

***CAPITAL FORMATION IN
AGRICULTURE IN MADURAI DISTRICT***

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PREFACE

An addition to existing resources cannot be accomplished without a judicious combination of more resources and their proper and better use. It is this fact that has infused an increased interest in the study of capital formation and the question of mobilising surpluses for capital formation.

The present study is an attempt to gauge the potential capital formation with a distinction of it between Agricultural and non-agricultural, in irrigated and unirrigated cultivation. Further the study also provides informations regarding the influence of certain important factors like size of holding, farm income, income from other sources and size of family, on the pattern of capital formation in irrigated and unirrigated cultivation.

The work was completed for an M. Litt. dissertation under the supervision of Dr. D. Bright Singh. I wish to express my deep sense of gratitude for his valuable guidance, advice and suggestions. I am highly indebted to Mr. R. Subramaniam, Head of the Research Department of Economics, Gandhigram Rural Institute, who took a keen interest in this work and helped me with his valuable criticisms and suggestions. My thanks are due to Sri V. Krishnamoorthy, Statistician, Institute of Rural Health and Family Planning, Gandhigram, who helped me in the statistical analysis. Finally I wish to thank the Collectorate, The Revenue Department, The Department of Agriculture, Madurai District and the Village Officers and their colleagues, without whose kind co-operation it would have been difficult to collect such a wide range of informations from the farmers within the short time at my disposal.

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CHAPTER I
INTRODUCTION

The primordial^y problem that confronts an underdeveloped country is their poor living standards consequent on a low ratio of productive employment to total work force and a constant proportion of disguised unemployment to the total population. From the economic point of view the abundance of labour force, if appropriately utilised should enable the economy to increase its stock of wealth and thus raise itself to a virtuous cycle of prosperity.

CLASSICAL BACKGROUND

Economic literature has grown on this, from the classical economists down to present day. They were faced with the same problems. *Ricardo and Malthus analysed the factors that ultimately limited economic progress; of them, Ricardo was more concerned with the problem of integration with theories of relative prices and capital formation. According to him economic growth was set by the increasing intensity of the difficulties arising out of dynamic implications of the law of diminishing returns in Agricultural production. Further, limitations in regard to output of wage goods, mostly food grains, reduced the rate of growth of supply of labour and hence slowed down the process of capital formation. While Ricardo was concerned with the problems relating to the terminus of accumulation, Malthus emphasised the limitations with regard to rate of growth.

*Planning for expanding Economy - C.N. Vakil and P.R. Brahmanand ... pp.193.

The latter observed that in consequence of the inefficiency of effective demand, the actual rate of accumulation would fall short of the potentially possible rate. Thus one was concerned with the goal and the other with the speed.

But Keynes, in his analysis dealt with both the problems of the difficulties arising out of the deviation of the actual investment rate, from that required to provide the volume of effective demand necessary to maintain full employment and foresaw the possibility of the emergence of a stationary state as a result of a decline in population growth and the gradual dwindling away of the potential investment opportunities.

CAPITAL FORMATION.

THE DETERMINANT OF ECONOMIC GROWTH.

The rate of economic growth may be analytically considered as being the function of two factors (a) the rate of capital formation (b) the capital output ratio. Accordingly development policies may be described as aiming to increase the former and reduce latter or do both.

The term capital formation, covers the changes in assets from the beginning to the end of accounting period under review. The assets, accordingly are the fixed means of production, all buildings and stocks of good, including goods in process.

The low income rates are not the entire explanation of a low rate of capital formation. But a certain combination of social and economic factors can make a substantial capital formation.

Inadequate institutional arrangements for mobilizing both private and public savings and lack of inducement to develop productive outlets are of particular importance and interrelated. The existence of productive outlets would help to call forth institutions for mobilizing the financial resources; policies for mobilizing savings may encourage the search for productive resources. The lack of inducement to invest shows that there has been little capital formation. So unquestionably the productive investment opportunities, and outlets form a fundamental step in development programming.

Net capital formation could be increased if the requirements of replacing the existing capital could be reduced, for which saving or taxation potential can be increased by a reduction of unessential consumption. Increased national income does not always mean increased rate of capital formation. Savings together with the availability of underutilised real factors suggests an opportunity for increasing the rate of capital formation by deficit financing. Limitation of available physical resources of course constitute the crux of the problem of development and the establishment of a proper relationship between the financial resources brought into play and physical resources is one of the fundamental task of development programming. If the development programme exceeds currently available financial resources the gap may be bridged in three ways.

- ***
- (a) By adjustment in the balance of payment (by running down foreign exchange resources)
 - (b) By fuller utilization of existing physical resources with little or no inflation, making possible an increase in real income through credit expansion.
 - (c) By an inflationary development-creating an artificial disequilibrium in the system, intended to provide increased incentive to production.

Without reducing the low level of consumption further, capital formation can be raised either by increased output obtained with existing capital equipment or by non-monetary methods as for example, the community development which utilises free labour time—capital formation can be speeded up by austerity rather than privation. Once income has been raised it becomes possible in the second stage plan for relatively high marginal rates savings and the rate of capital formation raised correspondingly.

The rate of capital formation achievable by a country's unaided efforts can be supplemented by bringing the resources of other countries to bear through by foreign trade, foreign investment and foreign aid. When trade is balanced, imports being paid for exports, it is true in the sense the resources used to production of exports are really these of the country itself. Thus it provides an instrument by which capital formation can be accelerated. International co-operation can raise a country's rate of capital formation by foreign investments and by grants. Here the recipient country acquires imports not paid for with exports and thus it makes a net draft on the resources of the outside world. So then, international flow of capital is limited by some fundamental factors. Firstly, foreign private

capital has hesitated to venture due to a lack of encouragement and consistent policies towards external investment.

SECONDLY because of the absence of an "infrastructure" of basic facilities, the productivity of new capital is lower. Thus the opportunity of profit making for private capital are limited, particularly within the frame work of balanced national development.

Even taking the case that loan capital is freely available a limitation on borrowing is imposed by the external debt servicing burden which it creates. So the development programme should aim at a higher rate of saving to catch up with the planned rate of capital formation before the balance-of-payment drain involved in paying for the saving obtained from abroad becomes excessive.

FINALLY the flow of capital from abroad has undoubtedly been retarded by limitations on "absorptive capacity" which could be remedied through properly prepared projects within the frame work of clearly formulated programmes of economic development.

FORMATION OF CAPITAL IN THE RURAL ECONOMY

Capital formation plays a crucial role in the advancement of the rural economy. This has got a greater application in the economy where land has reached the margin of cultivation and where labour is abundant. More intensive utilisation of labour under such a situation would involve intensification of capital. Here one should not mistake between inventory of capital and capital formation. *Unlike inventory of capital, capital formation is essentially a growth over time.

Capital formation may not have its counterparts in money savings for the small farmer. For an underdeveloped country the definition of the term should be widened to embrace every striving of people and every act of new investment directed towards augmenting the productive capacity of every small farmer of the society to deliver finished consumer goods in future at enhanced rates.

* Mandal G.C. - Studies in the Problem of Growth pp.51.

To the individual farmer any purchase of asset is capital formation. In aggregate this means all constructional activities directed towards enhancement of real social income in ^{the} near or distant future. Capital formation in the aggregate sense depends firstly upon surplus over consumption and secondly upon the desire of the community to invest. Thus in actual practice, it is the resultant of the desire to consume, the desire to hoard, and the desire to invest.

But investment in trade does not conform to the idea of capital formation defined in an aggregate sense in so far as it does not help in expanding productive capacity of the community. Construction of residential house is apparently an illustration of capital formation. But of course the ~~the~~ installation of a brick manufacturing factory would be capital formation, as it enhances the capacity of the community to produce more residential houses. Further purchase of land obviously is no construction or capital formation. This proposition can be disproved if the sellers of land were able to use the sale proceeds in a productive way. Generally we see that the money acquired through a sale of land ~~is~~ used for consumption expenditure. Thus living upon capital is a common experience among poor peasants.

Capital formation can always easily be linked to the marketable surplus in agricultural products. Because in an economy where entrepreneurship is offered by the household itself, where production is chiefly motivated by household consumption and where monetization is less important, savings may emerge in the form of surplus store of food grains or other agricultural products.

Marketable surplus in the agricultural sector of an underdeveloped economy is a crucial question from the three following points of view:-

- I. Marketable surplus in agricultural sector would contribute to capital formation in non-agricultural sector.
- II. It would contribute to an improvement in the standard of living in the agricultural sector by making available to it the industrial consumer goods.
- III. It would contribute to capital formation in the agricultural sector by fetching it the requisites of agricultural production.

Marketable surplus of food grains is arrived at by deducting from the net output received by the farmers, their consumption and disposals in the

form of seeds, kind loans and wage payments in kind. The excess of receipts over sale is partly held for consumption, partly spent up or disposed, and partly held in stock, potentially capable of further continuation to market supplies.

What is actually marketed may fall short of the estimated surplus. The divergence of marketed and marketable surplus may be due to various factors. But wherever the surplus emerges, the part of it which will actually be marketed would be affected by the general conditions of the village in question - particularly the extent of market facilities open to it, the standard of living of the household and the investment opportunities within their reach. So if the investment opportunities are wide and easily available, sale of agricultural produce will be larger to meet larger demand of funds for investment.

The surplus stock in the hands of the farmers may be looked upon as potentially equivalent to an investible fund. If investment opportunities are widened in the rural sector, technical innovations

requiring capital investment are brought within the reach of the farmers and its prospects made known, if rewards of hoarding in the form of enhanced prices were curbed, it is likely that larger quantity of food grains would be flowing out of stock of the farms to find their way into active investment.

Again^a reserve of idle labour is a fund for capital formation. If pressure of unemployment pulls down wages in rural sector, enterprises are expected to expand employment till the reserve of idle labour is reduced. It is quite possible that wages cannot fall below the cost of living of the worker and his family. This means that cost of production in small family farms must diminish, so that they can yield a surplus of produce over their consumption.

Whatever forces that will enhance production in small family farms will also contribute to lowering of wage cost and increasing capital formation in the rural sector.

Capital formation is not merely the question of emergence of saving, rather it depends on the act of investment. Thus investment has got a more positive role in capital formation than savings. Thus

whatever planning that would raise the productivity of capital in the rural sector will also induce capital formation. It is obvious that the fragmented holdings of the small farmers were a deterrent on capital formation.

Co-operative organisations have got a special significance in the sphere of capital formation and they promote capital formation through a redistribution of a part of its income. It transcends the limit of human propensities in creating capital.

Further an effective education would foster the desire of the rural people for economic improvement and their knowledge of improved technique in production would enhance capital formation.

Capital formation is not only an economic process but a social process as well and it must reflect the desire of people to improve their economic condition. Wasteful ceremonial expenditures and early marriages are social hindrances to capital formation.

CHAPTER II**THE CONCEPT**

The fundamental principle of the modern economic system is to increase the welfare of the people. The pursuit of this requires an increasing stock of capital goods and capital formation is indispensable for increased economic production, total and per capita and hence economic welfare. Further saving is essentially a provision for economic security which should be channeled into capital formation, making that unit of security serving the purpose of capital formation. Thus the rationale of saving is capital formation.

A few notable definitions as under, would form the basis of discussion.

Testlebe views capital formation "not as an automatic process but a response to investment of money, effort and time in new resources or facilities of production"/*/

Capital formation is defined as the "growth of inputs" and is indicated by the growth of reproducible wealth "which helps for future larger production".[©] The reproducible wealth includes all resources inputs which helps for a future production of which capital assumes a greater proportion and takes the form of tangible assets. Thus capital formation is indicated by the growth or addition to "Reproducible Tangible Wealth"/&/

/*/ Testlebe A.S. - Capital in Agriculture - The formation and financing since 1870 - National Bureau of Economic Research - Princeton "Varsity" Press-1957 ... pp.6.

© J.R.Hicks - Value and Capital - Oxford 1950 pp.284.

/&/ Simon Kuznets - Capital in the American Economy - Its formation and financing - National Bureau of Economic Research - Princeton 1961 ... pp.15-16.

CAPITAL FORMATION

Capital formation denotes the addition made to the stock of tangible goods within the country or to foreign claims. Thus on a nationwide basis it is the net changes in the net balances of foreign claims. Changes in the stock of goods and in claims against the rest of the world originate from current production of the economy or from other sources. The current product which is not consumed, added to the stock of goods, and, or exported, denotes the positive capital formation. Conversely if internal needs absorbed more than the current net output, the initiated dissavings necessitates a draft upon the existing stock of goods, leading to negative capital formation. Thus savings or dissavings, either positively or negatively, help the formation of capital, which ultimately has a bearing on the current net output and consumption as a source of capital formation. And on a nationwide basis, savings obviously equals capital formation. The identity of savings and capital formation, on a nation-wide basis is highly useful in measurement and analysis.

*Yet capital formation can be defined broadly as the total change in the stock of goods and in claims, that is, the change in the national wealth due to economic processes and savings.

Disposition of income between consumption and savings coincides with the distribution of product between flow of goods to the consumer and capital formation. In a planned economy the term savings means the diversion of current product from consumption or current income from expenditures on consumer goods, which can simultaneously be assumed to match the orders of capital formation.

THE BASE OF CAPITAL FORMATION

The definition of capital formation thwarts an explanation of the connection between changes in the amount of capital and changes in the inflow of income, because the words capital, income and investment are used to represent different concepts. For, capital refers to the stock of all goods in existence

* KUSNETS.S. - Capital in the American Economy - Its formation and financing - National Bureau of Economic Research - Chapter II.

at a particular moment, where as income refers to goods and services produced during a period of time. *This capital is a "stock" concept and income the "flow" concept.

The investment goods at the finished stage become part of capital and the process by which they get completed is the process of capital formation. During any period things which are in existence or at the start, disappear or get destroyed or eaten away or discarded. So to get an accurate picture of the amount by which capital has changed, only net amounts should be considered.

Capital in the real and the simplest form consists of a wide variety of dissimilar objects: like machinery, tools, buildings, inventories and so on. Thus the flow of real goods and services also consists of heterogeneous items. In general measurement of capital is analagous to measurement of income: i.e. the money equivalents of all things included in the category are used to obtain a list of values which can be summed up.

* Buttrick J.A. and Williamson - Economic Development
The formation of Capital - Chapter V - pp. 135.

IMPORTANCE OF INVESTMENT

Advocation of levels of capital formation should be considered in line with the levels of investment. Savings of any individual during any period of time depends upon his income during ~~any~~ that period and his consumption expenditures. To increase his capital stock he should save more than he spends. Investment goods are always purchased at the expense of potential consumption. *The limits to investment during a given period of time depend upon the potential output of goods and services and the proportion of this which must be in the form of consumption goods. If the consumption flow is reduced too much, total potential output will drop, since the main (various) factors of production will not all be able to work.

**INVESTMENT CAN BE INCREASED BY
THE FOLLOWING WAYS.....**

- (a) By using wholly the unemployed resources without cutting into consumption.
- (b) By reducing the output of consumption goods and using the resources thus freed for the production of investment goods.
- (c) By introducing a technological change.

*Buttrick J.A. and Williamson - Economic Development-
Chapter V

Beyond all these, it is important to consider even the existing stock of capital ^{as} one of the resources.

