CHAPTER - II

REVIEW OF LITERATURE

The review of literature forms an integral part of any systematic research work. Moreover, it becomes imperative on the part of the research worker to have knowledge of research work carried out by previous researchers in the research area of interest. This enables him to plan for his own research work on more systematic lines. It is therefore necessary for every research worker to review the research findings of previous studies closely related to a particular field of his research problem from various sources. The knowledge obtained by him through such review of literature efforts enables him to get insight in respect of a manner in which a selected research problem has been tackled. Keeping this in view, the review of literature in respect of the problem selected for research, has been taken in following manner.

The farm cost accountancy has two facets viz. 1) Maintenance or recording of transactions in a set of farm records and 2) Costing of farm business data to arrive at costs and returns on the farm (farm as a whole) and for the production of various crops grown on the farm. Therefore, at first the review of the aspect of maintenance of accounts (i.e. farm records) is taken.

(A) Maintenance of farm Records:

'Maintenance of farm records/accounts' is also called as 'Farm Book Keeping'. Farm Book Keeping is defined as the art as well as the science of recording in book (or set of farm records), the business transactions in
the regular and scientific manner, so that their nature and financial effects can readily be ascertained. The maintenance of farm records is nothing but past history of the farm business, giving valuable information. It will depend upon the type of farm, size of the farm, organisation of the farm, purpose of accounting, time and money to be spent for keeping records, the intelligence, education and interest of the farmer and so also the competence of the farmer/farm manager.

Orwin (1921) have long back stated that the interest in the study of farm management through the agency of scientific book keeping has been greatly stimulated by the demand for information on the cost of farm products arising out of the control of agriculture during and since the 1st world war. He has made attempts to demonstrate the value of scientific book keeping and recording on farm for wider purposes than that of the farmer alone and showed with examples the fundamental importance of farm data in the examination of the organisation of agriculture industry as a whole.

Yang (1965) has pointed out that the books and records used in various countries of the world differ so much from each other in size, farm structure and the system that it is hard to decide which set of record forms would have the widest application. He further said that the farm book keeping is not an entirely new thing even in under developed countries although the forms used may be crude and simple and system unsound. He also viewed that after having gained some experience in accounting of farm transactions by the farmer, the improvements and modifications of the records and books could be done by him to suit his requirements of the cost accounting.
The types of farm records used and recommended by the selected economists and the farm management specialists in the foreign countries are reviewed here as below.

A: Selected literature on farm records - Foreign countries:

Hopkin and Heady (1962) suggested the following farm records for the purpose of farm accounting. They suggested the single entry farm records for maintaining farm financial accounts. However, when farm operations are large and complicated, double entry accounts may be most effective. In single entry accounting, each transaction is entered in only one account. Single entry accounts are ordinarily organised in multiple columns. In these, instead of a page or portion of a page for each specific source of income or expense as in double entry accounts, parallel columns are provided for the various expense and income items. Sales also may be handled in multiple columns. They stated the following types of record be kept on the farm:

1. Crop record.
2. Feed record.
4. Comparative inventories of various assets.
5. Records of income and expenses.
6. Production record.

The farm financial accounts pattern are depicted in the following figure:
Yang (1965) viewed that the first task of the farmer should be the taking of an inventory of tangible and intangible assets. Another important record is the cash book, having two separate columns. One for entries in cash receipts and the other for those of payments made in addition to the columns needed for entering data and explanation of the particular transaction. He also mentioned that the books for cash receipts, some times are kept separately from those for cash payments and each in turn is rallied into several columns, the number of columns would depend upon the number of important and normal sources of receipts/expenditure. Apart from the cash book, several other records and books are needed for financial accounting because there are two other categories of transactions on the farm viz.:

a. Transactions which affect income and expenses do not involve any payment or receipt in cash.
b. Transactions which appear in cash book but do not affect income and expenses.

Other necessary records concern the production and the use or disposal of farm produce. Besides, the labour record should be kept daily or weekly, showing the work done by a labourer or draft animal and the payment of wages for the hired one. Likewise machinery record, livestock records are necessary.

Mallyon (1966) stated that the cash record, other books of account, non-financial records are necessary for operating the accounting system on the farm. The final accounts should be prepared, showing 1) Statement of assets and liabilities 2) Profit and Loss statement 3) Production data. Then the analysis of accounts be done. He also mentioned that while doing the costing of any enterprise on the farm, the farmer producer must keep labour use record, wages record, fertilizer and feed record, fuel and oil record machinery use record, repairs to farm assets, sundry livestock expenses. In case, the farm is big, the operating account for each of the crops activity, livestock activity will have to be maintained.

Brigham (1969) pointed out that most of the farms are basically family owned, with book keeping done by a member of the family. The specific records are normally those which will provide, with a minimum of effort, all the information the farmer must have. These informational needs are generally two folds viz.

1) To satisfy outsiders particularly Government agencies, lending agencies, landlord etc.

2) To provide data for management decisions. He further reported that the records most usually maintained by
farmers are inventories (both of fixed assets and production assets, production and performance records, depreciation schedules, record of assets and the usual income and expenses details.

James and Stoneberg (1976) discussed the accounts, records and analysis of farm business. The major components useful to farm accountants were depicted in the following manner:

I ASSETS AND LIABILITIES:

a. EXTERNAL ACCOUNTS:

<table>
<thead>
<tr>
<th>Payable</th>
<th>Receivable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open accounts</td>
<td>Loans</td>
</tr>
<tr>
<td>Production loans</td>
<td>Notes</td>
</tr>
<tr>
<td>Chattel mortgages</td>
<td>Credit sales</td>
</tr>
<tr>
<td>Real estate mortgage</td>
<td></td>
</tr>
</tbody>
</table>

b. Holding Accounts:

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank accounts</td>
</tr>
<tr>
<td>Feed and seed inventory</td>
</tr>
<tr>
<td>Livestock inventory</td>
</tr>
<tr>
<td>Machinery inventory</td>
</tr>
<tr>
<td>Building inventory</td>
</tr>
<tr>
<td>Land inventory</td>
</tr>
</tbody>
</table>

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II. RECEIPTS AND EXPENSES ACCOUNTS:

<table>
<thead>
<tr>
<th>Operating Accounts</th>
<th>Productive enterprise Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>-&gt; Machinery</td>
<td>-&gt; Livestock</td>
</tr>
<tr>
<td>-&gt; Labour</td>
<td>-&gt; Crops</td>
</tr>
<tr>
<td>-&gt; Business</td>
<td>-&gt; Custom services</td>
</tr>
<tr>
<td>-&gt; Frm overhead</td>
<td></td>
</tr>
</tbody>
</table>

III. PRODUCTION EFFICIENCY RECORDS:

A. Enterprise Records:
   a. Livestock
      i. Birth and death
      ii. Feed
      iii. Production
   b. Crops
      i. Seed
      ii. Fertilizers and chemicals
      iii. Yield

B. Input Service Record:
   a. Machinery
   b. Labour.

Sturrock (1971) viewed that the farmer who has decided to keep accounts can select one of a number of different systems. He suggested that the cash analysis system be adopted by a farmer because this system has the merit of being simple and will give clear and accurate results with a minimum of labour. In the examples of farm accounts given by him in his book, the receipts and expenses were arranged in lists ready for copying into the account book. He further says that the farmer must adopt a system so that all transactions are recorded in methodical way with the minimum of writing and in a form convenient for future reference. To carry out a system of farm accounts on the lines recommended in his book, the following books and records are essential:
a. Cash Analysis Account Book  
b. Petty cash book  
c. Wage book  
d. Cheque book counterfoils and receipted accounts  
e. Paying in slip.  

Other records:  
a. Livestock movement book  
b. Invoice book  
c. Records for retail round  
d. Records for cropping Cultivation sheet  
e. Files (For invoices, receipts and correspondence)  

It is a fact that the size of farm and farm situations in foreign countries and those in India are not alike. It is therefore obvious that the nature of some of the transactions in foreign countries is different than that in India. So in India, the work done relating to farm accounting or farm records have shown that the forms/schedules set out for recording the data under Indian conditions are different than those in foreign countries. The literature on this aspect as available here is reviewed below:  

Patil (1933) explained the plan adopted in presenting the farm cost studies. In this, the data of the selected farmers was collected in respect of the following items.  

1. Land held.  
2. Land utilization.  
3. Cropping pattern.  
4. Human labour available.  
5. Employment details of permanent servant.  
7. Employment details of owned bullocks.
8. Inventory of the property liabilities and assets on the farm.
9. Cropwise cultivation details with cultural and manurial practices followed and the labour.
10. Farm output details: cropwise fieldwise. On the basis of data collected in these farms, he worked out the farm costs, farm business income, family labour income and net income on the farm.

Gadgil and Gadgil (1940) used the following set of forms for collection of farm business data of sample farmers selected in Wai taluka of Satara district.

<table>
<thead>
<tr>
<th>Form No.</th>
<th>Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td>I - A</td>
<td>Distribution of farm area.</td>
</tr>
<tr>
<td>I - B</td>
<td>Details of area operated.</td>
</tr>
<tr>
<td>I - C</td>
<td>Details of utilization of area operated.</td>
</tr>
<tr>
<td>II</td>
<td>Real estate and implements.</td>
</tr>
<tr>
<td>III - A</td>
<td>Baluta dues and charities paid.</td>
</tr>
<tr>
<td>III - B</td>
<td>Expenses on seeds and plants.</td>
</tr>
<tr>
<td>III - C</td>
<td>Crop yield and disposal.</td>
</tr>
<tr>
<td>IV - A &amp; B</td>
<td>Inventory of livestock.</td>
</tr>
<tr>
<td>IV - C</td>
<td>Livestock products.</td>
</tr>
<tr>
<td>IV - D</td>
<td>Livestock summary.</td>
</tr>
<tr>
<td>V</td>
<td>Inventory of implements and tools.</td>
</tr>
<tr>
<td>VI</td>
<td>Other sources of Income.</td>
</tr>
<tr>
<td>VII - A</td>
<td>Feeds purchased.</td>
</tr>
<tr>
<td>VII - B</td>
<td>Record of estimated monthly consumption of feeds et</td>
</tr>
<tr>
<td>VII - C</td>
<td>Inventory of feeds.</td>
</tr>
<tr>
<td>VIII - A</td>
<td>Fertilizers and manures used.</td>
</tr>
<tr>
<td>VIII - B</td>
<td>Record of casual hired labour.</td>
</tr>
</tbody>
</table>
Misra (1942) reported a detailed accounting procedure and the accounts books for recording the farm accounts on Government farm. He used the following account books on the farm:

1. Permanent labour book.
2. Temporary labour book.
5. Produce book.
8. Inventory book.

Few other record books were as follows:

5. Inward bill file.
7. Repairs and supply order book.

Panse and Bokil (1954) carried out pilot study for estimation of the cost of production of crops in Akola district. For the purpose, they used the following proforma for collecting primary data from the selected farmers.
1. Area held by farmers - its cropping pattern.
2. Stock position of live stock.
3. Stock position of livestock feeds.
4. Inventory of property and investment, implements etc.
5. Record of daily agricultural operations.
6. Fortnightly account of cattle maintenance.
7. Expenditure on livestock maintenance.
8. Income from livestocks or services.

Agarwal and Khudanpur (1961) have developed a suitable farm accounting records, under pilot project 'Methods and practice of Farm Accounts' entrusted to the Gokhale Institute of Politics and Economics, Pune during April, 1955. They finalised a set of following farm records for the maintenance of farm accounts by farmers in Indian conditions.

<table>
<thead>
<tr>
<th>Form No.</th>
<th>Title of the form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inventory of owned land.</td>
</tr>
<tr>
<td>2</td>
<td>Inventory of cash rented and share rented land.</td>
</tr>
<tr>
<td>3</td>
<td>Inventory of property and financial assets.</td>
</tr>
<tr>
<td>4</td>
<td>Outstanding debt and credit transactions during the year</td>
</tr>
<tr>
<td>5</td>
<td>Inventory of livestock.</td>
</tr>
<tr>
<td>6</td>
<td>Inventory of implements and machinery at the beginning of the year and cost of renewal and repairs during the year.</td>
</tr>
<tr>
<td>7</td>
<td>Members of the family (including farm servants.)</td>
</tr>
<tr>
<td>8</td>
<td>Crops on owned and self cultivated land.</td>
</tr>
<tr>
<td>9</td>
<td>Crops on leased in lands - cash and/or share rented.</td>
</tr>
</tbody>
</table>
10. Particulars of farm servant and work done (weekly record)

11. Record of work of owned bullocks and buffaloes (Weekly record.)

12. Record of daily work on the farm (Family and exchange labour of men, women, livestock and implements).

13. Record of the daily work done on the farm (hired labours, bullocks and implements)

14. Record of maintenance of livestock.

15. Farm product and its disposal. (Weekly record.)

16. Livestock produce and its disposal (Weekly record.)

17. Particulars of commodity/receipts.

18. Particulars of commodity disposal.

19. Particulars of marketing of farm produce.

20. Particulars of cash purchases for current cultivation and livestock maintenance.

21. Record of cash transactions.

22. Credit transactions in kind (debts and borrowings)

23. Credit transactions in kind (Dues receivable)

24. Fodder account (Monthly record.)

25. Commodity account (Excluding fodder)

Jain (1964) stated that the books of account are merely devices for systematic recording of information and business transactions. The essential detail of each transaction which is considered important to remember is written in it. The number and type of books required for a farm or dairy will depend on the nature and volume of business transactions it has during the course of a year. He further stated that under the double entry system the following books are kept for purposes of providing permanent record of financial transactions.
A: Financial books (Books of Accounts)

a. Principal books
   1. Ledger

b. Subsidiary books or books of original entry:

Tandon and Dhondyal (1971) viewed that the farm records are the best guides to indicate the profit and loss on the farm as a unit. They suggested the following important records.

1. Inventory
2. Diary or memorandum.
5. Stock register.
7. Attendance register of dairy and monthly labour.
8. Daily allocation record of the hours of man labour, bullock labour and equipment use.
10. Supplementary records such as cattle feed record and cost of production records.

Johl and Kapoor (1973) viewed that the types of farm records will differ from farm to farm, because of the diversity of the farm situation. They stated that there are three parts of farm records system.
1. Physical farm records.
2. Financial farm records.
3. Supplementary farm records.

Under each of these systems, the following records are mentioned.

Physical farm Records:
1. Farm map, soil map, contour map.
2. Charts on Physical efficiency.
3. Land utilization record.
4. Crop production and disposal.
5. Livestock production and disposal record.
7. Machinery use records.
8. Feed records.

Financial Records.
1. Farm inventory.
2. Farm cash accounts.
3. Classified farm cash accounts and Annual farm business analysis.

Supplementary Financial Records.
1. Capital assets sales register.
2. Cash sale register.
3. Credit sale/purchase register.
5. Funds borrowed repayment register.
6. Farm expense register.
7. Non-farm income records.

Patel (1970) viewed that the farm records are essential in present development of farming business as
they help in maintaining up-to-date information of different transactions taken place on the farm as well as furnish the required information at any time of past and present, for future planning and adjustment. He suggested the following records for the farm.

1. Farm history Records
   - Farm Layout
   - Farm Layout: Measurement book
   - Plot history book

2. Labour Records
   - Muster roll
   - Daily labour sheet
   - Programme book

3. Crop Records
   - Cultivation sheet
   - Yield book

4. Farm produce sale Records
   - Farm petty cash memo
   - Petty cash memo
   - Credit memo (Sale)
   - Vegetable Sale book

5. Store Records
   - Farm produce delivery
   - Store issued farm
   - Store journal
   - Store ledger
   - Food & Fodder register
   - Power plant register
   - Irrigation supply book

6. Permanent article Register
   - Dead stock register
   - Building register

7. Weather Records
   - Weather Record register

8. Orchards Records
   - Identification mark Register
   - Tree register
   - Yields record register
   - Distribution chart register

9. Livestock Register

10. Milk and its products and distribution records
Mukund Lal (1981) suggested a system of accounting, from which costing of a farm or a single activity could be done directly. He evolved a proforma in which four columns have been suggested. In the said form, column No.1 is for recording the serial no. of farming operation, second column for particulars of operation, third for recording the date/s of operation/s and the last column is provided for recording the cost/charges for the respective operation/article/item. In addition to cultivation cost for each crop, the information on storage cost, selling and distribution, details of borrowing and repayments etc. is to be recorded from time to time in the same set of proforma, in respect of the crops grown by the cultivation.

The Institute of Chartered accountants of India, New Delhi (1983) brought out a system of accounting for agricultural operations. It is based on a certain classification of transactions viz. exchange transactions and revenue transactions, assets and liabilities. The system lays down a set of books in which the classified transactions are to be recorded. It included i) A day book ii) Register for fixed assets. iii) Register for non-monetory assets and iv) Register for monetory assets and liabilities. Further, it is quoted that in order to derive information regarding crop-wise costs and profits, it would be necessary to maintain some...
cost accounting records, which are basically in the form of analysis tables, i.e. cost analysis tables. In order to ascertain the crop-wise cost of labour, cattle etc. certain non financial records such as labour utilization book, and register for cropping pattern are to be maintained.

Ram (1963) emphasized the following kinds of records viz.

1. Inventory of farming resources being used - Land livestock, implements and labour etc.
2. Records of the use of land and the amount of crops and other products produced.
3. Records of disposition sales and cash receipts, family consumption etc.
4. Records of cash expenditure by categories hired labour, expenses on crops and those other than on crops and labour rent, interest, expenditure on livestock.
5. Records of capital items purchased and sold.
6. Records of borrowing and repayments etc.

Aiyadurai (1990) suggested the following accounting records.

1. Material record
2. Labour record.
3. Equipment usage register.
4. Livestock register.
5. Produce records.
7. Farm inventory.

He further suggested that the following accounts and statements may be prepared.

1. Individual crop account.
2. Livestock account.
5. Final accounts for the year..........

The above various farm records/farm account books as suggested by the various researchers/organisations suit well under the situation for which they were used or evolved. Now, considering the present status of crop production on farms of various size groups and the competancy of the Indian farmers, a suitable set of farm records/schedules needs to be evolved. The same has been presented in Chapter IV.

B. Review of farm costing techniques:
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The farm costing studies and the studies related to cost of cultivation of crops have been done by many researchers and the institutions. The various methodologies of costing adopted by them in their studies did vary in a few or more aspects. Specific studies on farm costing techniques have not received much attention. A few empirical studies available in India and abroad involving the objectives or the issues raised in the present study are reviewed here. The review is grouped into the following sub-headings.

a) Cost concepts used in estimation of farm costs and returns.
b) Valuation of farm assets.
c) Depreciation of farm assets.
d) Valuation of items of variable costs.
e) Valuation of items of fixed costs.
f) Allocation of costs and related issues.
g) Farm business efficiency measures.
h) Cost concepts used in estimation of cost cultivation of fruit crops and appraisal of capital investment in growing of fruit crops.

a) Cost concepts used in estimation of farm costs and returns

The development of various cost concepts to be used either in farm costing or costing of single crop production activity have taken place slowly with the changes in outlook towards farm production. These changes in cost concepts seems to have taken place in view of the objective or purpose of costing. It may either be for price policy decisions to be taken by the Government or for farm planning and organisation by the individual farmer. The stages in development of cost concepts can be cited as follow.

