ECONOMIC IMPACT OF MINOR IRRIGATION IN PALAKKAD DISTRICT

By

AJI C. GEORGE

THESIS

Submitted in partial fulfilment of
the requirement for the degree

Master of Science in Agricultural Economics

Faculty of Agriculture
Kerala Agricultural University

Department of Agricultural Economics

COLLEGE OF HORTICULTURE
Vellanikkara, Thrissur
1996

DECLARATION

I hereby declare that this thesis entitled "**Economic impact of minor irrigation in Palakkad district**" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellanikkara
15-1-96

AJI C. GEORGE

CERTIFICATE

Certified that this thesis entitled "**Economic impact of minor irrigation in Palakkad district**" is a record of research work done independently by **Mr.Aji C. George**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

Dr.E.K. THOMAS
Chairman
Advisory Committee
Associate Professor
Dept. of Agricultural Economics

Vellanikkara
15/1/96

CERTIFICATE

We, the undersigned members of the advisory committee of **Mr.Aji C. George**, a candidate for the degree of **Master of Science in Agricultural Economics**, agree that the thesis entitled "**Economic impact of minor irrigation in Palakkad district**" may be submitted by Mr.Aji C. George, in partial fulfilment of the requirement for the degree.

13/5/96

Dr.E.K. THOMAS
Associate Professor
Chairman

13/5/96

Dr.V.RADHAKRISHNAN
Professor and Head (Rtd.)
Member

Dr.K.P.MANI
Assistant Professor
Member

S. Krishnan

Sri.S.KRISHNAN
Assistant Professor
Member

EXTERNAL EXAMINER

13/8/96

Dedicated to

Rev. Fr. Gabriel Chiramel, C.M.I.

ACKNOWLEDGEMENT

I am grateful to **Dr.E.K.Thomas**, Associate Professor, Department of Agricultural Economics and Chairman of the Advisory Committee for his valuable guidance.

I am also grateful to:

Dr.V.Radhakrishnan, Professor and Head (Retd.), Department of Agricultural Economics.

Dr.K.P.Mani, Assistant Professor, College of Co-operation and Banking, Mannuthy; and

Shri.S.Krishnan, Assistant Professor, Department of Agricultural Statistics for their valuable guidance as the members of Advisory Committee.

I am thankful to Smt.Indira Devi, P., Assistant Professor, Department of Agricultural Economics, for her sincere help.

I take this opportunity to thank Smt.S.Geethabai, Typist, Department of Agricultural Economics, Sri.Joy and Sri.K.J. Wilson, Interfase Softwares, Ayyanthole for typing of the manuscript.

I express my esteemed gratitude and indebtedness to my parents whose constant attention and encouragement enabled me to complete this venture successfully.

AJI C. GEORGE

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS USED

CARDB	-	Co-Operative Agriculture And Rural Development Bank
KAU	-	Kerala Agricultural University
NABARD	-	National Bank For Agriculture Rural Development
PACS	-	Primary Agriculture Credit Society
PCARDB	-	Primary Co-Operative Agriculture And Rural Development Bank
RBI	-	Reserve Bank Of India

Introduction

INTRODUCTION

Generally it is an established fact that Indian agriculture needs modern improved inputs for raising productivity. Irrigation, which serves as a spring board for adoption of such inputs amounting to technological development in agriculture, hardly needs any emphasis. In fact, it acts as a harbinger of change and brings far reaching changes in the cropping pattern, inputs absorption, influence production and productivity, investment pattern and in the ultimate analysis brings prosperity to the area.

In India large proportion of irrigation potential created in the country through major and medium irrigation projects, highlighted the snags at different levels in the execution of irrigation projects. Major irrigation projects mostly because of cost escalation, were not commissioned in time and the benefits expected out of them could not be realized. The advantage of minor irrigation by exploiting the ground water resources are many and varied. It is mainly a programme of individual farmers with small investments, yielding quick results. Minor irrigation through wells and tanks has therefore been the major source of irrigation in our country accounting for over 50 percent of the irrigated area and will continue to be so.

The development of minor irrigation has rightly been the priority programme under plans, as irrigation is the basic need of agricultural development. The country has invested about Rs.45,000 crore on major, medium and minor irrigation projects since the past 40 years. Total irrigation potential by the end of the

seventh plan (1985-90) was 78.35 million hectares -31.52 million hectares from major and medium irrigation and 46.83 million hectares from minor irrigation. Total irrigation utilisation at the end of the plan was 71.30 million hectares - 27.77 million hectares from large and medium projects and 43.53 million hectares from minor projects.

In the seventh plan (1985-90), the country invested Rs.11,107 crores on development of major and medium projects and Rs.6426.91 crores in minor irrigation works - surface water and ground water schemes. The Eighth Plan outlay for irrigation and flood control is Rs.33,055.57 crores. For major and medium irrigation projects, the allocation is Rs.22,836.67 crores. For minor projects Rs.6,083.64 crores and for command area development Rs.2,469.84 crores.

Greater emphasis will also be given to minor irrigation schemes during the 8th plan as they can be completed fast and are labour intensive and employment generating. Besides priority given by the Government, financing institutions providing investment credit has been actively operating in this sector. The land development banks which is the specialised institution for investment credit began providing production credit since 1950s. It is estimated that 65 percent of the aggregate advances by Co-operative Agriculture and Rural Development Banks (CARDB) was for minor irrigation schemes. The CARDBs continue to view financing minor irrigation as the most important single purpose in their loans portfolio. According to recent statistics on CARDB it was found that the 70 percent of finance for minor irrigation purpose in India is provided by these banks. The share of commercial banks in providing minor irrigation loan is only 9.27 percent.

1.1 Problem of study

In the present study an attempt has been made to evaluate the economic impact of bank finance extended under minor irrigation scheme (well and pumpset) by Primary Co-operative Agricultural and Rural Development Banks (PCARDB) in Palakkad district. Attempt has also been made to examine the process of implementation of the scheme and the various problems faced by the implementing banks and the beneficiaries.

1.2 Objective of the study

The viability of any programme is measured by certain indicators. The minor irrigation projects using surface water (well) is largely intended for small and marginal farmers and the success of the system is manifested as a higher yield and farm income through a shift in cropping pattern and cropping intensity. Hence to assess the impact of minor irrigation loans given by the PCARDBs in Palakkad district, a study was under taken with the following specific objectives.

1. To examine the economic impact of minor irrigation finance in terms of incremental income, employment generation and changes occurred in production and cropping pattern.
2. To examine the economic feasibility of the loan.
3. To assess the repayment capacity of the borrowers.

1.3 Plan of work

The thesis is divided into six chapters. A review of the relevant literature is given in the Chapter II. A brief description of the area of study and profile of the

PCARDBs of Palakkad district is given in third Chapter. Methodology adopted for the study is described in detail in fourth chapter. The results of the study are presented and discussed in detail in the fifth chapter. A summary of the major findings of the investigation is presented in the sixth and the final Chapter.

Review of Literature

REVIEW OF LITERATURE

An attempt is made in this chapter to review the past works on economic impact of minor irrigation related to the present study.

Anand (1960) studied various aspects of pattern of utilising irrigation potential in Chambal valley and found that the area under foodgrains was replaced considerably by cash crops. Generally commercial crops like vegetables, sugarcane, spices and fruits replaced food crops wherever there was supplemental irrigation facilities through well. He concluded in general, the cropping intensity increased from as low as 90-105 per cent to 130 to 180 per cent when supplemental irrigation was available.

Rao (1963) analysed the influence of irrigation on cropping intensity in the different states of India and found that perennial hydrological sources of irrigation as provided by the wells promoted multiple cropping and increased the cropping intensity. However, the cropping intensity did not increase uniformly with irrigation development in all areas because of annual crops like banana and sugarcane which reduced the intensity.

Shah (1963) studied the cropping pattern in relation to irrigation in Nandia district of Madhya Pradesh. He observed an increase in cropping pattern with reference to the replacement of food crops by non food crops which led to greater agricultural production through larger use and better productivity of various resources.

Radhakrishna (1964) conducted a study on regional productivities of agricultural inputs. He compared the irrigated region with unirrigated regions. A production function was fitted separately for irrigated and unirrigated regions and the results indicated that the productivity of resources in the irrigated region was twice that in the unirrigated region.

Ramanna (1966) in his study on productivity of resources and income potential on subsistence and commercially oriental farms in Bangalore district worked out optimum farm plan using linear programming technique and observed an overall improvement in the utilisation of available family labour.

Sevak (1966) conducted a study to find out the role of irrigation and cropping pattern in agricultural development in Dharward in Karnataka state. In the study it was found that employment of human labour was less on unirrigated farms. It was noticed that even during intensive work periods out of 110 days of available family labour 9 to 13 days of family labour remained unutilised. The study on an irrigated farm revealed that it not only utilised all the available human and bullock labour during the above period, but also hired additional units of 62 man days of human labour and 52 days of bullock labour with optimum cropping plan.

Patil and Hinge (1969) in their study on the economics of rural electrification in Gujrat state observed that 58 irrigation schemes brought about nearly 22500 acres of additional area under irrigation. It enabled a better utilisation of labour and created new employment opportunities.

Srinath (1969) in his study on the economic impact of well irrigation in Karnataka state observed visible changes in the cropping pattern under well

irrigation. The area under potato increased from nine hectares to ninety six hectares in the study area.