In order to be more objective in observations, a method is needed to determine whether there is "gap" between the actual and potential output at a particular period of time. Further the consequences of a reduction in the flow of consumption goods are also to be justified. Considering the output of each factor of production and subsequently on being removed from its present occupation to a different one, the total income ~~is~~ rises. This process makes it possible to increase investment without decreasing consumption. Of course the process of moving a factor of production should also be considered as a part of investment.

Thus we could find three general and identical reasons for a gap between actual and potential output.

I. The existence of involuntary employment is one of the clear cases that the economy is producing less than possible.

II. The second reason is the existence of hidden unemployment.

III. Thirdly the poor allocation of factors of production which naturally leads to frictional unemployment.

Thus a gap exists whenever the output which could be produced with given factors is worth more than the output actually being produced.

Further in a complex economic set up, a major portion of the saving decisions are made with one set of considerations in mind, while decisions to invest are made in a different context and for^a different purpose. Here financial institutions like banks, investment houses and insurance companies play an intermediary role between these two decision making functions.

Higher levels of investment represents an increase in the wealth of a country and hence the marginal potential revenue will be lowered. But the growing technical skill, inventories and expanding population and labour will tend to raise it. This

is exactly the thing that happens in our under-developed country in the initial stages of growth where the marginal potential revenue is high because of the domination of the last two above mentioned forces. But in the latter stage, the marginal potential revenue begins to fall as capital formation proceeds, which tends to counteract the influences of these factors.

Hence investment means a growing stock of capital and a greater current output. Further there is a possibility to produce more goods and services in the future. Thus an investment programme without ignoring the possibility of international trade and the availability of raw materials and labour, sets the limit to the rate and type of achievable capital formation.

FORMATION OF CAPITAL IN UNDER DEVELOPED COUNTRIES.

*Economic development has much to do with human endowments, social attitudes, political conditions and historical accidents. Capital is necessary

*Ragnar Nurkse - Problems of Capital Formation in under developed countries. - Oxford 1955.

but not a sufficient condition of progress. But capital formation means in itself the progress in action.

Normally a society does not always apply the whole of its current production to the needs of immediate consumption, but directs a part of it to the making of capital goods like tools and instruments, plant and equipment, machines and transport facilities. All these various forms of real capital can greatly increase the efficiency of productive effort and capital formation. Thus the essence of the process is the diversion of a part of society's currently available resources to the purposes of increasing the stock of capital goods, so as to make possible an expansion of consumable output in the future.

The first difficulty in underdeveloped countries is the small volume of domestic savings because of the low level of income. Further the small amount of savings is found to be used unproductively because of the inadequate financial organisations and lack of education. Apart from all these, the main difficulty stems from the deficient inducement to invest, due to the poverty of the domestic market. Thus there

is a possible deficiency on the demand side of the problem of capital formation in underdeveloped countries. From the above analysis it is clear that capital formation requires an act of investment as well as capacity to save.

Among the potential domestic sources of capital formation in underdeveloped areas, it is impossible to go on without making distinction between "over populated" and "under populated" countries. Chronic and large scale underemployment in agriculture is common in the overpopulated areas. They suffer from large scale disguised unemployment.

Improvements in methods and techniques are extremely important. This with the change in the organisation would help to move a large part of population engaged in agriculture to other productive purposes without reducing the agricultural output.

The term disguised unemployment implies to some extent a disguised saving potential. This is one of the possible sources of capital formation in underdeveloped countries. As it is, the unproductive

surplus labourers on the land are sustained by the productive labourers. Thus the virtual savings of the productive labourers are used by the unproductive consumption. The savings can be made effective by removing the unproductive labourers on land and diverting them to work on capital projects. Then the unproductive consumption of the surplus farm population would become productive consumption. The use of disguised unemployment thus for the capital accumulation could be financed from within the system itself. All that happens is the reallocation of labour in favour of capital construction.

Whatever may be the machinery employed, a form of collective saving enforced by the state may prove to be indispensable for the mobilization of saving potential implicit in disguised unemployment. The theory of capital formation under conditions of disguised unemployment rests on a static view of population resources.

On the supply side of capital formation the vicious circle of poverty runs from the low income level to the small capacity to save, hence to a lack of capital leading to low productivity and back to

low real income per head. Foreign investment is necessary to bring about the initial improvement in productivity and real income that is required for any substantial saving. Thus foreign investment is one of the redeeming forces that has to be invoked on the supply side of capital formation in underdeveloped countries. It is a necessity to bridge the transition period, when an increase in productivity has to be achieved. Then a flow of saving will result from the increased real income.

Individually consumption functions are interrelated and not independent. Duesenberry calls it the "demonstration effect". Where people come into contact with superior goods and new articles ~~or new articles~~ or new ways of meeting old wants their knowledge gets extended, their imagination stimulated, new devices are aroused and thus the propensity to consume is shifted upwards. Thus the interdependence of consumers preferences, stressed by this theory, significantly affects the choice between consumption and savings.

New goods, whether home-made or imported,

become part of the standard of living and so become indispensable or at least desirable ~~and one actually desires~~ as the standard of living rises . The term "standard of living" should be understood to mean, first, standard simply in the sense of aspiration means the norm to which one aspires or the measuring rod; secondly, standard in the sense of what a country or a community can afford on the basis of its own productive efforts. Some articles of luxury consumption may well be a part of a country's standard of living, in the first but not in the second sense.

This attraction is a handicap for the late comers in economic development. It affects not only voluntary personal savings but also renders it politically more difficult to use taxation as a measure of compulsory savings and resists demand for government spending on current account. The use of potential domestic sources of capital can be seriously hampered by the impatience and dissatisfaction which the demonstration effect tends to produce.

The conflict between the desire to consume and the need to save is made more difficult in the underdeveloped countries by the international dis-

parities in real income levels, which are inherent in the accumulation of capital. Further the small rate of saving is not due only to the low absolute level of real income, but also to the high propensity to consume, caused by the allurements of superior forms of consumption.

Even so, inspite of the absolute increase in levels of real income per head in most of the under-developed countries it has become harder rather than easier for these countries to do any saving out of the increased incomes, as a result of the decline in the relative position in their income levels. Further their willingness to save has also been adversely affected.

The interdependence of consumption functions can significantly affect the choice between consumption and savings. In addition the international disparities can inhibit not only voluntary private saving but also the use of public finance as one instrument of capital formation.

REFERENCES

CHAPTER III**AIMS AND METHOD OF STUDY****INTRODUCTION**

The Industrial growth in our country will largely depend upon the quantum of surpluses made available in Agriculture and Agriculture in turn has got to make a great leap forward to buttress industry. So the phase and pattern of Capital Formation in Agriculture holds the key to economic growth in our country.

A preoccupying problem facing the Agricultural economy in India is the raising of the Agricultural output. This indirectly stresses the need for increasing the cropped area simultaneously with an increase in the capital expenditure.

*Many tests of productivity have proved the impracticability and unprogressiveness of Indian Agriculture, but one single factor that could lead to increased yields is the capacity of the cultivator to invest individually. This makes clear the importance of capital formation in Agriculture.

It is also generally felt that capital formation is substantial only in the case of large holdings, but nowadays it is argued that the rate of investment per acre is increasing in both the cases of small and big cultivators. Further, our agricultural sector is highly diversified and there are many sub-sectors like household sector, owner cultivators, tenants, landlords, landless labourers co-operative sector and the government sector. Capital formation occurs or activities tending toward capital formation

*Deshmukh M.B. and Bhargava M.P. - Capital formation in Indian Agriculture - Vol. IX - Indian Journal of Agricultural Economics ... pp.119.

take place under all these sectors. So it is planned to project this study in the following specific lines:-

OBJECTIVES.

First, this study is an attempt to gauge the potential of Capital Formation in the Agricultural sector. In so doing an emphasis is continuously maintained to orient the study to owner cultivators *because it is generally felt that in this particular sector alone there is a clear motivation to improve the standards with an emphasis on capital formation. Moreover, it would seem that in this sector there would be enough responsibility for the need of Capital formation than it would be in any of the subsectors of the agricultural economy.

*Madan S.G. Institutional framework and capital formation - Indian Journal of Agricultural Economics - January-March, 1965...pp.143.

Second, the present study endeavours to measure the rate of investment and agricultural capital formation, because in general capital accumulation is the acquisition of capital stock where the productivity of such acquired wealth is not clearly defined. Hence a distinction between productive and unproductive investment is made which would incidentally illumine Capital Formation also. Productive investment is taken as agricultural capital formation which is otherwise the accumulation of *****Reproducible Tangible Wealth*** in Agriculture. In as much as this study aims at measuring the potentiality of agricultural capital formation, for the purpose of analysis only the productive investment in Agriculture is considered Capital formation to ensure the homogeneity in the analysis of the data collected.

*****Factors like soil, climate, crops, irriga-**

**** Simon Kuznets - Capital in the American Economy- Its Formation and Financing, National Bureau of Economic Research, Princeton 1961 ...pp.18-19.**

*****Doctor Agarwal G.D. Capital Formation in Agriculture, Indian Journal of Agricultural Economics March, 1954 - Vol. X ...pp.116.**

tional facilities, means of transport and communication, size of cultivating unit, operating and living expenses, farm income and income from other sources have a direct bearing on capital formation. Among these the current study aims at uncovering the influence of the size of holding and an attempt is made to distinguish the possibilities of capital formation under irrigated and unirrigated cultivation.

For the analysis less than five acres of holding is subdivided into five distinct class intervals of one acre each and five to ten acres as a whole is considered in one class interval.

Third, present study also aims at bringing out the individual influence of income from farm and income from other sources on capital formation.

Fourth, it is also proposed to throw some

light on the pattern of farm income and farm expenditure with a view to get a standardised picture of income and expenditure relative to size of holding as well as in irrigated and un-irrigated cultivation.

And finally, the study also attempts to bring out the impact of size of family on capital formation.

**SUMMING UP, THE OBJECTIVES OF THIS
STUDY ARE:-**

- (a) To gauge the potential of capital formation in the agricultural sector, of owner cultivators, under both irrigated and un-irrigated categories.
- (b) To find out the influence of size of holding on capital formation.
- (c) To find out the influence of income from farm and income from other sources on capital formation.
- (d) To obtain a standardised picture of farm income and farm expenditure relative to size of holding.

- (e) To find out the impact of size of family on capital formation.

THE METHOD

*Capital Formation is a long process which is logically susceptible to division into three stages:-

First, it is the creation of savings which are a surplus of income over expenditure. The source may be individuals, businessmen, traders, agriculturists, etc. in different capacities.

Secondly the money savings thus generated are converted into funds available for investment. Thirdly the funds are spent on the acquisition of capital stock which is capital formation in the strict sense of the term used.

* Jakhade V.M. - Capital Formation in Indian Agriculture - A note on methods - The Indian Journal of Agricultural Economics - Vol. IX. pp.95.

Studies are undertaken in each of the three stages depending on the purpose. Since the present study converges mainly on the acquisition of capital as Reproducible Tangible Wealth, it is proposed to focus the study on the third stage. As such neither the extent of capital formation could be measured either by the money expenditure method or the production method.

The Production Method is generally based on statistics of production and imports of capital goods. By this method capital formation equals production of capital good plus imports of capital goods minus export of capital goods. In our country the absence of statistical data is one of the main limiting factors in applying successfully this method for the study. Since the study is oriented toward the individual cultivators, the volume of building and

repairs of farm, cattle sheds, reclamation and improvement of the soil carried out by the cultivator and his family being non-monetary spheres of activity it was found rather difficult to adopt the Production method for this study. Hence money expenditure method was chosen as the tool for this study. Information regarding expenditures of a capital nature can be obtained by administering a schedule. Expenditures incurred in lump sums can be easily remembered by the agriculturists. Information on such items which would serve the purpose can be collected by adopting the money expenditure method for a specific period of one year with a good amount of reliability of the data furnished. This will largely help compilation of data regarding capital formation in the agricultural sector.

Since there are many major items of capital investment the current study being aimed at

dealing with the importance of acquisition of reproducible tangible wealth the criteria for distinguishing farm investment and non farm investments were made in the following ways so as to prepare the indices of measurement of capital formation. The investment on the construction of residential buildings, purchase of consumer capital goods, non-farm business investment, purchase of bonds, shares savings certificates, etc., and purchase of gold and silver ornaments can only mean an increase in the capital assets and they do not represent reproducible tangible wealth in agriculture.

With due consideration to the above factors the following items are mainly considered capital investment on farm or capital formation for the purpose of this study.

PURCHASE OF LAND.

Buying land leads to an increase in capital assets of an individual cultivator. So resources spent in purchase of land is reckoned as an act of investment resulting in capital formation. But for the community as a whole the same may be a simple transfer of assets.

RECLAMATION OF LAND.

This means either reclamation of uncultivable land or cultivable land. So expenditure tending toward this is taken as capital formation.

BUNDING AND OTHER LAND IMPROVEMENT.

Expenditure on bunding, terracing, fencing etc., are included in this category. Thus expenditure which do not come under maintenance are taken as capital investment on land which tend to increase the productivity.

DIGGING AND REPAIR OF WELLS.

Digging a new well is definitely capital formation. Further deepening and repairs to an existing

well is also taken under productive capital expenditure.

DEVELOPMENT OF OTHER IRRIGATION SOURCES:

Expenditure reported under this category is really an addition to the capital asset. Such new investment forms part of capital formation.

LAYING ORCHARDS AND PLANTATIONS:

Since the expenditure involved in turning a field into an orchard or plantation is significantly large and returns realized only after some years it should certainly form part of an addition to capital asset.

PURCHASE OF LIVESTOCK:

This is taken under the head of capital formation making all allowance for replacement costs.

PURCHASE OF CARTS, VEHICLES AND FARM IMPLEMENTS.

The purchase of the above items is considered under the head of capital formation.

The expenditure incurred on the construction of farm houses and cattle sheds is taken into account as capital formation.

Data were collected with the help of a * schedule including all the items under productive farm investment, all the income from the farm, from other sources and subsidiary occupations and income from livestock, expenditure annually incurred on the farm, family and consumption and acquisition of non-farm capital stock. The schedule was pretested for consistency and personally administered to the individual farmers sampled for the study.

The Method of approach has been developed on the following operational definitions.

INCOME:

The concept is divided into two distinct aspects for the purpose of analysis. It is dealt under "Farm Income" and "Income from other sources"

*Vide Appendix I

Farm income means the gross income realised by the cultivator from his owned and cultivated lands. Income from other sources includes all the income realised by the cultivator as an agricultural labourer from his subsidiary occupation, the gross income he has realised from the lands leased in and out and income realised from his livestock.

EXPENDITURE:

Farm Expenditure includes all the expenditure incurred by the cultivator on the purchase of seed, farm yard manure, fertilisers and pesticides etc., and the amount he pays toward labour for the cultivating operations from ploughing to processing on his owned lands. It also includes items like land revenue, interest paid on loans, salary paid to permanent labour and the cost of maintaining his livestock.

OTHER EXPENDITURE:

Other expenditure includes expenditures incurred by the cultivator and his family on consumption and other extraordinary items like marriage, ceremony,

festival etc., and those incurred in cultivating the lands leased in and lease charges he pays.