1. Traditional system of maintaining itemwise cost of cultivation of crops.
2. Concept of variable costs only.
3. Concept of variable, fixed costs and total cost.
4. Concept of implicit cost and explicit cost.
5. Concept of direct and indirect cost.
6. Concept of prime cost.
7. Concept of cost A, A1, A2, B and C.
8. Concept of cost A, B and C.
9. Concept of variable Cost (V.C), fixed cost (FC), V.C.+ Rental value, V.C. + imputed family labour.
10. Concept of A1, A2, B, and C costs.
11. Concept of operational cost, fixed cost and the total cost.
The various concepts as above have been evolved by the research workers and the institutions engaged in agricultural economics.

It is to be noted that although the various cost concepts as listed above have been evolved, the use of any one of the concepts can be done by any userer depending upon the purpose of costing etc. The cost concepts as listed above have been reviewed here as below.

In a process of agricultural production, various kinds of material inputs and services of a heterogeneous nature are used. Costs of all these represent the cost of production. In order to make the cost of production valuable and meaningful, all the items of farm costs must be identified carefully and systematically classified. Farm cost or crop production cost includes the following items.

1. Land, Land improvements.
2. Farm buildings.
3. Implements, machinery equipments and tools.
4. Irrigation structure.
5. Livestock.
6. Human labour.
8. Machinery use.
9. Material such as seed, manures, fertilizer, pesticides, fodder.
10. Irrigation.
11. Miscellaneous.

The cost of production of a crop can also be presented according to operations. These are as follows.
1. Land preparation i.e. preparatory tillage viz. plowing, harrowing, clod crushing etc.
2. Sowing, seeding, transplanting.
3. Thinning / gap filing.
5. Weeding, interculturing.
6. Irrigation.
7. Crop protection measures i.e. use of insecticides, fungicides etc.
8. Watching.
9. Harvesting, threshing, winning cleaning etc.
10. Drying, bag filling, transport to store.

Likewise the itemwise production cost of livestock enterprise can be had. This includes the following.
1. Housing - Shelter.
2. Feeding - feeds, fodder.
3. Grazing
4. Breeding.
5. Milking, egg collection, wool collection.
6. Veterinary charges, shoeing etc.
7. Selling of products.

There are of course, other ways of designing and grouping of production cost items. The scope and method of classification depends on the particular need of the farmer or object of costing. However, the classification of cost items should be such that it should satisfy the purpose for which they have been classified.

The National Sample Survey Reports of the 7th round (1951-52 to 1952-53), No. 32, Part III contained the total cost of cultivation of crops like sugarcane and
oilseeds. This included the selected items of costs, such as seed, manure, water charges, animal labour (hired and owned) and human labour (both hired and owned) required for different operations of cultivation of the crops. The cost items considered in this report seemed to be of variable or direct cost items. No items of fixed cost have been included in showing the cost of cultivation of crops.

In order to have appropriate classification of cost items into some categories, some concepts are followed. These are called cost concepts. The views on the cost concepts of the research workers are reviewed and these are given below.

Tandon and Dhondyal (1964) stated that the cost of production means money cost or expenses of production of a commodity. The cost consists of the sum total of the prices that must be employed in the production of commodity. The cost of production includes the following

1. The price of the raw materials.
2. Wages paid to labourers.
3. Remuneration of the organiser.
4. Depreciation.
5. Rent.
6. Interest.
7. Marketing charges.
8. Normal profit of the farmer as an entrepreneur.

Sarveshwara Rao (1961) mentioned that a concept is a tool of analysis. Some concepts are useful for theoretical analysis and have limited operational significance. Some concepts are used by businessmen like capital, cost and profit. These concepts do guide them on actual decision making. They are therefore of operational
significance for the business men but the Economist used different concepts of capital, cost and profit for his theoretical analysis as well as for the practical studies. The concepts to be used for dealing with macro economic problems may be very different from the concepts to be used for dealing with micro economic problems. Rao further pointed out that the essential idea involved in the concept of cost is the idea of sacrifice. He meant that certain resources for one particular purpose instead of for other purpose are used in such phenomenon and this is nothing but opportunity cost concept. This opportunity cost is usually calculated by taking into account the market prices.

Rao (1961) at first classified the cost into money cost and the physical cost. According to him, cost of production is the cost of inputs valued in terms of money, while the physical cost concept is useful to individual farmer in determining the extent to which a particular input has to be increased or decreased by arriving at an optimum dose of the particular input.

Dr. Desai (1961) doubted whether the applicability of western or European cost concepts in analysing the farm problems in Asian Countries where farming is mostly at subsistence level would be worthwhile or otherwise and hoped that with the change in conditions in our country, the farmers may develop a commercial approach to their activities and gradually the concepts used in western countries may be accepted for dealing the economic problems of Indian agriculture.

Johl and Kapoor (1973) referred the cost as the total amount of funds used in production. They mentioned that the cost of production exists because the supply of productive resources are scarce relative to their
demand. These costs have relevance to a specific time period. The cost includes the resource services which are of two types i) Poly period resources viz. use of tractor is made for some years in production ii) Mono-period resources viz. use of seed, fertilizer pesticides in crop production is done once (i.e. in single period.)

Another classification of costs into cash costs and non-cash costs have been reported by Yang (1965), Rao (1961) and Johl and Kapoor (1973) and this classification is important for an individual farmer. Cash costs are also called paid out costs or out of pockets expenses. According to them, cash costs are incurred when resources are purchased and used immediately in production process. The resources so purchased are non-durable inputs such as seed, fertilizers, diesel oil and feeds to animals etc. These do not last more than one production period. Non-cash costs or imputed costs included the payment to resources owned by the farmer e.g. inducted payments towards labour of farmer and his family members, owned capital, depreciation on building, owned machinery, equipment etc.

Rao (1961) also referred to cost concepts from three different angles viz. 1) the historical cost 2) the necessary cost and 3) the fair price cost. According to him, the historical cost is the cost actually incurred in the past i.e. past cost. The 'Necessary cost' is the cost which the farmer must recover in order to continue to produce what they have been producing and sometimes in order to provide for normal expansion of output in course of time. The 'Fair price' concepts refers to question of income which the farmer should get from the cultivation of a particular crop and this is nothing but the difference between the cost
and the price that would be necessary to give him that income.

From the point of view of average farmer, farm costing or costing of any agricultural commodity, the simple concepts of cost viz. costing according to agricultural operations could be followed. This was suggested by Patil (1927), Misra (1942) Sarveshwara Rao (1961) and also Yang (1965). The various agricultural operations on the farm or for cultivation of crop includes mainly plowing, harrowing, sowing, transplanting, weeding, application of manures, fertilizers, irrigation, harvesting and threshing etc. These operations may vary from crop to crop also from region to region. This type of classification would throw light on the extent of expenditure on various operations and this would help the farmer in planning for capital requirement in farming.

The basic classification of costs into direct costs and indirect costs have been reported by many (Yang - 1965, Goswami and Bora - 1974). According to this, the Direct costs are called factor cost, and the indirect costs are called overhead costs. The former costs include the costs towards seeds, fertilizers, manures, fertilizers, pesticides, irrigation, hired labour charges, feeds and fodder to animals. These costs are incurred only when an enterprise or production activity is actually undertaken and the amount of such costs varies directly with the size or scale of the operation. The indirect costs include land, land improvements, farm buildings, indirect labour and depreciation and interest on machinery investment. These costs comparatively fixed, at least in a relatively short period of time, regardless of the size of the operation or whether an enterprise is actually undertaken or otherwise.
The Institute of Chartered Accountants of India (1983) also accepted the method of calculating Direct Costs on farm and for a particular Agricultural commodity. Indirect costs do not normally decrease with the elimination of an enterprise or with the reduction of scale of its operation or vice versa. This distinction would be helpful to a farmer in planning the size of a farm operation or in choosing a farm enterprise. However, it is necessary to give an immediate and most careful consideration to direct costs rather than to a fixed or total of both direct and indirect costs.

Ram (1962) viewed that, for use with farmers, costs fall into two general categories. One category includes the Direct Costs that are associated with the particular enterprise, and the category includes the fixed costs such as Land revenue, irrigation charges etc. About human labour and bullock he clarified that the inputs of hired labour for the particular enterprise becomes direct costs factor. Inputs of family owned labour of operator will not be considered as a direct costs of an enterprise. It is an opportunity costs, however, the actual time required may be used. About the interest, he stated that the interest on borrowed capital should be considered as a part of variable cost. If use of the farmers own capital remain constant, there is no great need for considering interest charges but when its use is increased or decreased then the rate of interest even on owned capital becomes part of variable costs.

Other type of classifying the costs of production into explicit costs and implicit costs was used by Tandon and Dhondyal (1971) and Shivappa (1991). According to Tandon and Dhondyal (1971) Cost is divided into two costs.
vz. Explicit costs which includes the items such as wages of hired labour, value of bullock labour, manures and fertilizers, pesticides, irrigation charges, land revenue, taxes etc. while the implicit cost included the items such as interest paid in cash, depreciation on implements. Shivappa used the terms viz. 1) Total costs comprising of implicit and explicit costs and 2) Total cost comprising explicit cost excluding interest on seed capital and imputed value of family labour.

Classification of total costs into variable costs and fixed costs is very important from the point of view of farmer as it helps him to plan his operations for the next year.

According to Hopkins and Taylor (1935) the fixed costs include such items as taxes, upkeep of buildings and fences, interest on investment already made, depreciation on farm building and machinery while the 'Variable costs' include charges of hired labour, seeds, feeds, fertilizers etc. which are incurred on the current output.

Tondon and Dhondyal (1971), Singh and Sharma (1968) Sankhyan (1983) and Singh I.J. (1977) have mentioned that the total cost as a summation of two components of costs. viz. variable cost and fixed cost. According to them, the fixed costs are related to fixed resources and are overhead costs. According to Tandon and Dhondyal (1971) Rent, interest, depreciation, land taxes, insurance of buildings, equipment and livestock and wages of permanent labour are included under fixed cost. Family labour costs is also treated as fixed cost. The variable costs are related to variable resources and change with output. Johl and Kapoor (1973) called the variable costs as
sunk costs or prime costs. Fixed costs can be cash or non-cash costs. Fixed cash costs include land taxes, interest, insurance premium, annually hired labour etc. Non-cash fixed costs include depreciation on buildings, machinery, equipment etc. interest on capital investment, cost of family labour and cost of management. In the very long run, all the costs become variable. Variable costs are the costs of using variable inputs. These costs vary with the level of the output. These costs include items such as seed, fertilizers, insecticides, fuel consumption, feeds and water, hired casual labour, hired machinery and other services, current repairs and replacement which vary with the use of building and equipment, interest on current capital. Sing (1977) and Singh and Sharma (1968) included the interest on current capital in the variable costs and the maintenance of draft animals in the fixed costs.

Patil (1927) while justifying the classification of costs into variable and fixed costs, stated that this classification of cost is important one in helping the farmer to plan his operations for the coming year. As long as the variable costs in farming are covered by the gross income of the farm, the farmer does not stop his farming activity as he knows that there fixed costs will continue to be there on the farm even he may or may not take up the production activity.

Singh K.V. et al. (1994) analysed the cost of cultivation and return structure of sugarcane in western Uttar Pradesh. In this they used following cost concepts.

Under fixed cost (A), they incorporated usual items viz.
1. Interest on values of farm building, machinery and implements.

2. The depreciation on farm building, machinery and implements and,

3. Rental value of land. Here, no specific mention has been made about item "Land revenue and taxes on land. Whether this item has been incorporated in rental value of land or otherwise is not made clear by them. While presenting the itemwise cost of items, they have shown the expenditure under two three subheads i) Human labour ii) Material cost iii) Bullock labour and sum of items was called as working capital and thus when added with the interest on working capital, they called working cost (B).

   Further, to the total of fixed cost and working cost, they added three more items viz. i) Risk cost (C) ii) Normal profit (D)

   Thus the sum of four subsections viz. A+B+C+D was called as total cost. So, here a different type of cost classification is observed.

   Deshmukh et al. (1991) followed the concept of cost as a variable cost, a fixed cost and a total cost in their study on cost structure of sugarcane. Under variable cost, the usual items of costs have been stated. However, the item viz. imputed charges of farmer's labour were not shown under variable cost but under fixed cost. Under fixed cost the other usual items viz. i) Depreciation ii) Rental value of owned land iii) Interest on fixed capital and iv) Land revenue and cesses were included.
The inclusion of family human labour charges either in a variable cost or fixed cost seemed to be controversial issue because some have included under variable cost and some have included under fixed cost. Acharya (1985) however appropriately solved this issue by putting the imputed items viz. family human labour charges and rental value of land separately from variable cost and fixed costs. He splitted up the total cost into 4 subsections as mentioned below.

i. Variable cost: Under this, the charges towards the items viz. seed farm yard manure, fertilizer insecticides, irrigation hired human labour machinery and bullock labour, interest on working capital owned bullock labour own tractor and other machinery.

ii. Fixed cost: It included the items viz.
   i. Land revenue and cesses.
   ii. Depreciation charges.
   iii. Interest on fixed capital.

iii. Imputed rental value of owned land.

iv. Imputed value of family labour.

v. Total cost = i+ii+iii+iv

Singh and Sharma (1968) categorised the total cost of production into variable costs and fixed costs. The variable costs included the items of costs included items of costs towards human labour, hired machine and implements, seed, farm yard manure, fertilizer, irrigation, plant protection chemincals and interest on current investment while the fixed cost included such overhead charges as land revenue, interest depreciation and up-keep of farm buildings, machinery and implements and draft animals, maintenance cost of animal etc.
Turner and Taylor (1989) illustrated the calculation of variable (direct costs) costs and fixed cost (indirect costs) from the annual accounts viz. Trading account and profit and loss account.

Dey (1993) also classified the total cost of cultivation into variable cost and fixed cost, But the items of cost that were included under it were slightly different. The variable cost comprised of items of costs towards:

i. Wages of hired human labour.
ii. Imputed and hired bullock labour.
iii. Owned and hired bullock labour.
iv. Seeds (purchased and farm grown)
v. Manures and fertilizers.
vi. Working expenses such as requiring of implements fencing etc.

While the fixed cost comprised of
1. Rent paid for leased in land
2. Depreciation of farm assets (excluding land)
3. Interest on fixed capital, including on owned land.
4. Land revenue taxes etc.

In this, no interest on working capital is accounted.

The concept of prime cost was adopted by Panse and Bokil (1966) for presenting the results in bulletin on "Cost of cultivation of some Indian field crops" for the principal reason that it represents the physical requirement of the production of crop. These can be reasonably considered to be more or less stable as long as there are no revolutionary changes in the methods of cultivation. This prime cost included the items such as the value of human
labour (including imputed value of farmer’s own labour),
bullock labour, seed, manure, irrigation charges (where
appropriate) and repairs and depreciation of implements and
equipment. Mukhopadhyaya (1990) also justified the concept
of prime cost as a proper measure for inter-regional
comparison of crops.

Instead of classifying the cost items
into some categories, some have accepted the concept of total
cost,( Patil 1927, Agrawal and Ramsaran 1949, Panse 1954,
Economics, Agricultural University Kanpoor 1983).

Patil (1927) included the items such as
human and bullock labour.(both from home and outside), manure
(purchased and from the farm), water charges, marketing
charges, interest, rent of land, charges for fuel, oil etc.
While Agrawal and Ramsaran (1949) added the items viz.
depreciation of fixed assets, supervision charges, misc.
charges, in the above list of items. Panse (1954) in his
pilot study of cost of cultivation of cotton on cultivators
farm in Akola Dist considered the cost of such as human and
bullock labour (both owned and hired) seed, manures, implement
charges, rent and taxes. Yang (1965) also suggested the same
set of items of cost in working out the total cost. The
Government of Maharashtra (1958) have used more or less the
same cost items while costing the data maintained at
selected Agricultural Demonstration centres - human labour,
bullock labour, material used, irrigation charges, equipment
charges, interest on both working capital and fixed capital
and rent of land.

Patel (1970) put the items of total cost
of production in different manner. He listed the items as
given below:
1. Charges for preparatory tillage.
2. Charges for seeds and sowing.
3. Charges for manures and manuring.
4. Irrigation charges.
5. Charges for after care operations.
6. Charges for harvesting, threshing etc.
7. Interest @ 10 %.
8. Supervision charges @ 10 %.
9. Rent of land.
10. Repairs and depreciation of implements.

Rao (1961) while commenting on cost concepts used by the Directorate of Economics and Statistics, Govt. of India, in first series of farm management studies stated that in the concepts viz. cost A 1, Cost A 2, Cost B 1 and Cost C none of them is strictly a prime cost. In each of them both variable and fixed costs have entered. In cost A 1, family labour is omitted while depreciation is included. The purpose behind such classification is to determine certain kinds of income like farm business income, family labour income and farm investment income.

The ICWA, Calcutta (1980) presented the estimates cost of production of jute in terms of per acre cost and per quintal worked out by the committee on public undertakings in their third and eight report concerning Jute Corporation of India Ltd., and exploitation of Jute growers and of Jute Corporation of India Ltd. (Govt.'s unfair pricing policy for raw Jute) respectively.

The elements of costs in production of Jute were as under:
1. Human labour - family and hired respectively (charged at statutory minimum wages of Rs. 8.10 per day of 8 working hours.
2. Bullock labour
4. Fertilizers and manures.
5. Plant protection - chemicals.
6. Depreciation of implements.
7. Irrigation
8. Land revenue and irrigation tax.
9. Interest on capital at 12.5 % p.a. both fixed and working capital including land at Rs.80 per acre per month.
10. Management charges.
11. Miscellaneous charges.
12. Marketing charges.

The classification of items of cost of production have been done into two sub groups viz. operational cost and fixed cost. This categorisation is simple to understand and could be helpful to plan the resource requirement. This classification has been used in the cost of cultivation studies sponsored by the Directorate of Economics and Statistics, Government of India, (1973,1974) in various states since 1971-72. The operational cost included the charges towards the variable cost items.

While the fixed cost included the following items.

i. Rental value of land

ii. Rent paid for leased in land.

iii. Land revenue, taxes, cesses etc.

iv. Depreciation on implements and farm buildings.
   (excluding cattle shed.)

v. Interest on fixed capital.
The above classification has been used in cost studies by Singh et al (1974), Singh (1975), Shastri and Ramanna (1978) and Singh and Singh (1990). However, Babaria (1974) considered only operating cost. Others have presented the cost items in slightly different way (Chaurasia and Sing, 1972, Gupta et al. 1988) The classification was as follows.

1. Operational cost:
   Comprising of charges towards both family and hired human labour, owned and hired animal labour, owned and hired machinery.

2. Material cost:
   Comprising of expenses on seed, seed treatment, farm yard manure fertilizer, fertilizer, chemicals, weedicides, water, and interest on working capital.

3. Fixed cost:
   This includes the items such as the rental value of owned, land revenue, cesses and taxes, depreciation on implements and interest on fixed capital (excluding land).

These three costs together formed the total cost of cultivation.

Chougule and Patil (1988) presented the data on itemwise cost of cultivation of sugarcane in a simple manner showing the operationwise cost of cultivation. To this they added interest on working capital to arrive at total variable cost.