Jakhade and Gadgil (1970) analysed the economic feasibility and repayment capacity of the borrowers financed by co-operatives and commercial banks. They found that investment in wells alone and in pumpsets alone were feasible only in two out of four districts considered joint investments in wells and pump sets was feasible in three districts out of five with regard to repayment capacity and only one district passed the test in case of wells alone, all passed in the case of pumpset loans and four in the case of joint investments.

Shah and Agarwall (1970) based on the information collected from 120 progressive and 91 less progressive farmers in Central Uttar Pradesh found that with the introduction of irrigation the income level of progressive farmers had considerably increased.

Viswanath (1970) made a comparative study of the four irrigated and unirrigated regions in Rajasthan. The major crops studied were paddy, wheat, barley and sugarcane and noticed forty four per cent increment in labour use for irrigated sugarcane as compared to unirrigated sugarcane and a 30 per cent increase in bullock labour use.

Nagarajappa (1971) in his study on the economic impact of irrigation in a village in the Thungabadra irrigation project area, Karnataka concluded that the cropping pattern was influenced more by the type of irrigation than by the presence or absence of roads.

Chakravarty (1972) conducted a study of 72 farmers distributed in eight villages in Hoogly district of West Bengal. The study indicated that even the small farmers with operational holdings below five acres might stand viable provided sufficient market orientation and irrigational facilities. The irrigational facilities helped to raise cropping intensity to introduce high yielding varieties which resulted in increased farm income.

Dasgupta and Das (1972) made a study in Dhankamal district in Orissa to test the hypothesis that (1) irrigation by inducing improved technology and higher intensity of cropping generates higher level of disposable income, which on the other hand brings about higher rate of savings. (2) larger farmers securing more of disposable income shall have higher saving potential. The study disclosed that 100 per cent increase in the farm business income and from crop husbandry was generated with the provision of irrigation. The same percentage increase was also observed in the total disposable income.

Deole and Anthurkar (1972) collected data from sixty farmers in three villages of Theni district of Maharashtra and classified beneficiaries into two main groups, viz., those getting the benefits of irrigation and those not benefited from irrigation. The study revealed that in regard to the non-beneficiaries, crop production accounted for about 68 per cent of the gross annual income per holding on an average, the annual expenditure on crop production in the case of non-beneficiaries was 46.25 per cent and the expenditure on consumption was 53.75 per cent of the total annual expenditure. In the case of beneficiaries these percentage were 51.81 and 48.19 respectively.

Miglani *et al.* (1972) made a study in Ferosepur district of Uttar Pradesh and found income inequalities between farms with irrigation and without irrigation. The result showed that the farmers having assured water supply had a higher farm business income as compared to the farms having unassured irrigation. Farms with assured irrigation had the highest income disparity during the first two years of study.

Rai *et al.* (1972) made an attempt in Haryana to examine the impact of green revolution on different sized farms namely assured irrigated zones, relatively less assured irrigated zones and unirrigated zones. The operational holdings were further subdivided into small, medium and large size groups. The study showed that capital investment and income generation were found to be the highest on different sizes of farms in assured irrigated zone followed by relatively less assured irrigated zones and unirrigated zone. Thus the benefits of new technology were directly related to the irrigation facilities which resulted in increasing income disparity in different zones.

Singh and Patel (1972) conducted a survey and randomly selected 42 farms in Anand Taluk of Gujrat to estimate the level of income and pattern of investment in agriculture on the irrigated and partially irrigated farms. The study revealed that large cultivators earned more income per hectare than the small.

Waghmore and Maral (1972) analysed the data collected from 228 farm holdings selected from 11 villages in Sholapur district of Maharashtra state. The operational holdings were classified into three size groups. Category I (0-14 acres) category II (14-30 acres) and category III (30 acres and more) and further divided

into four groups according to sources of irrigation viz., canal irrigation, canal and well irrigation together, purely well irrigation and dry farms. Correlation analysis was used to study the relationship between various factors. It was observed that net income per farm tended to increase with the increase in size of farm but the per acre net income tended to decrease with the increase in size of the holding. The average net income per acre was the highest in canal and well irrigated group followed by canal irrigated, purely well irrigated and dry farms.

Paramasivaih (1973) from his study in the Tungabhadra project area of Karnataka concluded that the intensity of cropping was mainly dependent on the extent of land development and exploitation of irrigation potential apart from availability of capital, managerial ability and such other factors.

A study conducted by economics and statistics department of Bank of India (1977) revealed that the investments in well irrigation gave the farmers greater capacity to stand adverse effects of drought. It enabled them to adopt a remunerative cropping pattern improved agricultural practices and proper utilisation of agricultural inputs.

Siddappa and Radhakrishnan (1977) assessed the economic feasibility and repayment capacity with the same data used by Jakhade and Gadgil (1970) with modified formula and found that investments in wells alone was feasible only in two districts out of five and investments on pumpsets as well as joint investments were feasible in all districts. The income per farm as well as per hectare was high on the irrigated farms than on the partially irrigated farms in all the size groups.

Chauhan *et al.* (1978) in their study on impact of lift irrigation on cropping pattern, level of investment and income on farms in Farrukhabad district of Uttar Pradesh reported that increased irrigation facilities, had increased the investment pattern with reference to consumption of inputs in crop production.

Dhawan and Kahlon (1978) conducted an evaluation of the irrigation projects on the small farmers of Punjab and concluded that irrigation resources such as well and pumpset generated sufficient income, created more employment thus making a viable unit.

Sadeghi (1978) used the Cobb Douglas production function to estimate the production coefficients of rice before and after an increase in irrigation water supply to small farms in a village in Iran and concluded that the amount of water available for irrigation is one of the major determinants of the optimum size for rice production.

Singh *et al.* (1978) in their study in Punjab analysed the impact of Bank credit on cropping pattern, farm income and employment. They observed that borrower farmers devoted more area to high value crops. The borrower farmers could increase their area under irrigation leading to an increase in cropping intensity, levels of income and employment.

Sinha (1978) in his study on the impact of lift irrigation on cropping pattern and crop yields in Bhivani district of Haryana found that there is no significant change in cropping pattern. There was slight increase in cropping intensity and crop yield.

Sisodia (1978) in his study in Chambal command area in Madhya Pradesh state found out that higher use of inputs and water resulted in higher yields per acre of all the crops in command area. There was a shift from low value crops to high value crops.

Bagi (1980) analysed farm level data in Haryana and concluded that irrigation with affect the technical and allocative efficiencies of the farms. Irrigation reduced the risk and uncertainty of crop production and encouraged more intensive use of inputs. Irrigation made high volume of production possible.

A study conducted by economics and statistics department of Bank of Baroda (1980) in Murshidabad District of West Bengal revealed that the availability of irrigation on sample farms had increased the income more than twice as compared to the period before the provision of minor irrigation.

Mishra *et al.* (1981) studied the effect of higher irrigation on employment pattern and recovery position of farmers financed by State Bank of India in Madhya Pradesh. The loans had generated additional employment on the farm. The change in family labour days engaged on farm was highest in case of borrowers for new wells.

Umarasiya and Arora (1981) studied the impact of pumpset loans on the farm economy in Mysore and concluded that the loans put the farmers on a higher technological level. There was higher increase in the yield of crops, the overall productivity of resources improved and employment potential was increased by 25 per cent.

A study conducted by Agricultural Refinance and Development Corporation (1982) on minor irrigation schemes in Bhojpur District of Bihar state indicated that yield as well as value of production in the farms increased substantially as a result of irrigation.

Pillai (1982) studied the impact of agricultural loan on socio-economic conditions of the farmers in Aurangabad Taluk of Maharashtra reveals that due to the development of minor irrigation, area under dry crops were decreased and total area under cultivation has increased with improvement in production and income.

Rageena (1982) in her study on impact of Bank finances for minor irrigation in Trichur District report favourable shift in cropping pattern, cropping intensity, crop productivity etc., after irrigation.

Reddy (1982) conducted a study on the impact of minor irrigation loan in four villages in Andhra Pradesh. He concluded that prosperity of rural villages depends upon the improvement of agriculture and allied sector. The provision of adequate rural credit for development activities like minor irrigation is very vital. In fact the farmers needs credit not only for day to day cash expenses but also for capital investment on the farm to drive high productivity.

Santha (1982) on economics of coconut cultivation in Puzhakkal block in the command area of Peechi irrigation project in Kerala was studied, without taking into costs incurred during the pre bearing stage. The average cost of maintenance per hectare was calculated as Rs.9029.81. On an average gross returns from coconut was Rs.14289.32 per hectare of which 89.15 percent was through sale of coconut, an over all net income per year at total cost was Rs.6261.49 per hectare.

Singh *et al.* (1982) in their study on Land Development Bank finance for developing irrigation facilities conducted in Agra district of Uttar Pradesh state showed that a significant increase in net irrigated area, cropping intensity and yields occurred due to financing small farmers for development of irrigation. It was further noted that farmers were able to adopt multiple cropping and there was a shift in cropping pattern towards high income groups.

Union Bank of India (1982) in their study on minor irrigation development in Nirmal district of Andhra Pradesh observed that irrigation had led to increased land use intensity thereby enhancing the net returns to beneficiaries.

Nair and Narayana (1983) analysed the impact of irrigation in stabilising and increasing the yield of paddy crop in Kerala. For this they used the data on fields taken from the crop cutting surveys conducted by the Directorate of Economic and Statistics in irrigated as well as unirrigated area. They concluded that the impact of irrigation in farms was that of stabilising productivity of paddy lands and increasing it over time is seen to be increase in the state.

