. Stocks of products, stocks for intangible goods and stocks for resale are come under inventory assets. In this, the following diagram shows the relationship among different types of assets such as financial and non-financial. In the case of non-financial assets depends upon the produced and non-produced assets.
Flow Chart – 2.1
Assets

- Financial
- Non-Financial

Non-Produced

Produced

- Land
- Forest
- Minerals

Fixed

- Building, Machinery, & Equipment
- Productive Livestock
- Computer Software

Inventory

- Stocks for intangible goods
- Stocks of products

Valuables

- Stocks for resale
The above flow chart depicts an overview of classification of assets and a rough grouping of items under each category. Assets mainly depend upon the two categories of sources like financial and non-financial. In regard with fixed capital formation, System National Accounts (SNA) – 1993 provides the following detailed list of fixed capital formation.

1. Dwellings

2. Other buildings and structures

3. Cultivated assets – trees and livestock – that are used repeatedly or continuously to produce products such as fruit, rubber, milk etc.,

4. Mineral exploration

5. Computer software

6. Entertainment, literacy or artistic originals

7. Major improvements to tangible non-produced assets, including land

8. Cost associated with transfer of non-produced assets

Capital formation in the broader sense would cover many more items than what SNA – 1993 has identified. However, in several cases, there is ambiguity regarding classification of some expenditure as capital formation or consumption expenditures. For example, expenditures on training and development, education and research etc.
3. Structure of Capital Formation

A. Private (Household) Investment in Agriculture

Private sector investment in agriculture comprises primarily investments in the corporate sector and household sector. Corporate sector in India is normally categorized into organized and unorganized segments. The organized segment contains big firms primarily in the plantation sector, and their estimates of capital formation are available in their accounting books. The unorganized sector, however, does not have any such systematic information. Information on their contribution to capital formation in agriculture is diverse and diffused.

It is accounted through some benchmark surveys conducted by the Central Statistical Organization (CSO). Similarly, for households’ component, CSO along with Reserve Bank of India (RBI) has to conduct surveys (All India Debt and Investment surveys, popularly known as AIDIS) once in ten years to estimate their contribution to capital formation in agriculture. For the intervening years, estimates are interpolated.

B. Public Investment in Agriculture

Public sector investments in agriculture are estimated through investments by Departmental Commercial Undertakings (DCU) and Non-Departmental Commercial Undertakings (NDCU). Further, public sector investment in agriculture is also decomposed into three sub-sectors: agriculture
proper, forestry and fishery. Investments by the public sector in fisheries have been almost negligible, less than half a per cent of the investment in agriculture as a whole. It is agriculture proper, which accounted for almost 94 per cent of the investments in agriculture and allied activities during 1980s. Its share marginally came down to about 88 per cent by the mid 1990s, but rose to 90.5 per cent during the period of 1995-97. Accordingly, the share of forestry, which hovered around 5 per cent in 1980s, increased to about 9 per cent by late 1990s. In both cases of agriculture proper and forestry, the overwhelming share is that of DCU. Also, within the forestry sector, plantations and orchards occupy bulk of share in the total GCF. In the total public sector investments in agriculture and allied activities, the share of irrigation (basically on major, medium and minor schemes) investment being incurred through DCU is the most dominant, accounting for as much as almost 90 per cent.

The NDCUs, such as agriculture, irrigation and water resource development corporations (like tubewell corporation), meat and poultry corporations / boards, forestry corporations, tea corporations and plantation and development corporations etc. owned by the central and the respective state governments, account for only about 9 to 10 per cent. In this connection declining public sector investment in agriculture and its likely consequences on agricultural growth, basically referring to the decline in investments in irrigation, that too basically in major and medium irrigation schemes. This is because investments in minor irrigation come largely through the private
household sector, and there are no alarming signs of its deceleration. If any, it is so the contrary, i.e., investment in minor irrigation through the household sector has improved over the years.

Hence the above concepts explain the structure of public and private investment in agriculture. While the public investment mainly depends upon the government expenditure, private investment mainly depends upon the individual. In this context the following picture (flow chart - 2.2) shows the components of GCF in agriculture. It has been categorised by the type of assets, type of institutions and the GCF as per the industry use.