The classification of costs, reviewed so far was made into one to three categories and the terminologies used for categories of costs were more or less
relevant to its meaning. With the wider application of farm costing, techniques or costing of production of crops, particularly, from the point of view of farm planning, judging the farm efficiency and price policy purpose, a new type of classification of cost was suggested by many. Economists and research workers on farm costing. In this classification, alphabets viz. A, B, C, D are used. This type of classification is reviewed in the following paras.

The classification of costs as A, A1, A2, B, C was made at the centre on Agricultural prices and policies held at New Delhi in March - April 1958 under the auspices of the F.A.O/E.C.A.F.E. (Economic conference for Asia and far East countries) ("Report of the F.A.O./E.C.A.F.E centre on policies to support and stabilise Agricultural prices and income in Asia and far East" F.A.O.E.T. A.P. Report No. 887 of the F.A.O. of the United Nations, 1958 and the Government of India) and an attempt was made to standardise the definitions of costs. Such standard definitions are finding general acceptance in India. These various costs defined at the centre were as follows.

Cost A: It stands for the aggregate of the paid out costs in cash and kind. By implication this refers to owner cultivators. This cost includes the items viz. hired human labour owned and hired bullock labour, seeds, manures and fertilizers, irrigation, plant protection, implement charges, land revenue, and other taxes, other misc. charges.

Cost A1: It indicate the total of paid out costs for the tenant of cultivator and includes, in addition to various items in cost A, the rent paid by him to the landlord.
Cost B: Cost A + imputed rent of owned land and the interest on owned capital.

Through not explicitly defined at the centre, the corresponding cost for a tenant farmer will obviously be obtained from Cost A1 by addition of imputed interest on owned capital only, as rent on land is already included in cost A1.

Cost C: It includes in addition to cost B, the value of the labour of the cultivator and his family.

This approach to the concept of cost and the various definitions was approved at the seminar on Problems of cost studies in Agriculture held at Matheran (Maharashtra state) in October November 1960. The centre also recognised one more cost Viz. Cost A2 which is derived from cost A, by the addition of the imputed family. This comes very close to the concept of "Prime Cost" (Panse and Bokil 1966), which is generally understood as the cost occasioned by the growing of a crop.

Such classification was used by Acharya et al. (1958) and Harpal Singh et al. (1993) in their studies.

Subrahmanyam (1989) altogether used different type of classification of cost for his study on economics of vegetable cultivation. He used the following cost concepts.

(A) Input costs: This included the following items.

1. Cost of Seed/seedlings.
2. Cost of manures and fertilizers.
3. Cost of irrigation.
5. Cost of human labour.
6. Cost of bullock labour.

(B) Interest on working capital at 14% per annum for six months.

(C) Fixed costs like rental value of land, land revenue taxes, interest on fixed capital and depreciation etc.

(D) Marketing cost like transport commission charges, packing, loading and unloading etc.

Cost I = (A + B)
Cost II = (A + B + C)
Cost III = (A + B + C + D)

Although such classification is used it would be observed that Cost I seemed to be operating cost, Cost II seemed to be the total cost inclusive of operating cost and fixed cost and Cost III showed the total cost inclusive of marketing charges.

With the initiation of Farm Management studies by the Directorate of Economics and statistics, Govt. of India in Sixties in selective districts and such repeat studies in seventies, they have adopted the four concepts of costs keeping in view the objectives and utility of such concepts. (1966, 1973). The input items included under each category of cost are indicated below.

Cost Al = i. Value of hired human labour.

ii. Value of hired bullock labour.

iii. Value of own bullock labour.

iv. Hired machinery charges.

v. Value of owned machine labour.

vi. Value of seed (both farm produced and purchased)

vii. Value of insecticides and pesticides.

viii. Value of manures (owned and purchased)

ix. Value of fertilizers.

x. Depreciation on implements and farm buildings.
xi. Irrigation charges.

xii. Land revenue, cesses and other taxes.

xiii. Interest paid on crop loans.

xiv. Interest on working capital (excluding crop loans)

xv. Miscellaneous expenses (Artisan etc.)

Cost $A_2 = Cost A_1 + Rent paid for leased-in-land.$

Cost $B = Cost A_2 + imputed rental value of owned land (less land revenue paid there on ) + imputed interest on owned fixed capital (excluding land.)$

Cost $C = Cost B + imputed value of family labour.$

The cost concepts described above would help in working out different measures of income. Moreover cost C is most comprehensive cost and represents the estimate of the farm cost when farming is considered to be a strictly commercial farming.

The above cost concepts have been used by the Directorate of Economics of Statistics, Government of India in their Comprehensive study on cost of cultivation/production of crops, initiated in various states of the country since 1971-72.


Recently a slightly different type of cost classification is being used by many research workers, economist. The classification has been made into three classes viz. Cost A, Cost B and Cost C. This might be due to simplicity in adopting this type of classification. Another reason is the abolition of zamindari in most part the country
and the cultivators cultivating the land on tenancy basis are no more in existence and as Cost A1 and Cost A2 concepts adopted in respect of owner cultivators and tenant cultivators respectively do not remain in practice. So it led to adoption of simple classification viz. Cost A, Cost B, Cost C.


According to all of the researchers as above, the components of various costs were as follows.

Cost A : This included the items such as
- Value of hired human labour
- Value of hired and owned bullock labour.
- Value of hired and owned machinery hours.
- Value of seed (owned and purchased)
- Value of manures (Owned and purchased)
- Value of fertilizers.
- Irrigation expenses.
- Crop protection expenditure.
- Depreciation of implements and repairs, hiring of implements.
- Land revenue and cesses.
- Interest on working capital.

Cost B = This included Cost A + Rental value of owned land + Interest on fixed capital.
Cost C = It included cost B items + imputed value of family labour.

A special Expert Committee on Cost of Production Estimates was constituted on the 30th January, 1979 by the Government of India for reviewing methodology, procedure and other related issues concerning cost of production estimates. The committee was headed by Dr. S.R.Sen and hereafter referred to as Sen Committee and have brought out the report on the above aspect (1980). While recommending the new classification of cost, the Committee have kept in view the following things:

i. The new technology in agriculture has changed the agricultural panorama in the country.

ii. Personal cultivation has increased, replacing tenant farming to a large extent.

iii. The cost structure has undergone considerable change.

Keeping these things in mind, the Committee recommended the following classification of costs.

Cost A1 = All actual expenses in cash and kind incurred in production by owner operator.


Cost B1 = Cost A1 + interest on value of owned capital assets (excluding land)


Cost C1 = Cost B1 + imputed value of family labour.


While explaining the utility of such classification, the Sen Committee (1980) mentioned that Cost A1, Cost B1 and Cost C1 are free from land rent/rental element while A2 gives paid out costs including rent for
leased in land B2, in addition includes imputed rental value of owned land. Adding the imputed value of family labour to cost. B2 gives total cost at the farm. The classification is therefore, more meaningful from an analytical stand point and more useful from a practical one.

The committee further stated that the above classification permits computation of all the farm efficiency criteria usually derived so far. In addition, it enables computation of returns to land factor which is important over previous type of classification. Another distinct advantage is that the break up of cost by major components provides a range which the pricing decisions can be based on informed judgement.

Attempt has been made by Bal et al (1991) to use the above concepts advocated by the Sen committee, in his study viz. "An Economic Analysis of Farm Business in Punjab."

On critical examination of review on cost concepts as above, it was observed that it not only varied over the years but also from a scientist to scientist or organisation to organisation. The appropriate cost concepts that could be accepted, have been given in chapter III.

b) Valuation of Farm assets.
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The review in respect of the following farm assets is presented as below.

1. General.
2. Methods of valuation of farm assets in general.
3. Valuation methods for
   a. Land
   b. Farm buildings.
c. Machinery and equipments.
d. Livestock (draught animals)

4. Valuation methods for
   a. Farm produce in store.
   b. Fodder.
   c. Unthreshed crops.
   d. Standing crops (growing crops)
   e. Cultivations.
   f. Un-exhausted improvements.

General:

Before starting the farming business, one has to list out the items of assets that are available for production purpose. Having made a complete inventory of all the assets on the farm, the next step is to allot values to them. The list will then provide, in terms of money, all the resource available for production of agricultural commodities on the farm. Actually, the valuation of assets is one of the most important and perplexing problem with which the accountant has to deal. No doubt, it is highly important that realistic values have to be employed to the items of assets i.e. various resources used in the farm business.

Methods of valuation of farm assets:

The various methods of valuation of farm assets employed or suggested by few Economists, research institutions have been reviewed here.

1. According to Agrawal (1961), in the process of evaluation of inputs that go in production of agricultural commodities, the input factors have to be evaluated in terms of its market price i.e. the price at which it is available in the market or at the cost at which it is produced viz. the cost of production. He further stated
that for making a choice of the above two methods. The following principles should be observed:

i. The objective of costing.

ii. The general economy of agriculture.

iii. The simplicity and ease in keeping accounts.

2. Actually, the cost price basis should be the basis for valuation of farm commodities. The whole approach should be based on the basis of the objective in view. Indian Society of Agril. Eco Bombay (1961) viewed that if it is to know how much the product has cost the evaluation should be on cost price. If it is to know the value of assets created by the work done, the market price or farm value is more suitable.

3. Hopkins and Heady (1962) viewed the following methods be used for valuation of farm assets.

1. Valuation at cost.
   Valuation at cost means entering in the inventory the amount actually invested in the assets when it was acquired.

2. Valuation at cost or market price whichever is lower.

3. Valuation by available Net selling price:
   Under this method, the price which could probably be obtained for the asset, if marketed less the cost of marketing.

4. Valuation by Reproduction value:
   Valuation of asset under this method is to value the asset at what it would cost to reproduce it at present prices and under present method of production.

5. Valuation by capitalization of earning power:
   Assets like land can be valued through capitalization of their future earnings:
Value = \frac{\text{Annual net income}}{\text{Rate of interest}}

First method ceases to be useful after the farm business has been in operation after some years. It gives no guide to business decisions after conditions have been changed. Further, the record would not show the net worth of asset. This method is not useful for valuation of the items produced on the farm.

Second method seems to be arbitrary method wherein the lower of market or cost of assets is considered as its valuation. The valuation under this method would be understated or overstated. This is because, when prices are rising, cost will probably be the lower of the two valuation bases and when prices are falling, market price will be the lower of the two.

Third method is nothing but estimation of present worth of an asset. This method would be suitable for valuation of crops or livestock produced for the crops but is of little use in case of worn out items such as building or machines, for which there are no actual markets.

Fourth method is usually adapted to long lived or fixed assets.

Fifth method depends much on expected annual income and also expected interest rate.

4. Jain (1964) stated that the fixed assets are usually valued at cost less depreciation irrespective of their market values and floating assets on the basis of cost or market value, whichever is lower. He further stated that in cases, when the cost or the year of purchase of any property is not known, the individual farmer should
use his own judgement in estimating its value.

Yang (1965) viewed that in production of agriculture, many farm assets and a significant portion of farm products are not traded in the open market. Consequently, they do not possess an objective and recognised value. The main difficulty in farm accounting is in valuing a right farm assets and in determining the depreciation allowances for the appraisal of the farm's financial condition and of ascertaining its final success in the fiscal period.

6. Mallyan (1966) reported ten principal methods of valuation that can be used to evaluate the farm assets.

These methods have been listed as below:

1. Original cost.
2. Lower of cost of market.
3. Average cost price.
4. Cost of production.
5. Standard price.
7. Present value.
8. Capitalised income value.
10. Farm price.

Sturrock (1965) also mentioned the two methods of valuation mentioned by Agrawal as above and further stated that when a farm changes hands, the valuation of live and dead stock which the incomer takes over is based largely on market values. But, when valuations are made for book keeping purposes, cost of production is generally the most satisfactory basis. As a general rule, valuations are based on cost of production or market value whichever is the
lower. Hopkins and Taylor (1935) however used the term "purchase price" which forms the better basis of valuation and so while evaluating the farmers.

The methods of valuation followed by various research workers, cost accountants and the economists in evaluating various input factors of farm production have been reviewed here as follows.

**Land:**

The real object of farm valuation for cost purposes is to ascertain the investment value and reflect the normal return from land. But many of research workers differ in evaluation procedure of land. Some view that like other commodities, land does not enter the market frequently. Land is the mainstay of majority of people in India. The various land reforms in almost states of the country have imposed numerous restrictions on transfer of land. The sale-purchases of land are becoming scarce. Moreover, the land being a long term investment and its possession being assumed to be prestige issue, there arises a problem of its appropriate valuation.

Even then for cost accounting purposes, the values of land are to be determined or estimated by following some procedure.

The Directorate of Economics, Govt of India (1966, 1973, 1991) laid down the procedure for the evaluation of owned and self cultivated land. This stated that the land should be evaluated at rates prevalent in the villages, taking into account the differences in type of soil, distance from village, source of irrigation etc. This procedure was also followed by Jain (1981) and Bal et al (1991).
The method of valuation viz. multiple of the value of gross produce/ net produce (income) of land, suggested by Tandon and Dhondyal (1971) has some limitations for its use. In this method, one has to consider the series of prices for commodities which go into the produce and hence the cultivation of any crop with a view to get average production or so would depend upon the capital resources and managerial ability of a farmer. Therefore they suggested another criteria viz. Sale value of land as the basis of land valuation. But this method is also not sound under present circumstances. This is because, during the transactions of land, real price is not coming forth at the time of sale deed in the sub-register's office with a view to avoid the heavy stamp duty levied on sale transaction of land, a minimum value is stated by both the buyer and seller of land. So "Sale value of land" method does not form the right base for land valuation.

The method viz. market price of land has been suggested Indian society of Agril. Eco (1953). This method is also suggested by Agrawal (1961). This method through practical has however some limitations as the market price of land may be too high or too low depending the local situations. Yang(1965) mentioned that land should be evaluated on the basis of their current worth to the farmer. The price that the farmer is willing to pay for similar land should be taken as its value.

Another method viz. cost or purchase price method of land valuation put forth by Indian Society of Agril Economics (1953) and Jain (1964) though a proper or correct one, a view was expressed that this method can not be applied in cases of inherited lands as no cost figures are
available. In case the cost figures are available, they may not be appropriate values under present circumstances as over period of years, there might be improvement or deterioration of land productivity. Besides, the original cost may be too high or too low depending upon the conditions under which lands were acquired.

Jain (1964) also suggested the "Sales basis" method of valuation of land. Under this method the value of land is the price obtainable from its sale. This price is based on the recent sales of similar types of land in the locality or in a similar locality. The drawback of this method is that there are likely to be wide variations in sale values in times of booms and depression.

Indian society of Agril-Economics (1953), Tandon and Dhondyal (1971), Agrawal (1961) have mentioned that the "capitalising the rent of land" method is more accurate, convenient and of practical criterion for evaluating the land. Formula for valuation is \( V = \frac{R}{r} \). Where, \( V \) is the capitalised value of land, \( R \) is net rent, \( r \) is the rate of interest on long term investment. Although this method is accurate, the component viz. rent is now a days disappearing in many areas because of abolition of Zamindari or intermediary system of land tenure. Besides, because of erratic behaviour of season, the rent amount is not fixed but changes from year to year. Agrawal (1961), therefore, suggested the rent component may be replaced by net income and then the formula of land valuation will be as follows

\[
\text{Land value} = \frac{\text{Net income per year}}{\text{Rate of Interest}}
\]

This method is called as income method.
capitalization method. This method was also suggested by Hopkins and Heady (1962). Sing I.J. (1977) and Jain (1964). Considering the different views of the research workers and the Economists, the best and the simplest method as suggested by Dr. P.C. Patil (1927) be accepted. In this method, the inquiries of land values from local people are to be made and the transactions of sale purchase of land in the village or near about villages are to be taken into consideration. The real or actual value of land i.e. the actual transaction value but not the value recorded in Register's office is to be taken as the present value of land. This information is known to local village leaders and should be made use of as a base for determining the values of lands. It is important to note that whatever be the method taken and adopted in estimating the value of land, the values once taken in the inventory should not be changed from year to year except in situation where the major improvements of land are undertaken by the farmer. Yang (1965) also stated that the method of valuation must be rationally chosen and uniformly followed every year, so that financial statements prepared in the different periods represent true conditions and can be accurately compared. For interfarm comparisons, it is desirable that all farmers in the area should follow the same standards of valuation.

Adams (1921) expressed that the cost or purchase price of the land may be taken where it is possible to ascertain from recent records. The remaining two alternatives suggested by him are the current market price and the capitalised rent value. Though the former suffers from the speculative values entering into the prices resulting in too low or too high price of land, the I.S.A.E. prefered this to the latter which is subject to greater
variability due to vagories of seasons and variation in production.

FARM BUILDINGS:

On Commercial farms, the farm buildings include the structures like storehouse, implements shade, machinery shade, cattle byre, engine shade and electric motor shade etc. The cost of construction of these structures is generally the value entered in the inventory. But, most of the farmers in this country do not have separate farm buildings for each of the structures as above. The average farmers construct their residential house and parts of these houses are used for livestock, storing the seed, farm produce, fertilizers, pesticides, small equipments etc. The farm buildings can be evaluated by the procedures reported by the reasearch workers or the institutions.

Agrawal (1961) suggested that for part of the residential house being used for farm stock, if the area and structure can be clearly demarcated, their value can be estimated on cost or market price basis. If area can not be estimated a rough judgement, a portion of the cost of the residential houses can be charged to the farm account.

Hopkins and Heady (1962) argued that the principle of cost or of reproduction cost depreciated to the present should be applied in valuation of farm buildings. In case, the original cost of owned farm building is not known at the time of taking inventory, the reproduction cost method or replacement cost may be used. In this method one should value them at what it would cost to reproduce them at the existing level of building cost and depreciated them for the length of time already used.
In cost studies carried out by college of agriculture, Poona during 1968-69 to 1971-72, the value of farm buildings (where no separate buildings for farm business were constructed) was taken to 1/3 rd value of residential buildings, wherever, residential buildings were used for farming purposes.

Tandon and Dhondyal (1971) suggested the following methods.

1. Original cost less depreciation.
2. Market value.
3. Value at commodity.

The first method is also suggested by Jain (1964), but this method may not be appropriate if the cost data is to be used for determination of cost of production during the period of rising or falling prices. For the purpose, second or third method would be correct. Johl and Kapoor (1973) advocated the method viz. "valuation by replacement cost minus depreciation". This method is to value the asset at what it would cost to reproduce them at present prices. The Indian society of Agril Economics (1961) held the view that the value of fixed durable assets like farm buildings, wells, roads, fence drain etc. could be done by any one of the following four methods.

i. Capital originally invested in assets with due allowance for depreciation.
ii. At cost of production or replacement at existing prices.
iii. At sale or market prices.
iv. Imputed economic value.

Sing I.J. (1977) expressed that the old buildings should be evaluated by using the replacement cost minus depreciation method, and for the new buildings the cost minus depreciation method is preferred. While Yang (1965)
suggested that the farm buildings be evaluated on the basis of their current worth to the farmer.

The Directorate of Economics and statistics, Govt. of India (1973, 1991) used the simple evaluation procedure of farm buildings for cost crop-production studies. In these studies, the prevailing prices of farm buildings in the villages are considered. This method was also used by Jain (1987). Patil P.C. (1933) used the simple method of valuation where in the values are based on the basis of local enquires and looking into the conditions of the buildings. This seems to be workable method for cost studies. After having considered the methods as suggested or used as above, for cost accounting purpose, if it is started a fresh, the method suggested by the Directorate of Economics and statistics would be correct one.