CAPITAL FORMATION.

In the light of the objectives and certain limitations that follow, capital formation for the purpose of this study means reproducible tangible wealth in agriculture. As such the utilisation on investment is divided into two broad heads: Agricultural and Non-agricultural investments. Under agricultural utilisation all accumulation of capital assets that could help to improve the productive efficiency of the land are considered. The investment on residential building, their repair, purchase of cycle, radio, ornaments and investment in Bonds are considered non-agricultural utilisation.

LIMITATIONS OF THE STUDY:

- (1) This study is limited to Madurai District in Madras State.

- (2) It is also limited to one agricultural year (June 1966 to July 1967) Fasli 1376.
- (3) It is also limited to holding sizes upto ten acres so as to make a focus and concentration on small and medium holdings.
- (4) No distinction of crop-wise yield and income is made for the analysis.
- (5) Only the owned and cultivated area of the agriculturist by himself is referred to as the size of holdings and this is the basis for grouping the data.
- (6) The study is limited only to the completely settled ryotwari villages in the sampled taluks. Since tenant cultivation is a predominating feature in Inam and Jamin Villages.

SAMPLING.

The fact that the study was a one man project, we could not embark on a survey of sampled villages and instead decided to follow a modest course in selecting the villages and number of respondents for the investigation.

*Madurai District, the main area of study naturally gives way for two distinct division as taluks irrigated by the Periar and Vaigai systems and comparatively drier plains. On this basis the taluks in this district were arranged into two distinct groups as irrigated areas and unirrigated areas. From this Periakulam was selected to represent the irrigated area and Tirumangalam to represent the unirrigated area.

**

Then the villages in the irrigated and unirrigated sampled areas were listed and arranged in a serial order. It was decided to chose five villages to represent the irrigated stratum and thus the same was chosen at random. The percentage of net area sown of these five villages to the net area sown in this taluk was calculated and then the villages from

* See Chapter IV for a detailed description.

** Name of villages and sampling pattern - Vide Appendix II and II (a)

the unirrigated area were selected at random until they represented the same percentage to the net area sown in that taluk. Thus eight villages were selected to represent the unirrigated stratum.

As already indicated, we are concerned with the owner cultivators, a list of the same for both irrigated and unirrigated areas was obtained from the village records of the respective sampled villages. Then the land owners in each village were first stratified into the following size groups of ownership holdings and serially numbered.

0	.....	1
1	.....	2
2	.....	3
3	.....	4
4	.....	5
5	.....	10

Then a systematic sampling method was adopted to select the respondents to be investigated.

Thus it was decided to interview 92 from the irrigated area and 97 from the unirrigated area.

METHOD OF ANALYSIS:

Firstly all the absolute values of each variable included for the study were converted into per acre figures by dividing them individually by the size of holding. Then the mean per acre value was obtained for all the variables separately for irrigated and unirrigated categories since this could help for the purpose of comparison.

To find out whether there is any inter relationship or any significant difference between investments of type agricultural and non-agricultural, irrigated and unirrigated forms of cultivation and also between different sizes of holding, a statistical design namely "Analysis of Variance" or "Three Way Classification" was adopted.

To determine the extent of influence of the factors, size of holding, per acre farm income, farm expenditure, per acre income from other sources, size of family, on agricultural and non-agricultural investment and also to determine the influence between these variables correlation coefficient technique is used.

Correlation is an expression of the relationship between one variable and one or more variables. In another way, it is the measurement of the degree of association between two or more factors. Correlation may be simple (or) multiple.

In correlation analysis if the variables are independent then the value of correlation coefficient would be zero. If there is an exact linear relationship between the variables then the value would be + 1, if the two variables increase or decrease simultaneously and - 1, when one variable increases there would be a

corresponding decrease in the other. But in practice the correlation coefficient can be either positive or negative with values anywhere between zero to one. Then the plus or minus signs indicate whether the correlation is positive or negative and the magnitude shows the degree of correlation.

XXXXXXXXXXXX

CHAPTER IV.**AGRO ECONOMIC BACKGROUND OF MADURAI****PHYSICAL FEATURES**

Geographically the district is situated at the foot of the Western Ghats between 9.30' and 10.50' of the northern latitude and 77.10' and 78.30' of the eastern longitude. It has an area of 4,869 square miles. It is rounded off in the north by

Coimbatore and in the east by Tiruchirapalli in the south by Ramanathapuram bordering on Kerala State, with the latter extending its western borders, to form the western boundary with Coimbatore.

On the basis of the physiographic characteristics, Madurai can be divided into five broad natural divisions. The Palani hills with its neighbourhood in the east constitute a hilly stretch. Similarly Thirumangalam taluk in the south is a level plain of black cotton soil with small granite hills and with a little vegetation, it is widely different from other regions.

The other remaining parts of the district can be grouped into three natural divisions.

- (a) The level tracts of Nilakottai and Madurai taluks and southern part of Melur taluk irrigated by the Periyar system.

(b) Comparatively drier plains of red soil similar to the adjoining Coimbatore district and stretching across the northern parts of Melur, Palani and Dindigul taluks.

(c) The Cumbum valley in Periyakulam taluk with its thick vegetation and watered by the perennial streams from the great hills on the west.

Madurai District has a total acreage of 31,18,048 acres. The different uses to which the area has been put are detailed as under.

***T A B L E I.**
CLASSIFICATION OF THE AREA
(As on 1955 - '66)

Description	Area in acres	% to Total
I Forests	3,83,089	12.3
II Barren and un-cultivable lands	2,23,450	7.2
III Land put to non-agricultural uses	2,45,792	7.9
IV Cultivable Waste	97,001	3.1
V Permanent pastures and other grazing lands	2,94,546	9.4

Contd....

VI	Lands under other Miscellaneous crops and flowers not included in the net area sown	62,079	2.0
VII	Current fallows	2,63,838	8.5
VIII	Other fallow lands	1,54,736	5.0
IX	Net area sown	13,91,464	44.60
		<hr/>	
		31,16,045	
		<hr/> <hr/>	

* A short note on Agriculture in Madurai District.
1956 - Prepared by the Collectorate, Madurai.

S O I L.

There are mainly two major groups of soils in the district namely the black and the red variety; Over 85 per cent of the area in this district are red ferruginous soil, and black soil or regon is found in Thirumangalam Taluk and in some parts of Periakulam and Palani Taluks.

TABLE II**PERCENTAGE DISTRIBUTION OF SOILS IN MADURAI DISTRICT***

Taluk	Black soil	Red soil
Palani	6.5	93.5
Dindigul	2.8	97.2
Nilakottai	6.4	93.6
Melur	0.4	99.6
Periyakulam	9.0	91.0
Thirunangalam	60.8	34.2
Madurai	17.4	82.6

* District Census Hand Book - Madurai 1961 - Vol. I
Government of India

From the above table it is evident that the red soil dominates all the taluks except Thirunangalam where the black cotton soil predominates with a little over 60%.

CLIMATE AND RAINFALL

There are four distinct seasons which are

noticed in this district. They are:-

- I. The dry season which extends from January to March.
- II. The hot season from April to May.
- III. The south-west monsoon period; and
- IV. The North-East monsoon period.

Naturally the rainfall during the dry season is found to vary from 52 M.Ms. at Palani to 164.3 M.Ms. at Kedaikanal. Further February and March are generally the driest months of the year.

The rainfall during the South-west monsoon period is often heavy in the eastern and southern taluks. There is a considerable variation in rainfall during this period of the season. In Cumbum valley and Palani the lowest amount of rainfall is experienced. Kedaikanal experiences the heaviest rainfall during this season.

The district records the maximum rainfall on the eve of retreat of the monsoon.

On the basis of the rainfall the district can be divided into three distinct rainfall regions:-

- I. Hilly regions of entire Kodaikanal Taluk.
- II. The eastern region consisting of Thirumangalam, Nilakottai, Madurai and Melur Taluk and the eastern part of Dindigul Taluk and
- III. the Kumbum region with Palani taluk and western part of Dindigul taluk and Periyakulam taluk.

In the hilly regions the rainfall is uniformly distributed and the maximum rainfall occurs during the months of October and November. The eastern region receives the maximum rainfall during the retreating period of the monsoon and a considerable amount of rainfall during south-west monsoons. The west conspi-

one of the prominent features of the Cumbum-Palani region is the low amount of rainfall during south-west monsoons.

The average rainfall of the district excluding Kodaikanal is 36.72". About more than one fourth of the total rainfall is registered during south-west monsoon (i.e.) from June to September, and about half during the months of October and December, the period of the north-east monsoon. October and November are the wettest months of the year and the driest are January, February and March. The district does not always get the full benefit of the monsoons and the distribution varies in the different parts of the district.

AGRICULTURE AND ANIMAL HUSBANDRY.

The agricultural practices of this district do not differ greatly from those of the other

parts of Southern India. Most of the arable lands are dry. Manuring is done before ploughing and sowing or transplanting as the case may be. Local manures are cattle dung, green leaves, tank silt, compost, cattle and sheep penning and oil cakes. The use of chemical fertilizers such as ammonium sulphate and super phosphate have greatly increased in quantity for manuring paddy and sugarcane.

Even with the prevalence of fertile soils of the alluvial type in scattered areas like Nilakottai, Melur, Madurai and to a certain extent in Cumbum valley, agriculture in this district is found to be seriously handicapped due to the presence of numerous hills. Out of a total geographical area of 3,116,045 acres, only 13,91,464 acres are being sown. This net area sown forms only 44.6 per cent of the total acreage of this district. But in consequence with the provisions of irrigation and reclamation of waste and fallow lands, agriculture in this district has made some progress.

TABLE III**CROPWISE ANALYSIS OF TOTAL AREA IRRIGATED -FOR FASLI 1974(1964-'65)****FOR PRINCIPAL CROPS.**

S.No.	CROPS.	Area in acres 1964-'66.	Area in acres 1963-'64.	Difference
I.	Rice	3,81,241	3,69,971	+ 11,270
II.	Cholan	78,529	72,156	+ 6,373
III.	Cumbu	8,621	6,200	+ 2,422
IV.	Ragi	28,818	28,417	+ 401
V.	Groundnut	25,679	18,795	+ 6,884
VI.	Sugarcane	14,653	10,166	+ 4,487
VII.	Cotton	22,691	27,431	- 5,260

* Source: Seasonal and Crops Report of the Madurai District Statistical Officer's Office.

Paddy is raised over an extent of 3,72,580 acres in this district. It is not only the staple product of this region but also the principal food of the people. Madurai, Melur, Nilakottai, Periyakulam and Tirumangalam Taluks are found to have the most favourable conditions for the cultivation of paddy and these taluks account for over 84 per cent of the total area under paddy in this district.

Normally paddy is raised in two crops; a short term crop and a long term crop. The former is begun in June and is called "Kodai" while the latter is begun in September and is usually known as "Kalam".

MILLETS.

The soil conditions are found to be best suited for the cultivation of millets. These crops are found to account for a considerable portion of the total cropped area of this district. Dindigul, Periyakulam and Palani taluks are the most important areas

TABLE IV.

**AREA UNDER PRINCIPAL CROPS WITH IRRIGATION FACILITIES WITH SOURCES
(1965 - 1966)**

S.No.	CROPS	Periyar and Vaigai Projects	Tanks	Wells	Un- irrigated	TOTAL
I.	Paddy	1,79,000	1,34,600	56,300	2,620	3,72,520
II.	Cholan	410	3,200	68,300	2,21,000	2,93,000
III.	Cumbu	...	1,600	3,070	33,130	37,800
IV.	Ragi	...	12,130	16,310	6,260	34,700
V.	Sugarcane	9,000	1,020	1,305	...	11,325
VI.	Groundnut	...	700	4,800	2,30,500	2,36,000
VII.	Cotton	...	...	...	1,01,621	1,01,621
	T O T A L:-	1,88,410	1,53,250	1,80,235	5,95,131	

Source: Reports - Short Note on Agriculture in Madurai District 1966 - Prepared by the Collectorate, Madurai.

of the millet cultivation. Thus the three taluks have the maximum acreage under these crops.

IRRIGATION.

With scanty rainfall, Madurai has all along felt the need for proper irrigation facilities. Further there are no perennial rivers of any importance that can afford a good irrigation facility.

Excepting the Periyar system the best irrigation sources are the Vaigai and its tributaries, the Suruli and Varahanadhi. But these can only be regarded as equal to the second best irrigation source in the Tirunelveli and Coimbatore Districts.

The Periyar system takes its source at the head of the Cumbum valley. A few miles across the border between Madurai District and Kerala territory,

at the head of Cumbum valley the Periyar river runs into the Kerala territory, through the Western Ghats towards Cochin.

The aspect of the system as a whole is divided into three parts: The Cumbum valley and the single and double crop areas of the delta. The first of these lies close to the Periyar lake though at a much lower level and is irrigated by means of a system of channels and tanks which existed are fed directly by the river down through which the Periyar water now flows into the Madurai District. The delta is the name given to the area irrigated below the dam at Peranal dam where the periyar water is drawn from the river to ^{the} main canal. The position near to the Peranal dam is called the double crop area and it receives the Periyar water earlier and for a longer period than the single crop area, from which it is divided by a set of sluice gates across the main canal at Kallanchi. The estimated extent of area irrigated at present by

the periyar system is about 1,46,000 acres.

Besides the Periyar system another project in the district called Berijam project has been engaging the attention of the Government. This not only assures continuous supply to Periyar scheme ayacut but also irrigates an additional extent of 18,400 acres of Madurai alone. Ramanathapuram also enjoys the benefits of this scheme to a little extent.

In addition to these two major projects the district is benefited from other schemes also. Most of them are ancient works, but have been of use till this day. Mention must be made of the Chittanai dam across Vaigai and the Nilayur channel that takes off from it, the Ayyampatti ayacut across Balar, the Kotten dam across Varatar and the Athur dam across Kodavanar.

Other than rivers, the chief sources of irrigation in this district are ^{the} tanks, wells and a few spring channels. Especially in Melur and Dindigul taluk, there is a very large number of small tanks, though many of them are extremely small and rainfed, under which the ryots struggle, with success proportionate to their industry to raise wet crops.

As shown below, sources of irrigation with less than 50 acres ayacut account for 4/5 of the total number ^{of} sources in the district.

*SOURCES HAVING AYACUT.	TANKS.	OTHERS.
I. Under 50 acres	1,835	897
II. 50 acres and more	1,103	144

* A short note on Agriculture in Madurai - 1956 -
Prepared by the Collectorate, Madurai.

The capacity of sources shown against item one is small because they have to be filled several

times before the crops raised under them are brought to maturity.

TANKS.

Tanks are a useful source of irrigation in this region. There are over 2,800 tanks in this district. Of these 466 have ayacut extending over 100 acres. These tanks are fed mostly by irregular streams. There are also a few rainfed tanks. The total net area irrigated under tanks in this district is 1,54,458 acres.

WELLS.