Das (1984) reported that the cost of production of coconuts in irrigated farms in Kerala had been estimated at Rs.1.10 per nut under 1982-83, factor costs, without taking the value of land into consideration. The annual maintenance cost of one hectare of irrigated coconut garden with 82-83 factor costs worked out to be Rs.5500 per hectare.

Palaniswamy (1984) in his study on the pattern of water allocation, use and management in lower Bhavani project command area in Coimbatore found that crop yields were directly influenced by water availability and fertliser application.

Patel and Patel (1984) after a study of 144 sample farms in Dantivada irrigation project of Gujarat observed that the cropping pattern and input use structure in irrigated farms are distinctly different from those observed in rainfed farms. Employment of human labour in irrigated farms was found to be higher by 34 man days per hectare and by 61 per cent over the one used in rainfed farms.

Baghialakshmi (1985) conducted a study on the impact of minor irrigation in Mattathur village of Trichur district. The analysis showed that the net economic benefits earned by the beneficiaries from the utilisation of the minor irrigation scheme loan have been highly encouraging. It was also found that the beneficiaries in the village started the cultivation of perennial crops like coconut, arecanut, etc.

George and Rajasekharan (1985) found out the average annual cost of maintaining an irrigated coconut garden in Kerala state. On adding the interest on capital investment for the value of land at the rate of 15 per cent to the annual maintenance cost the total annual cost worked out to Rs.18,888 per hectare on the basis of an average yield of 9000 nuts per hectare the average cost per 100 nuts worked out to be Rs.210.

Indira (1985) studied the impact of minor irrigation loans on the cropping pattern in Chittur block of Palakkad district. The study proved that coconut cultivation has improved with the availability of irrigation. The income effect on the beneficiaries showed that even though the income in the post investment period was higher than the pre investment period, the incremental income could not cover the loan installment in many cases. It was also noticed that the loan amount was inadequate and most of the borrowers had to resort to other borrowing.

Suryanarayana and Cheranjeevalu (1985) in their study on utilisation of farm credit in Srikakulam district of Andhra Pradesh found out that, of the total credit 40.91 per cent was utilised for production purposes and the diversion was mainly to clear old debts and purchase of land. Repayment performance was positively related to productive utilisation of credit and because of proper utilisation by small and medium size groups, the number of defaulters among them was less as compared to large size group.

Naik (1986) conducted a study in Kasargod district of Kerala state to assess the impact of minor irrigation on cropping pattern, income and employment generation. The cropping pattern showed a shift towards coconut and other perennial crops. The extent of additional employment due to minor irrigation is 280 man days per year.

Vijayakumary (1986) studied the economic impact of minor irrigation scheme in Trichur district. The study concluded that the provision of minor irrigation facilities through schematic lending was highly beneficial to all the beneficiaries. The cropping pattern showed a shift towards multiple cropping and intensive cropping. The impact was that income and employment in the farm has increased considerably.

Banakar and Suryaprakash (1987) in their study to identify the extent of loans sanctioned to various size groups of farmers and their utilisation in irrigated and unirrigated area of Harapanahalli taluk in Karnataka state found that small and medium farmers received a lower proportion of the loans compared to

large farmers. The utilisation pattern of loans for various purposes indicated that irrigated farms spent a fairly higher share on seeds and fertiliser while unirrigated farms on fertilisers. Loan misuse was more in the case of small farmers than large farmers.

Radhakrishnan and Mukundan (1988) in their study in supply and utilisation of short term co-operative agricultural credit in Palghat district of Kerala observed that around 50 per cent of the holdings of borrowers as well as non borrowers belonged to the size group of one hectare or less and an inverse relationship was found between the amount of loan per hectare and size of holdings.

Palaniswami (1989) in his study of the Konganapuram Agricultural Service Co-operative Society in Tamil Nadu made an investigation on the utilisation of crop loan and brought out the fact that nearly 50 per cent of the beneficiary members fully utilised the loan. There existed a positive relation between the extent of utilisation and size group.

Sreelatha (1990) studied the impact of pumpset loan on income generation, cropping pattern and cost of cultivation in Chathannor panchayat of Kollam district. The analysis showed that cropping pattern of small farmers does not showed any significant change. From the analysis it was also found that coconut had highest per unit of total cost of cultivation.

Arunachalam and Palaniswami (1991) examined the magnitude of diversion of crop loan and the reasons for non repayment in Salem district of Tamil Nadu. Crop area due to drought which account for 52 per cent of non repayment, low production to the extent of 34 per cent and increasing family expenditure are the

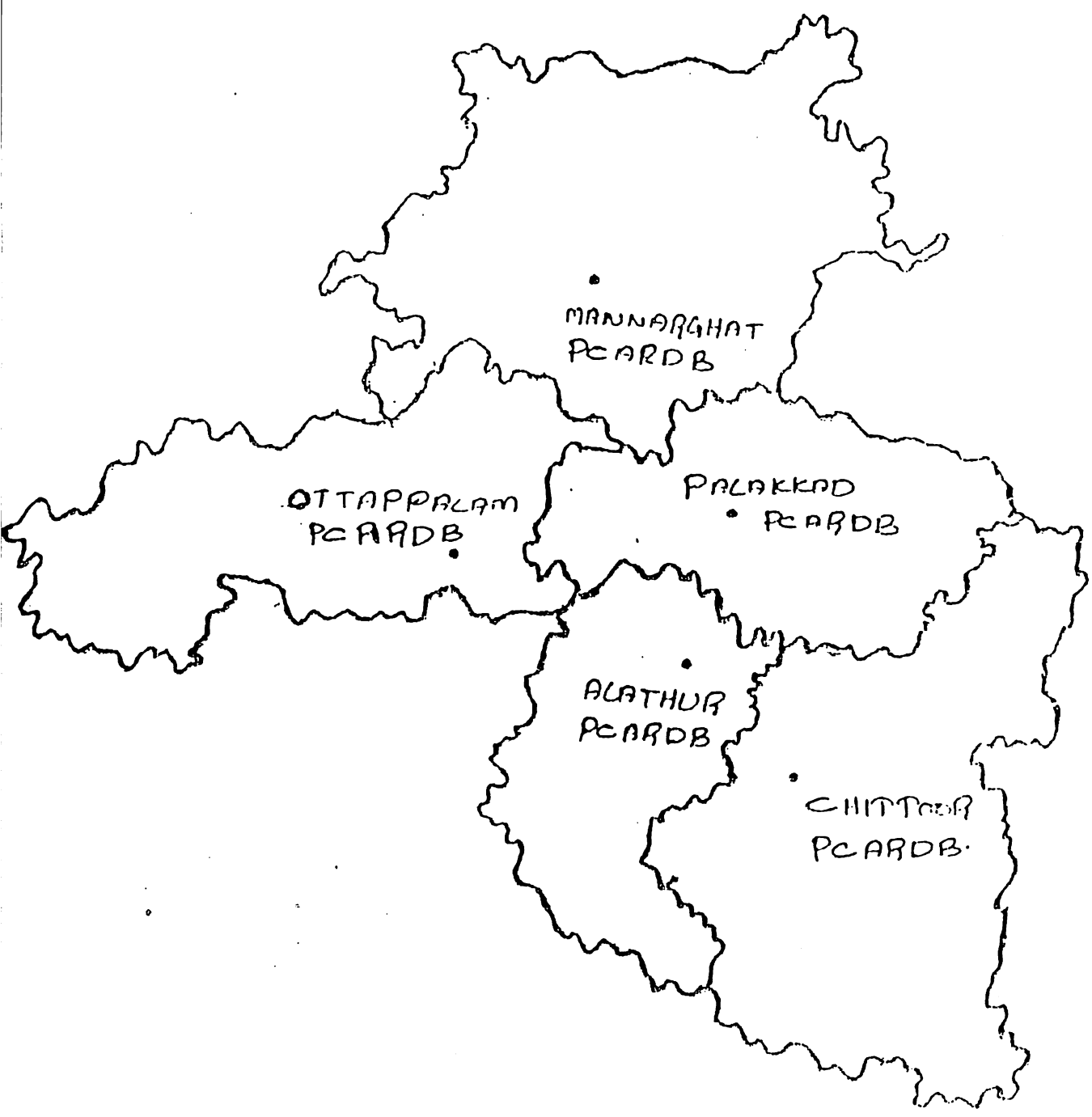
difficulties which obstructs repayment. There is positive association between size group and extent of repayment of crop loan.

Vaikuthe (1991) conducted a study in Dharwad district of Karnataka to analyse the utilisation and repayment performance of agricultural credit. The study revealed that 50 per cent of credit in irrigated area and 60 per cent in the unirrigated area was spent on fertilisers. Misutilisation was found to be more in unirrigated area as compared to the irrigated area.

Area of Study

FIGURE-1

MAP OF PALAKKAD DISTRICT SHOWING THE JURISDICTION OF PCARDB's



AREA OF STUDY

Palakkad is an agriculture dominated district where about 64 percent of the population are either cultivators or agricultural labourers. The district has five Taluks, viz., Alathoor, Chittoor, Mannarghat, Palakkad and Ottappalam. Palakkad district is known as Rice bowl of Kerala since it produces 27.95 per cent of the total rice production in the state. Administratively the district is divided into five municipal towns and twelve community development blocks. The district comprises of 96 Panchayats.