In third method, the value of the building is assessed on the basis of detailed estimates of the material used in the building and the cost of construction. It is divided into three heads viz. (a) Cost of land (b) Cost of structure (c) Depreciation. They also suggested another method viz. "Sum of the Present worths of its Future Income" and is stated as below.

\[ P = \frac{a \left[ (1+r/100)^n -1 \right]}{n \left[ \frac{r}{100} - (1+r/100) \right]} \]

Where

- **P** - Present value
- **a** - Expected annual income from farm building (i.e. approx. its rent)
- **r** - Expected rate of interest
- **n** - Estimated life in years.

The method is theoretically sound but in practice, it is very rarely used.
Machinery and equipments (implements):

Prior to introduction of machinery like tractor on Indian farms, the farmers were using implements such as iron plow wooden implements such as plough, harrow, seeddrill, bullock cart and other small tools. The valuation procedure of such implements was very easy as these were locally made and their manufacturing costs were known to the farmers. In cases, the implements are purchased in towns, their purchase price can be taken up in inventory. However, with the introduction of mechanical technology, the use of tractor, thresher, oilengine, electric motor is slowly increased. These being costly items as compared to the wooden implements, their values were required to be accounted for in the inventory of farm fixed assets. Regarding implements, machinery and tools, Adams felt that the best way to place the value (on a machine) is to carefully estimates the year of remaining life and then by considering the age and cost (of the machine), a fairly correct value can be assigned. Jain (1964) was of the opinion that in actual practice, the scrap value, being small, is usually ignored and a percentage on the original cost or diminishing value is deducted at the end of the year. Panse (1954) adopted the approximate current value of the implements and their anticipated life for evaluation.

The Indian Society of Agril. Economics, Bombay suggested that the original cost method should be preferred to in most cases because of the nature of these assets and the fact that it is possible to know their original cost price.

Jain V.K. (1981) also suggested that the locally made implements be valued on the basis of how much it
costs to make an implement and fix up the inventory value after taking into account the number of years used, the existing condition and possible future usefulness. Singh J.J. (1977), Johl and Kapoor (1973) and Sturrock (1965) suggested that the cost minus depreciation method be adopted.

As regards the purchased items, there was no difference of opinion among the research workers and the Economists (Johl and Kapoor 1973, Directorate of Economics and statistics, Govt. of India (1973), Agrawal G. D. 1961, Jain V.K. 1981) in accepting the purchase price of these items as inventory value. However, the Directorate of Economics and statistics, Govt of India (1966, 1973), Agrawal (1961) have used the simple method where in prevailing market price of such items were used as its values for their cost studies. This method is well suited when the purchase price or cost price is not known. In brief, it may be stated that whenever the cost prices or purchase prices of machinery and equipments are known, these values be used and in cases where such prices are unknown, then the present market prices be accepted for valuation.

Hopkins and Heady (1962) and Jain (1964) stated that the equipment is usually valued at cost, depreciated to its present condition.

Livestock (Draught animals):
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The draught animals maintained on the farm form an important asset but in view of latest development of machinery use on the farms, the use of bullock power is declined to some extent. The average farmer do maintain a pair of bullocks for carrying out various tillage operations. The draught animals are also used for hauling purposes wherever necessary. The farmers purchase such animals either locally or from the livestock market. Some
farmers do breed on their farms for which cows/buffaloes are maintained. The valuation of such draft animals have been reported by many researchers as below.

Adams (1921) is of the opinion that in valuing farm animals, the farm value should be preferred to the market value. While Jain (1949) preferred the cost of rearing the farm animals upto 2 1/2 years for taking the inventory of farm breed animals. Where this is not possible, the I.S.A.E. felt that a little (10%) below the market price may be adopted. The actual market rate if recently purchased, the farm value in the case of home bred bullocks and the current market rates in other cases was adopted for inventory of animals on the farm.

Yang (1965) suggested that the draft, breeding and other productive animals can be evaluated according to their current replacement value.

Sturrock (1965) suggested that the trading livestock should be valued at cost of production basis while the productive livestock be valued, for the first time, at the estimated cost of production, which will be slightly less than market value.

Jain (1981) have stated that the purchased bullocks be valued on the basis of original price less depreciation while home bred bullocks may valued at market price. The Indian Society of agricultural Economics, Bombay (1953) stated that in the case of home breed cattle, the problem of valuation is somewhat complicated because of their being neglected and left to fed for themselves on free and stray grazing till they reach the earlier period of productive capacity. However, rough etimation of cost of rearing the cattle upto earliest productive stage should be 081
done. Second method would be to fix the price for the animal less 10% of the cost. In case of purchased bullock the actual cost (including the transport cost) must be taken into account with due allowance for depreciation based on the remaining estimated useful life of the animal on the date of purchase. In case of absence of information on cost and age of bullock or work animal, whether purchased or farm bred, the value should be estimated at a figure that would equal the fair market price.

The Directorate of Economics and Statistics, Govt. of India, 1966, 1973 and 1991 accepted a simple method of valuation of draught animals which is nothing but to value the animals at market price. Even the age of animal exceeds 13 years, the prevailing market value of the animal at the time of taking inventory is taken. The animals are supposed to have depreciated fully at the age of 13 years.

Of the methods suggested the above, the simpler method as suggested by the Directorate of Economics and Statistics, Govt. of India, New Delhi could be accepted under conditions of Indian farmer. It is also necessary that the price of bullocks once fixed by adopting any method of valuation should not be changed every year at the time of inventory. Once the particular basis of valuation is adopted, it should not be changed every year. If we change the price every year according to market price, the cost accounts will have to show paper profit or loss in the statement of accounts every year. Sturrock (1965) also remarked that juggling with valuations i.e. making the valuation of animals every year, is undesirable and defeats the object of accounting which is to show the genuine profit or loss on the year's trading.
FARM PRODUCE:

Farm produce includes the stock of farm produce on hand viz. grain, feeding stuff, bhussa, straw, silage, milk products etc. At the end of the year these are evaluated by following some procedure so as to incorporate them in annual financial statements.

Orwin (1917) viewed that in making valuation of goods produced on the farm, the basis must be in every case, the cost of production of the matter concerned. Under no circumstances must the market prices be allowed to exert any influence or serious misconceptions may result. Patil (1927) reported that the value of produce sold and even that part which was held over was calculated at market rate at harvest. The commodities kept for home consumption were valued at the current local rate at harvest.

Yang (1965) Mallyon (1966) suggested that the farm produce in store can be evaluated according to market price less the cost of marketing. Indian Society of Agricultural Economics (1953) viewed that in case of products held for sale, the appropriate basis is the 'Farm Value' i.e. market price minus the probable cost of delivery to market.

In case of harvested crops, the main product and by-product should be evaluated at price prevalent during the harvesting period when bulk of the products is disposed off (Jain 1981), (Govt. of India 1966).

Fodder crops:

The Directorate of Economics and Statistics, Govt. of India, 1966 viewed that the Fodder crops should be valuated at the rate prevailing in the village while the Indian Society of Agricultural Economics used the
cost of production basis.

Jain (1981) suggested that the fodder be evaluated at the rates prevailing in the village. Tondon and Dhondyal (1971) mentioned that in U.S.A. the basis of valuation of farm produce, feed, fodder, and manure is 'Opportunity cost'. They further stated that under the existing conditions of farming in India the better way of valuation is to charge farm produce commodities at prices current in the locality.

Unthreshed crops in stocks:
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The Indian Society of Agricultural Economics, 1961 suggested that the unthreshed crops may be valued on the estimation of yield, assigning value to it at market rates, making allowances for cost of threshing, winnowing, carting etc.

Standing crops or growing crops:
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These are usually valued at cost of production upto the date of valuation. This was expressed by Yang (1965), Jain (1964) Mallyon (1966), the Indian Society of Agricultural Economics, (1961). However, Yang stated that the valuation of growing crops cannot be very accurate unless cost accounts are systematically kept or unless standard values based upon opportunity cost are set up by accounting agencies for use by all the farms in the region. Jain (1964) also stated that, in case, cost of production data is not available, the value of standing crops could be an estimated figure only.

Cultivations:
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Cultivations mean the expenses incurred on various operations on fields which remain unsown on the date of valuation or closing inventory. e.g. summer plowing, summer harrowing, clod crushing, operations carried out in
the fields. The charges paid on these would be the valuation of such items. (Jain, 1964)

Unexhausted Improvements:

There are some items of land improvements and the like carried out on a farm during a year which are not exhausted within that year and their effect last for longer period e.g.

i. Leveling the fields.

ii. Making embankments and irrigation channels

iii. Digging Kutcha wells.

In such cases, the initial cost (actual cost) is divided by the number of estimated year’s life and this amount will give annual charge to be deducted at the end of each year from the initial cost of land improvements. The value of the unexpired benefits is thus carried forward.

DEPRECIATION OF FARM ASSETS

Depreciation is the decrease in value of an asset through wear and tear. The wear and tear of farm assets like buildings, machinery, equipments, work stock etc. are gradual and depend upon the service taken from the asset, care or attention given to it and the timely repairs made on it. The Indian Society of Agricultural Economics, Bombay (1953), Jonl and Kapoor (1973), Hopkins and Heady (1935) have listed the following important methods of working out the depreciation of farm assets.

1. Annual valuation at market price. (This is also called 'Revaluation method')

2. Straight Line Method (Fixed Instalment Method)

3. Sum of years digits method.

4. The Compound Interest Method.
5. The Diminishing Value Method. (i.e. Diminishing Balance Method.)

Singh I. J. (1977) listed only three methods in the above list at serial No. 2, 3, 5 while Tondon and Dhondyal (1971) listed the methods as given at serial No. 1, 2, and 5 in the above list.

All the methods as suggested above are not usually made applicable to various farm assets. The Economists, Research Workers/Institutions have suggested/used some selective methods for the various farm assets. These have been reviewed below.

While commenting on various methods of depreciation, Johl and Kapoor (1973) remarked that every method has its strong and weak points but for most of the purposes normally straight line method is used.

Singh I. J. (1977) also stated that the straight line method is the most commonly used method because of its simplicity in calculation. In this, the depreciable value is formed by subtracting the salvage value from the cost. The depreciable value is then divided by the number of years the items is expected to last. This gives the average annual depreciation of the use of the items for the year.

Farm Buildings:

For working out depreciation of farm buildings, Johl and Kapoor (1973) suggested the first method while Indian Society of Agricultural Economics, Hopkins and Heady (1935) have suggested the straight line method. The Govt. of India (1966) have used straight line method and depreciation is calculated at 5% for Katcha Buildings and 2% in case of Pucca Farm Buildings. Jain (1951) and Tandon...
and Dhondyal (1971) also followed the same procedure.

Machinery & Equipments:

Johl and Kapoor (1973) suggested the 'Annual Valuation at Market price' method for working out the depreciation of machinery and equipment. However, they specified that the method of Diminishing value be used in case of depreciation of tractor. Because this method possesses certain advantages which makes it applicable for general use. It allows a higher charge of depreciation in earlier years than in later years. The diminishing value method is also suggested by Hopkins and Heady (1935) and the Indian Society of Agricultural Economics, Bombay (1961). The Society pointed out the method adopted by Dr. Orwin, the then eminent economist of England.

Dr. Orwin's method envisages to depreciate each implement separately by assigning it a life and finding out the depreciation by dividing the cost or value by the number of years of life.

According to the Directorate of Economics and Statistics, Govt. of India, 1966, the depreciation on implements and machinery excluding irrigation equipments is calculated on the basis of expected life of implement plus cost of repairs if less than Rs.10/-.

Patil P.C. (1933) emphasised that if the equipment of the farmer consists of costly machinery and implements it is better to ascertain the approximate life of machinery and its probable scrap value. The balance between the original cost or first inventory value and the scrap value may be distributed over number of years, the implement is expected to give work. And each year, its value may be reduced by that amount. If the implement lasts longer than
its expected life, value during such years may be carried as scrap value. This procedure of calculation of depreciation is nothing but application of straight line method of depreciation. This is also suggested by Hopkins and Heady (1962). The rate of depreciation to be applied to present value or purchase price of machinery and equipments reported by various Economist / Institution is given below.

Depreciation rates given by Jain (1981)

<table>
<thead>
<tr>
<th>Item</th>
<th>Depreciation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractors</td>
<td>10 %</td>
</tr>
<tr>
<td>Thresher</td>
<td>10 %</td>
</tr>
<tr>
<td>Deshi Cart</td>
<td>20 %</td>
</tr>
<tr>
<td>Short live assets</td>
<td>100%</td>
</tr>
<tr>
<td>Whole charge during the year</td>
<td></td>
</tr>
<tr>
<td>Fodder cutter</td>
<td>20 %</td>
</tr>
<tr>
<td>Well</td>
<td>2 %</td>
</tr>
<tr>
<td>Pump Set</td>
<td>7.5 %</td>
</tr>
</tbody>
</table>

Depreciation rates given by Tandon and Dhondyal (1971)

<table>
<thead>
<tr>
<th>Implement</th>
<th>Depreciation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plow, Harrows</td>
<td>10 %</td>
</tr>
<tr>
<td>Water lift</td>
<td>5 %</td>
</tr>
<tr>
<td>Fencing</td>
<td>5%</td>
</tr>
<tr>
<td>Wells</td>
<td></td>
</tr>
<tr>
<td>Tube well</td>
<td>10 %</td>
</tr>
<tr>
<td>Pucca well</td>
<td>3 %</td>
</tr>
<tr>
<td>Katcha well</td>
<td>15 to 20 %</td>
</tr>
<tr>
<td>Tractors (Life in hours= 10000)</td>
<td>Cost - Scrap value</td>
</tr>
<tr>
<td></td>
<td>10,000</td>
</tr>
</tbody>
</table>

Jain (1964) mentioned few methods of depreciation that can be used for various items on the farm. These were as follows
1. **Straight line method.**

   It can be commonly used for depreciating farm buildings, machinery, implements, furniture and adult live stock.

2. **Diminishing Balance Method:**

   Suitable in case of depreciating machinery and equipments.

3. **Sum of the years digits method:**

   Suitable for those assets which depreciate heavily during the first few years and slowly in the later period of live stock.

4. **Depreciation Fund or Sinking Fund Method:**

   Suitable for plant machinery and other wasting assets.

5. **Annuity System:**

   Under this system, fixed rate is charged on the amount invested in the acquisition of asset. This method is suitable in respect of long leases where the outlay is considerable.

6. **Revaluation method:**

   Mostly useful in case of depreciating the live stock.

   Jain (1964) however suggested the use of diminishing value method of depreciation in case of machinery. The depreciation rates of various items as suggested by him were as follows.

   i. Improved plows, wooden persion wheel, electric motor. 10 %
   ii. Chaff cutter 12.20 %
   iii. Pipes, pumps and oil engine 7 %
   iv. Wooden implements 20 %
   v. Bullock carts. 12 %
   vi. Tractor 20 %
Dey (1993) calculated the depreciation at the 2% of Gross Income from agriculture. This procedure has also been adopted by National Council of Applied Economic Research for 'All India Household Survey of Income, Savings and Consumer Expenditure in 1967-68.

Hopkins and Heady (1936) have also suggested the the Sum of the year Digits method for working out depreciation of machine on the ground that this method has some advantages over the diminishing balance method. It avoids an undistributed balance at the end of the useful life and depreciates the investment to the scrap value assigned.

Although the methods of depreciation as suggested above for various machineries and equipments are sound due to its peculiarities, the method viz. straight line method that is being used by the Directorate of Economics and statistics. Govt. of India and others is workable, simpler for cost accounting purposes for the farms in India.

Patil et al. (1978) calculated the depreciation by the straight line method at the rate of 2% in case of Pucca buildings and 5% in case of temporary (Katchha) building. In case of implements the rates of depreciation were calculated at the rate of 10% for iron implements and 20% in case of wooden implements while that of bullock carts, it was 15%. Minor repairs were directly added to the depreciation charges, while major repairs were treated as addition to the value of implements and depreciation on its value was charged in the usual way.

Acharya (1985) calculated the depreciation for items of fixed capital as per average value and life of the item of fixed capital.
LIVE STOCK:

The draft cattle used for draft purposes on farm do have some appreciation value in its earlier year and get depreciated over its productive life. The Directorate of Economics and Statistics, Govt. of India (1966) have assumed the life of draft animals as 13 years for the purpose of calculating depreciation. Its value has been taken to appreciate during the first 3 years in the ratio of 1:3:5, constant upto five years and depreciated thereafter upto the age of 13 years; at 12.5 % p.a. in a straight line method. If the age of animal exceeds 13 years no depreciation is accounted for. If the animal is died during the year, total remaining value has been debited to the crop account. The Indian Society of Agricultural Economics (1961), Bombay have also suggested this method. But Jain (1981) assumed the average age of bullock as 10 years. Depreciation has been charged at the rate of 20 % after the age of five years, while Tondon and Dhondyal accepted 10 % rate of depreciation to be charged for bullock by straight line method.

Patil P.C.(1933) followed the procedure wherein, the depreciation of bullocks was arrived at by valuting the animals at the beginning and at the end of the year. An allowance of 5 % due to death rate was made. In this method, animal is valued from 5th to 16th years of age without anticipating any fluctutations in bullock prices and some kind of recknor is prepared and the percentage depreciation and death allowance is prepared for the age of animal right from the 5th year to 16th year. These percentages are 5.00, 15.00, 23.51, 23.18, 21.66, 25.00,
30.00, 38.33, 55.00 and 0.00 for those years respectively. This method involves valuation every year and introduces subjective element.

The Indian Society of Agricultural Economics and Statistics, Bombay (1953) stated that in USA, the experts value the work horses from year to year and on this they do not take into account the changes in the market value of animals. In the U.K. on the other hand, the procedure is to value animal at cost or purchase price after assigning to it a working life, depreciating it annually by dividing it by the number of years of probable life.

Mallyon (1966) stated the stud sheep and cattle, wherever possible, be subjected to an expert valuation. While, in case of surplus selling stock, their value would be based on best farm price.

Jain (1964) viewed that the depreciation of farm bred working animals of age 4 years should be calculated by dividing the value of the animal at the age of 4 years after deducting skin or meat value at the end, (if any) by 8, being the number of years of his estimated working lifes. In the case of purchased bullock, his remaining useful life should be estimated on the date of purchase. His cost i.e. purchase price - the value at the end of his working life, if any, should be divided by remaining no. of years of his useful life. The resulting will be the annual depreciation.

VALUATION OF ITEMS OF VARIABLE AND FIXED COSTS

The farm costing envisages the cost of various items, may be fixed cost items or variable cost items, that go into production of agricultural product. The issue of
categorisation of farm cost into fixed cost and variable cost is already discussed earlier. Here the procedure of evaluation of items of costs, is discussed.

HUMAN LABOUR:

Under Indian conditions, mostly family labour is used. On commercial farm, the casual labour is engaged. On some farms annual farm servant is also employed. The costing of all these categories of human labour is reviewed below.