The following flow chart 2.2 clearly explores that the components of GCF. GCF mainly depends on type of assets, type of institutions and industries use. Construction, machinery and equipment and change in stocks come under the classification of type of assets. Type of institutions can be classified into public and private and household sectors. Agriculture and allied activities and other industries come under industries of use item. Public, private cooperative sector and private household and organized sector come under the category of agriculture and allied activities. Major, medium and minor irrigation works come under the category of public sector item. Plantations like tea, coffee and rubber come under the classification of private corporate sector. Farm buildings, orchards, animal sheds, land improvement, machineries and transport come under the category of private household and unorganized sector.
Flow Chart – 2.2
Gross Capital Formation

Gross Capital Formation

- As per Type of Assets
  - Construction
  - Machinery & Equipment
  - Change in Stocks

- As per Type of Institutions
  - Public Sector
  - Private Corporate & Household Sector
  - Agriculture & Allied activities

- As per Industries of Use
  - Other sectors / industrial of use

  - Public Sector: DCU, NDCUs
  - Private Corporate Sector
  - Private Household & Unorganized Sector

  - Major, Medium and Minor Irrigation Works, State Farm Corporation, Orchards & Plantations, Forest Development Corporations etc.,
  - Plantations – tea, coffee & rubber
  - Farm buildings, Orchards and Plantations, Animal Sheds, Land Improvement and Reclamation of Land, Field bunding and other improvements, Machinery and equipment, construction of embankments, Transport, Private Co-operatives like sugar and milk Cooperatives
Flow Chart – 2.3
Gross Capital Formation in Agriculture

Gross Capital Formation in Agriculture

- Construction
  - Industry of Use
    - Agriculture
    - Manufacturing
      - Trade, Hotels & Restaurants
        - Banking, Insurance, Real Estates, Ownership of dwellings
    - Community, Social & Personal Services / Public administration & Other Services

- Machinery & Equipment
  - Indirect Use
  - Direct Consumptive Use
    - Mining & Quarrying
      - Electricity, Gas & Water Supply
        - Construction
          - Transport, Storage & Communication
    - Agriculture & Allied Activities

Output as input in agriculture & allied activities

- Power
- Water
- Seeds / Fertilizer
- Infrastructure

Final Output: agricultural products, dairy products, livestock, fishery, wood etc.,
The above chart (2.3) clearly states the various components of GCF in agriculture. In this view GCF is classified into two broad classifications such as construction, machinery and equipment. Construction includes industry of use, agriculture, manufacturing, trade and hotels, banking and insurance, community and social services, input and output in agriculture and allied activities.

In particular industry of use is classified into another classification - mining and quarrying, electricity, gas, water supply and transport, storage. On the other hand machinery and equipment includes indirect and direct consumptive use. In addition to this, direct consumptive use depends upon agriculture and allied activities. Finally agriculture and allied activities create final out of the agricultural production.

4. Other Concepts

A. Forest Area

This includes all land classified either as forest under any legal enactment, or administered as forest, whether State – owned or private, and whether wooded or maintained as potential forest land. The area of crops rose in the forest and grazing lands or areas open for grazing within the forests remain included under the “forest area”. In addition to this some other related concepts are also discussed as follows.
B. Barren and Un-Cultivable Land

Barren and un-cultivable land means land covered by mountains, deserts, etc. Land which cannot be brought under cultivation except at an exorbitant cost is classified as uncultivable whether such land is in isolated blocks or within cultivated holdings.

C. Area under Non-Agricultural Uses

This contains all land occupied by buildings, roads and railways or under water, e.g., rivers and canals, and other land put to uses other than agriculture.

D. Cultivable Waste Land

Cultivable waste land means land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession including the current year for some reason or the other. Such land may be either fallow or covered with shrubs and jungles which are not put to any use. They may be accessible or inaccessible and may lie in isolated blocks or within cultivated holdings.

E. Permanent Pasture and other Grazing Land

It means all grazing land whether it is permanent pasture and meadows or not. Village common grazing land is included under this heading.
F. Fallow Lands other than Current Fallows

This kind of land means all land which was taken up for cultivation but is temporarily out of cultivation for a period of not less than one year and not more than five years.

G. Current Fallows

This represents cropped area which is kept fallow during the current year.

H. Net Area Sown

This explains the total area sown with crops and orchards. Area sown more than once in the same is counted only once.

I. Total Cropped Area

It portrays the total area sown once and / or more than once in a particular year i.e., the area is counted as many times as there are sowings in a year. This total area is known as gross cropped area.

J. Area Sown more than once

This states the area in which crops are cultivated more than once during the agricultural year. This is obtained by deducting Net Area Sown from Total Cropped Area.
K. Irrigated Area

The area is assumed to be irrigated for cultivation through such sources as canals (Government and Private), tanks, tube-wells, other wells and other sources. It is divided into two broad categories such as Net Irrigated Area and Total / Gross Irrigated Area. Net Irrigated Area means area irrigated through any source once in a year for a particular crop. Gross Irrigated Area states the area under crops, irrigated once and / or more than once in a year. It is counted as many times as the number of times the areas are cropped and irrigated in a year.