3.1 Physiographical features

The total geographical area of the Palakkad district is 4390 Square Kilometers. The Sahya ranges bordering the region has a 20 mile gap in the mountains. Due to this peculiarity this district is also called the Gate way of Kerala. There is no coastal belt for this district. Vast paddy fields, mountain ranges on the eastern side, etc. are the particular physiographic features of the district. The district is densely populated and has some industrially advanced belts like Kanjikode.

3.2 Demographic features

As per 1991 census the district has a total population of 23,76,561 with a density of 530 person per Sq.kilometer. The population growth for the decade 1981-91 denoted is 16.23 per cent. The total number of households are 370567. Literacy rate in the district is 69.78 per cent. The number of female population is higher than that of males with a sex ratio of 1046 females to 1000 males.

3.3 Occupational pattern of working population of Palakkad district

The occupational pattern of the working population in the district is depicted in the Table 3.1. Total working population of the district is 7,86,363. Agricultural labourers form 44.29 per cent of the working population while cultivators form 12.37 per cent. Household and Industry workers constitutes 2.79 per cent of the working population. All this highlights the fact that economy is basically an agrarian based.

3.4 Climatic conditions

The Sahya ranges bordering the region influences the climate of the district. During summer months oppressive heat and drought is particularly experienced in Palakkad district. The temperature noted on the district varies between 22°C to 42°C. The four main seasons are:

1. Dry weather - December to February
2. Hot weather - March to May
3. South west monsoon - June to September
4. North east monsoon - October to November

3.5 Precipitation

The districts normal rainfall is 2329 mm, mostly from south-west monsoon. Average rainfall is 1878 mm as shown in Table 3.2. Velocity of wind recorded in Palakkad district is highest in Kerala, ie., 12.7 km per hr compared to state average of 7.9 km per hr.

Table 3.1. Occupational pattern of working population of Palakkad District (1991 census)

Particulars	Number	Percentage
Cultivators	97289	12.37
Agricultural labourers	348299	44.29
Household industry workers	21904	2.79
Other workers	318871	40.55
Total main workers	786363	100.00

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala

Table 3.2. Normal and average monthly rainfall in Palakkad district 1993-94 (in mm)

Month	Normal	Average
January	8	0.00
February	9	21.80
March	27	1.00
April	87	21.50
May	161	111.40
June	477	361.80
July	633	560.70
August	349	301.40
September	165	33.30
October	249	355.50
November	136	96.10
December	28	13.50
Total	2329	1878.00

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

Table 3.3. Net area irrigated (source-wise) in Palakkad district 1993-94 (in ha)

Source	Area	Percentage
Government canal	50018	67.67
Private canal	224	0.30
Government tanks	245	0.33
Private tanks	5019	6.79
Government wells	54	0.07
Private wells	10405	14.08
Minor and lift irrigation	1364	1.85
Others	6586	8.91
Total	73915	100.00

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

3.6 Soil types

Major soil type found in Palakkad district is red soil. The majority of soils are loams consisting of a soil crust of varying depth. Soluble salts are also present in considerable amount. Black soil is also found in some regions of the district. Black soil areas have a high degree of fertility but some in the uplands are poor. They are sandy on the slopes and uplands and are moderatively productive. In the broken regions between the hills and the plains they are darker, deeper and richer and are constantly enriched by the additions washed down from the hills. Laterite type of soil made by withering of the rocks is also found abundantly in this semi arid district.

3.7 Water resources

Malampuzha, Chittur Puzha, Gayatri, Mangalam, Pothundi and Walayar are major river projects of the district. The annual rainfall of the district is about 2329 mm with scanty rainfall during the first four months and its peak during the months of July, August and September. The various major and medium irrigation projects will be able to provide irrigation for about 78299 hectares partially. Though Palakkad gets moderate rainfall, owing to its concentration in two spells the long dry season and heavy surface run off, it is essential to build up an irrigation system to ensure availability of water for cultivation during the dry season and for stabilisation of cultivation in other seasons. This has not made much headway in the district as is shown by the fact that all the existing sources irrigate 73915 hectares partially. Table 3.3 shows the sourcewise irrigated area in Palakkad district. This accentuates the need for the irrigation facilities in the district, unless this is provided

for in the required manner the adequacy of other factors of production may have no effect at all. Table 3.4 provides information on cropwise irrigated area in Palakkad district. Paddy, coconut, banana and sugarcane are the main crops irrigated as revealed by the Table.

3.8 Land utilisation pattern

The total geographical area of the district is 438980 hectares out of which forests occupies 136257 hectares. The land under cultivation is 303758 hectares. Even though favourable conditions are prevailing in the district for agricultural operations land utilisation is not optimal. Cultivable waste land alone comes to 21,796 hectares, current fallows comes to the tune of 7949 hectares and fallows other than current fallows occupies 5089 hectares. The detailed land utilisation pattern is depicted in Table 3.5.

3.9 Cropping pattern

A study of crop wise land utilization pattern reveals that paddy alone occupies 48 percent of the total cropped area. Out of 3,03,758 hectares under crops 146095 hectares are occupied by paddy alone. Coconut occupies the second prominent position with a total area of 39514 hectares. This comes to 13.01 percentage of the total cropped area. Other major crops cultivated in the district are fruits, vegetables, sugarcane, spices and condiments, sesamum etc. Rubber is cultivated in large scale especially in Mannarghat and Alathoor Taluks of the district. Rubber occupies 25,531 hectares and it comes to 8.41 per cent of the total cropped area. The detailed cropping pattern is given in Table 3.6.

Table 3.4. Cropwise irrigated area in Palakkad district 1993-94 (in ha)

Crop	Area	Percentage
Paddy	63622	81.26
Tubers	11	0.01
Vegetables	728	0.93
Coconut	6563	8.38
Arecanut	1921	2.45
Clove and Nutmeg	14	0.02
Other spices/condiments	338	0.43
Banana	1405	1.79
Betalvine	16	0.02
Sugarcane	1273	1.63
Others	2408	3.08
Total	78299	100.00

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

Table 3.5. Land utilization pattern in Palakkad district 1993-94 (area in ha)

Category	Area	
	Palakkad	Kerala
Total geographical area	438980	3885497
Forest	136257	1081509
Land put to non agricultural uses	33038	297381
Barren and uncultivable land	9393	58308
Permanent pastures and other grazing land	81	1912
Land under tree crops not included in net area	6928	34375
Cultivable waste	21796	94608
Fallow other than current fallow	5089	26466
Current fallow	7949	44164
Net area sown	218456	2246774
Total cropped area	303758	3043044

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

Table 3.6. Cropping pattern in Palakkad district 1993-94 (area in ha)

Crop	Area	Percentage to total cropped area
Paddy	146095	48.00
Pulses	6960	2.29
Sugarcane/Palmyrah	7621	2.51
Spices and condiments	16426	5.41
Fruits	20798	6.85
Vegetables	20938	6.89
Coconut	39514	13.01
Sesamum	504	0.17
Other oil seeds	870	0.29
Drugs and Narcotics	6	0.00
Coffee	2290	0.75
Rubber	25531	8.41
Cocoa	85	0.03
Fodder grass	139	0.05
Green manure crops	1356	0.45
Other non food crops	14625	4.79
Total cropped area	303758	100.00

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

3.10 Production of crops

Production of important crops in Palakkad district is shown in Table 3.7. The total production of rice was 3.36 lakh tonnes. Coconut which is a major crop in the district has an annual production of 163 million nuts. Rubber production was 15786 tonnes. There is a vast scope for vegetable and fruits cultivation in the district and is fast catching up. The banana production during 1993-94 alone was 23767 tonnes. Betelnut production during 1993-94 was 364 million nuts.

3.11 Profile of the organisation

The Primary Co-operative Agriculture and Rural Development Banks occupies a very prominent position in the development activities of the Palakkad district. Started in 1938, Lender Act VI of the 1932 of Madras Presidency, the bank has grown to a remarkable level. During 1970's the area of operation of bank was reallocated and PCARDB's Ottappalam, Chittoor, Alathur, Mannarghat came into existence. Thus altogether five Primary cooperative Agriculture and Rural Development Banks operate in the entire district of Palakkad.

The main objective of these banks according to the byelaw are to promote the economic interest of the members and to arrange for funds for agriculture development. It also aims at developing allied activities of agriculture like Poultry, Dairy, Piggery and Agro Industries.

3.12 Lending activities of the Bank

The Primary Co-operative Agriculture and Rural Development Bank provides finance under ordinary loans and scheme loans. The National Bank for

Table 3.7. Production of important crops in Palakkad district 1993-94 (in tonnes)

Crop	Production
Rice	335646
Pulses	5243
Sugarcane	20249
Black pepper	407
Dry ginger	1774
Betel nut (million nut)	364
Tamarind	11689
Mango	54639
Jack ('000 nos)	14490
Banana	23767
Tapioca	187888
Papaya	6551
Sesamum	137
Cconut (million nuts)	163
Rubber	15786
Cocoa	49
Cashewnut (raw)	3395
Nutmeg	35

Source: Farm Guide, 1995, Farm Information Bureau, Government of Kerala.

Agriculture and Rural Development (NABARD) gives more thrust to schematic lending. Thus the banks have various identical schemes which may be broadly classified into general schemes which are implemented by all the Primary Co-operative Agriculture and Rural Development Banks and the schemes of each of the banks prepared for the bank itself. General schemes include Rubber scheme, Cashew scheme, Coconut Scheme and farm mechanisation scheme. Of these the first three gets subsidy from the respective boards, The specific schemes implemented in Palakkad include.