1) HIRED HUMAN LABOUR:

In this case, almost all agree that hired human labour employed on casual or work contract basis, should be costed at the wages paid to them. Pande (1961) stated that the wages paid to hired labour are often paid in kind partly or wholly. If such kind payment is made out of purchased stock, the purchase value of such kind payment is known and there is no difficulty of evaluation. Generally, however, such kind payment is made out of home produce and in this case, the value of home produce to be considered may either be harvest price or prevailing market rate.

Patil P.C. (1927) viewed that, whatever the farmer has actually to pay for outside human labour was charged against the crop for which such labour was employed. Payment in kind for labour was converted into cash at market rate of the commodity for which such labour was exchanged.

Panse (1954) also stated that the hired labour employed for different field operations was charged at prevailing rates of wages. Panse and Bokil (1966) and Jain V.K. (1981) also costed the hired labour at the wages paid.
Sen Committee (1980) viewed that the hired labour should be evaluated at actual paid out cost including perquisites for either services. However, a view has sometimes been expressed that the hired human labour should be charged at the administered rates. The administered or statutory rates of hired agricultural labour fixed by Govt. involves some welfare motive. But there would be deviation from the costing principle if the statutory labour rates are considered for costing of hired labour, when they are paid either more or less than the statutory rates. So the hired labour may be annual or casual should be charged at paid out charges.

ANNUAL LABOUR:

This type of labour, now a days is paid in both ways

i) Fully on payment in cash

ii) Partly in cash and partly in kind with some perquisites.

In order to allocate this type of labour cost among different enterprises / crops, it is necessary to work out labour charges per day on the basis of total yearly payment and total no. of days in a year for which the work was done by the annual labour. In a farm management studies and cost studies sponsored by the Government of India (1966), the wage rate for the annual servant was worked out by dividing the total wages paid to the servant in cash and/or kind by the total number of eight hour working days irrespective of type of work.

Here the value of payments made in kind estimated at the harvest prices has been taken to be the total wages paid to the servant. Payment in kind include
Agrawal (1961) stated that the wages paid to the permanent labour can be calculated by following simple procedure. The wages made in kind payment and other perquisites should be included. In case the permanent labour on the farm attend partly to household work either every day or when there is no work on the farm, a proportionate deduction in this total wages is to be made to arrive at working days of the labour for farming purpose.

FAMILY LABOUR:

There are differences of opinion on the question of evaluation of family labour. According to one view, family labour has no opportunity cost or at best a cost corresponsive to permanent farm labour. The other view is that family labour has the same cost as that of casual labour and that it should be equated to the latter according to operations performed. Panse (1954), Agrawal (1961) emphatically stated that the imputation of family labour be done at the rates of wages paid to permanent labour.

However, Panse (1958) later on mentioned that the evaluation of family labour can also be made by adopting the wage rate of casual labour.


While some have evaluated the family labour at the prevailing wage rates for hired labour in the
Agrawal (1961) rightly pointed out that sometimes, on small farm, no permanent labour is employed. In such cases it may be desirable to impute the value of family labour at the rates of wages paid to permanent unskilled labour in non-farm operations in the rural areas or at the rates of wages paid to casual labour, during the slack seasons whichever is lower.

However, Panse (1958) mentioned that the evaluation of family labour can also be made by adopting the wages rate of casual labour although there is a difference of opinion among economists as to whether family labour should form a component of the cost of production or should be included in the farm income.

Dey (1993) also took the same view as Panse V.G. and stated that it is the general practice of valuing the family labour at the prevailing wages rate for casual labour, even though the imputation of family labour at the rate of wages for casual labour has an element of inflation.

In farm management studies, Directorate of Economics and Statistics (1966) have specifically stated that:

a. Man labour days of the family have been evaluated at the village average wage rate for annual servant.

b. Woman and child labour of the family have been evaluated at the wage rates prevailing in the village for hired woman and child labour.

c. Exchange or gratis labour were evaluated at family labour rates.
Patil et al (1978), Dhongade and Dangat (1985) treated the exchange or gratis labour on par with the family labour and wages have been inputted as in the case of family labour.

Some farmer leaders view that the family labour being assured of duty conscious, turning out the job superior both in quality and quantity over hired labour. It needs to be paid atleast 20 % more than the hired wage rate or statutory rate which ever is higher. They also add that, one or two family members are always engaged in skillful daily operations like tractor driving, sowing, maintenance of oil engines, farm implements and tools. In such cases, these family workers need to be paid on par with wage of hired skilled labour prevailing in the locality.

The another view is expressed that the family labour has no opportunity cost as there are least opportunity for family workers outside the farm. And so on many farms, family labour put their idle hours for some repeat operations which might have been required by the crop/farm. So hired wages considered for family labour would lead to higher labour cost to the crop production. Therefore, it would be proper to evaluate the family labour at the wage rates of hired labour prevailing in the village for a particular operation. And whenever, family labour performs, skilled labour work, the wage rates in such cases should be those prevalent for skilled labour work in the village.

ICWA (1980) reported that the committee on public undertakings in their third and eighth report concerning Jute Corporation of India Ltd. have
evaluated the family and hired labour on the basis of statutory minimum wages of Rs. 8.40 per day of 8 work hours.

ANIMAL LABOUR:

Next to human labour, animal labour also constitutes the sizeable cost on the farms of average farmer. However, on big farms and commercial farms, the mechanical technology is being introduced very fast where use of tractor is common. The maintenance of pair of bullocks is continued on average size of farms. The small farms usually do not afford to maintain bullocks for farm work. In some cases, they are maintained with a view to hire out on custom service basis for agricultural operations or hauling work. For cost accounting purpose, the valuation of bullock labour is to be done by following some procedure. The methods suggested or used by researchers/institutions have been reviewed below.

1. Patil P.C. (1927) quoted that the hired bullocks were charged at the actual payments made for it. In case of owned bullock labour, the cost is arrived at by considering the values of feed and fodder, depreciation charges, death allowance and housing charges, interest on the value of bullocks and of feed and fodder given to them.

2. Panse (1954) stated that if the principle of evaluating owned bullock labour at prevailing rates of hiring the bullock, is accepted it would no doubt, introduce very considerable simplification in the farm business analysis work. But it would inflate the cost of bullock labour, as the rates of hiring the bullocks would include a margin to provide the bullock owner some
profit over and above the cost of maintenance of animal. This necessitates the estimation of the cost of bullock labour on the basis of its maintenance cost i.e. the cost of feed, grazing, depreciation of bullocks and its shade and the total amount of work done by the animals during the year. Further problem in estimation of owned bullock labour arises when the farmer maintains few milk animals and young stock along with bullocks and attend to them together in various items of work such as feeding, grazing, watering, etc. To make realistic apportionment of the net cost incurred between working bullocks and other animals consequently presents the problem.

3. In a study carried out by Department of Agriculture, Govt. of Maharashtra, (1958), the cost on account of farm bullocks are worked out at average daily hire rates at each centre. The cost on account of exchange and gratis bullock labour was also worked out similarly. The cost on account of hired bullock labour was worked out by considering actual hire charges.

Patil et al (1978), Dhongade and Dangat (1985) and Dey (1993) have accounted the owned bullock labour as per the hired bullock labour prevailing in the locality.

4. Panse (1958) and Agrawal (1961) reported that the hired bullock labour is valued at actual rates of hire, while the owned bullock labour is evaluated at its maintenance cost.

5. ISAE (1953) quoted that The I.C.A.R. applied such principle in bullock labour costing, wherein the account of feed consumed, items such as shoeing, veterinary attention, upkeep, depreciation of shelter, interest thereon and also investment on animals were considered.
On the credit side were noted the items of manure obtained and work done outside the holding (owner farmer). The balance was divided by the total no. of days worked in the year to get the figure for the daily cost of bullock labour.

6. Panse and Bokil (1966) and also in farm management studies, the Government of India accepted the usual method of costing hired bullock labour viz. costing at the rate paid. However, the major portion of bullock labour being provided by owned bullocks or bullocks working on exchange basis. Cost of this labour was arrived at on the basis of rates calculated by dividing the total cost of maintenance of draught animals including their depreciation by total work days credited to them.

7. The Government of India (DES) in their comprehensive scheme for studying the cost of principal crops, estimated the charges on owned bullock labour on the basis of maintenance cost and productive employment of draught animals. The maintenance cost included the following.

   i) Cost of green and dry fodder
   ii) Cost of concentrates.
   iii) Depreciation on animals and its sheds.
   iv) Unkeep labour charges.
   v) Other expenses of any.

From the total cost of maintenance the value of dung produced and receipts if any, against hiring out of the bullocks were deducted to get the net maintenance cost. In case of labour charges on upkeep and depreciation on cattle sheds, details of which are available for all the livestock together, apportionment as between the draft animals and other categories has been done on the basis of no. of standard units in the different categories.
which are,

i) A bullock, cow, buffaloes, horse.
above two years ... one animal unit

ii) Sheep or goat ... 1/5 animal unit

iii) Young stock between one and two years ... 1/2 animal unit

iv) Young stock below 1 year 1/4 animal unit

In the event of death of a draught animal the inventory value (less the value of hide and skin) was charged to the maintenance account.

Acharya (1985) valued the own animal power for the concerned crop on the basis of prevailing hiring rates in each area.

In the Farm Management Studies sponsored by the Directorate of Economics during sixties and seventies, animal maintenance cost of a bullock has been taken as the base for imputing owned and exchanged bullock labour with the exception of studies in Mysore (Karnatak) and West Bengal states where prevailing rates of hired bullock were considered for imputing the cost of owned and exchanged bullock labour. While in the study carried out by Mukhopadhaya (1990), an average cost of a bullock pair/day was arrived at by dividing the total bullock labour cost by number of bullock pair days per hectare for the individual crops.

MACHINERY CHARGES :
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Of late, the use of machinery is being increased on large farms and the commercial farms. The use of tractor is common in sugarcane area of Maharashtra.
Similarly due to irrigation development programme, the use of oil engine and mostly electric motor is also being made by those farmers who have irrigation facilities. In such cases, the charges of machinery are sizeable. These charges are to be accounted as per cost accounting principles.

Agarwal (1981) stated that for estimating the charges towards machinery use, the maintenance and running cost, interest and depreciation are totalled. Any income earned by hiring out the machine is deducted. The net cost thus arrived at is divided by the total days of utilization on the farm. Minor repairs of the machine are treated as item of maintenance while the major repairs to the machine should be considered as an addition to the value of the machine. In the farm management studies carried out by the Directorate of Economics and Statistics, Govt. of India, New Delhi during 1954-55 to 1956-57, repairs charges exceeding Rs.10/- were treated as major repairs. But considering the present inflation, the amount of Rs.10/- is too meagre for major repairs. Some sizeable amount, viz. Rs.500/- and above should be considered. This may vary from machine to machine. Agrawal suggested the limit of 5 to 10 % of cost of the implements costing less than Rs.100/- and 1 % in case of implement costing more than 100/- rupees as minor repair charges.

Directorate of Economics and Statistics, Govt. of India, 1973 and 1991 worked out the charges of owned machinery on the basis of cost of maintenance of farm machinery which included diesel/electricity, lubricant, depreciation, repairs and other expenses. More or less the
same procedure for many cost studies, as suggested by Agrawal (1961) was followed. In this, the charges of owned machinery are worked out on the basis of its maintenance and its utilization. The total maintenance cost inclusive of depreciation of machinery is to be related to the number of hours of use to arrive at the rate of expenditure per hour of machinery utilization. The method thus suggested the more accurate and can be accepted for accounting of machinery charges.

The farmers who take machinery on hire like tractor for plowing, clod crushing, threshing machine for threshing farm product. Oil engines for lifting water for irrigation etc. may account for the amount actually paid.

IMPLEMENT CHARGES:
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The Directorate of Economics and Statistics, Govt. of India have estimated these charges (1973 & 1991) for their cost studies by taking into account the depreciation and the charges on account of minor repairs of implements. This procedure was also maintained by Panse & Bokil (1966).

Patil P.C. (1931) worked out the implement charges by considering the actual depreciation i.e. difference in the values of the opening and closing inventories and the interest at 12% on the value at the beginning of the year.

The valuation procedure for estimating the implement charges as suggested by the Directorate of Economics and Statistics could be accepted in farm cost accounting.
Acharya (1985) had valued the actual use of own tractor for the concerned crop in hours by using the prevailing rates of tractor hiring in the village.

**IRRIGATION CHARGES:**

Canal irrigation charges actually paid by the farmers can be taken as it is, for the costing of irrigated crops. Similarly in cases where irrigation charges paid by the farmer to the lift irrigation society can also be taken as it is. The irrigation charges thus paid may be allocated on the basis of number of irrigations and area proportionate basis.

Panse & Bokil (1966) reported that in farm management studies, the expenses incurred and paid in cash for water are included under 'Irrigation charges' head. In case of owned well, cost of water is calculated on the basis of depreciation and cost of repairs of the well and the water lift, apportioned between crops in proportion to their utilization. Expenditure on the labour employed in irrigation is not included under this head but under human and bullock labour.

In the above method, the depreciation of water lifting devices such as oil engine and electric motor and its operating expenses, their fuel, oil charges, electricity charges in case of electric motor and minor repair charges should be included under irrigation charges.

Patil et al. (1978), Dhongade and Dangat (1985) viewed that the irrigation charges included the irrigation charges to irrigation for the use of canal water. In the case of well irrigation, actual charges paid for fuel or electric power used, be considered.
In the farm management studies and also in the method adopted by Mukhopadhyaya (1990) the irrigation charges have been valued by taking up the sum of items viz. depreciation and repair charges of owned irrigation equipment and cost of fuel oil, lubricants etc. The actual payments made for purchasing water were also included.

Acharya (1986) observed three models of irrigation in the study on production prices and marketing of pulses and cereals in Rajasthan. Accordingly, cost of irrigation were computed. Wherever canal irrigation was used, the amount paid for the crop was included. In case of hired water from the pump sets and wells of other farms, the actual charges paid by such farmers was included. In the case of farmers using owned pumps (electric or diesel) for irrigation, operating cost of these pumps (electricity/diesel/lubricating oil for diesel pumps, repairs charges) were included here while depreciation and interest on capital cost were included with fixed capital separately. Electricity or diesel and oil costs were computed for the actual hours of use for a crop based on per hour conception and prevailing prices which the farmer has actually paid.

**MATERIAL INPUTS:**

Material inputs include seed, manures (farm yard manure), fertilizers, pesticides, fungicides, fuel oil, feeds, fodder, etc. The charges of these inputs are sizeable but usually not much greater than labour charges.

Fatil (1933) considered the price of seed purchased as its cost to the crop for which it was used. Farm grown seed is also charged at the current local rate.

In brief, the purchased material inputs have to be evaluated at the actual prices paid and the transport charges if any. In case of farm grown inputs, mainly seed, farm yard manure, the cost of production basis should have been used. Earlier Hopkins and Taylor (1935) also suggested that the farm yard manure be valued at the prevailing rates in the locality.

Some view that the owned seed should be valued at 25% higher than the highest conception price of a particular commodity prevalent in village or nearby market as farm produced seed is quality seed and is well taken care of in its production process. Similar view is taken in respect of owned farm yard manure.

On the issue of costing of farm produced seed, fodder and manure, Orwin (1917) writes "in making valuation of goods produced on the farm, the basis must be in every case the cost of production of the matter concerned. Under no circumstances must be the market price be allowed to exert any influence or serious mis-conception may result. In USA the basis of valuation is 'Opportunity Cost'.

Panse (1958) also viewed that the home grown seed, manures should be charged at the cost of production or else standard sale price be used. But the cost...
of production basis being somewhat complicated procedure, the simple procedure viz. evaluation at the prices prevailing in the village at the time of use of these inputs be used.

SUPERVISION CHARGES:

Jain (1981) stated that the majority of agricultural holdings in India is family managed and as such the supervision of agriculture to a great extent, is carried out by family members themselves. In view of this, it is difficult to compute supervision charges separately in terms of money-value. Some authorities however, recommended to allow supervision charges at the rate of 10% of the working capital. In this study, no supervision charges were calculated as no special agency for supervision was kept and the cultivators while working on the fields, supervised the work occasionally.

Patel D.P. (1971) considered the supervision charges at 10% of working capital of the crop.

WATCHING CHARGES:

V.K. Jain (1981) viewed that the process of watching may be categorised as:

a. General watching of the whole farm.
b. Watching of two or three standing crops.
c. Watching of individual crops.

The process in the first category is adopted in the case of either Government farms or big holdings. In this case, charges are added up at the end of the year and are transferred to the establishment charges and divided amongst the various crops in proportion to acerages.
In the second category of the process, there is divergence of opinion as some are of the view that the watching charges at the end of the year should be added up and adjusted on the basis of total No. of crops and the area under them and the crops requiring more intensive watching should be charged at a little higher rates. Others suggest that the watching charges be allocated according to the value of produce.

In the third category the entire cost is assigned to the individual main crops as they need special watching.

In the study carried out by Jain (1981), it was found that the services of the watchman were utilised exclusively for individual crops like jowar and maize etc. and hence the entire cost was charged directly for the concerning crop.

Indian Society of Agricultural Economics, Bombay evaluated the effective hours of watching at ordinary rates and distributed equally over all the crops excluding those which ordinarily would not be watched independently. The family watchman generally spends both his day and his night in the field. In such case 24 hours of watching need not be counted but effective hours of watching be taken into account. Family labour here be evaluated at ordinary rate for a watchman's labour or at a special low rate.

OUT PUT:

Value of main product and by-product has been considered at post harvest prices in almost farm management studies. In cost of cultivation studies sponsored
by the Directorate of Economics and Statistics (DES 1973, 1991) and Mukhopadhyya (1990), the Sen Committee (1980) also agreed with the practice of evaluating farm products at the post-harvest price prevailing in the village or the nearby market duly adjusted for transport/marketing charges.

Ram (1962) viewed that the yield of crops both main and by-products be valued at going market prices of the respective crop. The part of produce, given to labourers as kind payment should also be valued at going market prices and the amount should be considered as an income from crop, however, it should be as cost in payment of wages to labourers.

**INTEREST ON WORKING CAPITAL**

1) A working capital includes the charges of following items.

1) Hired human labour (Casual, contract, annual).

2) Bullock labour (owned and hired).

3) Machinery charges (owned and hired).

4) Seed (farm grown and purchased).

5) F. Y. M. (owned and purchased).

6) Fertilizers.

7) Irrigation.

8) Pesticides and insecticides.

9) Misc. & incidental charges.

The depreciation and the land revenue taxes are not included.

The farmer uses either his own capital or borrows from financing institutions or private money lenders. In farm costing, the charges towards the interest on working capital has to be considered.
There are wide differences of opinion amongst those who calculate the interest on working capital. Some view that the period to be considered for charging the interest should be half life period of crop while others say that it should be full period of crop life. This is because, the former group expresses the view that bulk of the capital required for tillage operations, expenses use of improved seed, manures, and fertilizers is required partly before sowing and partly immediately after sowing. Very little is required for harvesting, threshing etc. and hence full period of crop life should be considered.

P.C. Patil (1933) mentioned that in the U.S.A., interest on operating capital at going rate, is included in the cost of production. English view is against including interest on operating capital in the cost of production on the ground that cost which includes interest cannot be true cost but cost plus some profit. Dr. Patil P.C. did not support this view as the exclusion of interest on operating capital does not satisfy other conditions. Investment in operating capital if withdrawn and is kept in bank will fetch some interest and so, in considering farming as a business, it is therefore fair to include interest on operating capital in the cost. He, in his cost of cultivation studies, charged the interest on the capital required for a particular operation, from the date of operation, till the produce was actually ready for market.