This is one of the districts where well irrigation is greatly prevalent. The Dindigul taluk contains by far the greatest number of wells, but in Palani taluk, though the number of wells is smaller, the wells themselves are much bigger than those in the

TABLE V.CLASSIFICATION OF THE SOURCE OF IRRIGATION AND THE
EXTENT IRRIGATED - IN FASLI 1374 (1954-'55)

SOURCE	Area in Acres 1954-'55	Area in Acres 1953-'54		DIFFERENCE
A) <u>CANALS</u>				
I. Government	1,71,734	1,63,848	+	7,886
II. Private	...	...		...
B) <u>TANKS</u>				
I. Government	1,29,601	1,16,358	+	13,243
II. Private	941	903	+	38
TOTAL	1,30,542	1,17,261	+	13,281
C) <u>TUBE WELLS</u>				
I. Government	440	433	+	7
II. Private	...	...		...
TOTAL	440	433	+	7
D) <u>ORDINARY WELLS SOLE IRRIGATION.</u>				
I. Government	56	52	+	4
II. Private	1,65,918	1,49,933	+	15,985
TOTAL	1,65,974	1,49,985	+	15,989
E) <u>OTHER SOURCES:</u>				
I. Government	5,833	5,333	+	500
II. Private	218	212	+	6
TOTAL	6,051	5,545	+	506
<u>TOTAL AREA IRRIGATED:</u>	<u>4,74,741</u>	<u>4,37,072</u>	<u>+</u>	<u>37,669</u>

* Source: Season & Crops Report Fasli 1374.

other taluks and commend a larger extent of land. Well irrigation is found to be the most important in Dindigul, Palani and Thirumangalam Taluks. In every taluk except Madurai and Melur garden cultivation carried on with the aid of wells is a striking feature. With many wells, three crops are grown in a year and their variety is tobacco, cotton, paddy and sugarcane and their comparative yield is also found to be higher. The wells in Melur taluk are found to be principally in wet lands and supplement precarious sources of irrigation. Over 36% of the net area irrigated comes under well irrigation in this district.

Apart from these there are a few spring channels that irrigate over 8000 acres in this district. The proportions of gross area irrigated is higher than the proportion of net area irrigated to net area sown. In per centage the former is 21 while the latter is only 35.5 in the district. This is due

to the extensive acreage that receive irrigation facilities for the second crop. Further it can also be attributed to the completion of Vaigai Project. The acreage irrigated more than once totals to 1,81,170. Thus it is evident that the extension of irrigational facilities through projects has considerably improved the position of agriculture in this District.

**THE FIVE YEAR PLANS AND
AGRICULTURAL DEVELOPMENT
IN THE DISTRICT.**

The economy of Madurai district has developed greatly as a consequence of the three five year plans. The dependence on agriculture of the people for their livelihood has dwindled through the plans, although agriculture continues to be the main stay of the people in the district. The plans particularly the Second Plan aimed at starting new industries in various rural centres. But by the by

agriculture also received a good treatment in the plans.

There has been evidence of increase in the area under cultivation of different crops during the decade. The net sown area has gone up from 1,205,261 acres in 1950-51 to 12,71,342 acres in 1955-56*. Similarly area under paddy cultivation has also gone up from 3,16,236 acres in 1950-'51 to 3,72,580 acres in 1955-'56*. The same trend can also be noticed in the case of all the other crops and especially in case of principal crops.

IRRIGATION

The total area under irrigation in the district has increased from 4,31,500 acres in 1950-'51 to 4,42,053 acres in 1955-'56 and to 4,94,404 acres in 1960-'61.* The Vaigai reservoir is an important project

* A pamphlet on achievements in Madurai District - During the First, Second and Third Five Year Plan Period - 1966 - Report prepared by the Collectorate, Madurai.

of the plans. A sum of 53.41 lakhs of rupees and Rs.174 lakhs has been spent during the First and Second Plans on this project. The storage capacity of the project is 68,000 lakh cubic feet.

Irrigational facilities have been provided by this project to Thirumangalam and Melur taluks. A 17½ mile long canal has been constructed in Thirumangalam taluk to bring 10000 acres of land under cultivation. During 1959-'60, 11,384 acres were irrigated. Since July 1960, a total area of 10,384 acres received irrigational facilities by the Thirumangalam canal. Further by lowering the watershed of Periyar reservoir at a cost of 25 lakhs of rupees 4,000 acres of additional land have been benefited.

Towards minor irrigation works, a sum of Rs.30 lakhs was spent during the last 10 years.

TABLE VI.
PRODUCTION OF DIFFERENT CROPS FROM 1950-'51.

PRODUCTION IN TONNES

S.No.	CROPS.	1950-51.	1955-56.	1960-61.	1965-66.
I.	Rice	2,30,250	2,17,230	2,52,560	2,37,820
II.	Cholan	82,750	1,08,450	1,33,610	65,760
III.	Cumbu	9,180	17,100	18,850	8,623
IV.	Bagi	16,740	21,330	20,920	14,100
V.	Groundnut	53,690	71,080	1,19,660	84,667
VI.	Sugarcane	2,95,900	2,75,470	4,21,800	4,14,720
VII.	Cotton (in bales)	30,290	44040	44,040	97,555

Source: 1961 Census volume and the Season and Crops Report of the Office of the Statistical Officer.

The number of minor works constructed was 188.
An ayacut of 32,980 acres were brought under
plough through it and the additional increase
in production was also effected.

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CHAPTER V**ANALYSIS (A)****FARM INCOME AND EXPENDITURE**

It is a practically accepted phenomena that only when there is a surplus, there is a clear indication and motive for investment on capital formation. Here we feel the importance of income as a main indicator of the surplus that could accrue. But we cannot compute the amount of possible surplus with income alone.

So here we have to consider the amount involved in expenditure head. Thus income and expenditure become the most important things to designate the amount of surplus that could be available. So it is decided to analyse the pattern of income and expenditure in farming the irrigated and unirrigated areas.

Further a substantial increase in income can be attributed to intensified cultivation and also to the increased area of land cultivated; so is the case of expenditure, an increase in it can be attributed to the intensive methods of cultivation adopted. But, generally, the expenditure is to decrease as the area of land cultivated increases, which could be ^{the} result of the accruing of economies of large scale operation.

*Further the total annual income constitutes the income from farm and the income received from the subsidiary occupation, as a payment received in

* See Concepts used - Chapter III for a clearer definition.

functioning as agricultural labourer, and also from the land leased in or out.

Apart from all the above said factors, the size of family has also a greater role to be played in influencing the pattern of income and expenditure.

FORM OF ANALYSIS

The method adopted for measuring the influence of size of holding on income from farm and expenditure on farm is as follows:- Initially an analysis of holding size wise per acre income and expenditure distribution is given to establish a gross relationship and as a "p priori" case. Subsequently the results of correlation coefficients are also worked out to establish the relationship.

A tabular summary of the influences of the different variables is given below for irrigated and unirrigated cultivation.

IRRIGATED:

	<u>Size of holding</u>	<u>Income from Farm</u>	<u>Expenditure on Farm</u>
Size of holding	...	mild negative relation	mild negative relation
Income from farm	mild positive relation

UNIRRIGATED:

Size of holding	...	mild positive relation	mild negative relation
Income from farm	...	...	positive relation

INCOME FROM FARM.

In table VII the frequency distribution of per acre income for irrigated and unirrigated cultivation is arranged according to the sizes of holding. With a general look of the table it is evident that irrigated cultivation is more profitable than unirrigated cultivation. Because we find that in all the size groups under irrigated cultivation there is evidently very high potential for higher per acre income than unirrigated cultivation.

TABLE VII
PER ACRE INCOME FROM FARM
UNDER IRRIGATED AND UNIRRIGATED CULTIVATION.

Size of holding in acres	IRRIGATED		UNIRRIGATED	
	Mean size of farm	Income £.	Mean size of farm	Income £.
0-1	.7080	3,407	.8763	271.68
1-2	1.4700	2,768	1.6268	345.30
2-3	2.4144	2,947	2.6619	435.38
3-4	3.6850	2,753	3.7094	304.13
4-5	4.6050	2,850	4.4488	295.13
5-10	8.1620	2,702	7.5023	388.13

TABLE VIII
PER ACRE EXPENDITURE ON FARM
UNDER IRRIGATED AND UNIRRIGATED CULTIVATION.

Size of holding in acres	IRRIGATED		UNIRRIGATED	
	Mean size of farm	Expendi- ture £.	Mean size of farm	Expen- diture £.
0-1	.7080	1,540	.8763	192.00
1-2	1.4700	1,322	1.6268	315.85
2-3	2.4144	1,254	2.6619	187.48
3-4	3.6850	1,251	3.7094	289.75
4-5	4.6050	1,184	4.4488	165.75
5-10	8.1620	1,392	7.5023	203.77

Graph: 1 and 2.

TABLE IX
PER ACRE INCOME BY SIZE OF HOLDING AND SIZE OF FAMILY
I R R I G A T E D

Size of holding / Size of family	0-3	4-5	6-7	8 & above
0-2	3113.50 (8)	3102.47 (30)	2964.78 (9)	2977.4 (9)
2-4	Nil	2668.82 (11)	2974.57 (7)	3028.33 (9)
4 & above	Nil	3319.00 (1)	2789.50 (2)	2691.83 (6)

TABLE X
U N I R R I G A T E D.

Size of holding / Size of family	0-3	4-5	6-7	8 & above
0-2	250.40 (10)	350.93 (14)	253.88 (8)	319.43 (7)
2-4	634.00 (4)	254.23 (21)	322.00 (5)	632.00 (7)
4 & above	Nil	356.88 (8)	355.30 (10)	301.00 (3)

Figures in bracket represent the number of an observations in each group.

IRRIGATED

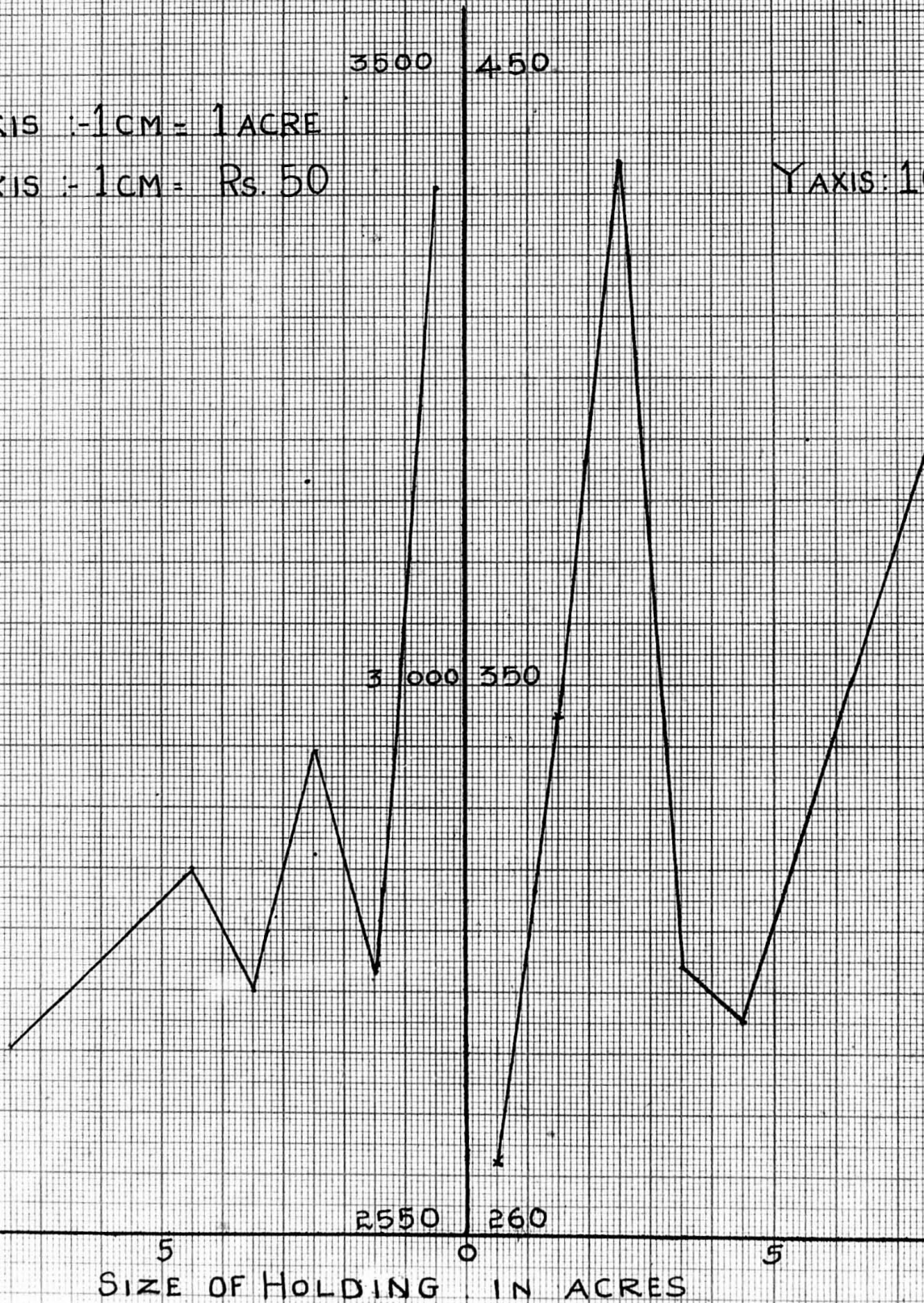
UNIRRIGATED

PER ACRE INCOME IN RUPEES

X AXIS :- 1CM = 1ACRE

Y AXIS :- 1CM = RS. 50

Y AXIS: 1CM = RS.10



Further looking at the table individually for irrigated and unirrigated cultivation, we find a basis for comparison of the per acre farm income to the increase in size of holding. Under irrigated cultivation we find the per acre farm income is as high as 3,407 rupees, from there as the size of holding increases we find a definite trend declining in the per acre income though it is fluctuating.

But in the case of unirrigated cultivation the per acre farm income goes on increasing till 2-3 acre level where it is 435.38 rupees/acre where from it falls and again increases at the 5 to 10 acre level. But the increase at the 5-10 acre level does not commensurate with the 2-3 acre level. So it looks that the cultivators in the 2 to 3 acre size group are in an

advantageous position in getting the maximum per acre income unlike in the case of irrigated cultivation where the cultivators in the one acre level are better off in getting the maximum per acre income.

The result of the correlations though not statistically significant, have shown us the trend which we have watched in the table VII. As we have seen a negative trend of per acre income decreasing with the increase in the size of holding in irrigated cultivation, the correlations figure also shows a mild negative trend between size of holding and per acre income which is -0.1049 for irrigated cultivation.

In the case of unirrigated cultivation we have seen a mild increasing tendency which is also represented by the correlation figure being positive

.0469., which can be statistically explained as zero correlation. Even this positive tendency we could see in the table VII where the per acre farm income is 271.68 rupees at 0-1 acre level and it is 388.13 rupees at 5-10 acre level, Though it is found to be fluctuating, in none of the size groups it has touched or gone below the level at one acre which is again the lowest per acre farm income under unirrigated cultivation.

So we can safely conclude that there is higher per acre income in irrigated cultivation and in that at ^{the} one acre level it is the highest and more advantageous.

FARM EXPENDITURE.

Table VIII gives a comparative picture of the per acre farming expenditure between irrigated and

unirrigated cultivation, in relation to the size of holding.