3.12.1 Pepper Scheme

This is for the small farmers for 12 years with 10 percent interest rate. The installments are disbursed over four years and the repayment starts only after six years.

3.12.2 Kapok Scheme

This is designed for the small farmers to help them grow silk-cotton, in the uncultivable land and is implemented in the Chittur Block only.

3.12.3 Bullock and Bullock Cart Scheme

This is extended to small farmers and the loan amount is given in two installments. The loan period is for five years with 10 percent rate of interest.

3.12.4 Dairy Scheme

The bank has recently started implementing the dairy scheme which helps the small farmer to buy two cows at a rate of interest of 10 percent. The loan period is five years and the repayment is by way of monthly installments.

3.12.5 Minor Irrigation Scheme

The major purpose for which the banks give loans is the minor irrigation. The objective of this scheme is to increase production due to irrigation and thus help the farmers to get additional income. The loan assistance is provided for:

3.12.5.1 Digging of Wells/Tanks

As per the scheme prepared for the Primary Co-operative Agriculture and Rural Development Bank, the minimum operational area required for the construction of ordinary well is 50 cents. The loan amount is to be decided by the size of the holding and size of the well.

3.12.5.2 Dug cum-bore well

Loan amount can be provided for which the yield of the well can be increased to a great extent by boring the well. The minimum size of holding required for this purpose shall be 50 cents. However, its feasibility should be ascertained by the State Ground Water Department.

3.12.5.3 Renovation of well

Existing domestic wells may not provide adequate water for irrigation purposes, which can be renovated by deepening or widening. This will increase the storing capacity and recharge efficiency.

3.12.5.4 Installation of pumpset

Pumpset includes motor pump, suction and delivery pipes, foot valves, hose clips, washer starters etc. Electric motor should be provided except in interior areas where there are no electric connection.

3.12.5.5 Storage Tank

This is necessary where the area is undulating. The tank should be at the highest elevation point.

3.12.5.6 Pump house

A solid vibration free foundation for the motor is to be created with tiled roof and cement floor for which loan will be provided. Besides these, installation charges, cost of meter, fuse units etc. is also financed upto Rs.200/-. If necessary, land development work to make the land levelled and make it irrigatable is also financed by bank along with this loan.

3.13 Working of the minor irrigation schemes

For finding out suitable sites for the sinking of new wells and tanks the PCARDBs hire the services of Hydro Geological Department. Hydro Geologists after surveying the land and testing the soil will find out suitable sites. Wells and tanks according to the size of the plot are recommended by the Hydro Geologists and Agricultural officers of the banks. While wells are recommended for small holdings, tanks are recommended for vast plots. Size of the well will be in accordance with the extent of the land. Feasibility conditions should be obtained from Kerala Electricity Board. For Kerala conditions, 90 percentage of plots are suitable

for well irrigation. The bank shall ensure that the necessary capacitors are fitted to all pumpsets financed under the scheme.

If the pumpset is for lifting water the bank shall ensure the concerned department's permission for a period which will cover at least three years longer than the entire period of the loan.

Loans shall be granted only where the pumpset has already been installed or loans therefore proposed to be availed of under this scheme.

3.14 Period of Repayment

The period of repayment are as follows:

1. Renovation of well/tank - 5 years
2. Pumpset/motor - 5 years
3. All other loans - 15 years

3.15 Security of Loan

The very same land on which development activities have to be carried out, is accepted as security for the loan. The security must be unencumbered.

3.16 Interest Rate and Repayment

Interest for all types of loans is 10 percent, irrespective of the size of the holding. There is no demarcation between small farmers and other in the case of minor irrigation unlike in the case of other loans.

The loan is advanced at the rate of twenty times of the paid up capital of the loanees. Sixty per cent of the value of hypothecation of disbursed as the loan amount. The repayment of the loans are on the basis of annual equitable installments including principal and interest. Grace periods are not allowed for minor irrigation scheme loans.

3.17 Guidelines given by the apex bank for the implementation of the scheme.

Before implementing the scheme it was made obligatory on the part of PCARDB's to ensure following points.

1. To ensure that the beneficiaries are permanent residents of the area of operation of the society.
2. To ascertain that the projects for which financial assistance sought are based on local needs.
3. Projects to be financed should have recommendations of Technical Officer. Board alone cannot sanction. This is to ascertain economic and financial viability.
4. The progress of the scheme should be regularly monitored.

3.18 Terms and conditions of loans by PCARDB

1. Loan will be provided at a rate of interest of 10 percent (during 1990-91 period).
2. Borrowers who possess at least 50 cents of land will be given the loan.
3. The bank shall ensure that minimum spacing of 100 meters is maintained between pumpset financed and any other existing well.

4. The borrowers will have to mortgage the implements/motor pumpset to the bank bought through the loan.
5. In the case of motor and pumpset loan the cheque will be issued to the shop owner who supplied ISI marked pumpset.
6. In the case of misutilisation of loan borrowers will be debarred from further loan and the recovery of loan will be called for immediately in one installment.
7. Loan should be repaid according to the schedules given.

3.19 Control of the Organisation

While the day to day affairs are looked after by the Secretary, the periodical supervision over the utilisation of the loan given, is done by the supervisors and when the loan amount is large the Agricultural Officer too accompanies them. The regional office carries out monthly inspection. Besides, the regional conference held on 10th of every month reviews the loans given by the bank. Apart from the control by the Central Co-operative Agriculture and Rural Development bank, all the schemes enjoying NABARD refinance facility will be supervised and evaluated periodically by the NABARD officers.

Eventhough the problems of inadequate staff, delay in the sanction of schemes etc. create hindrances to the bank's smooth working, the banks has been able to stick to its objective of helping the members to improve their economic conditions. Accordingly, it identifies areas where lending is possible.

Methodology

METHODOLOGY

The present study attempts to analyse the economic impact of minor irrigation financed by Primary Co-operative Agriculture and Rural Development Banks (PCARDB) in Palakkad district. A number of factors other than irrigation influence crop yields and thereby income. It is thus difficult to determine the exact contribution of bank finance to production and income of beneficiaries . Therefore what is proposed in the present study is to indicate the nature and extent of benefits realised by farmers after availing of bank finance. For this purpose a sample survey of borrowing farmers has been undertaken.

4.1 Selection of sample respondents

The list of farmers who had availed loans for minor irrigation (well and pumpset) from the five Primary Co-operative Agriculture and Rural Development Banks in Palakkad district during 1990-91 were collected from the records of these banks. The total sample size was fixed as 120, which was apportioned among the banks based on probability proportional to size of total beneficiaries under this category in each bank, as detailed below:

PCARDB, Palakkad	: 50
PCARDB, Mannarghat	: 16
PCARDB, Alathoor	: 18
PCARDB, Chittoor	: 16
PCARDB, Ottappalam	: 20
Total	120

The sample farmers were further classified on the basis of size of operational area, viz., small, medium and large. According to bank's classification those who have upto one hectare of land are small farmers, 1 to 1.80 hectare comes under medium category. Above 1.8 hectares land owning class comes under large category. Thus among the 120 sample farmers 56 were small, 42 medium and 22 large. In order to have a realistic evaluation of bank finance only fully utilised loan and those who had at least completed two years after utilisation were selected.

4.2 Collection of Data

A pre tested structured comprehensive interview schedule was administered to collect the information from the sample respondents through personal interview which formed the major source of information for the study. Data on aspects such as profile of the sample borrowers, land use pattern, cost of cultivation, details of pumpset, income and employment generation were collected for two periods, viz. pre investment period (1990-91) and post investment period (1993-94). The study was carried out during the period 1993-94.

Data for the study were supplemented from other sources. This included the records of PCARDBs, Apex bank and discussions with the officials of these agencies. The procedural arrangements and the problems in the supply side were revealed by such investigation.

4.3 Analysis of Data

The impact of bank finance were measured on the basis of changes reflected in certain parameters like irrigated area, cropping pattern, cropping intensity,

returns and employment generation during the post investment period. Using the simple percentage analysis.

The economic feasibility and repayment capacity of each sample borrower were estimated employing the following formulae.*

$$E_f = \frac{Y_2-Y_1-(X_2+I_2)-(X_1+I_1)}{C} \times 100$$

Where E_f = Economic Feasibility

Y_2 = Return after investment

Y_1 = Return before investment

X_2 = Cost after investment

I_1 = Interest on working capital and investment (before investment)

X_1 = Cost before investment

I_2 = Interest on working capital (after investment)

C = Capital cost.

---

*Source:

Subramanian, S.R. 1990. Regional Disparities in Agricultural financing Techniques and Estimation. *Proc. of the Summer Institute on Agricultural Financial Manangement.* University of Agricultural Sciences, Hebbal. pp.36-56

4.4 Repayment Capacity

$$R_c = (Y_2-Y_1)+Y-(X_2-X_1)+F_e-OL-I + i$$

Where R_c = Repayment Capacity

Y_2 = Post investment farm income

Y_1 = Pre investment farm income

Y = Non farm income

X_2 = Post investment farm expense

X_1 = Pre investment farm expense

F_e = Family expenditure

OL = Other Liabilities

I = Loan installment

i = Interest per annum for loan.

Results and Discussion

RESULTS AND DISCUSSION

The attempts made to achieve the stated objectives and the analytical results obtained are presented in this Chapter. It covers an in depth study on the institutional factors which influence the repayment of credit, socio-economic back-ground of the sample borrowers, their cropping pattern, production pattern, income generation, expenditure pattern, employment generation, assessment of repayment capacity and various problems faced by the sample borrower in availing and utilising the credit.