Panse (1958) viewed that a reasonable rate of interest has to be adopted in farm cost studies, as it is difficult to ascertain with any degree of reliability the rates of interest actually paid by farmer for borrowed
capital. In most of the early reports on farm management studies sponsored by Govt. of India, interest on working capital has not been worked out. Farm Management studies carried out in Meerut and Muzaffarnagar region in Uttar Pradesh, however, provides an exception where interest on working capital has been charged at 6% per annum for which the crop occupied the field. As against this, no interest has been charged on fixed capital. Considerable inter-regional variation in the rate of interest on working capital is noted in the Farm Management studies conducted in the late sixties.

In this context, Agarwal (1961) viewed that the interest need not be calculated on working capital on the assumption that it is difficult to estimate the average operating capital during the year and the period for which the interest should be charged on it. It was also viewed that, in our farming practices, there is not much cash or kind expenditure, the major part of actual payments is in the form of land taxes, rent, irrigation charges etc. usually paid from the sale proceeds of crops. However, here again, the present trend is towards capital intensive farming, a practice is to charge the interest on the total working capital for six months i.e. half the agricultural year.

Patel D.P. (1971) charged 10% interest on the amount spent for cultivation of crop during the year.

While Patil et al. (1978) and Dhongade and Dangat (1985) charged the interest at the rate of 13% per annum for 3 months / 6 months in case of seasonal and perennial crops respectively. In case of Adsii sugarcane crop and banana crop, the interest was charged for 9 months.
Directorate of Economics and statistics 

Government of India, (1991) has been charging the interest at the rate of 10% per annum (12.5 per annum in Maharashtra) for the half period of crop on the working capital i.e. cash or kind expenses excluding the items of land revenue and taxes.

Sen committee (1980) suggested that a weighted average interest rate based on from the various sources for short term loan may be estimated to arrive at appropriate rate of interest for working capital. Working capital should be charged the interest for half the period of the crop. This practice is based on the assumption that the working capital expenditure is evenly spread between the sowing and harvesting periods of the crop. Some criticizes that, in the new technology in agricultural production the major working capital expenses are on seed and fertilizer, both of which are expended at the sowing time or before and harvesting and threshing expenses are not so much as is for seed and fertilizer. Secondly, the initial working capital is loan-financed and contracted at the beginning of the crop and rest are farm supplied at various periods. However, the committee recomended that a weighted average period, taking value of inputs used as weight, be computed to decide the time period for charging interest, for each area and for the principal crops separately. This time period may be reviewed after every five years.

Acharya (1985) calculated the interest on working capital at the rate of 12% per annum for half length of production period of crop. Here, the working capital included the sum of total paid out cost.
e) Valuation of items of fixed Costs :

The items of fixed cost included the following.

i. Interest on fixed capital items.

ii. Rent of land.

iii. Management

i. Interest on fixed capital items :

The farmer invests the amount on various fixed assets before initiating his crop production activity. On the farm, the investment is usually done on the following items.

i. Farm land

ii. Farm buildings.

iii. Livestock draft animals for crop production.

iv. Implements and machinery

v. Irrigation structures like well, oilengine electric motor, pipeline drains etc.

In costing of farm or farm product, the interest on the fixed capital (either own or borrowed) has to be considered. The interest on value of land is not to be accounted as this amount has been accounted in the form of rental value.

But wide differences of opinion exists as to the validity of inclusion of interest on investment in the cost figures. According to some people that this is not element of cost, others regard it as a cost if paid or not a cost, if not paid. While still others consider it a cost whether paid or not. Views of some of researcher workers have been given below.
Pati (1933) brought to the notice of farm cost Accountants that the depreciation and interest on fixed investment items like bullocks and implements need not be clubbed together. They should be separated. The separation of interest from other charges is found convenient to pick up the same for including in the farm business income. As against this, the DES (1966) in their farm management studies considered the interest on agricultural assets excluding land and was calculated at 3% in all cases.

In the farm management studies conducted in the 1950's interest on fixed capital has been worked out mostly at the rate of 3% per annum. In the farm management studies, for Meerat and Muzaffarnagar region of U.P., no interest has been charged on fixed capital. In some of the regions where rental value for owned land has not been worked out separately interest has been charged on fixed capital including land. Even in the recent reports on Farm Management studies, the interest rates of fixed capital ranged from 6% to 8% in different districts selected for study. Besides, the method of apportionment of interest on fixed capital was also not common in all the region. In some regions, apportionment has been done on the basis of proportionate area of different crops to total cropped areas. In other regions, the proportionate value of the respective crops to total value of all the crops has been considered.

Rent of land:
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In view of the land reforms in various states of the country, the practice of leasing in or out the land is being declined. The method of estimating the rent
for leased land is to consider the actual amount paid to land owner and this is a direct cost. But in case of owned land, the land being the factor of production, its share towards its use has to be imputed. Many Economists have differences of opinion in issue of inclusion of land rent in the cost of production. They argue that even if the rent is accepted for owned land, it may not influence the price of product, but it is the cost to those who pay it and so if it is cost to tenant farmer, on the same analogy, it is justifiable to consider the same in case of owned land.

The other justification, that is put up is that in case, the investment in land if withdrawn by selling it outside and the amount is deposited in fixed deposit, it will give some interest. So some share of land has to be considered in case of owned land, in the form of imputed rental value of land. The views expressed by the economists and the organizations have been reviewed below.

Patil F.C. (1933) carried out some farm cost studies. He accepted the following procedure i. in the case of leased land, the actual cash paid or when leased on share and some perquisites, their value is charged. ii. In the case of owned land, rent is charged at rates, current in the community for such lands.

Patel D.P. (1971) considered Rs.150/- as an amount of rent of land per year during 1970-71 but the basis of this rate of rent is not mentioned.

The ISAE stated that the tendency in recent economic thought and accounting practice is to include rent as an element of cost. It is suggested by a
few that the question of inclusion or otherwise of rent and interest on real estate should depend on the object underlying the cost of production studies. If the object is to judge the comparative efficiency of farms, they would exclude these two elements. If the object is one of price fixation and state assistance to farms, they would include rent and interest in the cost of production. From the individual farmer's point of view, rent should figure as an element of cost. In the determination of rent and interest, where the land is leased and the capital borrowed, the procedure is easy.

In the case of owner farmers, the Americans adopt 'the alternative use value' as the basis for determining rent and interest. In India, this base may not be suitable. Here, the land and its improvements form major part of farm investment. Land has always a sentimental, social and speculative rent value. The rents whether they could be ascertained, are normally below the interest calculated or expected on the value of land.

T.G. Shirname (1953) viewed that in calculating the cost of production, it could be desirable to charge the normal rate of rent as cost and also include the interest for that portion of the capital which has been actually borrowed by the farmers.

Panse (1958) viewed that, in case of land, sale-purchase transactions are very very few and so it is difficult to judge the correct value of land, required for estimation of rental value of land. Moreover it involves the personal judgement in valuation of land. The usual method of
evaluating the rental value of land is to charge a reasonable rate of interest on the value of land.

In the farm management studies sponsored by the Government during the mid-sixties, the rental value has been calculated either on the basis of 3 per cent interest on the value (excepting that for Pali region in Rajasthan) of land or on the basis of prevalent rents of similar land. In the farm management studies carried out during seventies and early eighties, there is disparity in the method of estimation of rental value, as the rates of interest considered for charging it on the value of land ranged from 2 to 7 per cent in the districts of different regions selected for study. And this has led to difficulty in comparing the rental values of land in different regions of the country.

Acharya (1985) stated that mostly the land is leased out or leased in on produce and/or cost sharing basis. The rent has to be such that reflects the productive capacity of land. The imputed value of land was taken as lower of the one-tenth of the land value or value of one third produce from the land.

Sen committee (1980) pointed out that the rental value of land is probably the most disputed item of cost in economic literature. In comprehensive scheme, a rental value equivalent to the prevalent rents in the area is computed. The charge so computed is subject to the ceiling of 'fair rent' as fixed in the state legislation. The latter is determined as a fixed proportion of output evaluated at the harvest price.
A no. of alternative procedures to compute rental value of owned land have been suggested:

a. An appropriate rate of interest on the value of land.
b. Market rent.
c. 'Fair rent' as defined in the state legislation and
d. A fixed proportion of output valued at harvest price as per national plan.

First alternative is very simple but in practice, it is difficult because the choice of interest rate is the real problem. Besides, the real problem lies in the objective determination of the economic value of land. In country like India, where the pressure of population on land is there, the ownership of land offers the best form of security and so the transactions in land are few. Besides, land values are sensitive to product prices, Govt. price support and urban development. Under conditions of inflation and/or rapid expansion of new technology, the speculative element pushes land values to unreal values.

Imperfections of rural land market and the high content of speculative and non-economic elements in the few sales of land that are actually recorded and errors in mutations make it difficult to assess the economic value of land. For these reasons, the state legislations provides special price fixation for land acquisition for public purpose. And so such values of land if considered for computation of rent, would be disputable question.

The Committee further stated that the cash rental rate and share rent are probably better indicator of demand and supply position of the agricultural land in rural areas. Generally market rents are related to
productivity of land. But now, because of enforcement of some land legislations in various states, the practice of renting in or out of land is not common. So this method cannot be accepted for determination of rental value of land. The committee further viewed that the 'fair rent' as defined in the state legislation is another alternative often advocated to determine the rental value of land. The uniform rental rates based on fixed proportion of output demed to be desirable from the point of view of comparability of reward to the land factor can be basis for the imputation of rental value of land. The lacuna in this method is that the same parcel of land put under different crops will yield different rental value. This apart, the variations in the fixed proportion say 1/8th to 2/5th between states, and this will result in large variation in the unit cost of production for the same crop.

The Committee pointed out that the draft K.Y.P. 1978-83 states that the States where the rent exceeds the limit accepted at national level i.e. 1/5th to 1/4th of the gross produce, should scale down the rent through legislation.

All the imputational methods are open to criticism. The Committee has considered the imputed rent of land on the basis of market rents as it is the most appropriate procedure. In case this practice is uncommon in the state, actual rents paid by other cultivators in the village may be taken into account.

Govt. of India (1966 ) viewed that the rent has been estimated for the land owned by the cultivators on the basis of prevalent rent in the village for similar
lands. However, the Directorate of Economics and Statistics, Govt. of India has suggested for their cost of cultivation studies of major crops in Maharashtra (Kapre 1974) that one sixth value of Gross produce of the crop be taken up as rental value while under state scheme of cost of cultivation studies, the procedure for calculating the rental value is to take 1/4th share of value of gross produce of crop/s. (Kapse 1992) and Jain (1981). While Bal et al. (1991) estimated the rental value of owned land on the basis of prevailing rates in the village for similar type of land. Patil et al. (1978) and Dhongade and Dangat (1985) considered the rental value of owned land as 1/6th of the value of gross produce of the respective crop.

It is to be mentioned that, the method adopted by the DES, Govt. of India for cost studies in Maharashtra is stated to have basis of land legislation of Maharashtra Government. Dandekar and Khudanpur (1957) stated about fixation of rent in their paper on working of "Bombay Tenancy and Agricultural lands Act (Amendment 1955)". They pointed out that according to this new amendment, the rent should be reduced in such a way that the total amount of rent, land revenue and local fund cess paid by the tenants should not be in any year exceed the value of 1/6th of the produce. In view of this, the DES (1991) mentioned that the rental value of owned land be estimated on the basis of prevailing rents in the village for identical type of land subject to the ceiling of fair rents given in the agricultural land act of the concerned state.

Lastly it can be argued that the average sale prices of land do not provide a suitable base for estimation of land value because of speculative and non-
economic dealings in a few sales of land that are actually being recorded. So the only alternative left for the calculation of rent of owned land was on the basis of either the fair rent fixed by the State Government or the market rate.

III. Management as an item of cost of production:

It is always said that the Indian farmer plays his role in various capacities such as owner, labourer and entrepreneur. He is the man who has control over his farming resources. Besides, he has control over the methods of farming and also over the marketing of farm output. In other words, he has to see the five aspects of his farm business.

1. What to produce?
2. How to produce?
3. When to produce?
4. Where to sell?
5. When to sell?

So he is decision maker. The role of the farmer in his decision making or managerial capacity is to assemble, organise and co-ordinate the use of various resources in an effective way.

Panse (1958) pointed out that a great difficulty is there in evaluating the farmers own physical labour in organising the cultivation and his management skill and initiative and further stated that the general consensus of opinion in India is that it should form the part of the farm income. In the investigation on the cost of production of sugarcane carried out in 1958-59, however, the farmer's supervisory labour and management have been considered as
legitimate items of cost of production and an allowance equivalent to full crop season's labour for a male adult is considered towards it and 10% of the gross value of the produce was accounted as an item of cost towards the farmer's role of supervision and management.

Under cost studies carried out by research institutions and research workers, the management item was not considered as an item of cost of production of crops. Very few have attempted to include this item over and above the total cost. (Patil et al. 1967). Many have expressed the view that in case, full time farm manager or farm supervisor is employed to look after the management aspects or supervision aspects of production, the charges, payment made to them can be considered as management or supervision charges as the case may be.

ICWA (1980) mentioned that the committee on public undertakings (1977-78) in their third and eighth report concerning Jute Corporation of India Ltd., included management charges as an item of cost of production of jute. In that, the management cost has been assessed at the rate of Rs.800/- p.m. per 10 acres for a period of six months and further stated that this provision has been made for cost of management and supervision (including risk taking) which should be conceptually different from the cost of family labour.

Hopkins and Taylor (1935) mentioned that the manager or operator of a business combines several different functions. First he generally does some actual labour which compares to that of hired man. The status of wages of this labour should be based on opportunity cost.
principle. In addition to this, the operator of farm or other business generally supervises the work of other persons who are employed by him. This function of supervision is hired on large farm business. This corresponds to special grade of labour. Thirdly the business manager or operator also has the problem of decision in various occasions on the farm business. The major decision he has to make about buying and selling of commodities which involve serious element of risk and is to be borne by the Operator. Such services of operator needs to be rewarded. But there is no standard rate of remuneration for this purpose and under such situation, the simplest and the most satisfactory way out of the dilemma seems to allow the business operator to receive whatever return he can get above the market rate of remuneration for labour and the use of capital.

The Sen Committee (1980) also mentioned in its report that there are two schools of thought about the management charges. One group holds the view that the management is an essential input of modern farming and so successful farm operators are said to spend more time in organising timely supplies of off farm inputs and selling their products then those who rely primarily traditional market channels. The extra effort and expenses involved should be counted for.

Other group is of the view that since the management leads to efficiency and higher output if it is fully paid for in terms of additional output. To this, the committee pointed out that, in theory, the managerial function is distinguishable from the entrepreneurial function. Yet it is the quantification of management input and lack of acceptable measure of award that presents
difficulties. It was for this reason that the mangement was, in the past, treated to be awarded in profit alongwith the entrepreneurial function. The Committee agreed that wherever a hired manager is employed, payment to him should be treated as cost. It is not possible to use such cases to the opportunity cost of management of farmers in general.

The Committee further mentions in its report that the suggestion of some people that some fixed percentage of cost be treated as management charges. Although the management is not hired and paid out, it is possible to ascertain its opportunity cost with a fair degree of accuracy. But others say that in situation of falling prices of agricultural commodities, the management charges considered as above would not be covered at all and hence do not favour any arbitrarily % cost on account of managerial functions and are of the opinion that the management functions be regarded as paid in profit alongwith entrepreneurship and price policy makers may keep this fact in view while fixing procurement prices.

It is also argued that the aspect of management involves time and expenses. A farmer manager have to look out for timely availability of casual or contract labour, credit institutions or Government offices district offices, sale / purchase co-operative associations for enquiry into availability of agricultural production inputs and timely purchase of the same. So this, expenditure and time spent by the farmer manager is identifiable and measurable and should be treated as cost. But it is rather difficult to isolate such expenses and to find out a method of allocating the same between different farm enterprises.
Attemps are being made by the Directorate of Economics and Statistics, Govt. of India, New Delhi to collect some information on this aspect under cost of cultivation studies carried out in Maharashtra State. The proforma for the purpose is suitably designed so as to give the necessary data of time spent and expenses incurred on superiority/managerial functions. The time spent would be evaluated at the family labour rate and adding the actual expenses to it will approximate the total expenses on managerial functions. Chaudhary et al. (1968) attempted to examine the significance of management factor in commercial agriculture for this purpose two sets of farms, having same size of farm, same cropping patterns, livestock enterprises excluded, were compared to measure the managerial ability by using economic criteria such as

i. Net farm income

ii. Productive man work units

iii. Investment in machinery.

iv. Crop yield index.

v. Returns per rupee invested.

vi. Expenditure on irrigation.

Valuation of output :

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Values of main product and bi-product have been considered at post harvest prices in almost all farm management studies. In cost of cultivation studies sponsored by Directorate of Economics and statistics (DES 1973, 1991), Mukhopadyaya (1990) and the sen Committee (1980) also agreed with the existing practice of evaluating farm products at the post harvest prices prevailing in the villages or the nearby market duly adjusted for transport / marketing charges.
Kam (1962) viewed that the yield of crops both main and by products be valued at going market prices of the respective crop. The part of product given to labourers as kind payment should also be valued at going market prices and the amount should be considered as an income from crop. However, it should be as cost in payment of wages to labourers.

(F) ALLOCATION OF COSTS AND RELATED ISSUES
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i) Allocation of cost:

Allocation of cost is one of the very important questions in cost allocating. The seed sown, fertilizer applied, labour employed for various agricultural operations viz. plowing, harrowing, sowing, weeding, harvesting and threshing different crops can easily be recorded and their costs can also be debited to the respective crops. There are some fixed charges or overhead charges which need to be distributed among different crops or enterprises on the farm. These overhead charges include the charges towards annual farm servant, depreciation and interest on fixed capital, rent paid or rental value imputed, supervisor employed for supervision on the farm. The problem of allocation also comes up in cases of production of joint product (e.g. grains and fodder in case of jawar, bajra, paddy production), mixed cropping growing of more than one crop on the same piece of land (i.e. multiple cropping). Similarly, when the manures (FYM) are applied to a crop, the question is to how much of it is to be charged to that crop and how much for the crops grown during two succeeding years. Watching of crops of the entire farm or watching of few plots grown with some commercial crops also needs attention for
allocating of cost incurred in paying the watchman or watching charges.

The above issue of allocation of costs among different crops/products has been considered by the economists/research institutions and some procedures have been laid down and these have been reviewed as below.

Problem of joint cost:
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Joint product is a product of the same operation or set of operations like grain and straw in case of paddy, jawar, bajra, maize etc. The Indian society of Agricultural Economics Bombay (1953) stated that the cost of production incurred for the whole product (e.g. jawar) is actually for both the resultant products viz. main product (grain) and by-product (fodder). In study of cost of cultivation of such crops, one comes up against the problem of allocating or distributing expenses among main and by-product of the crop. For the computation of accurate cost of cultivation of main and by-product, allocation is necessary for both products separately. The allocation of combined cost of cultivation may be based either on the ratio or the deduction of the value of the values of by-products from the total cost.