In irrigated cultivation, we see a continuous decrease in the per acre farm expenditure, till 4-5 acre level and there is an increase in the 5-10 acre level which again is not above the per acre expenditure involved in the one acre level. So here we could definitely sight an example for the advantages of the large scale cultivation, that the per acre farm expenditure decreases with the increase in the size of holding cultivated.

The same is the trend that can be observed from the unirrigated cultivation farm expenditure figures. Here the movement is a bit erratic and the figures are found to be alternatively increasing and decreasing.

**PER ACRE EXPENDITURE BY SIZE OF HOLDING AND SIZE OF
FAMILY.**

TABLE XI
IRRIGATED

Size of Holding/Size of family	0-3	4-5	6-7	8 & above
0-2	1449.00	1223.97	1316.11	2071.89
	(8)	(30)	(9)	(9)
2-4	Nil	1285.45	1332.86	1154.22
		(11)	(7)	(9)
4 & above	Nil	1598.00	1262.00	1294.00
		(1)	(2)	(6)

TABLE XII
UNIRRIGATED.

Size of Holding/Size of family	0-3	4-5	6-7	8 & above
0-2	221.00	216.78	190.88	488.57
	(10)	(14)	(8)	(7)
2-4	183.00	223.80	241.80	268.57
	(4)	(21)	(5)	(7)
4 & above	Nil	211.25	137.50	167.00
		(6)	(10)	(7)

Here, from the correlation figures, though not as statistically significant, we are to call on them to prove the argument that per acre farm expenditure decreases with an increase in the size of holding cultivated; because the correlation figures also show the same trend in irrigated and unirrigated cultivation. For irrigated cultivation the correlation is -0.035 and for unirrigated cultivation it is $-.1322$.

From the above we can conclude, perhaps the whole hearted adoption of improved farming practices, may really help to prove the argument with significant result.

Further tables XI and XII give a clue to the fact that the size of family has also some influence on the expenditure on farm; because here we get the question of family labour.

Definitely with an increase in the size of family and if the concentration of members is also directed towards their farm the size of expenditure on farm will register a decrease. The Tables XI and XII give a ^{some} ~~clearing~~ idea of the above said factor.

From the above tables we could watch a decreasing tendency in the per acre expenditure, with an increase in the size of family in the same size groups respectively in irrigated cultivation (with an exception of 0-2 size group in the case of 8 and above members in irrigated cultivation)

But in the case of unirrigated cultivation, we could not observe a regular tendency, the movement is a bit erratic. In the 0-2 acres level the expenditure is found to decrease upto 6-7 member family and above that there is a sudden increase. In the case of 2-4 acre level the expenditure is increasing with an increase in the size of family. In the case of 4 and above acres

of holding the expenditure pattern shows a decreasing trend, though not continuously decreasing.

FARM INCOME AND FARM EXPENDITURE

A study of the correlation figures of farm income and farm expenditure proves that with an increase in the amount expended on farm there is an increase in the income realized.

In the case of irrigated cultivation the correlation figure is .1871 and for unirrigated cultivation it is .3010.

It can be observed from the correlation coefficient for irrigated cultivation; There exists a positive relation between per acre farm income and expenditure . Since the correlation coefficient is not substantial, we may assume the amount of increase in income is not proportional to the amount of increase in expenditure but there is a positive tendency for the income to increase in small proportions. The same is supported by the positive correlation for the unirrigated cultivation.

INCOME FROM OTHER SOURCES

The table, XIII gives an idea of the per acre income from other sources that accrue at different sizes of holding. It is evident from the figures of irrigated and unirrigated cultivation, that the per acre income from other sources is continuously decreasing till 4-5 acre holding and there is a small increase at the 5-10 acre level.

Further the per acre income from other sources is phenomenally high at the one acre level. This may be due to the smallness of the farm and naturally the cultivator resorts to other sources to increase his income potential. But the decrease in per acre income from other sources with an increase in the size of holding cultivated suggests that the cultivator is more occupied with the cultivation of his own land as the size of the cultivated area by him increases.

Further from the tables XV and XVI we could also see the influence of size of family on the income from other sources. Because if there are more members in a family and more than they go and engage in employment outside, there is a general increase in the total annual income of the family.

PER ACRE INCOME FROM OTHER SOURCES ACCORDING TO SIZE OF HOLDING.

TABLE XIII

Size of Holding	IRRIGATED	UNIRRIGATED
0-1	4475	1167.53
1-2	2111	728.06
2-3	1813	301.48
3-4	1514	346.85
4-5	409	162.13
5-10	927	194.77

TABLE XIV.

PER ACRE TOTAL INCOME ACCORDING TO SIZE OF HOLDING

Size of Holding	IRRIGATED	UNIRRIGATED
0-1	7882	1439.21
1-2	4877	1073.35
2-3	4760	736.66
3-4	4267	651.01
4-5	3259	357.26
5-10	3629	683.08

**PER ACRE INCOME FROM OTHER SOURCES BY SIZE OF HOLDING
AND SIZE OF FAMILY.**

TABLE XV.
IRRIGATED

Size of Holding / Size of family	0-3	4-5	6-7	8 & above
0-2	1716.87	3843.87	791.77	8458.11
	(8)	(30)	(9)	(9)
2-4	Nil	614.55	2127.43	2668.55
		(11)	(7)	(9)
4 & above	Nil	118.00	417.00	2401.50
		(1)	(2)	(6)

TABLE XVI.
UNIRRIGATED

Size of Holding / Size of family	0-3	4-5	6-7	8 & above
0-2	831.40	616.36	798.75	1915.86
	(10)	(14)	(8)	(7)
2-4	140.50	314.71	422.20	4000.00
	(4)	(21)	(5)	(7)
4 & above	Nil	130.75	200.40	259.67
		(8)	(10)	(3)

XV and XVI

From the tables we can clearly find a relationship between the income from other sources and the size of family. Undisputably the income from other sources in irrigated and as well unirrigated cultivation increases with an increase in the size of family. This can be seen by observing the data, size of holding wise in parallel lines. Thus we find an increase in the income from other sources in each size of holding with an increase in the size of family. The increase is continuous.

But on the other hand as already described, the income from other sources does not increase, if the data is been observed in vertical line, by keeping size of family constant and increasing the size of holding. In that case we see a definite decrease in the income from other sources, when the size of holding decreases. The same is the case as for families both in irrigated and unirrigated cultivation.

The same result can be exemplified by the correlation figures between size of holding and income from other sources. They are as follows:- $-.2839$ for irrigated cultivation and $-.5006$ for unirrigated

PER ACRE LOAN AND REPAYMENT.

TABLE XVII
IRRIGATED

Size of Holding	Per acre total income	LOAN	% of loan to total income	REPAYMENT	% repayment to total income	% repayment to Loan
0-1	7882	2105.4	26.71	667.2	8.465	31.70
1-2	4877	1335.8	27.38	480.8	9.847	35.97
2-3	4760	1321.0	27.75	619.0	13.00	46.86
3-4	4267	1033.9	24.23	276.8	6.494	26.80
4-5	3259	1156.8	35.50	496.8	15.24	42.94
5-10	3629	624.8	17.22	109.4	3.015	17.51

UNIRRIGATED
TABLE XVIII

0-1	1439.21	255.6	17.76	72.00	5.003	28.10
1-2	1073.35	364.4	33.96	69.50	6.477	19.07
2-3	736.86	232.7	31.58	42.00	5.699	18.05
3-4	651.01	229.0	35.18	54.00	8.294	23.58
4-5	357.26	136.0	38.07	11.50	3.220	8.46
5-10	683.08	201.2	29.45	61.40	8.991	30.52.

cultivation respectively. Thus there is a strong linear negative trend in both the cases of irrigated and unirrigated cultivation. So it can be concluded that there is a clear tendency for the income from other sources to decrease with an increase in the cultivated size of holding.

SIZE OF LOAN AND REPAYMENT

The tables, XVII and XVIII give a gross idea of the magnitude of loan and the repayment with in the size groups for irrigated and unirrigated cultivation. It is even a previously known fact that under our conditions of agricultural practices, the loans ~~are~~ form an important proportion. From the above tables we can clearly get an idea of the per acre loan and repayment per acre at each size group separately for irrigated and unirrigated cultivation.

From the tables we are ^{also} ~~above~~ able to observe a salient trend in the magnitude of loan in relation to size of holding for both irrigated and unirrigated cultivation. As the size of holding increases, the amount of loan goes on decreasing continuously in ^{the} case of irrigated

cultivation and but for the 5-10 group in unirrigated cultivation the trend is found to be the same.

Further we find that the magnitude of loan is comparatively high in the case of agriculturists in the irrigated area. That may be because of the assured source of income by the canals, they resort to bigger borrowings. We also watch a decreasing tendency in repayment; the amount of repayment is high in lower cases which can be explained as—that the cultivators in the lower size groups may be resorting to recurring loans from the authorised financing institutions as they have to pay it every ten months and will be repeating it again.

The tables, XIX and XX are giving a general idea of the size of family and the magnitude of loans. Though we can't draw a definite conclusion from the above tables, we definitely could note some trends and bases for an argument on them. We could definitely find a trend that the size of loan increases with an increase in the size of family, if we observe the table keeping the size of holding constant. On the other hand if the table is observed vertically keeping the size of family constant then we see that the amount of loan ^{is} going on

PER ACRE LOAN AND REPAYMENT BY SIZE OF HOLDING AND SIZE OF FAMILY. IRRIGATED.

TABLE XIX.

Size of Holding/ Size of family	0-2		4-5		6-7		8 & above	
	Loan	Repay- ment	Loan	Repay- ment	Loan	Repay- ment	Loan	Repay- ment.
0-2	975.63	439.25	1274.80	577.73	1509.00	481.33	1789.00	31.11
	(8)		(20)		(9)		(9)	
2-4	Nil		924.00	382.18	1424.71	592.71	765.11	393.00
			(11)		(7)		(9)	
4 & above	Nil		0		729.00	420.00	1057.50	190.67
			(1)		(2)		(6)	

UNIRRIGATED.

TABLE XX

0-2	126.70	0	248.28	54.78	278.50	20.25	574.57	261.14
	(10)		(14)		(8)		(7)	
2-4	91.50	20.75	184.58	22.42	189.00	67.60	390.00	76.43
	(4)		(21)		(5)		(7)	
4 & above	Nil		197.63	34.25	162.90	52.60	164.67	30.00
			(8)		(10)		(3)	

decreasing. Thus we find a triangular inter-relation between family, farm and the loan.

C O N C L U S I O N S.

From the above analysis we find the following facts to be concluded:-

I. Increasing in the per acre income from farms is not proportional to the increase in the size of holding; in fact there is a mild negative relation in irrigated cultivation and the same is mildly positive in the case of unirrigated cultivation.

II. The farm expenditure decreases with an increase in the size of holding which may be attributed to the existence of economies of large scale operation. But the variation is found to be very mild both in the case of irrigated and unirrigated cultivation.

III. Income from other sources increases with an increase in the size of family but decreases with an increase in size of holding in both the types of cultivation.

IV. The magnitude of borrowings increases with an increase in the size of family and decreases with an increase in the cultivated size of holding in irrigated as well as in unirrigated cultivation.

XXXXXXXXXX

CHAPTER V**ANALYSIS (B)****CAPITAL FORMATION**

Investment of any type whether Agricultural or non-agricultural is verymuch dependent on the factors like size of holding cultivated, income from farm and other sources and size of family. So this part of the analysis is to deal with the importance and influence of the above said factors on capital formation.

To test and find out the inter-dependence of factors like size of holding, irrigated and unirrigated cultivation and agricultural and non-agricultural invest-

TABLE XXI
STATISTICAL TABLE.
THREE WAY CLASSIFICATION

VARIATION	D.F.	Sum of square	Mean sum square	F. RATIO.
S.S. between size of holding	5	74944.54	14988.91	1.605
S.S. between irrigated & unirrigated	1	161462.93	161462.93	17.266**
S.S. between Agricultural investment & non-agricultural investment	1	89566.49	89566.49	9.559*
Interaction size of holding and irrigated & un- irrigated	5	101268.89	20253.78	2.168
Interaction irri- gated & unirri- gated. vis. agricultural & non-agricultural capital formation	1	21807.50	21807.50	2.335
Interaction size of holding vis. agricultural & non-agricultural investment	5	32674.23	6534.85	.....
Residual	5	45702.52	9340.50	.....
T O T A L:	23	529427.10	.....	.....

* Significant at 5% level

** Significant at 1% level

TABLE XXII.
CAPITAL FORMATION . THREE WAY CLASSIFICATION . FREQUENCY TABLE

SIZE OF HOLDING	IRRIGATED			UNIRRIGATED			IRRIGATED & UNIRRIGATED		
	Agri.	Non-Agri.	Total.	Agri.	Non-Agri.	Total.	Agri.	Non-Agri.	Total.
0-1	609.6	199.9	809.5	22.58	8.74	31.32	632.18	208.64	840.82
1-2	187.1	89.3	276.4	31.25	1.90	33.15	188.35	91.20	279.55
2-3	177.8	179.9	357.7	106.76	24.10	130.86	284.56	204.00	488.56
3-4	257.5	62.3	319.8	140.31	4.55	144.87	427.81	66.86	494.67
4-5	57.8	15.0	72.8	77.25	2.50	79.75	135.05	17.50	152.55
5-10	471.8	120.4	592.2	37.46	5.46	42.92	509.26	125.86	635.12
TOTAL:	1761.6	668.8	2430.40	415.61	44.26	459.87	2177.21	711.06	2888.27

ment , the method of analysis of variance is adopted and the table, XXII shows the per acre investment; agricultural and non-agricultural classified according to size of holding for irrigated and unirrigated cultivation.

It is found that the interactions are not significant, which otherwise implies and leads to the assumption that there is no entanglement between the factors and that the three (I) Size of holding, (II) Irrigated and unirrigated cultivation and (III) Agricultural and non-agricultural capital formation are independent factors affecting pattern of investment independently.

It is found, ^{that} the difference, in investment between irrigated and unirrigated cultivation is highly significant (since the observed F ratio is found to be significant even at 1% level) and also the difference between agricultural and non-agricultural investment is also significant but only at 5% level. The difference due to variation in the size of holding is not found to be significant. Hence it is concluded that the variation in investment is high due to variation between irrigated and unirrigated cultivation and again the variation is

significant between agricultural investment and non-agricultural investment.

It may be clear from the above analysis that there is higher potential for capital formation in irrigated areas than unirrigated areas and further there is always a choice for investment in agriculture, than in non-agricultural assets. The second point is the same for both irrigated and unirrigated cultivation. Because the observed F ratio 9.589 is significant at 1% level which refers that there is always a clear motivation for agriculturists; either in irrigated and unirrigated areas to direct their funds in productive agricultural activities rather than in accumulation of the non-agricultural capital assets.

From the table XXII, we could find easily the difference stated in the analysis by observing the table individually and ^{the} aggregate of the figures given on agricultural and non-agricultural investment for irrigated and unirrigated cultivation corresponding to the size of holding cultivated.

Observing the total of figures on agricultural and non-agricultural investment for both irrigated and unirrigated cultivation we find a significant difference.