5.1 Institutional Factors

The proper use and the repayment of credit is largely influenced by certain factors in the supply side apart from those of demand side. In what follows is a brief, critical analysis of some of these institutional aspects such as the procedure of credit, delivery, its appropriateness and related problems is done. This is mainly based on primary data collected from bank records and discussion with the officials as well as beneficiaries.

Basically there are three stages which are involved in the implementation of minor irrigation scheme, viz. sanctioning of the scheme financed by NABARD, sanctioning by the Apex bank (Central Co-operative Agriculture and Rural development Bank) and disbursement through PCARDB. It was envisaged in the scheme that secretaries of bank in consultation with Agricultural officer in the bank would identify the beneficiaries. The Agricultural Officer will provide necessary technical guidance and other supportive services. He will also help the borrowers in

preparation of bankable projects and in obtaining financial assistance from the bank. Apex bank would advice the primary bank the kind of projects to be financed after testing its economic and financial viability.

As soon as the complete loan application in all respects are submitted to the financing primary bank, the bank after prior verification of the loan application will sanction the loan to the identified borrowers. The same will be forwarded to the Apex bank with details, for refinance. As per the existing procedure, the loan application of the borrowers goes for verifications and checks at various levels before it is finally sanctioned and the loans are disbursed. Usually the applications of the borrowers is processed in such a way that the borrower can start work before the rainy season especially in digging the wells. The borrowers who desire loans, submit their applications to the bank officials. Bank officials accept the applications after verification as per their requirement and resource position of the bank. Application is then forwarded to Agricultural officer in the bank. He will visit the site of the borrower/applicant to ensure the viability of the proposal. Application is then put before the Director Board of the society for their approval which generally meets twice in a month.

At bank level, application is again scrutinised by the legal officer for ascertaining the eligibility of the applicants and also to check whether the application is supported with required certificates and documents such as ownership of land or cultivation rights of land, no due certificates from the banks/institutions in the area of operation of the PCARDB. After the verification, hypothecation/mortgage of land is insisted by the bank. Once these formalities are over, the amount is disbursed in two to three installments on successful completion of work in respective stages.

It was pointed out that a credit worthy farmer with a viable project may not get the loan even if the loan is recommended by officials. It has to be finally approved by the managing committee which sometimes may have political interests. This, lead to a situation of denial of loan to a particular person, at least in few cases.

It was observed during the survey that application form of different banks are identical in respect of terms and conditions, information required etc. Apex level institution has developed a printed loan application form which consists of the details about the borrowers family, land records, past loans and dues of different banks. Rs.10 is charged per application form. The borrowers are required to give many certificates and documents as mentioned earlier in order to get the loan. From the side of the institution this is a justifiable procedure to ensure the credit worthiness of a borrower. But the social system taxes the borrower at various stages of acquisition of these documents and finally it become a costly and time consuming affair for the borrower.

5.2 Institutional problems

The general problems as experienced by PCARDBs were identified as follows:

5.2.1 Target orientation

Every year Apex bank fixes the target amount without considering the genuine needs of the region. It was reported that officials of PCARDB were not consulted in fixing the target. Further, as already pointed out that a credit worthy farmer with a viable project proposal may not get the loan even if the loan is

recommended by the officials. It has to be finally approved by the managing committee which sometimes may have political interests. This may lead to the situation of denial of loan to particular persons, at least in a few cases.

5.2.2 Institutional support

The institutional support from state government, NABARD, Apex bank etc., are very essential because funds available with PCARDBs are very limited. Large amount of money is locked up since PCARDBs are long term financial institutions. Ample refinance support from Apex level agencies are essential at adequate time for successful operation of various schemes.

5.2.3 Absence of viable loan proposals

Distant location of bank branches and poor awareness among rural poor and fear about losing their lands can be cited as some of the basic reasons for poor demand for credit from these co-operative institutions in Palakkad. Realising this the officials of these banks have stepped forward for conducting seminars, workshops and celebrating propaganda to educate and motivate the farmers.

5.2.4 Documents

Some of the PCARDB's pointed out that sometimes it became difficult for the bank to grant loan in time due to lack of proper land particulars, certificates and documents with the borrowers. From the side of the credit institution it is only appropriate to ensure the credit recycling for social good. But most often the existing social system taxes the farmer very highly, at various places/stages of acquisition of these documents and finally it become a costly and time consuming affair for the

borrower. The importance of correctly estimating the basic resources of all citizens and issuing basic information cards like ration cards which can be regarded as a proof of ones assets/liabilities may save the time and efforts of both the borrowers and banks.

5.2.5 Lack of sufficient bank staff and their attitude

The allocation of the staff at the bank branches are determined based on the financial business of the branches rather than considering the volume and type of work to be attended. Further many of the staff of the branches are untrained and hence find it difficult to derive maximum quality work output. Inadequate guidelines on specific schemes, compounds to the situation. Selecting qualified personnel and programme for man power development are to be carefully followed for improving the quality of co-operative institutions.

5.2.6 Inequality in lending

Though project lending is described as a scientific credit system with amount of credit based on cost of project rather than the extent of collateral security, most often it is not so. Or in other words some of the farmers find it difficult to provide adequate collateral security. The very purpose of the loan is questioned due to inadequate credit. Moreover, this made an impression in the borrowers that bank officials are showing partiality.

5.3 General Socio-economic characteristics of the sample

The general socio economic characteristic of the sample borrowers viz., family size, age, education status, occupation, holding size and family income have

been examined. These data relate to post investment year (1993-94). An idea about these characteristics will serve as a useful background information for the present study.

5.3.1 Family size

The sample farmers are divided into three category on the basis of total land possessed, viz., small farmers are those who possess upto one hectare of land, medium farmers who possess 1 to 1.80 hectares and large farmers with more than 1.80 hectares. The results are given in Table 5.1. The sample households with one to four members, 5 to 6 members and above 6 members. In the first class there were a total of 16 families of this five were of small farmers, ten medium and one large. In the second class there were 64 families of which 36 were small 15 medium and 13 large farmers. In the third category, that is, above six family members there were 40 families of which 15 were small 17 medium and eight large farmers. The analysis also showed that majority of small and large farmer household had a family size of five to six members whereas most of the medium sample farmer households had more than six members in the family.

5.3.2 Age

The classification of borrowers on the basis of age is given in Table 5.2. There were 9 borrowers below 35 years. But majority of the borrowers were in the age group of 35 to 55. They formed 73.33 per cent of the total sample. There were 23 farmers above the age of 55 years and above.This comprises of 19.17 percent of the total sample. In all the three size groups of farmers, majority of borrowers were in the age group of 35-55 years. This perhaps is a reflection of greater involvement of youth in agriculture.

Table 5.1. Distribution of sample holdings on the basis of family size

Size of family	Small	Medium	Large	Total
1-4	5 (8.93)	10 (23.81)	1 (4.55)	16 (13.33)
5-6	36 (64.29)	15 (35.71)	13 (59.09)	64 (53.33)
Above 6	15 (26.78)	17 (40.48)	8 (36.36)	40 (33.34)
Total	56 (100.00)	42 (100.00)	22 (100.00)	120 (100.00)

Figures in the parentheses are percentage to total

Table 5.2. Classification of the respondents on the basis of age

Age Group	Size of holdings			
	Small	Medium	Large	Total
Below 35 years	3 (5.36)	4 (9.52)	2 (9.09)	9 (7.50)
35 to 55 years	40 (71.43)	32 (76.19)	16 (72.73)	88 (73.33)
55 years and above	13 (23.21)	6 (14.29)	4 (18.18)	23 (19.17)
Total	56 (100.00)	42 (100.00)	22 (100.00)	120 (100.00)

Figures in the parentheses are percentage to total

5.3.3 Educational level

Education is considered to be an important determinant of the progressiveness of the farmer. It directly affects the physical quality of life index and income. The classification of respondents on the basis of educational status is shown in Table 5.3. All the respondents are literate with different levels of educational attainment. It may be seen that 32.5 percent of the sample beneficiaries had formal schooling only, 56.67 percent of the beneficiaries studied upto graduation and 10.83 percent were graduates. Majority of large farmers had formal schooling only. But majority of small and medium farmers were college educated.

5.3.4 Occupation

Classification of the respondents according to the main occupation is shown in Table 5.4. It can be seen that only 10 percent of the beneficiaries had agriculture as their main source of income. Rest of them depended mainly on various sources of non farm income. The dependence on non agricultural activities as the main source of income was almost in the same proportion (90 percent) irrespective of status of landholding.