The Indian Society of Agricultural Economics (1953) suggested the following methods for allocation of joint costs.

i) Charging the by-product at market price and deducting from the total cost in order to obtain the net cost of the primary (main) product.

ii) Apportioning of total costs according to the market value of the joint products.
iii) apportioning of total costs according to feed value of the product.

In first method, in period of abnormal price relationship, the price of secondary product may be comparatively quite high and may thus give a wrong proportion. G.D. Agrwal (1953) has illustrated this with example. He therefore suggested that the apportionment should be done on the basis of the ratio between their market prices.

Patil (1927) stated the most common method for distribution of joint costs among the groups of product is on the basis of relative market prices of the products. He also stated another method viz. 'By-product' method for allocation of joint costs. In this, less valuable crop is considered as bi-product and its price is deducted from the total expenses to find the cost of main product. The method fails when the prices of bi-products rises and then after deducting such high value of by-product from total cost, the remained value being the cost of main product is very less as compared to that in normal price situation of main and by-products.

In the cost of cultivation study, sponsored by the Government of India (1973) in various states of the country, the allocation of cost between main product (grain) and by-product (Bhusa/fodder) is being done by following a procedure wherein the value of by-product is deducted from the cost of cultivation to get the cost of cultivation of the main product. In earlier farm management studies carried out during 1954-55 to 1956-57, the cost of
production of joint product was allocated according to the ratio of the values the output of main and by-product to the total value of output.

Sen Committee (1980) pointed out the defects in residual method for the apportionment of total cost of cultivation between the main product and by-product, In this method, the by-product is valued at market price at the harvest time. The amount is treated as receipt and is, therefore, deducted from the total cost of cultivation per hectare. The net cost so derived is divided by the total quantity of main product. The market price of the by-product as its cost of production which may not be true. At times of scarcity of the by-products, their prices are unduly high and consequently most of the cost of cultivation gets apportioned to the by-product. The cost of production of the main product, therefore, gets deflated. In extreme cases, the unit cost of production of the main product may even become negative. The method thus fails to reflect the real world situation.

The alternative method is what is known as the 'proportionate method'. Under this method, the allocation of cost of cultivation between the main product and the by-product is done on the basis of percentage receipts from the sale values of two products. The committee recommended the second method viz. proportionable method of allocation of costs. This method has followed in earlier farm management studies during sixties (Indian Society of Agricultural Economics, Bombay, 1961) and also by Jain (1987) in his study.
PROBLEM OF MIXED CROPS:
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A farmer, instead of growing single crop in the field in a season, he, sometimes, takes up more than one crop in the same field during the season. Such growing of crops is said to be 'Growing of mixed crops'. The crop mixture may be of the following forms:

i. Two or more crops are sown in separate lines in some ratio. e.g. cotton and Tur in 10 : 2 ratio, meaning thereby that every after 10 lines of cotton there would be 2 lines of Tur.

ii. Two or more crops are grown in mixtures in the same line. Here seeds of two or more crops are mixed together and are sown. Thus, in this type, in every line of sown crops we can see plants of two or more crops as the case may be. e.g. Bajara is grown alongwith math and matki crops. In case of such situation, the problem of separation of combined cost among the mixed crops. The combined costs are such as cost towards preparatory tillage, sowing, weeding, irrigation etc. Other costs such as harvesting, threshing etc. are the crops specific. So in separating the combined cost among the mixed crops the following basis are suggested.

i. The value of the product of the different crops (Indian Society of Agricultural Economics, 1953, 1961, Sen Committee, 1980)

ii. Area under the crops

ALLOCATION OF COST BETWEEN CROPS:
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As the cultivator normally raises more than one crop on his farm by way of double or multiple and mixed cropping the necessity of allocating the cost to
different crops arises. Such common costs or joint costs are observed in case of following items:

1. Interest and depreciation on farm buildings, implements, machinery, livestock.
2. Land revenue, taxes, cesses etc.
3. Rent.
4. Human labour for miscellaneous work on farm as a whole.
5. The residual effect of FYM.
6. Irrigation charges.

The Directorate of Economics and Statistics, Govt. of India, 1966 and 1977, 1994 in their farm management and cost studies have allocated the interest on fixed capital items in proportion to acerage under the crops to the total cropped area. The depreciation on farm buildings are also allocated in proportion to hectarage under the crops. In case buildings are used for specific crop, the whole amount has been debited to that crop.

About the allocation of depreciation of implements, it was done in proportion to bullock pair labour days put in for the different bullock drawn implements. With respect to specific implements, the cost has been debited to the crop for which they have been used.

Sen Committee (1980) viewed that the basic principle in allocation of joint costs viz. interest and depreciation of fixed costs items, land revenue, taxes, etc. The rent is to allocate these costs on the basis of use. Therefore, the interest and depreciation of farm buildings, farm machinery charged to the concerned crop and where two or more crops are involved the allocation should be done in proportion to the use of the equipments.
drawn implements, the number of bullock labour days would give correct basis. For others, human labour days can serve the purpose. The depreciation and interest on the value of bullocks may be allocated between different crops on the basis of their use on the crop concerned. In case of farm buildings, these can be done easily as the use of such buildings is purpose specific. e.g. Cattle shed, tractor shed, oil engine shed, small godown for strong farm product.

Hopkins and Taylor (1937) reported that the overhead charges cannot easily be allotted to any particular enterprise. Rent, interest, depreciation, repairs to implements, wages of watchman and residual values of manure are examples of overhead charges. There has not been found any best method of allocating indirect charges even in countries like America, England where farm management science has made considerable strides. They suggested that the interest and depreciation should be allocated in proportion to ratio of operating expenses of the single enterprise of the total farm operating expenses.

Tandon and Dhondyal (1971) suggested that the interest and depreciation may be distributed over various crops in the same proportion as exists between either of the two and the total operating expenses while Patil el al. (1978) allocated the interest charges to individual crops in proportionate to the area under each crop.

The Institute of Cost and Works Accountants of India, Calcutta viewed that in case of the joint expenditure, a pro-rata basis apportionment may be adopted. say, for instance, interest on fixed capital may be apportioned on the basis of area of each crop to total
cropped area. It is further stated that the basis of apportionment logically may be different with respect to the characteristics of each item of expenditure. The main point is that such bases should be reasonable. Wherever it is not feasible to allocate joint cost on basis of use-time, the costs may be allocated on the basis of value of gross produce.

Jain (1981) allocated the deprecation in respect of farm buildings and implements in proportion to the area under the crop while in respect of irrigation equipments, it is in proportion to the irrigated area under the crops while allocating the deprecation, the implements were categorized as general and special. The former being those used for all crops such as plough, harrow etc. while special implements are specific crop such as sugarcane ridger for sugarcane. The depreciation of general implements has therefore been allocated among different crops in proportion to the area while that of special implements to the particular crop. The interest on fixed capital items has been done in the proportion to the area under the crop to the total cropped area.

Land revenue, cesses, taxes on the farm have been allocated to the crops in proportion to area under them to the total cropped area. Specific taxes and cesses were allocated to respective crops for which they were levied. (Directorate of Economics and Statistics, 1966, 1973, 1992, Jain 1981) Mukhopadhyaya (1990) reported that in most of the farm management studies, the apportionment of land revenue on the basis of area under the crops. In some studies, growing period of the crops has also been considered along with their respective area.
Rent:

In the seminar organised by Indian Society of Agricultural Economics, 1961 it was viewed that the cultivator generally pays his rent for his entire holding. Then such rent has to be allocated to different crops raised by him. It can be done in 3 ways.

1. On the basis of value of crops.
2. On the basis of quantity of produce of crops.
3. On the basis of area sown under different crops.

If the area base is used, the area may be double or triple cropped area. Besides, the area may be sown with pure/single crops or mixed crops. In mixture crops, one of the crops may stand in the field throughout the year and other crop may be harvested within short period i.e. before six months. The ECAFE Centre considered that the basis of allocation of rent should be duration of respective crops.

Hopkins (1935) reported that the Rent should be distributed over the cultivated land at a flat rate per hectare and then apportioned on the crops according to their growing period.

Patil (1931) reported that in India, land rent forms an important part of cost of production. In his study, rent was ascertained from plot to plot in case of leased in land. In case of leased out, the rent actually paid or share paid is considered. He further stated that in England and America, rent of holding is distributed generally by acreage treating all land alike. In his cost of cultivation study carried out during 1927-28, the rent was allocated in proportion to the value of the crops. In the case of crops, which are merely supplementary (and not
corapetitative), the rent of the full period of rotation is distributed in proportion to the value of the produce of different crops entering into rotation.

The Indian Society of Agricultural Economics, Bombay (1961) mentioned that in overall cost accounting and in single enterprise costing techniques, the allocation of rent to a given crop is to be calculated on the per-acre basis. In case of lands which are double cropped the distribution of annual rent between the two or more crops may be done in proportion to their value.

Shirname (1953) also expressed that the rent be apportioned among the crops in rotation, on the basis of valuation of crops done arbitrarily. The Department of Economics and Statistics, Govt. of India (1966, 1973, 1992) have also adopted very simple procedure of distribution of land rent /rental value of land among different crops in their relative proportion to total cropped area on the farm.

Sen Committee (1980) viewed that, where rents are not specific for each crop, the allocation of rent and rental value should be done in proportion to the value of output of each crop to the value of gross output of all crops raised. However, Tondon and Dhondyal (1971) mentioned that the rent should be distributed over the cultivated land at the flat rate per hectare and then apportioned on crops according to their growing period.

Jain (1964) stated that in case two or three crops are taken in a year, rent is allocated either in proportion to the time taken by each crop or in proportion to the values of the crops produced during the year.
Irrigation charges:

The cultivator generally pays a lumpsum amount for irrigation, may be towards canal irrigation charges or co-operative lift irrigation charges. The charges are levied either on day basis or acre basis. However, these charges need to be distributed among different crops. The basis for this purpose, may be the following:

1. The value of produce or the quantity produced.
2. No. of irrigation hours.
3. No. of acers irrigated.

The Indian Society of Agricultural Economics (1961) suggested that the best practical method of allocation of irrigation charges is the irrigated area under each crop. The Directorate of Economics and Statistics, Govt. of India (1968) accepted the method of allocation for the farm management studies during 1954-55 to 1956-57 in which irrigation charges were allocated in proportion to irrigation days for crops while Hopkins and Taylor (1935) and also Tondon Dhondyai (1971) suggested the common irrigation charges be allocated on the basis of the value of the crops raised.

(G) FARM BUSINESS EFFICIENCY MEASURES

Raw data in the various schedules or in the financial record of farm business will have little value for the management of farm, unless they are properly summarised, tabulated and analysed. In that, the computation of various farm efficiency measures will have to be undertaken. These efficiency measures are to be designed to visualise the outcome as envisaged by the objectives or goals of an activity in relation to the efforts made. In
farming business, the effort is always made to make use of scarce resources among different activities keeping in view the objective of profit maximisation. Johl and Kapoor (1973) stated that efficiency measures are the tools of farm management analysis. Several measures to explain the efficiency of the business as a whole and in parts thereof are available. They help the farmer to point out the weaknesses in the farming business and provide guideline as to which part of business deserves the special attention for making comparisons.

Measures of size and Volume of Farm Business:

Farmers are commonly advised to increase the size of their business to get greater income. Size, however, is a complex factor to measure. Yang (1965) viewed that for the farms growing mainly the crops, one should know

1) The area of the farm (Net area)
2) Total cropped area
3) The area devoted to one or two of the most important kinds of crops, while Katar Singh and Sharma (1968) and Singh I.J. (1977), Karam Sing and Kahlon (1977) and Sankhyan (1983) mentioned the following measures of farm size.

1. Total hectares of farm operated land.
2. Total productive man units.
3. Total capital investment.
5. Total annual inputs into the farm.

Johl and Kapoor (1973) quoted the measures in different forms viz. A. Physical measures - Aggregate measures. This included i. Total area of the farm ii. No.
of livestocks iii. Total production. B. Financial measures
: i. Total capital managed. ii. Gross Income iii. Gross
expenses iv. Gross profit.

Sing l.J. (1977) mentioned more or less the same measures.

Measures of Capital Efficiency :

Jachak and Borude (1983) used the following capital efficiency measures:

i. Capital per rupee of gross income.
ii. Capital per worker (man equivalent)
iii. Rate of capital turnover.
iv. Rate of return on investment.
v. Input-output ratios.

Of the above the measures those at S.No. 2 and 3 were also suggested by Johl and Kapoor (1973) and those at 4 and 5 were suggested by Tandon and Dhondyal (1971).

Measures of Labour Efficiency :

The following labour efficiency measure have been suggested by both Katar singh and Shram (1977) and Yang (1965).

i. Total cropped area per man equivalent
ii. Gross income per man.

Johl and Kapoor (1973) also suggested the efficiency measures at Sr.No. 1 while Jachak and Borude (1983) worked out the following additional efficiency measures of labour in their study.
i. Employment per man equivalent (days)

ii. Returns to labour
   a. Gross income per man per day.
   b. Farm business income per man per day.
   c. Family labour income per man per day.

Financial Efficiency measures:

These measures can be studied from two angles viz. by working out cost ratios. The following ratios as used/suggested by the Economists and the farm Management specialist, provide the basis needed for comparing the relative efficiency of various farms and also in judging the efficiency of the same farm from year to year.

Cost Ratios.

1. Operating cost ratio.
2. Fixed cost ratio.
4. Cost per hectare.
5. Cash expenses ratio.

The above ratios at Sr. No. 1 to 4 as above have been suggested Johl and Kapoor (1973) Tandon and Dhondyal (1971) Katar Singh and Sharma (1977) and Sankhyan (1983).

Income Ratios:

The following income ratios have been suggested by many Farm Management Specialist (Johl and Kapoor 1973, Tandon and Dhondyal 1971, karam Singh and Sharma (1983), for measuring the farm efficiencies.
1. Rate of turn over.
2. Net income per Rs. 100 of capital.
3. Net income per hactare.
4. Income over cash expenses.
5. Return for family labour/ha.
6. Capital turn over ratio.

Sankhyan (1983) presented the farm efficiency measures in following parts.

I. Size or volume of farm business.
II. Capital position of farm.
III. Financial success of farm.
IV. Efficiency.

Under first parts, he stated the same measures as suggested by Karam Singh and Sharma (1968) and others.

As regards the capital position of farm he has stated the following measures.

1. a) Net capital ratio = \( \frac{\text{Total assets}}{\text{Total liabilities}} \)
   b) Working capital ratio
   c) Current capital ratio.

2. Turn over of assets = \( \frac{\text{Total receipts}}{\text{Total assets}} \)

3. Profit to total assets = \( \frac{\text{Total profit}}{\text{Total asset}} \)

While the measures of financial success of the farm, were stated as follows.

1. Net farm income.
2. Net family income.
3. Cash income.
4. Net operating income.
5. Return to farmer's management and capital.
6. Return to Farmer's management. Similarly, return to land and capital can be shown.

Patil P.C. (1933) discussed the income measures under three heads viz. i) Labour Income ii) Farm Income iii) Profit, as below.

He defined the Labour income as "the amount of money left over to reimburse the operator for his labour - manual or supervisory - after deducting from the gross receipts all operating expenses including depreciation, value of any unpaid labour of other members of the family and interest at going rate on the farm investment." While the farm income or net income was defined as "the difference between the gross income and farm expenses. He further stated that the Farm income includes labour income as defined above, including the value of what the farm furnishes towards the living of the operator and his family, interest on farm capital and on the value of land. The third income measure viz. Profit was stated as the gross income minus annual operating and overhead charges including marketing cost. If the wages of the farmers, according to his ability, are deducted from labour income " one gets net profit. Patil also mentioned that the Labour income measures commonly adopted in the United States of America do not suit Indian conditions. Under Indian conditions, farms are small in size, few farms are in profit and the "profit" measure is also unsuitable under Indian conditions. He therefore adopted two income measures.
i) Farm Business Income.

ii) Family Labour Income.

**Income measures in relation to Cost - concepts:**

The income measures in relation to cost concepts are easy to calculate and simple to understand. These will have meanings in relation to cost concepts used either for the farm as a whole or in production of single crop activity.

In Farm management Studies, sponsored by the Directorate of Economics and Statistics, Govt. of India during sixties and seventies the following measures of income were used.

i) **Farm Business income** : It is the Gross income minus Cost A1

   This is nothing but a return to the farm operator for his and his family labour and investment in owned land and owned capital.

   Owned Farm Business Income = Gross income minus Cost A2

   **Family labour income** : This is the return to the labour of the operator and his family. This is obtained by deducting Cost B2 from gross income.

ii) **Net income** : It is the excess of the gross income over cost cost C (i.e total cost) and gives overall picture of the farm business.

iv) **Farm Investment Income** : This is given by the excess of gross income over total cost (Cost C) excluding from it the inputed rent of owned land interest on fixed capital (i.e. gross income - Cost C ) + (Cost B - Cost 2)

v) **Family labour** = Gross income - Cost B.

Karara Singh and Kahlon (1977) and Sing J.J. (1977), Tandon and Dhondyal (1971) have put the income measures in different ways as follows.
i). Net income as remuneration (or return to) for the farmer's management.

ii) Family labour income as remuneration for the farmer's and his family's labour and management.

iii) Farm Business Income as return to (for) farmer's labour, capital and management.


Acharya et al. (1978) added one more measure of income viz. Capital earnings to those given by Karam Singh and Kahlon. The Capital earnings are nothing but return to capital investment. This is calculated by subtracting paid out costs (Cost A) and inputed wages of owned labour from gross income on the farm.

Profitability from the cultivation of various crops has been worked out by Patil et al. (1978), Dhongade and Dangat (1985) and shown as below.

Profit at cost A = Gross income - Cost A

Profit at cost B = Gross income - Cost B

Profit at cost C = Gross income - Cost C

While Acharya et al. (1978) calculated the profits at different cost levels which could provide various estimates of returns to the cultivator as given below.
In a seminar on "Cost and Return Ratio for major agricultural products, organised by the United States Economic Coordinator for (ENTO affairs), the following ratios were taken into consideration for judging the farm efficiency.

1) Gross value of produce per acre.
2) Costs including labour cost per acre.
3) Net Return to land labour.
4) Return per day of labour.
5) Rate earned on land investment (%)

Measures of Farm Income for crop enterprises:

Efficiency of production and income from any crop production could be judged by adopting some measures. These have been used in farm management studies sponsored by the Directorate of Economics and Statistics.
Govt. of India (1973). These efficiency measures are related to various cost concepts used in determination of cost of production of crops. These are given below.

Net income over Cost A1 = Gross value of produce - Cost A1
Net income over Cost A2 = Gross value of produce - Cost A2
Net income over Cost B = Gross value of produce - Cost B
Net income over Cost C = Gross value of produce - Cost C

Profit at cost C is nothing but net profit.

Sen Committee (1980) while giving the classification of costs (viz. Cost A1, Cost A2, Cost B1, Cost B2, Cost C1 and Cost C2) stated that this classification permits computation of all the farm efficiency criteria usually derived so far. It means net income over various costs could worked out by deducting various respective costs from gross value of produce and could be interpreted suitably.