Whanxtha

When the figures of total of per acre agricultural investment for all the size of groups stands at Rs.2,177.21, the non agricultural investment is only Rs.711.06.

Further in the total of figures of total investment in irrigated and unirrigated cultivation ⁱⁿ also the same way confirms the influence drawn from the three way classification. When the total for irrigated cultivation is Rs.2,428.40, the same for irrigated cultivation is only an Rs.459.87.

The table does not show any significant relationship between the size of holding and the pattern of investment whether agricultural or non-agricultural both in cases ^{the} of irrigated and unirrigated cultivations.

SIZE OF HOLDING AND CAPITAL FORMATION.

Tables XXIII and XXIV give a general picture of investment agricultural and non-agricultural for both irrigated and unirrigated cultivation respectively. From the above we could not observe

TABLE XXIII
MEAN SIZE OF FAMILY AND PER ACRE CAPITAL FORMATION
BY SIZE OF HOLDING

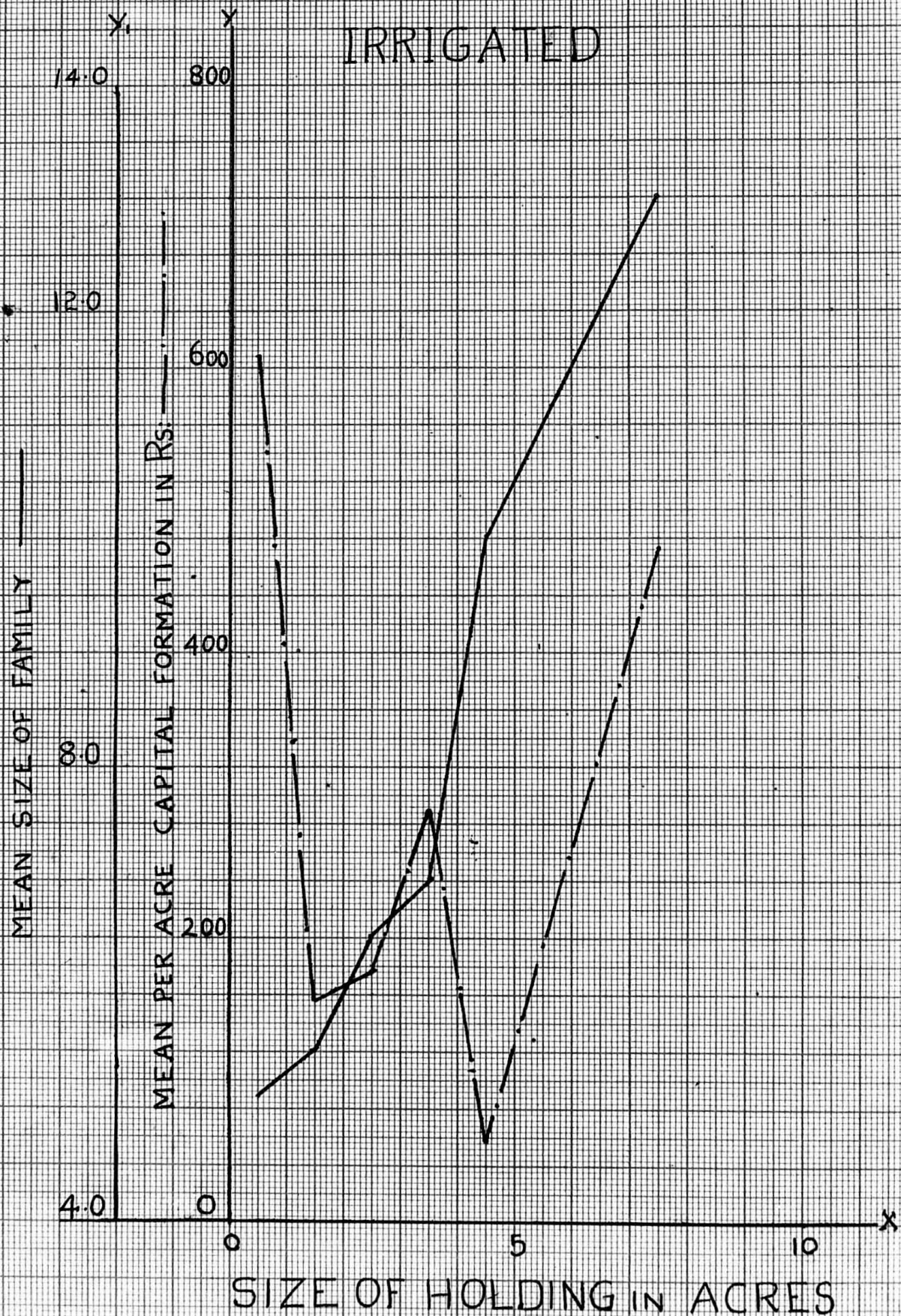
IRRIGATED

Size of Holding	Mean size of family	Agricultural	Non-agricultural
		Capital formation	capital formation
		Rs.	Rs.
0-1	5.11	699.6	199.9
1-2	5.52	167.1	39.3
2-3	6.50	177.8	179.9
3-4	7.00	267.5	62.3
4-5	10.99	57.5	15.0
5-10	13.90	471.8	120.4

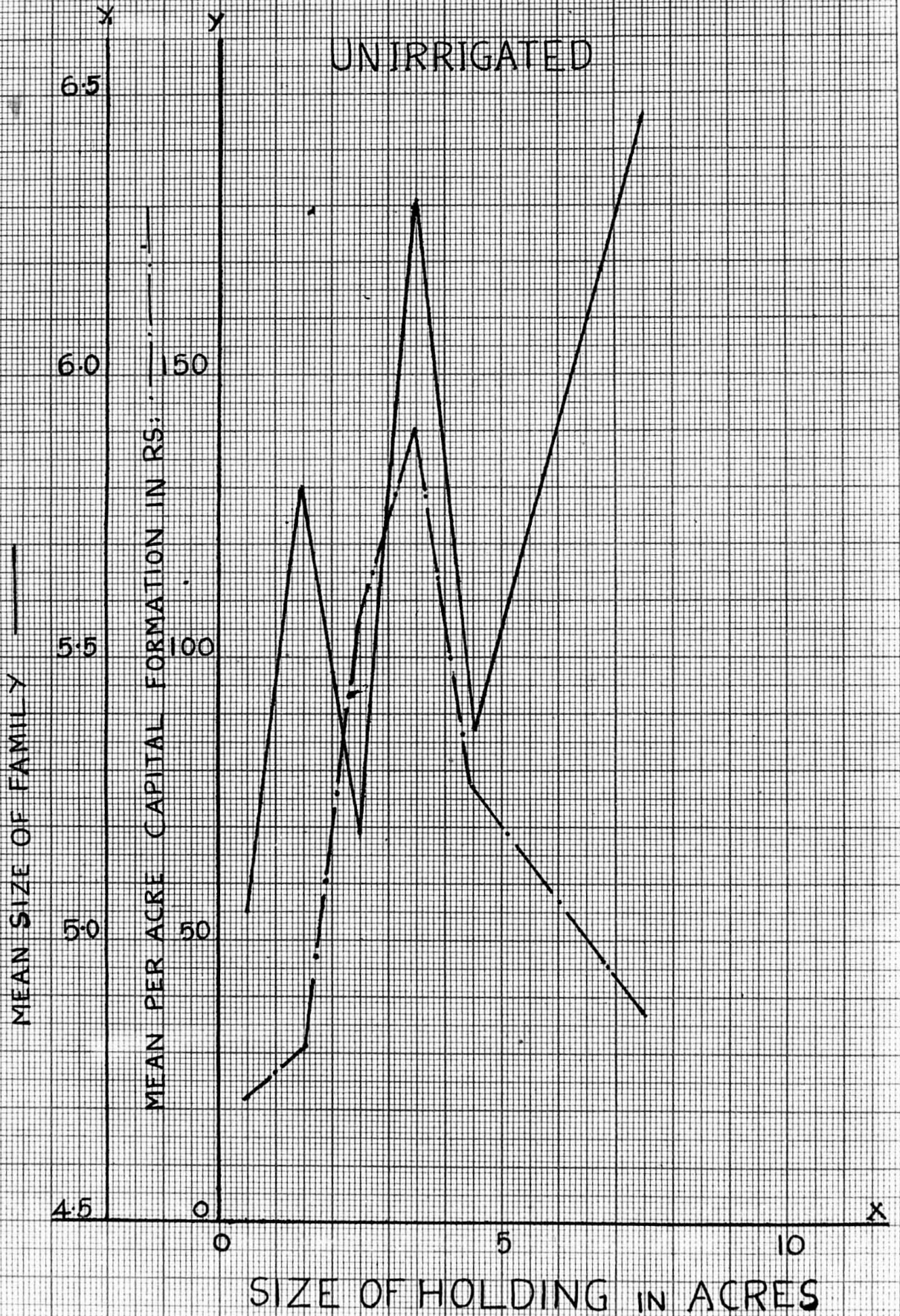
TABLE XXIV.
UNIRRIGATED.

Size of Holding	Mean size of family	Agricultural	Non-agricultural
		Capital formation	capital formation
		Rs.	Rs.
0-1	5.0526	22.58	5.74
1-2	5.8000	31.25	1.90
2-3	5.1905	106.76	24.10
3-4	6.3125	140.31	4.56
4-5	5.3750	77.25	2.50
5-10	6.4615	37.46	5.46

IRRIGATED



UNIRRIGATED



any definite relation between the size of holding and investment in both irrigated and unirrigated types of cultivation. This to an extent shows a fact that the pattern of investment either agricultural or non-agricultural has got no direct and linear relation with the size of holding. This we could say because the amount of investment agricultural or non-agricultural does not show any directly increasing or decreasing trend to an increase in the size of holding. On the other hand the one acre group in the irrigated cultivation and two to four acres group in the unirrigated cultivation is found to be advantageous ~~both~~ taking account of both agricultural and non-agricultural investment.

Even a study of the correlation factors show quite a negligible amount of relationship between the size of holding and agricultural or non-agricultural investment. As such the correlation coefficient between the size of holding and agricultural and non-agricultural investment are ~~*.0432~~ $-.0472$ and $-.0357$ respectively for irrigated cultivation and for unirrigated cultivation $-.0036$ and $-.0198$ respectively. Since the coefficients are almost negligible we can safely assume that the size of holding as such has got

no direct influence on the pattern of investment either agricultural or non-agricultural both in the case of irrigated and unirrigated cultivation. In fact, we derive from the correlation figures that there is a negative relation—that is when the size of holding increases the per acre capital formation is found to be decreasing. But studying the table it is observed that the investment is high in 0-1 group in irrigated cultivation and as far as the unirrigated cultivation is concerned it is 2-4 acres size group.

SIZE OF FAMILY AND CAPITAL FORMATION.

Before analysing directly the effect of size of family on agricultural or non-agricultural investment here an attempt is made to draw the influence of size of holding on the size of family. As such the mean figures in the tables XXIII and XXIV will give a gross idea of the size of family at each size of holding separately for the irrigated cultivation and unirrigated cultivation.

From the table we could observe a definite trend in the upward direction in the size of family as

the size of cultivated holding increases. But the increase is not very clear in the case of unirrigated cultivation. But we find the increase to be very rapid in the case of irrigated cultivation.

A study of correlation figures between the size of holding and size of family definitely show a positive trend. In the case of irrigated cultivation it is .5298 and .1404 in the case of unirrigated cultivation. But here we see a variation in the degree of correlation in the case of irrigated cultivation where it is higher and there is a lower degree of correlation in the case of unirrigated cultivation. But the higher degree of correlation may be explained as that the size of family is bigger because of the assuredness of income by the definite source of irrigation which is lacking in the case of unirrigated areas which may again be the limiting factor of the size of family. Thus in both the cases of irrigated and unirrigated cultivation the size of family is found to increase with an increase in the size of cultivated holding.

The size of family under conditions of our agriculture should be a contribution, because

it is generally accepted theory that there is always a strong farm family relationship in Indian agriculture. So in a way the increased number in a family should be a contribution to the level of capital formation because family labour is an indirect addition to capital formation.

The tables XXV and XXVI give a good idea of the amount of capital formation in irrigated and unirrigated cultivation according to different sizes of families and XXVII^A) gives an idea of non-agricultural investment in irrigated cultivation. (Because of the insufficiency of number of observations; the same is not computed for unirrigated cultivation)

Though we could not observe^a trend from the tables, we could easily sense an innate increasing tendency of the extent of capital formation with an increase in the size of family.

Because A study of the correlation figures show a definite positive trend. The correlation between the size of family and agricultural investment for irrigated area is .1121 and it is +.2481 in unirrigated cultivation. Though they are not substantial it is clear

AGRICULTURAL INVESTMENT ACCORDING TO SIZE OF HOLDING AND SIZE OF FAMILY.

TABLE XXV.
IRRIGATED

Size of Holding / Size of family	0-2	4-5	6-7	8 & above
0-2	309.38 (8)	118.67 (30)	265.11 (9)	1401.78 (9)
2-4	Nil	327.29 (7)	380.14 (7)	117.44 (9)
4 & above	Nil	759.00 (1)	58.00 (2)	276.67 (6)

TABLE XXVI
UNIRRIGATED

0-2	15.50 (10)	18.92 (14)	6.50 (8)	81.29 (7)
2-4	108.50 (4)	50.38 (21)	43.40 (5)	439.71 (7)
4 & above	Nil	77.00 (8)	25.40 (10)	44.33 (3)

NON-AGRICULTURAL INVESTMENT ACCORDING TO SIZE OF HOLDING AND SIZE OF FAMILY.