5.3.5 Earning members per household

The average number of non farm income earning members of the sample respondents were studied. Activity wise they were service, government employees, private firm employees, NRI, small business/small industries etc. Results are given in Table 5.5. Out of 147 non farm income earners 58 were in medium farmer group, 49 are in small farmer group and 40 are in large farmer group. Of the total 49

Table 5.3. Classification of the respondents on the basis of educational level

Level of education	Size of holdings			
	Small	Medium	Large	Total
Formal Schooling	15 (26.79)	12 (28.57)	12 (54.55)	39 (32.50)
Below Graduation	36 (64.29)	25 (59.52)	7 (31.82)	68 (56.67)
Above Graduation	5 (8.92)	5 (11.91)	3 (13.63)	13 (10.83)
Total	56 (100.00)	42 (100.00)	22 (100.00)	120 (100.00)

Figures in the parentheses are percentage to total

Table 5.4. Classification of sample farmers according to main occupation

Occupation	Category of farmers			
	Small	Medium	Large	Total
Agriculture	6 (10.71)	4 (9.52)	2 (9.09)	12 (10.00)
Non agriculture	50 (89.29)	38 (90.48)	20 (90.91)	108 (90.00)
Total	56 (100.00)	42 (100.00)	22 (100.00)	120 (100.00)

Figures in the parentheses are percentage to total

Table 5.5. Classification of family members on the basis of non farm income earning

	Category of farmers			
	Small	Medium	Large	Aggregate
Service	7 (14.28)	6 (10.34)	1 (2.50)	14 (9.52)
Government	5 (10.20)	25 (43.10)	8 (20.00)	38 (25.85)
Private	34 (69.38)	6 (10.34)	6 (15.00)	46 (31.29)
NRI	2 (4.08)	3 (5.19)	5 (12.50)	10 (6.80)
Business	1 (2.06)	16 (27.58)	14 (35.00)	31 (21.09)
Small/mini industries	-	2 (3.45)	6 (15.00)	8 (5.45)
Total	49 (100.00)	58 (100.00)	40 (100.00)	147 (100.00)

Figures in parentheses are percentages to total

nonfarm income earning members in small category, majority (69.38 percent) were employed in private sector, and 14.28 percent in service sector. In the medium farmer category, most of the non farm income earners had government jobs, (43.10 percent) followed by business (15.78 percent). In large farmer category, various business activities formed the major source of income (35.00 percent) followed by government sectors (20 percent)

5.3.6 Sourcewise income of Respondents

Total family income per annum is the sum of total income from farm sources as well as non farm sources. Income from salary/wages, small business like retail shops, NRI income etc. were sources of nonfarm income. The share of farm and nonfarm income in the total family income of the borrowers is shown in Table 5.6. It can be seen that for a small category farmer the average farm income was Rs.6354 per year (26.23 per cent) and nonfarm income Rs.17,873 per year (73.77 per cent), total income being Rs.24,227. For the medium farmer total income was Rs.31,240 per annum in which 70.41 percentage was contribution of nonfarm sources. For the large farmer total nonfarm income was Rs.29200 per annum (66.71 per cent) and farm income is Rs.14573 (33.29 per cent). At the aggregate level total nonfarm income was accounted to Rs.21393 that is 70.69 per cent of the total income of Rs.30265.

5.3.7 Operating area

Total area for the present study is defined as the total land possessed minus land used for house and farm house or other business purposes and land not benefited by irrigation scheme due to various reasons. Thus operating area for this

Table 5.6. Sourcewise family income of respondents

Source of income	Size of holdings			
	Small	Medium	Large	Aggregate
Farm income	6354 (26.23)	9243 (29.59)	14573 (33.29)	8872 (29.31)
Non farm income	17873 (73.77)	21997 (70.41)	29200 (66.71)	21393 (70.69)
Total	24227 (100.00)	31240 (100.00)	43773 (100.00)	30265 (100.00)

Figures in parentheses are percentage to total

study constitute the area irrigated by the scheme. Operating area for each category of farmers small, medium and large were worked out. Results are shown in Table 5.7 The average operating area for a small farmer was 0.52 hectare, for a medium farmer 0.86 hectare and for a large farmer 1.15 hectares. The average size of operating area for the sample was 0.76 hectare.

5.4 Cropping pattern

Installation of irrigation system assured a regular water supply and this persuaded the farmers to diversified cropping, intensifying the land use and bringing more area under plough. Venkataraman and Prahaladachar (1980) defined an unchanging cropping pattern as a situation where the respective areas under all crops bear the same proportion of the gross cropped area over the years. In the present study, cropping pattern was expressed as the percentage share of each crop in the gross cropped area. The percentage share of each crop in gross cropped area before and after installation of irrigation unit was calculated to find out the change in cropping pattern. The major crops in the sample households consisted of coconut, arecanut and banana, in addition to some multipurpose tree crops like mango, jack and cashew and miscellaneous tree components like palm, neem etc., which are a common feature in all homesteads. No new crop was seen introduced in the farm subsequent to the installation of pumpsets. But the relative importance of the various crops in the cropping pattern changed. Similarly hither to unoccupied land was utilised by planting seedlings of coconut, arecanut and banana. More over some land occupied by miscellaneous trees was also cleared out of this.

Table 5.7. Classwise operating area of the respondents (in hectare)

Categor	Number	Total operating area	Average operating area
Small	56	29.35	0.52
Medium	42	36.19	0.86
Large	22	25.74	1.17
Aggregate	120	91.28	0.76

5.4.1 Cropping pattern of small sized farms

Pre investment and post investment cropping pattern of small farmer category is given in Table 5.8. The area under these crops were estimated by converting the existing number of plants based on recommended spacing for respective crops as suggested by Kerala Agricultural University (Package of Practices, KAU, 1994). The area under coconut seedlings, increased from 0.01 to 0.08 hectare with an increase of 700 percent. Area under arecanut (seedlings) increased from 0.01 to 0.03 hectare. Area under banana increased from 0.01 hectare to 0.05 hectare an additional increase of 400 per cent. Banana cultivation under assured irrigation facilities are considered to be the most remunerative annual crop. Thus the unoccupied land or area occupied by other crops which doesn't yield any income considerably decreased and this area is utilised for three major income yielding crops, viz., coconut, arecanut, and banana. In this category 0.11 hectare of unutilised land was brought under cultivation during the post investment period.

5.4.2 Cropping pattern of medium sized farms

In the medium size group results showed a replacement of miscellaneous tree crops by agricultural crops (Table 5.9). The area under banana which was only 0.02 hectare during pre investment period rose to 0.09 hectare, an increase of 0.07 hectare (350 per cent). In the case of coconut 0.13 hectare was brought under new cultivation and for arecanut it was 0.05 hectare. The arecanut and coconut cultivation is done in the expectation of a future steady income and banana cultivation is more undertaken to meet the immediate cash requirements. The extent of unutilised land got reduced to 0.05 hectare from 0.25 hectare, as a result of irrigation facility.

Table 5.8. Cropping pattern of small sized sample farmers (in hectare)

Crops	Pre investment cropping pattern	Post investment cropping pattern	Change in cropping pattern (per cent)
Coconut (bearing)	0.18	0.19	5.56
Coconut (seedling)	0.01	0.08	700.00
Arecanut (bearing)	0.11	0.12	9.09
Arecanut (seedling)	0.01	0.03	200.00
Banana	0.01	0.05	400.00
Other crops	0.04	0.04	0.00
Unutilised land including miscellaneous tree crops	0.16	0.05	-68.75

5.4.3 Cropping pattern of large sized farms

The cropping pattern of large size category is given in Table 5.10. On an average the large farmer group had brought 0.18 hectare of land under coconut cultivation, in addition to the existing area. The area under arecanut increased by 0.06 hectares and that under banana by 0.12 hectare. The extent of unutilised land reduced from 0.31 hectare to 0.03 hectare.

5.4.4 Cropping pattern of an average sample farm

The cropping pattern of sample farmers were also studied and results are given in Table 5.11. The results showed that the sample farm had brought 0.15 hectare of unutilised land for the cultivation of crops like coconut, arecanut and banana. The area under coconut increased by 0.11 hectare, arecanut by 0.03 hectare and banana by 0.07 hectare. The cropped area also increased from 0.52 hectare during pre investment period to 0.73 hectare during post investment period, that is to an extent of 40.38 percent.

5.4.5 **Cropping intensity**

Cropping intensity measures the extent of the use of land for cropping purpose during a particular year. In the present study cropping intensity was expressed as the percentage share of gross cropped area to effective area (net are sown) under cultivation. The results are shown in Table 5.12. The results indicates that with the availability of irrigation in the study area cropping intensity increased significantly. At the aggregate level cropping intensity of the sample had increased from 68.42 percent to 96.05 percent. Among the size groups, large size holding attained highest intensity of 102 percent followed by medium sized holding

Table 5.9. Cropping pattern of medium sized sample farmers (in hectares)

Crops	Pre investment cropping pattern	Post investment cropping pattern	Change in cropping pattern (per cent)
Coconut (bearing)	0.31	0.32	3.23
Coconut (seedling)	0.03	0.15	400.00
Arecanut (bearing)	0.18	0.19	5.56
Arecanut (seedling)	0.01	0.05	400.00
Banana	0.02	0.09	350.00
Other crops	0.05	0.05	0.00
Unutilised land including miscella-neous tree crop	0.25	0.05	-80.00

Table 5.10. Cropping pattern of large sized sample farmer (in hectare)

Crops	Pre investment cropping pattern	Post investment cropping pattern	Change in cropping pattern (per cent)
Coconut (bearing)	0.42	0.43	2.38
Coconut (non-bearing)	0.04	0.21	425.00
Arecanut (bearing)	0.24	0.25	4.17
Arecanut(non-bearing)	0.01	0.06	500.00
Banana	0.02	0.14	600.00
Other Crops	0.08	0.08	0.00
Unutilised land including miscella-neous tree crops	0.31	0.03	-90.32