L. Irrigation Intensity

Irrigation intensity refers to the total irrigated area divided into seasonal irrigated area of the one year. In this regard two indicators are frequently used to assess irrigation intensity such as the rate of use of land equipped for irrigation, which is that part of the equipped area actually used for production at least once a year, and the cropping intensity, which is the ratio between irrigated crops areas and the physical areas equipped for irrigation.

M. Cropping Pattern

Cropping pattern refers to the proportionate area under different crops during a fasali year. The income from cultivation partly depends upon the nature of crops grown and partly upon the intensity of cultivation. In this view paddy, sugarcane, groundnut, maize, chillies and corn are the major crops
grown in the sample villages. Paddy occupies the highest percentage of total cropped area followed by sugarcane. In addition to this, other crops like flowers and vegetables are the additional crops of the sample villages. In this view the following concept explains the meaning of cropping intensity.

N. Cropping Intensity

Cropping intensity is the ratio of Net Area Sown to the Total Cropped Area. It is an index of agricultural development and is directly related to irrigation facilities. It is derived from gross cropped area divided into net area sown of the crops. This index used to find out the real trend of every crop. This depends upon various factors like irrigation facilities, soil condition, farm mechanization, fertilizers and pesticides.

O. Production

Agricultural production comprises the entire range of technologies associated with useful products from plants and animals, including soil cultivation, crop and livestock management, and the activities of processing and marketing. The principal technical programmes for increasing agricultural production, around which intensive work is to be organized are irrigation, soil conservation, dry farming and land reclamation, supply of fertilizers and manures, seed multiplication and distribution, plant protection, better ploughs and improved agricultural implements, and adoption of scientific agricultural practices.
P. Yield

In agriculture, crop yield is not only a measure of the yield of cereal per unit area of land under cultivation, it is also the seed generation of the plant itself, i.e., one grain of wheat produces a stalk yielding three grains, or 1:3. The figure, 1:3 is considered by agronomists as the minimum required to substan human life: one of the three seeds must be set aside for the next planting season, the remaining two either consumed by the grower, or one for human consumption and the other for livestock feed. Historically speaking, a major increase in crop yield took place in the early eighteenth century with the end of the ancient, wasteful cycle of the three course system of crop rotation whereby a third of the land laid fallow every year and hence taken out of human food, animal feed and production.

5. Research Issues and Gaps

After a detailed review (Chapter - III) of the relevant literature on the broad issue of capital formation in Indian agriculture, some of the research gaps and issues were identified. A number of studies dealt with the relationship between public and private investment in agriculture and its impact on agricultural sector. In this connection these studies denoted with the technology and terms of trade are the main determinants of private investment in agricultural sector. Conversely public investment depends on fiscal sources. On the one side, farm subsidies are increased and on the other, revenue receipts are declined. Hence, the share of agriculture in the GDP also declined.
Another set of studies dealt with the association between capital formation and marginal capital coefficient in agricultural sector. In addition to this, a group of studies explained the role of land and labour in capital formation in agricultural sector. Also a couple of micro level studies dealt with the components of capital formation and their role in agricultural households. Moreover, they outlined that the farm buildings is an important factor of private investment in agriculture. Some of these studies also dealt with livestock which is a major investment in agriculture. A handful of authors explained with the investment on land in the forms of reclamation of land, land improvements, digging and repair of wells also highly contributed by the private investment in agriculture.

A group of studies also dealt with the relationship between investments (public) in agriculture and rural savings. These studies mainly concentrated on the trend of rural saving and its impact on various aspects such as financial institution and productive economic activities in farm business.

Another group of studies have explained that credit is one of the sources for rural farmers. Generally these studies observed that rural savings and cooperative credit are the strongest determinants of investment, followed by high yielding varieties, agricultural wages, and commercial bank credit. Government capital stock has a positive effect. General issues of capital formation concerned in agriculture have also been outlined. A notable
observation is that capital formation has influenced the technological front and it influenced the agricultural production. These studies also focused on the ratio of investment in agriculture and the trend of capital formation in wet land and dry land regions.

After reviewing the relevant literature on the broad issue of capital formation in Indian agriculture, some of the research gaps and issues were identified for the present study. A number of studies dealt with the various aspects of capital formation at macro level. Only a limited number of studies dealt with the micro level (household) capital formation in agriculture. In addition to this there is no comparative analysis made in capital formation in agriculture.