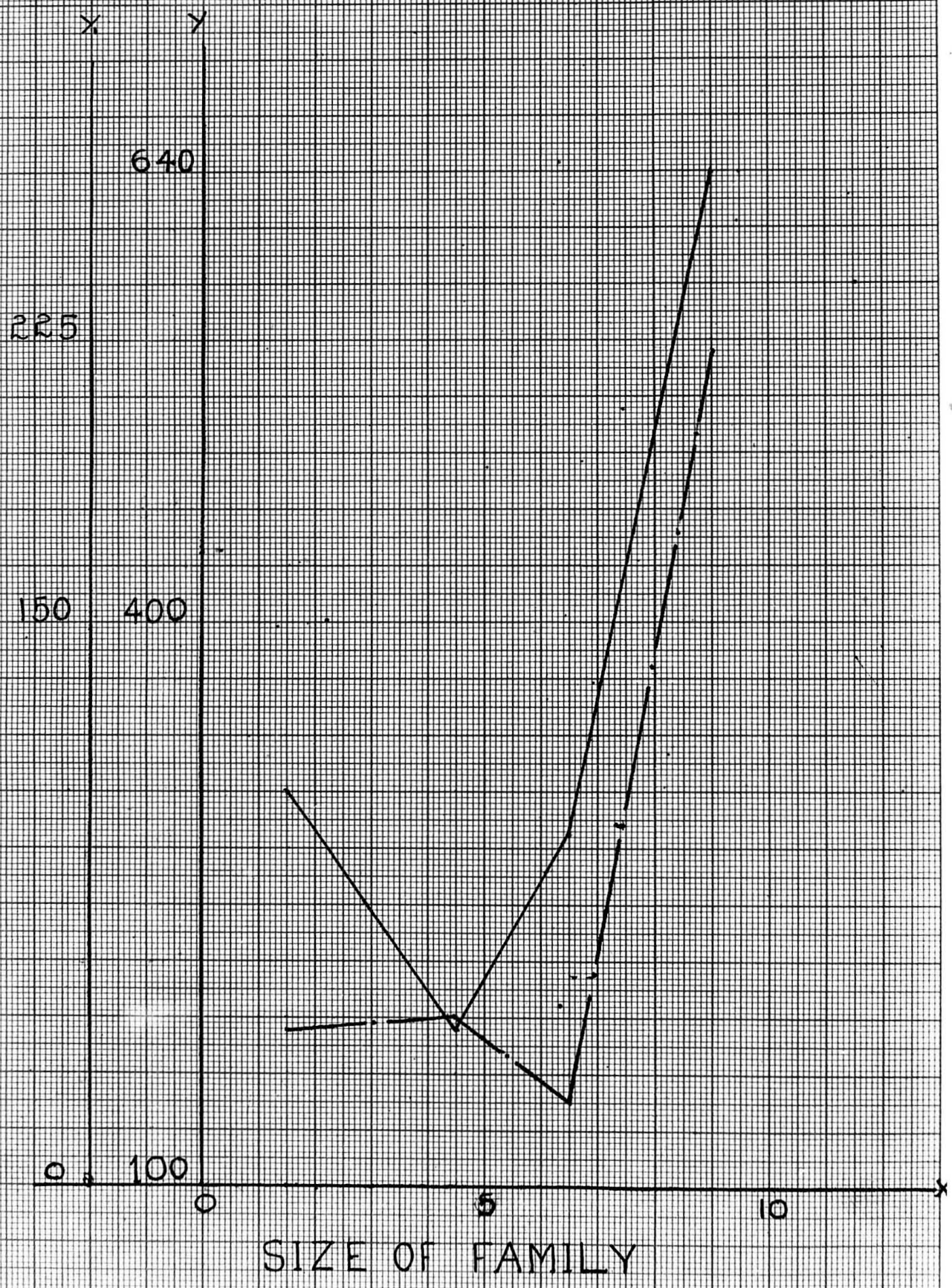
IRRIGATED.

TABLE XXV(A)

0-2	376.3 (8)	187.60 (30)	76.78 (9)	148.89 (9)
2-4	Nil	93.91 (11)	91.14 (7)	210.33 (9)
4 & above	Nil	20.00 (1)	0 (2)	22 107.00 (6)

CAPITAL FORMATION

———— IRRIGATED Y AXIS:- ICM = RS. 30
- - - - UNIRRIGATED RS. 15



that the size of family could help for higher levels of capital formation and perhaps an intensification and higher resorting to the disguised labour would help for significant results.

In the case of irrigated cultivation the correlation between size of family and non-agricultural investment is .0088 and in unirrigated cultivation it is $-.0744$. So in one case it is insignificant or otherwise "0" correlation and in the other it is negative. So it is evident that size of family can more be a factor of contribution in increasing the productive farming efficiency than it will be of help in accumulation of capital asset.

Further analysing the distribution of investment between agricultural and non-agricultural factor we find that it is always an alternating case by experience. So if a farmer in one year invests more in agriculture, definitely in the subsequent year his attention may be directed to accumulation of non-agricultural capital asset. So the correlation may be negative or positive. In the case of irrigated cultivation the relationship is negative, $-.0472$ but not substantial. But on the other hand we find in

the case of unirrigated cultivation there is a high positive correlation (.4987) which may be one of hypothetical case, because we find the investment either agricultural and non-agricultural to increase simultaneously.

FARM INCOME AND CAPITAL FORMATION

We have already examined the variations in the level of per acre farm income in relation to the size of holding. Now we analyse the influence of farm income on capital formation. The gross expressions of per acre capital formation and non-agricultural investment is given in the tables ~~XXIX~~ and ~~XXXI~~ respectively for irrigated and unirrigated cultivation. Further the total amount of investment is also given correspondingly to all size groups of income.

From the tables we find that the investment whether agricultural or non-agricultural, increases and found to be at the maximum at the top income bracket both in the cases irrigated and unirrigated cultivation. But we observe some offsetting in the middle income brackets that the agricultural investment is found to be

HOLDING SIZE WISE PER ACRE INCOME FROM FARM AND CAPITAL FORMATION.

TABLE XXVII
IRRIGATED

Size of Holding	Income per acre	Agricultural capital formation	Non-agricultural capital formation
		Rs.	Rs.
0-1	3407	609.6	199.9
1-2	2766	187.1	89.3
2-3	2947	177.1	179.9
3-4	2783	287.8	62.3
4-5	2880	87.8	18.0
5-10	2702	471.8	120.4

TABLE XXVIII.
UNIRRIGATED.

Size of Holding	Income per acre	Agricultural capital formation	Non-agricultural capital formation
		Rs.	Rs.
0-1	271.68	22.58	8.74
1-2	348.30	31.25	1.90
2-3	435.38	106.76	24.10
3-4	304.13	149.31	4.58
4-5	295.13	77.25	2.50
5-10	388.31	37.46	8.46

INCOME FROM FARM AND CAPITAL FORMATION, IRRIGATED.TABLE XXIX

Income from farm	Agricultural Capital Formation	Non-agricultural Capital formation	TOTAL
0-1000	Nil	Nil	Nil
1001-2000	280.43 (7)	2.88 (7)	283.29
2001-3000	156.34 (46)	133.91 (46)	290.25
3001-4000	538.58 (33)	122.06 (33)	668.64
4001-above	458.00 (6)	261.83 (6)	719.83

TABLE XXXUNIRRIGATED

Income from farm / Capital formation.	Agricultural capital formation	Non-agricultural capital formation	TOTAL
0-200	10.59 (17)	2.24 (17)	21.83
201-300	70.46 (35)	7.74 (35)	78.20
301-400	68.68 (22)	3.32 (22)	62.60
401-500	35.65 (17)	5.76 (17)	41.41
501 & above	266.17 (6)	50.33 (6)	316.50

IRRIGATED

UN IRRIGATED

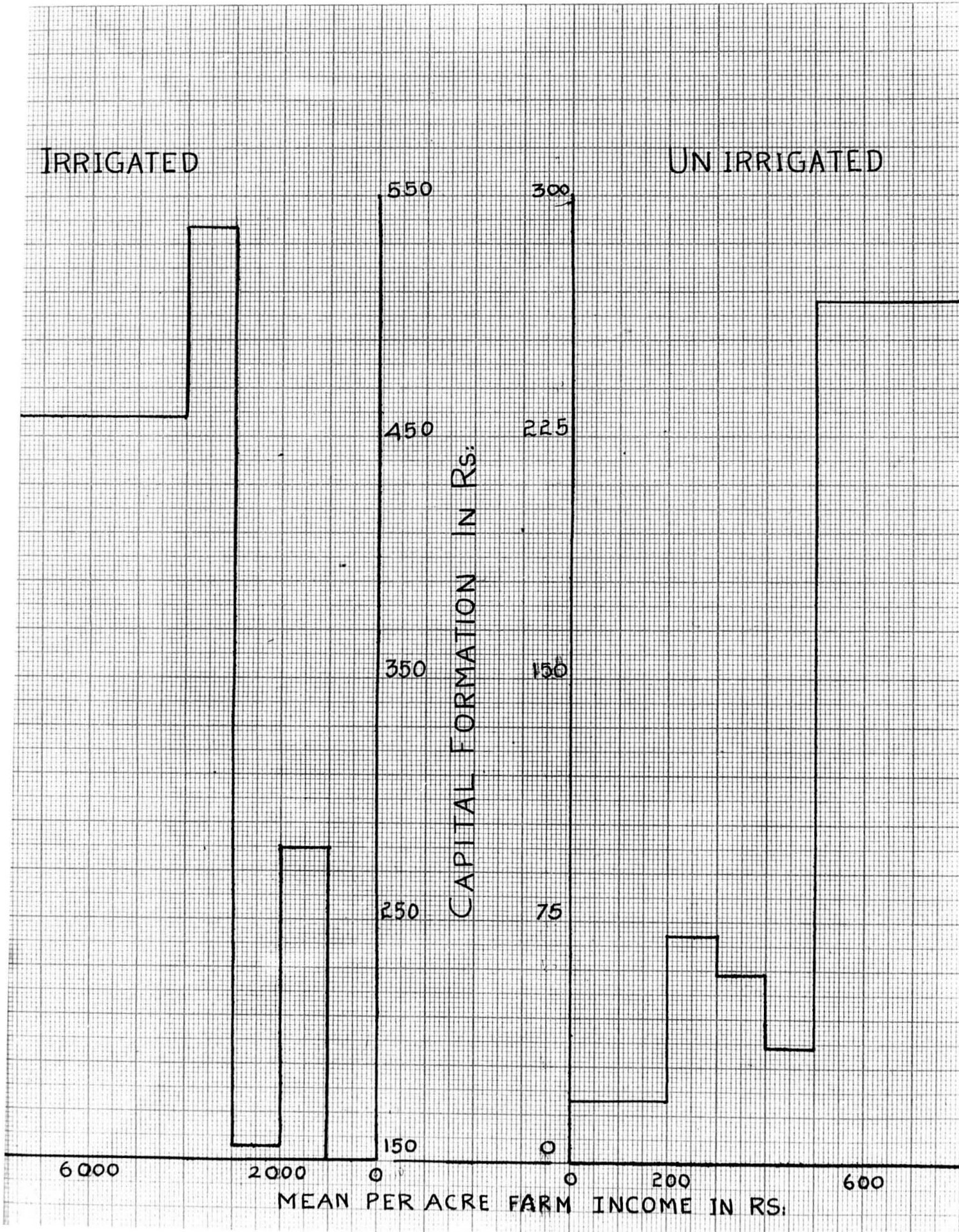
CAPITAL FORMATION IN Rs.

550
450
350
250
150
0

300
225
150
75
0

6000
2000
0
0
200
600

MEAN PER ACRE FARM INCOME IN RS.



fluctuating, but this is because of the distribution of equally higher amount in accumulation of non-agricultural capital assets. This type ^{of} tendency is found only in the irrigated cultivation.

In the case of unirrigated cultivation agricultural capital formation and non-agricultural investment is found to increase up to 300 rupees income bracket and then there is a slight decrease upto 500 rupees income group. Beyond that there is a sudden and steep increase in both the type of investments. Even then there is ultimately a strong increasing tendency could be observed as a gross relationship.

But this will be clear if we observe the total investment per acre figures corresponding to each size groups of income. Then we find that the amount totally invested both in agricultural and non-agricultural items is continuously increasing, in the case of irrigated and in the case of unirrigated cultivation, there is an ultimate increase at the 8-10 acre level though it is found to be fluctuating alternatively without touching or going below the 0-1 acre level.

The same is the trend we find from the

obtained correlations. Thus the correlation between income and agricultural and non-agricultural investment for irrigated cultivation is .1160 and .1304 and .5933 and .6930 for unirrigated cultivation. But from the figures we could find a variation in the degree of significance.

Though the correlation figures are positive in both the cases, the figures for irrigated cultivation are not compatible with those of unirrigated cultivation. This makes clear that investment pattern is highly dependent on the size of farm income in unirrigated cultivation where as the degree of dependency is less in the case of irrigated cultivation. But it is evident that for both the cases of irrigated and unirrigated cultivation there should be a definite increase in the income to realise higher levels of capital formation whether agricultural or non-agricultural, since they are positively correlated.

INCOME FROM OTHER SOURCES AND CAPITAL FORMATION.

Income from other sources has got a great importance since it forms a considerable proportion

of the total per acre income of the farmer. So here we study the influence of the income from other sources on capital formation and non-agricultural investment, since we have already studied the variation in the levels of income from other sources in relation to size of cultivated holding. Tables XXXIII and XXXIV are the gross expression of size per acre investment both agricultural and non-agricultural independently for irrigated and unirrigated cultivation classified according to stratified groups of income from other sources independently.

In the case of irrigated cultivation we find that agricultural investment goes on increasing upto 3,000 rupees group and then there is a sudden steep fall and again there is a steep rise in the highest income bracket. The non-agricultural investment is also increasing upto Rs.4,000 group of agricultural investment and there is a steep fall at the highest level. In both the cases there is a gross increasing tendency that can be observed. Further the steep fall in the Rs.4,000 group of agricultural investment can be explained by the fact that in this group there is the

**HOLDING SIZE WISE PER ACRE INCOME FROM OTHER SOURCES
AND CAPITAL FORMATION IRRIGATED**

TABLE XXXI

Size of Holding	Income from other sources	Agricultural capital formation	Non-agricultural capital formation
0-1	4475	609.6	199.9
1-2	2111	157.1	59.3
2-3	1813	177.8	179.9
3-4	1514	287.5	62.3
4-5	409	57.8	15.0
5-10	927	471.8	120.4

TABLE XXXII

Size of Holding	Income from other sources	Agricultural capital formation	Non-agricultural capital formation
0-1	1167.53	22.58	5.74
1-2	728.05	31.25	1.90
2-3	301.48	106.76	24.10
3-4	346.88	140.31	4.56
4-5	162.13	77.25	2.50
5-10	194.77	37.48	5.46

INCOME FROM OTHER SOURCES AND CAPITAL FORMATION.TABLE XXXIII
IRRIGATED

<u>Income from other sources</u>	<u>Capital formation</u>	<u>Agricultural capital formation</u>	<u>Non-agricultural capital formation</u>	<u>TOTAL</u>
0-1000		134.34 (48)	52.60 (48)	186.94
1001-2000		241.43 (7)	106.00 (7)	347.43
2001-3000		305.73 (11)	212.55 (11)	518.28
3001-4000		76.00 (3)	833.33 (3)	909.33
4001 & above		772.35 (23)	176.30 (23)	948.65

TABLE XXXIV
UNIRRIGATED

0-200		163.06 (17)	17.06 (17)	180.12
201-300		29.47 (17)	2.24 (17)	31.71
301-400		101.09 (23)	6.52 (23)	107.61
401-500		33.83 (6)	9.50 (6)	43.33
501 & above		35.14 (34)	5.53 (34)	40.67

highest level of non-agricultural investment which has just distorted the picture. But for this fact we find a strong relationship of capital formation and non-agricultural investment on the levels of income. This positive relationship is well supported by the total investment figures given in the last column of table XXXIII corresponding to each size group of incomes.

The correlation between the income from other sources and agricultural and non-agricultural investment are .1486 and .0185 in irrigated cultivation. Though not substantial, there is a positive trend that the levels of investment increase with the increase in the size of income from other sources in the case of irrigated cultivation.

But this is something to the contrary in the case of unirrigated cultivation. We find the income from other sources and both agricultural non-agricultural investments are negatively correlated with income from other sources. The correlation between income from other sources and agricultural and non-agricultural investment for unirrigated cultivation are $-.0329$ and $-.0690$ respectively. The correlation figures are not

noticeably high to base any conclusion. Anyhow the negative correlation suggests that there is a decreasing tendency in the pattern of investment with any increase in the income from other sources. This clearly shows that income from other sources in unirrigated cultivation is not an important factor in influencing the pattern of investment.