Johl and Kapoor (1973):

Suggested the following measures to evaluate the the farm income and profits.

i) Net cash income = Total cash receipts from production minus total cash operating expenses.

ii) Net Farm Income = Net cash income from production plus OR minus change in inventory in non depreciable items and depreciation on power machinery, livestock, buildings etc.

iii) Farm earnings = Net farm income plus value of farm privileges (farm product) used in home.

iv) Family labour earnings : Farm earnings minus interest charges on farm capital.
v) Percent Returns to capital = Ratio of farm earnings minus imputed value of family labour to average capital investment expressed in percent terms.

vi) Returns to management: family earnings minus imputed value of the family labour.

The above measures are mostly the same as quoted earlier. Farm earnings, family labour earnings and returns to capital are more or less the same as farm business income, family labour income and net income respectively.

Production efficiency ratios such as yield per hectare, crop yield index have been suggested by many (Tandon and Dhondyai 1971, Johl and Kapoor 1973, Yang 1965, Jachak and Borude 1983).

Turner and Taylor (1989) employed one measure viz. Gross margin (Gross income - variable cost) for comparing the profitability among different farms under same set of climatic condition.

Rathore (1974) used the following measures of farm business per farm for his study on Business Efficiency of Different Sizes of Farms in Udaipur District during 1968 - 69

i) Average cultivated area.

ii) Output in Rs./farm.

iii) Total input Rs/farm.

iv) Cash & kind input (Rs./farm)

v) Purchased inputs, Rs/farm.

vi) Actual expenses Rs/farm.

vii) Net profit/loss.

viii) Farm Business Income.

ix) Disposable income.
Gupta et al. (1988) followed the following few selected measures for judging the economic efficiency in paddy production.

i) Gross returns.

ii) Net returns.

iii) Total cost

iv) Variable cost.

v) Input output ratio.

vi) Per unit cost of production.

Karam Sing, Sharma and few others have followed another approach of measuring the efficiency of farm business for crop production activity in relation to their cost concepts. Those who have followed the concept of variable costs and fixed costs, they computed the farm income by deducting the variable costs and total costs from the gross value of total produce on the farm from the crops.

Chaugule and Patil (1988) used the efficiency measures such as Gross profit (Gross return - variable costs) for comparison of different sugarcane cultivation. According to them the term "gross profit" indicated the returns to land, management and other fixed factors. They also worked out average returns over variable costs and gross profit per month per hectare.

Hanumantha Rao (1965) have employed very simple measures of farm efficiency wherein he had shown physical efficiency measures such as

i) Man days per acre
 (Total labour input per acre)

ii) Family labour days per acre.

iii) Hired human labour days per acre.

iv) Capital input per man year.
Input - output ratios:

This measure is also simple to calculate and to interpret the results. The following are the input - output ratios that are generally calculated for judging the efficiency of farm under different situation. These ratios have been calculated and reported in farm management studies and cost studies in agriculture sponsored by the Directorate of Economics and statistics, Government of India. (1973, 1974, 1975, 1976)

All above efficiency measures can be employed in farm business analysis for the purpose of judging the efficiency of factors of production, economic variability of farming business and also for planning of farm business.

The efficiency measures as stated above could be used or employed by the farmers. The issue of the selected measures would depend upon the nature of farm business or objective of farm business analysis. So the measures adopted by one group of farmer may not be exactly the same measures used by others. However, there is a need to have common measures of farm efficiency with a view to have comparison between two farms or within farms over same years.

(H) COST CONCEPTS USED IN COSTING OF CULTIVATION OF FRUIT CROPS:

The cost concepts, followed in case of seasonal crops are not exactly applicable to perennial crops or fruit crops. This is because of the fact that the fruit crops have some peculiarities of growth period and fructifying.
period. In case of fruit crops, there requires a time period, ranging from one to 10 years period for bearing the fruits. So the cost involved prior to bearing and the period from which the bearing starts need to be separately worked out. The sum of these two periods thus forms the economic life period of the fruit crop. The various costs involved in 1st period is usually called the Establishment cost and the cost involved during the second period is called the Maintenance cost. The cost concepts used for the fruit crops, used by the researchers have been reviewed below.

Patel (1970) presented the cost of cultivation of various fruit crops, separately for two periods viz. one period is upto bearing age and the other period is the period of bearing fruits. He also stated the bearing age differ from one fruit crop to another but the methodology of costing is same. The items of costs for cultivation of grapevine as given by him were as under.

A. Cost of cultivation upto bearing age included the following items.

1. Preparation of land
   i) Tractor plowing - 1
   ii) Tractor cultivating II
   iii) Plowing ............ 2
   iv) Harrowing and planking

2. Plants and planting
   i) No. of plants
   ii) Digging pits.
   iii) Planting

3. Manures and Fertilizers
   i) Name : Qty. Value.
   ii) Labour for manuring
4. Irrigation
   i) Layout for irrigation
   ii) No. of irrigation
   iii) Total hrs. of irrigation
   iv) labour for irrigation

5. After care operations.
   i) Gap filling
   ii) Interculturing ....3
   iii) Weeding and stirring
   iv) Watching
   v) Labour for spraying
      and dusting.
   vi) Insecticides
   vii) Special operations
       like removal of

6. Total cultivation
   cost

7. Interest at 10 % on
   total cost

8. Supervision charges
   @ 10 % on total cost

9. Rent (Local rates)

10. Repairs to and depreciation of tools and implement.

11. Total cost upto bearing age of 1 year.

B. Yearly cost of cultivation of Grapewine.
   1) Manures and manuring.
   2) Irrigation (as above)
3) After care operations
   i. Interculturing .... (twice)
   ii. Weeding & Stirring
   iii. Watching
   iv. Pruning ....... (twice)
   v. Labour for spraying and dusting
   vi. Insecticides cost.
   vii. Special operations.

4) Harvesting and preparing for market.

5) Total cultivation cost (1 to 4)

6) Interest at 10 % on item 5

7) Supervision charges at 10 % on item 5

8) Rent @ Rs. 150 year / ha.

9) Repairs to and depreciation of hand tools and implements.

10) 1/15 th part of the total cost of cultivation upto bearing age (Here bearing period of grapevine is considered to 15 years)

11) Total cost of cultivation of bearing fruit vines.

   In this concept, no rental value of land, interest of fixed capital, seems to have been not included.

George and Joseph (1973) in an interesting exercise estimated the benefits and costs of a plantation crop like oil palm and compared with coconut and rubber plantations to examine their relative economic merits. They followed the well-established methods of estimating benefit-cost and came up with a finding that oil-palm has the greatest returns over cost in Kerala. For this study they collected detailed information regarding capital and maintenance cost of these three crops and the returns have been worked out on the basis of average prices.
prevailing over the past three years. The costs and returns were discounted at 9 P.C. rate of interest being the rate at which credit could be available for long term loans. The worthwhileness of the projects was determined by the internal rate of returns on capital investments for the three crops and two other indicators viz. B.C. ratio and pay-back period.

Gupta and George (1974), in their study on profitability of Nagpur orange, all the four criteria viz.
1. Pay-back period.
2. Net present value (NPV)
3. Internal Rate of Return (IRR)
4. Benefit-cost ratio (BCR)
were used.

Tandon and Dhondyal (1971) presented the economics of mango orchard by showing the budgetary analysis of financial and production programme of the mango orchard for 20 years period. In this, the details of yearwise estimates of fruit yields, income from cover crop, sale of fruits, yearing expenditure and net income, for the 20 years period were shown. The average profit per hectare was arrived at by dividing the sum total of net income by 20 years.

While estimating the yearwise expenditure, he divided the total period of 20 years into 3 stages viz.

I. Expenditure during 1st five years.
II. Expenditure during 6th to 10 years.
III. Expenditure during 11th to 20th years.

The yearwise expenditure included the operating cost and the depreciation on fixed capital and rent and taxes. But interest on both fixed capital and working capital seemed to have not been considered.
obtained per acre cost of Coorg Mandarin (orange) in Karnataka by using the quantity of inputs used per plant at an average plant density of 99 plants/acre. For the purpose of analysis, 40 years as the life of the orchard was considered. For studying the economic viability they used the project evaluation techniques. Besides, the present value summation method, commonly used (i.e. net present value, benefit-cost ratio, internal rate of returns) and the annual amortization method were used for the purpose of making comparison of these two methods and concluded that the annual amortization method seemed to be preferable to the present value summation method.

Garg and Yadav (1975) have worked out the economics of mango cultivation in Uttar Pradesh in 1973 - 74. The study was divided into five stages.

Establishment stage........... From first to sixth year
Growing stage - I ............ From seventh to tenth year
Growing stage - II ............ From eleventh to twentieth year
Fully matured stage.......... From twenty first to thirtieth year
Declining stage ............. From thirtieth year and above

The cost and return at the establishing stage of a mango orchard from first year to the 6th year were calculated. It included the following items.

i. Cost of bullock labour.
ii. Cost of human labour.
iii. Cost of mango sapling.
iv. Cost of manures and fertilizers.
v. Cost of irrigation.
vi. Cost of plant covers.
vii. Cost of watching and hoeing charges.
viii. Cost of insecticides and pesticides.
ix. Overhead charges.
x. Rental value.

Total cost is common during the growth period (1st to 6 years). The cost and return on intercrops from first year to sixth year per hectare and net income was calculated for all the six years separately by deducting input costs from gross income. Similarly, the input cost and value of output and net income were calculated from seventh to 30th year, separately for each stage.

Heddy and Kanwar (1985) carried out a study on economic evaluation of agro-forestry, silvo-agriculture and silva pastoral systems in dry lands at Research farm, Hyderabad. For the purpose, they collected the data on the investment, cost of establishment, management and also the returns were collected and analysed separately for each system. In this by discounting technique, further cash flows were reduced to the present worth estimation of benefits and costs to arrive at net present worth (NPW), benefit-cost ratio (BCR) and annuity value (AV).

Sikka and Swarup (1985) studied the economic viability of citrus production in Himachal Pradesh by using the project evaluation technique like pay-back period, net present value, internal rate of return and benefit-cost ratios.

Sikka and Swarup (1985) have examined the economic viability of apple orchard raising by working out the following costs.
1) Establishment cost: This covered all the costs incurred by the Orchardist for preparation of land up to planting of nursery and fencing the orchard.

This covered
1. Layout preparatory tillage
2. Digging pits.
3. Filling in pits.
4. Manures
5. Fertilizers
6. Plant protection
7. Nursery cost
8. Other
9. Total

2) Maintainance cost included the costs incurred subsequent to establishment cost, on its maintainance year after year. In this, items such as labour, manure, fertilizer, insecticides, land revenue and cesses, interest on working capital, depreciation, rental value of land interest on fixed capital, expected depreciation on fixed investment.

Hinge (1987) presented the cost of cultivation details of banana crop grown during 1981-82 in Jalgaon district of Maharashtra. He has used three concepts of costs viz. cost A, B & C. The items included in these three categories of costs were as under.

Cost A: 1 hired human labour
2 contract labour.
3 Bullock labour
4 Seed (suckers)
5 Farm yard manure
Dass (1985) attempted to examine the economic potential of pepper cultivation in Kerala under scientific management practices. In the case of pepper he considered pre-bearing period of 4 years as the establishment period and the following 11 years as economic bearing period. The economic life cycle of a pepper plantation has been assumed as 15 years in his study. He prepared yearwise and operation wise labour requirements for scientific cultivation. Similarly, the yearwise and itemwise material input requirements for raising pepper with package of practices were also prepared and then the details of investment cost during 4 years period of establishment of
3. Internal Rate of Return (IRR) were subjected to scrutiny. He also carried out the analysis by subjecting it to sensitivity test by assuming 8 additional situations in respect of factor product prices.

Patil et al. (1969) worked out per acre cost of establishment of mango garden for five years separately and then worked per acre cost of mango, production by considering the following items of cost.

1. Orchard manuring
2. Orchard cleaning
3. Plant protection.
4. Removing diseased and old twigs.
5. Interculturing.
7. Watching.
8. Harvesting.
10. Transport.

However for working out per acre cost of Grape cultivation, following concepts were used.

1) Cost A: This included
   1. Charges of hired human labour and bullock labour.
   2. Cost of manures, fertilizers.
   3. Irrigation cost.
   4. Plant protection cost.
   5. Packing
   6. Marketing
   7. Land revenue
   8. Inputed non-recuring expenditure
   9. Miscellaneous
ii) Cost B : Cost A + rental value of land + imputed charges + interest on capital invested.

iii) Cost C : Cost B + family labour charges

iv) Cost D : Cost C + managerial labour

Economic evaluation of capital investment in Alphanso Mango plantation carried out by Patil and Kumar (1986) was based on the data collected from 72 alphanso mango orchards selected from Ratnagiri Tahsil during 1979-80 and the computation of the following parameters viz.

1. Pay Back Period (PBP)
2. Net Present Value (NPV)
3. Internal Rate of Return (IRR)
4. Benefit Cost Ratio (BC Ratio) was done.

Subramanyan (1986) worked out the establishment cost of lime and sweet orange orchards in West Godawari District 1984-85. This included itemwise cost of planting and maintenance cost (up to bearing). This establishment cost was further converted in yearly amortized establishment cost for 1984-85 season and then came out with total cost/year by adding the maintenance cost and the overhead cost during the year.

He presented the results as follows:

a. Amortized establishment cost.

b. Maintenance cost.

c. Overhead cost.

d. Total cost/year.
Singh and Sidhu (1986) while reporting the Economics of fruit cultivation in Punjab classified costs into 2 concepts. 1. Establishment cost and 2. Operational cost - The Establishment cost comprised of the costs towards the following items:

1. Plowing and planking - Labour & Machinery charges.
2. Layout - Labour charges.
4. Nursing procurement - Labour, machinery and material charges.
5. Planting - labour
7. Fensing - Material and labour charges.
8. Tools.

The operational cost included the items such as:

1. Application of manures and fertilizers.
2. Hoeing, weeding.
3. Prunning and training.
4. Irrigation.
5. Watch and ward.
6. Plant protection.
They presented the cost and the returns in the following way.

<table>
<thead>
<tr>
<th>Items</th>
<th>YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6to30 years</td>
</tr>
</tbody>
</table>

1. Land rent
3. Establishment
4. Expected depreciation on fixed assets.
5. Interest (12.5%) on durable capital less depreciation. On operational cost for half period.

Total Annual cost.

The Economics of pomegranate production was put forth by Hinge (1987) for which the data from 56 cultivations of Sangola tahsil (Dist Solapur) was collected and the itemwise cost was presented in the following way.

Establishment Cost: (Till the crop reaches fruit bearing stage)

1. Hired human labour.
2. Bullock labour.
3. Machinery charges.
4. Manures and fertilizers.
5. Grafts.
6. Plant protection cost.
7. Irrigation charges.
8. Land revenue and taxes.
10. Interest on working capital

COST A 160
11. Rental value of land.
12. Interest on fixed capital.

COST B
13. Family labour.

COST C = TOTAL COST.

Cost of production of pomogranate during the bearing included the following items.
1. Hired human labour.
2. Bullock labour.
3. Manures.
5. Fertilizers.
6. Irrigation charges.
7. Crop protection.
8. Land revenue.
10. Depreciation.
11. Interest on working capital

Sub total = Cost A
12. Rental value of land.
13. Interest on fixed capital

Sub total = Cost B
14. Family labour

Total = Cost C
15. Marketing cost.
16. Total cost of production.

Considering the economic life period of pomogranate as 20 years, the yearly establishment cost was worked out by assuming constant cost over period of 20 years. So total establishment cost was divided by to arrive at per year establishment cost.
Subrahmanyanam (1989) also assessed the investment of capital in cultivation of perennial horticulture crops. He has applied the investment appraisal methods, by working out the various measures of investment worthy of horticultural garden of any unit. These measures were

i. Pay back period (years)
ii. Capital value (Rs.)
iii. Internal rate of return (%)

Subrahmanyanam (1989) while reporting the economics of cultivation of mango crop, classified the costs into three following costs.

Establishment cost: This included the maintenance cost upto bearing besides its plantation cost. The items of cost considered were

A. Planting Cost:
   i. Cost of planting material.
   ii. Cost of labour (human + bullock)
   iii. Cost of fertilizers and manures.
   iv. Cost of pesticides.
   v. Fencing cost.
   vi. Others.

B. Maintenance cost:
   i. First year.
   ii. Second year.
   iii. Third year.
   iv. Fourth year.
   v. Fifth year.
vi. Sixth year.
vii. Seventh year.
viii. Eighth year.

Total of (B)

Total cost of Establishment = A + B

This total cost of establishment was amortized.

Total cost of cultivation =

i. Amortized establishment cost.

ii. Operational cost.

iii. Overhead cost (excluding rental value of land)

On similar lines he presented the economics of other major fruit crops like Mandarin orange, sweet Orange, lime etc.

Patil and Dalvi (1990) made an attempt to have an economic evaluation of an investment in advance on coconut plantation in Konkon region of Maharashtra. In this, they estimated itemwise cost of establishment for the first seven years separately. The total cost for all input items used in these 7 years was considered to be the total investment for establishing the coconut orchards. The annual amortization cost was computed from the investment made on coconut orchards from preparation of land to the 1st bearing by the palms (i.e. for the first seven years from the date of plantation) Under an assumption that the rate of interest is 10 per cent and expected economic life of the orchards is 68 years. This annual amortization cost was worked out by using the following compounding cost equation and then it is added to the annual cost of maintenance of corresponding cost of bearing group.
\[ A = \frac{C \cdot r}{1-(1+r)^t} \]

Where

\begin{align*}
A &= \text{Annual amortized value of total cost} \\
C &= \text{Initial capital} \\
r &= \text{Discount rate} \\
t &= \text{Expected life of orchard in years}
\end{align*}

The following items of costs in establishment of coconut orchards were considered:

1. Human labour (wages)
2. Bullock labour charges.
3. Planting material.
4. Manures/chemical fertilizers.
5. Plant protection chemicals.
6. Irrigation.
7. Fencing.
8. Rental value of land.
9. Interest on capital.
10. Other inputs.

Total cost = 1 to 10 items.

According to them the annual cost of coconut production comprised amortization and maintenance costs.

Economic evaluation of coconut orchards was also done. For the purpose, the series of cash outflow (costs) and inflow (returns) were prepared, taking into account costs incurred on the production of coconut, yields and prices received by the producers. The inflow and outflow series i.e. costs and returns series for coconut plantation projects were estimated for an expected economic life period of coconut orchards (i.e. 68 years). The said series were used for computing the benefit-cost ratio (BCR), payback period (PBP) and net present value (NPV) at 10%.
discount rate. In addition to this, internal rate of return (IRR) was also calculated.

Singh et al. (1992) accepted the classification of total costs in grapevine cultivation into two costs viz. fixed costs and operating costs. Fixed costs were the cost of establishment of the expenditure on labor for plowing, planking, digging pits, irrigation, nursery plants, organic manure, planting, application of manure fertilizers, plant protection, hoeing interculturing, fencing, small tools, labor for watch and ward.

NABARD (1989) assessed the financial viability of capital investment of grape gardens in Karnataka State on the basis of financial rate of return (FRR) using the data on gross income cost of production, net income and net incremental income. Besides, the viability of the investment under adverse conditions was examined by applying out sensitivity test. The switch value test was undertaken to determine the proportion by which the investment can be increased so as to make the investment viable.