Hence, it is decided to assess the capital formation and agricultural productivity and composition of capital formation in agriculture in the study villages. This study finds that the investment in agriculture such as land, livestock and machineries. In addition to this saving is one of the important factor to determine the investment, hence the study tries to find the saving behaviour of the respondents in the study villages. Also a need is felt for examining the investment patterns for asset and farm business activities. Therefore, the present study has been attempted. Keeping these issues in view, the following broad objectives were formulated for the present study.
6. Objectives

The broad objectives of the study are as follows:

1. To assess the relationship between capital formation and agricultural growth.

2. To study the composition of capital formation in agriculture of the study villages.

3. To examine the productivity levels in agriculture in relation to levels of investment behaviour.

4. To find out the saving behaviour of the agricultural respondents of the study villages.

7. Hypotheses

1. There is a positive relationship between capital formation and agricultural development.

2. There is a significant difference between capital formation and annual income of the respondents.

8. Methodological Design

The present study is an analytical research based on quantitative data using statistical methods. Considering the objectives of the enquiry and availability of time, it is not possible to collect information from whole of Tamil Nadu State. Hence, only one district - Ariyalur is randomly selected. This district is newly formed by the Government of Tamil Nadu on November
23, 2007. This district is one of the drought prone districts of Tamil Nadu. This district is smaller compared to the other districts of Tamil Nadu. 201 villages come under Ariyalur district. All the villages of the district mainly depend upon the agriculture sector. Historically, Ariyalur town panchayat functioned as second grade town panchayat from 21.12.1943, then first grade town panchayat from 01.01.1955 and the selection grade town panchayat from 01.04.1966. The extent of town panchayat is 7.62 sq. km and the strength of population is 27822 according to the census of 2001.

In addition to this town panchayat, there are 18 wards by division and for which one president and 18 members have been elected by the public. Amongst the members, there are 7 women members. As per the Government order 150, dated 01.10.2004, this town panchayat was announced as special grade town panchayat and then by G.O.No.372 Municipality administration and department of supply of drinking water, dated 16.12.2004, this town panchayat has been functioning as third grade municipality from 20.12.2004. The following map shows vividly the study area.
Figure – 2.1
Map of the Ariyalur District
A. Sources of Data

This study used both secondary and primary data. Secondary data were collected from Books, Journals, Government Records, Annual Reports and Internet Source. At the national level, the information was collected from various publications of Central Statistical Organization (C.S.O). At the state level, the information was collected from the publications of Directorate of Economics and Statistics. Other important sources of data include the publication of Season and Crop Reports of Tamil Nadu, Agricultural Statistics Reports, Economic Surveys, Plan Documents, and Reserve Bank of India Bulletins.

The primary data were collected from sample respondents with the help of pretested schedules, which covered almost all the aspects of investment behaviour in agriculture of the farm households. During the period of pretesting schedule the researcher has observed a lot of information of the study villages such as dominant crops, sources of irrigation, banking facilities, communication facilities, geographical background, transport facility, awareness of the farmers and marketing facilities.

During the pretested schedules it was noted that some of the crops cultivation varied in the sample villages. Besides, during the field survey, the farmers were fully involved with the investigators to give the related information about the research schedule but some of the farmers gave some
criticism about the agricultural loan distribution among the farmers in the sample villages. Additionally few farmers suggested that the government should give some priority for the marginal farmers compared to the others in the loan distribution system in the villages. Besides few farmers stated that obtaining the agricultural credit is not easy in the study villages and that it was a very long time process. Primary data collected from the interview method under the seven investigators including the researcher.

B. Selection of Block and Villages

The above district comprises six blocks viz., Ariyalur, Thirumanoor, Jayamkondam, T.Palur, Andimadam and Sendurai. Thirumanoor block was selected on the basis of irrigation facilities. The main reason is that Kollidam River flows in this block.

In addition to this two sample villages were (one village progressive and another less progressive) drawn from the above block, based on the discussions held with the officials of the department of agriculture of the above block. Progressive village was selected on the basis of irrigation facilities and the less progressive village was selected on the basis of rainfed area of the above block. The following figures show vividly about the study block and villages of the study.
Figure – 2.2
Map of the Ariyalur District (Block wise)
Figure – 2.3
Map of the Thirumanur Block (Village wise)
C. Selection of Sample Size

The present study relied on the random sampling method. A sample size of 51 per cent of the respondents (households) were selected from the selected two villages namely Koviloor and Varanavasi. The main reason is that the number of households are large in both villages. The total number of households of the selected villages are 742 (Koviloor) and 992 (Varanavasi) as per 2001 Census. Hence the sample size of the study is 378 and 506 respectively from Koviloor and Varanavasi villages.