Further we find that in the case of unirrigated cultivation the per acre farm income is not regularly correlated with the per acre income from other sources. The correlation between income from farm and the income from other sources for unirrigated cultivation is $-.0980$, whereas for irrigated cultivation it is $.5449$ which indicates a strong positive relation.

The above clearly describes the fact that there is much dependency on farm income for investment either agricultural or non-agricultural in the unirrigated cultivation whereas the fact that there is not much dependency on farm income for capital formation in irrigated cultivation is clearly shown by the significant positive correlation between income from farm and income from other sources. So in the case of irrigated

PERCENTAGE OF CAPITAL FORMATION TO TOTAL INCOME. IRRIGATED.**TABLE No. XXXV.**

Size of Holding	Per acre total income	Agricultural Capital formation (% to Total income)	Non-agricultural Capital formation (% to Total income)	Total Capital formation (% to Total income)
0-1	7882	600.6 (156) 7.734	199.9 (2.54)	800.5 (10.27)
1-2	4877	187.1 (3.22)	89.3 (1.83)	246.4 (5.05)
2-3	4760	177.9 (3.74)	179.9 (3.78)	357.7 (7.52)
3-4	4267	287.5 (6.74)	62.3 (1.46)	349.8 (8.20)
4-5	3259	57.2 (1.417)	15.0 (.361)	72.2 (1.82)
5-10	3629	471.8 (13.02)	120.4 (3.32)	592.2 (16.33)

TABLE XXXVI**UNIRRIGATED**

0-1	1439.21	22.58 (1.56)	5.74 (.399)	28.32 (1.97)
1-2	1073.35	31.25 (2.91)	1.90 (.177)	33.15 (3.10)
2-3	736.86	106.76 (14.43)	24.10 (3.27)	130.86 (17.76)
3-4	651.01	140.31 (21.55)	4.56 (.70)	144.87 (22.26)
4-5	357.26	77.25 (21.62)	2.50 (.70)	79.75 (22.32)
5-10	683.08	37.46 (5.49)	6.46 (.80)	42.12 (6.16)

cultivation, unlike unirrigated cultivation there is an assured flow of income from other sources which can also be substituted for investment.

C O N C L U S I O N.

A brief recapitulation of the major facts in this part of the analysis are in point as follows:-

I. Among the samples studied for irrigated and unirrigated cultivation it is found that there is higher potential for capital formation in the irrigated sector than in the unirrigated sector.

II. The size of cultivated holding is found to have no direct and linear influence on the pattern of capital formation.

III. In the area studied there is a clear motivation for productive agricultural investment. The size of family being bigger with the larger farm, it acts in the positive direction and as such it is utilized for more capital formation.

IV. The income from farm and the income from other sources are found directly to influence the levels of investment either agricultural or non-agricultural. The size of total investment is increasing with an increase in the amount in both types of income. But it is found that in the unirrigated areas there is more dependency on farm income for capital formation than ⁱⁿ the case of irrigated cultivation.

EEEEEEEEEEEE

CHAPTER VI.**C O N C L U S I O N**

In the light of the analysis made in the last chapter and within the limitations of this study the following major conclusions emerge:-

I. The per acre income from farm tends to decrease as the size of cultivated holding increases.

II. The per acre income from other sources also tends to decrease with an increase in the size of

cultivated area; but the same increases with an increase in the size of family. At a constant size of family if the cultivated size of holding is increased, it is but natural, the concentration of the family is more on the farm than it could be distributed to any other profitable vocation. If the holding is small, a bigger family naturally diverts the excess of family members to other vocations. Thus we find an increase in the income from other sources at lower sizes of holding with comparatively bigger families.

III. The increase in the size of family corresponds to the increase in the size of cultivated holding. The size of family is bigger in irrigated cultivation than unirrigated cultivation areas. Perhaps the lack of assured irrigational facilities is the limiting factor on the size of the family in unirrigated areas and hence smaller families.

IV. We find the rate of per acre expenditure decreases with an increase in the size of cultivated holding which is a salient feature of economies of large scale operation. But there is also a corresponding increase in the levels of income with an increase in the per acre expenditure. Thus it is clear that the

higher the expenditure the higher would be the income.

V. The magnitude of per acre loan also increases with the size of the family and decreases with an increase in the size of cultivated holding.

VI. There is a higher potential for capital formation in irrigated areas than in un-irrigated areas.

VII. There is an inverse relation in the extent of capital formation relating to the size of cultivated holding. *The reason for per acre investment in the small size group being higher than the bigger size groups may be due to high investment on construction and repair. This type of investment includes mostly family labour. Further the motivation for high levels of investment in smaller size groups can be explained as related to quick realisation of produce and mostly being production

* Investment on farm and capital formation in agriculture with particular reference to Bihar -
H.C.P. Shastri - Indian Journal of Agricultural Economics - Vol. XX January-March, 1968..pp..175

oriented.

VIII. The size of family is more an incentive to capital formation as there is always a general tendency to adopt the idle family in place of hired labour. Further certain types of repairs and constructions on the farm are also done by the family. Hence the increased concentrations of the family on their own farm would definitely be a contribution to capital formation. Moreover, in the area studied we find the tendency more to concentrate on the improvements and activities that would help to increase the productive efficiency of their own farm than on any non-agricultural venture.

IX. The size of farm income has greater influence on the extent of investment. From this it is evident that any activity that would help to increase the per acre output goes a longway for increasing the extent of Capital Formation-Agricultural. Moreover, in the unirrigated area studied we find farmers more depending on farm income for capital formation or any type of investment.

X. In the irrigated area studied, there being an assured inflow of income from other sources, we find that the investment is influenced both by farm income or income from other sources. But this is not so in the unirrigated area where we find not much importance given to income from other sources.

XI. It is generally the preference of the farmer whether to invest the surplus on agriculture or in the accumulation of non-agricultural capital assets. But in the area studied there is greater preference for investment in agriculture both in the case of irrigated and unirrigated cultivation.

**TO SUM UP, THE FOLLOWING
CAN BE LISTED AS CRUCIAL
FOR ANY FURTHER STUDIES.**

**The size of cultivated holding
has no positive and direct
influence on the pattern of
capital formation.**

**The bigger the size of the farm
family the greater could be the
contribution to agricultural
capital formation.**

**There is a preference for agri-
cultural investment than non-
agricultural investment in
the case of small farmers.**

XXXXXXXXXXXX

APPENDIX

II. FARM INCOME**1. Agricultural products: Yield from land owned cultivated:**

Crops - Wet - Dry	Yield by weight	Value in Rupees
1)		
2)		
3)		
4)		
5)		
6)		
7)		
Other bi-products:		
1)		
2)		
3)		
Total value in Rs.		

II. 2. Gross income from land leased in and out:-

	Value in Rupees
1. Income realized from land leased in:	
1)	
2)	
3)	
4)	
2. Lease charges received from land leased out:	
1)	
2)	
3)	
4)	
TOTAL VALUE:	

II. 3. Inventory of Live stock and Capital stock at the base period:-

Description	Number	Value in purchase
1)		
2)		
3)		
4)		
5)		
Specify		
Capital Stock:		
1)		
2)		
3)		
4)		
Others specify:		
		TOTAL:

II. 4. Income from Live Stock:-

	Value in Rupees
1) Manure	
2) Other products	
3) Income from annual labour	
TOTAL	

II. 5. Human Labour:

	No. Man. Days.	Wage/Day	Total
Income from services rendered to others by the cultivator and family			
			TOTAL

III. Income from other sources:

-
- 1) Amount realized by sale of land if any:
 - 2) (a) Amount realized by sale of Live stock:
(b) Amount realized by sale of implements:
 - 3) Income from subsidiary occupation if any:
 - 1)
 - 2)
 - 3)

Rate of interest:

- 4) Loan (a) Private:
(b) Agricultural purposes:
-

TOTAL:

-
- | | |
|--|-----------------------------------|
| (a) Farm income | = Total of items in II 1. |
| (b) Other incomes | = Total of II 2 + 4 + 5 + IV 2 F. |
| (c) Gross annual income of the agriculturist | = (a + b) |
-

IV. FARM EXPENDITURE:**1. Cost of cultivation:**

Purchase of material	Owned Farm Quantity	Leased ⁱⁿ out Farm Quantity	Value in rupees.
1) Seed			
2) Farm yard manure			
3) Fertilizers			
4) Pesticides			
5) Others specify			

TOTAL VALUE IN RUPES:

IV. "2" Labour Charges:

	No. Man Daily	*C	Daily Value in		TOTAL
			wages	Rupees	
	*F		F	₹	
1. Ploughing					
2. Sowing and transplanting					
3. Irrigation					
4. Interculture					
5. Harvesting					
6. Threshing					
7. Processing					
8. Transporting					
9.					
Others specify					
10.					
11.					
12.					
13.					
14.					

TOTAL VALUE IN RUPEES

IV. 3. OTHER FARM EXPENSES

Annual Expenditure

- 1) Land revenue and other taxes
- 2) Lease charges paid
- 3) Cost of maintenance of
live stock (feed and grazing)
- 4) Interest paid on loans
- 5) Salary paid to permanent labour
- 6) Others specify: (a)
(b)
(c)

TOTAL:

* F = Family labour *C = Casual labour

Total Farm Expenses = IV 1 + 2 + 3 =

V. 1. OTHER EXPENDITURES:

FAMILY EXPENDITURE	ANNUAL EXPENDITURE IN \$.
1) Food	
2) Fuel and Lighting	
3) Clothing	
4) Housing	
5) Education	
6) Medical	
7) Others specify:	
(a)	
(b)	
(c)	

TOTAL:

V. 2. SPECIAL ITEMS OF EXPENDITURE:

DESCRIPTION	ANNUAL EXPENDITURE IN \$.
1) Marriages and Ceremonies	
2) Journey	
3) Festivals	
4) Others specify:	
(a)	
(b)	
(c)	
5) Repayment of loans if any:	

TOTAL:

Gross annual expenditures = IV + V.

VI. UTILISATION: _____ end period.

1. Productive Investments - (Agricultural)

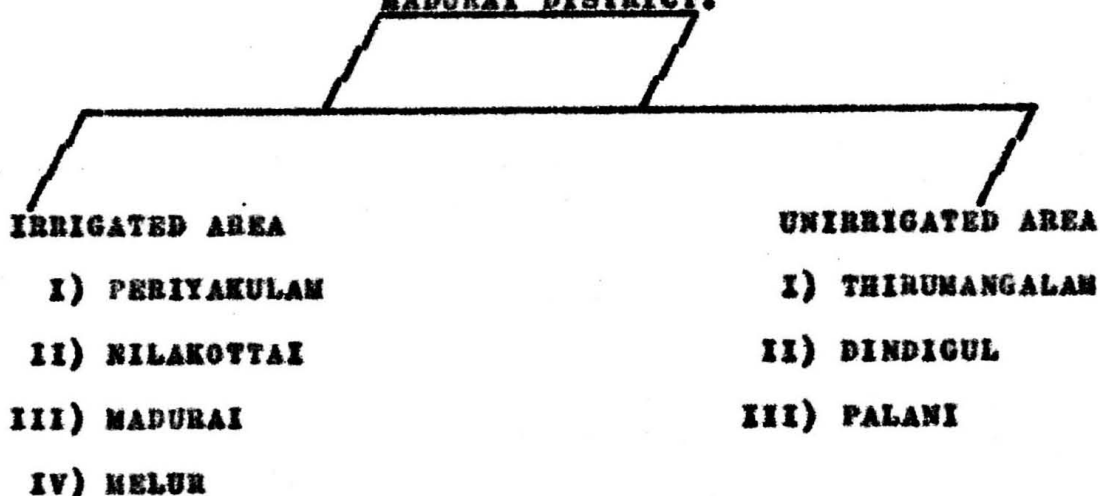
DESCRIPTION	VALUE IN RUPEES.
1) Purchase of land	
2) Purchase or construction of Farm buildings.	
3) Purchase of Farm implements	
4) Purchase of Live Stock	
5) Purchase of carts and vehicles	
6) Others specify: (a) Repair Charges etc. (b) (c)	
TOTAL:	

2. OTHER INVESTMENT (NON-AGRICULTURAL)

DESCRIPTION	VALUE IN RUPEES.
1) Construction or purchase of residential buildings	
2) Purchase of Capital assets like Cars, Cycles, Gold ornaments etc.	
3) Investment in shares and bonds	
4) Others specify:- (a) (b) (c)	
TOTAL	

SAMPLING PATTERN.

MADURAI DISTRICT.



SAMPLES TALUK: I) Periakulam from Irrigated -
 Net Area sown 1,61,997 (in
 acres)
 II) Tirumangalam from Unirrigated
 Area - Net area sown 1,64,488
 (in acres)

SAMPLE VILLAGES (I)	N.A.S. in acres	SAMPLE VILLAGES (II)	N.A.S. in acres
1) Uthamapuram	5851	1) Kalligudi	3783
2) Markaykottai	2510	2) S.P. Nathan	1726
3) Kotteer	2138	3) Madipancor	2892
4) Kulaynar	1070	4) Sennampatti	1369
5) Uthamapalayam	3584	5) Medagam	1519
		6) Karisalkulam- patti	1377
		7) Odaipatti	803
		8) K. Vellakulam	3470
	<u>15153</u>		<u>16939</u>

I) 15,153 represent 0.4% of the net area shown in the Periakulam Taluk.
 II) 0.4% in 1,64,488 acres is 15,480 acres

P.S: 1) Kodaikanal Taluk is not included in the classification since it is a Hill Station

II (A)

FREQUENCY DISTRIBUTION OF RESPONDENTS INTERVIEWED

Size of Holding	IRRIGATED AREA	UNIRRIGATED AREA
0-1	27	19
1-2	29	20
2-3	16	21
3-4	11	16
4-5	4	8
5-10	5	13
	92	97

II (B)

FARM INCOME AND FARM EXPENDITURE ANALYSED.

- x ... Size of Holding**
y ... Income from Farm
z ... Expenditure on Farm
r ... Correlation

		<u>IRRIGATED</u> <u>CULTIVATION</u>	<u>UNIRRIGATED</u> <u>CULTIVATION</u>
r	xy	-.1949	.0459
r	xz	-.0935	-.1322
r	yz	+.1671	.3010

II (C)

CORRELATION RESULTS

Analysis - Size of Holding, Farm Income, Income from Other Sources, Size of Family, Agricultural Investment and Non-agricultural Investment.

- A - Size of holding
- b - Farm Income
- c- Income from other sources
- d - Size of Family
- e - Agricultural Investment
- f - Non-agricultural Investment
- r - Correlation.

	<u>IRRIGATED</u>	<u>UNIRRIGATED.</u>
rab	- .1049	.0469
rac	- .2839	- .8006
rad	.5295	.1404
rae	- .0472	- .0036
raf	- .0375	- .0198
rbe	.5459	- .0980
rbd	- .0718	.1819
rbe	.1160	.5933
rbj	.1304	.6939
red	- .0028	.3603
ree	.1486	- .0329
ref	.0186	- .6699
rde	.1121	.2481
rdj	.0088	- .0744
ref	- .0471	.4087

III.

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