D. Period of Study

The secondary data for national level covered the period from 1980 to 2008. This is because the stated public investment stated declining after the 1980s. The secondary data were analyzed for two periods such as pre and post liberalization periods. The liberalization of India’s economy was adopted in 1991. These reforms can be broadly classified into three areas such as liberalization, privatization and globalization. Essentially, the reforms sought to gradually phase out government control of the market (liberalization), privatize public sector organizations (privatization) and reduce export subsidies and import barriers to enable free trade (globalization).

There was a considerable amount of debate in India at the time of the introduction of the reforms, it is being a dramatic departure from the protectionist, socialist nature of the Indian economy up until then. However,
reforms in the agricultural sector in particular came under severe criticism in the late 1990s when 221 farmers in the South Indian state of Andhra Pradesh committed suicide (The damage done, 2005)\(^4\). In this connection this study analyzed the pre and post liberalization periods. Pre liberalization period means the period from 1980-81 to 1990-91; post liberalization period means the period from 1991-1992 to 2007-2008.

**E. Tools for Analysis**

In order to examine the objectives of study, various statistical tools such as percentages, average, annual growth rate, compound annual growth rate, regression analysis, two-way ANOVA and paired sample T test were used for the present study. The variables referred in this study were Capital Formation, Public Investment, Private Investment, Cropping Pattern, Cultivable Area, Production and Yield of Agricultural Sector, Investment on Land, Irrigation, Livestock, Agricultural Machineries, Gross Domestic Saving and Institutional Credit. The primary data covered the Fasali (crop) Year July 2006 – June 2007 and July 2007 - June 2008. The main reason is that the above two years were the normal ones according to the village records. In addition to this the field survey explains various concepts like opinion about institutional credit, decision making, saving behaviour, subsidy scheme and investment on agriculture.

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\(^4\) The Damage Done (2005), "Aid, Death and Dogma", *Christian Aid.*
a. Compound Annual Growth Rate (CAGR)

It is used to find out the annual growth rate of capital formation and agricultural productivity in pre and post reform period. The result shows the trend of capital formation and agriculture growth rate during the pre and post liberalization periods. In this view the following equation is derived.

\[ \text{CAGR} = \left( \frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{n}} - 1 \times 100 \]

\( n \) – Number of years

b. Annual Growth Rate (AGR)

It is used to find out the annual growth rate of capital formation and agricultural productivity during the study period (per year). In this connection it is measured by the statistical software in Statistical Packages for Social Sciences (SPSS), 15th version.

c. Regression Analysis

It is a mathematical equation between a response variable (dependent variable) and an independent variable (can be predictor variable). Regression analysis shows the impacts of investment on yield of the crops like paddy, sugarcane, groundnut and chillies. This result explains the impact of investment on crops in the study villages. eg., The study finds the regression equation of paddy yield based on the investment.
d. Two Way ANOVA

It is used for comparing the response variable based on row and column classification. It means the sample village wise and farm size wise expenditure on the crops explained. Variables like investment on land, expenditure on paddy, sugarcane and groundnut cultivation analyzed under this method. eg., The study finds that investment on land can be compared between the type of farmers and study villages.

e. Paired Sample t Test

It is used for comparing significant difference in mean between paired samples. This test shows the significant difference between the variables like investment on land, livestock, expenditure on paddy and chillies cultivation and reference periods. e.g., The study finds the average investment which is compared between two years (2006-07 and 2007-08).

9. Significance of the Work

The discussion on capital formation in agriculture assumes greater significance in the context of agrarian change that has been taking place since the Green Revolution in India. Unless productive capital and technology is deployed, the yield of money field crops can not be increased to feed the growing population. Unfortunately the required capital is not flowing to this sector. Hence the present study attains relevance for debate.
In fact the macro and micro level deliberations, which have been done in this thesis, throw light on the capital formation in agriculture. Nevertheless, still there is a wider scope to ponder on capital formation and agriculture with varying degrees of description. Thus the present thesis paves way for further analysis as well.

10. Limitations

The secondary data analysis has been limited to a period of two decades (1980 - 2008). Primary data, covered only for the period of two Fasali years (July 2006 - June 2007 and July 2007 - June 2008). The main limitation of the study was that the cultivators do not have any record of their transactions and as a result of that much reliance had been made on their memory. Data on income and saving from farm households may not be accurate as normally the households hesitate to confess the income. Despite the care taken to collect accurate information from the households, there would have been some amount of recall bias.

The present chapter illustrates the various concepts like estimation of capital formation, items of capital formation, GCF in agriculture, research issues and gaps, objectives, hypotheses and methodological design. The next chapter focuses on the review of earlier studies. In fact the review provided help to take forward the present research in right perspective.