CROPPED AREA OF SAMPLE FARMERS

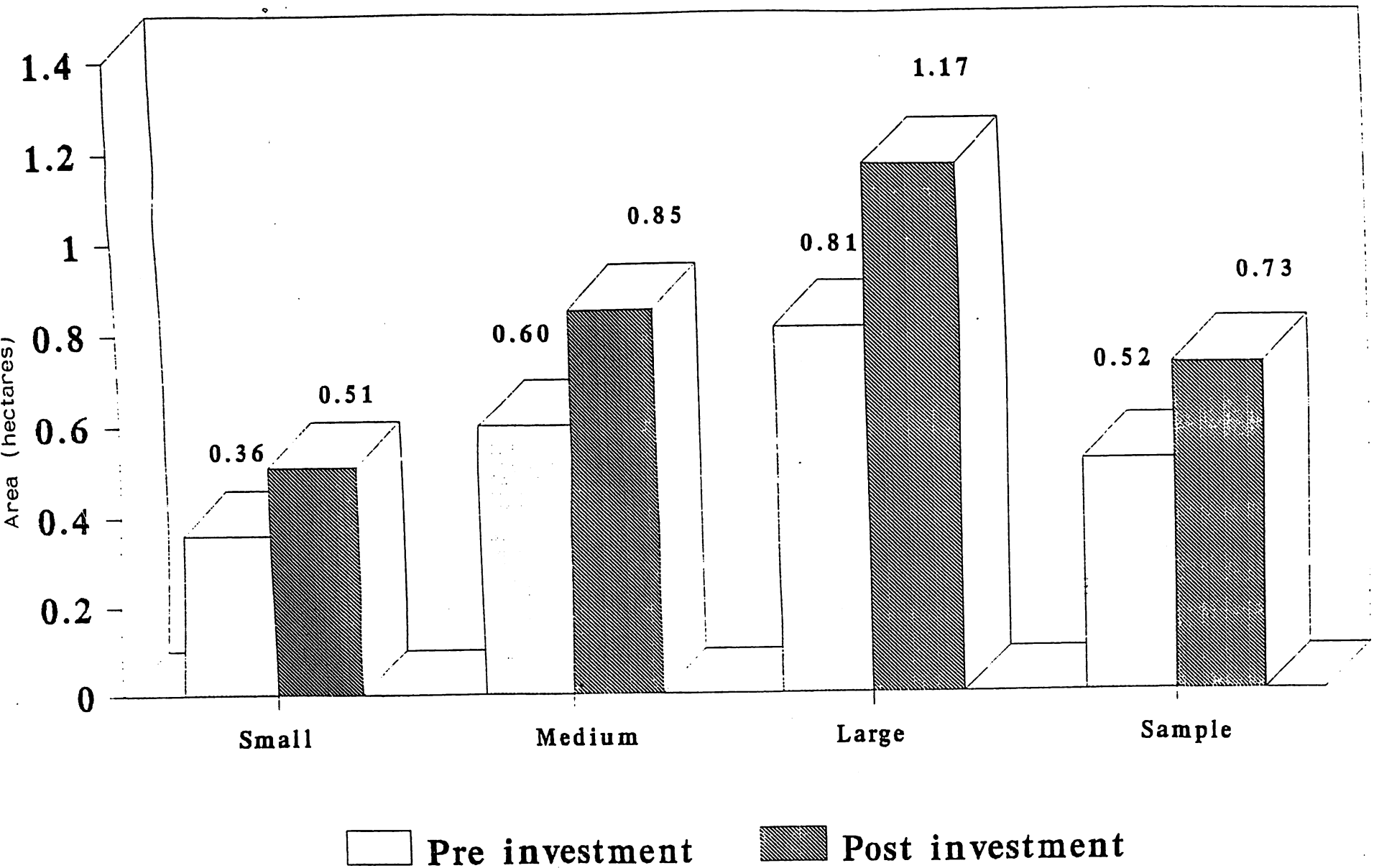


Table 5.11. Cropping pattern of an average sample farmer (in hectare)

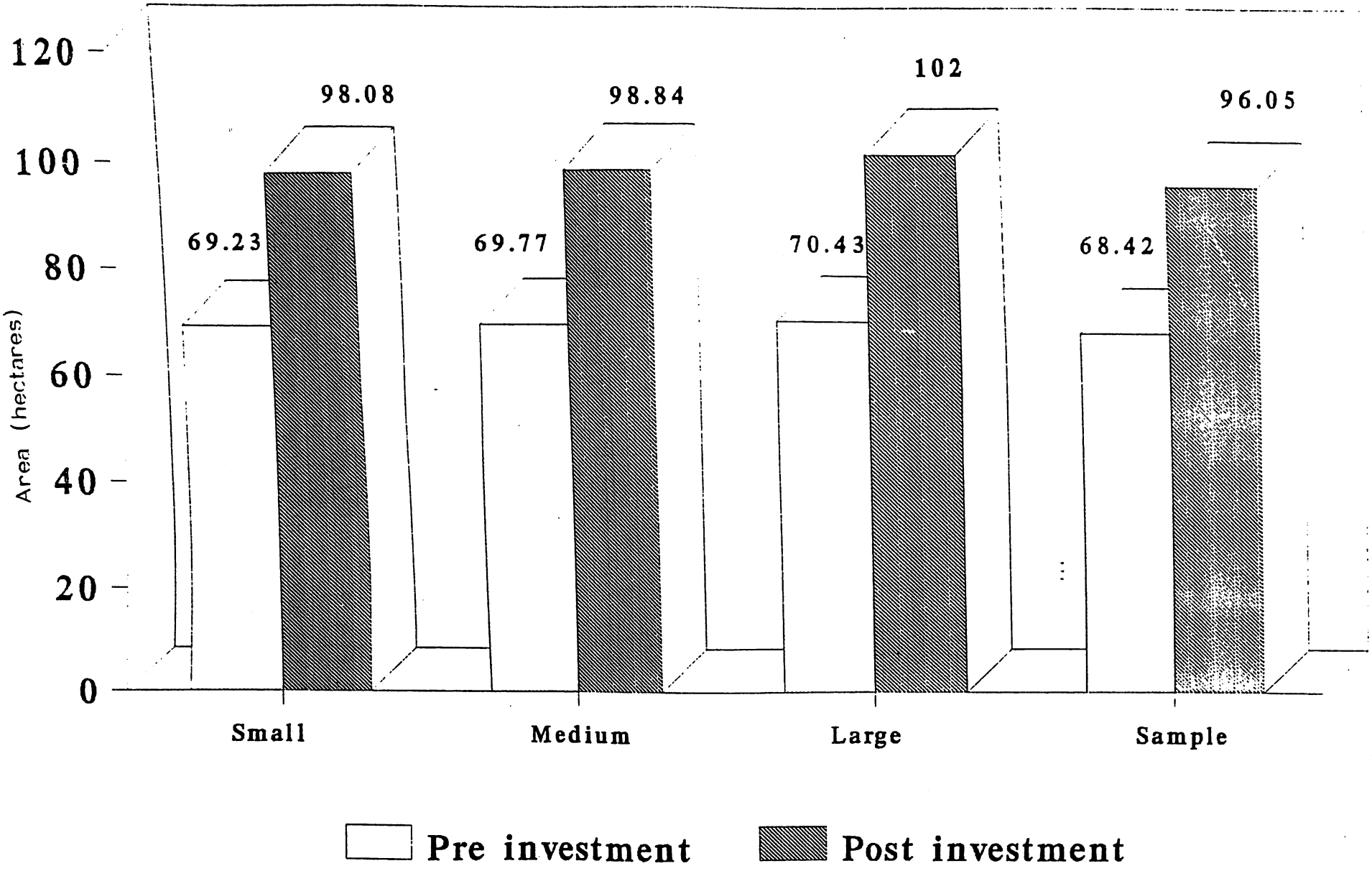
Crops	Pre investment cropping pattern	Post investment cropping pattern	Change in cropping pattern (per cent)
Coconut (bearing)	0.26	0.27	3.85
Coconut (seedling)	0.02	0.12	500.00
Arecanut (bearing)	0.16	0.16	0.00
Arecanut (seedling)	0.017	0.04	300.00
Banana	0.01	0.08	700.00
Other corps	0.06	0.06	0.00
Unutilized land including miscella-neous tree crop	0.21	0.06	71.43

Table 5.12. Cropping intensity of sample farmers

Category	Cropped area (ha)		Effective area (ha)		Cropping intensity	
	Pre investment period	Post investment period	Pre investment period	Post investment period	Pre investment period	Post investment period
Small sized	0.36	0.51	0.52	0.52	69.23	98.08
Medium sized	0.60	0.85	0.86	0.86	69.77	98.84
Large sized	0.81	1.17	1.15	1.15	70.43	102.00
Aggregate	0.52	0.73	0.76	0.76	68.42	96.05

FIGURE-3

CROPPING INTENSITY OF SAMPLE FARMERS



(98.84 percent) and small sized holding (83.02 percent) during post investment period.

5.5 Impact on production

Increase in production of the crops is the immediate objective of the farmer in the installation of the irrigation facility. This can be achieved either through an intensified use of production inputs or through an increase in area under crop or both. Assured irrigation lead to an increased production on account of both these factors. Irrigation facilitates an increased and efficient use of fertilizers, as its most direct effect, which leads to an increase in productivity. The productivity figures of crops before and after investment are given in Table 5.13. The result shows that the increase in productivity in coconut was highest in small farmer category, followed by medium and large. It has to be noted that the percentage change in average expenditure on coconut cultivation was also highest in small farmer category, compared to other two groups. Small farmers, due to their higher dependence on farm might have resorted to more intensive use of modern farm technology, than other two groups. The productivity of coconut in small farms increased from 60 nuts to 65 nuts per palm in the period after acquiring facility. The percentage increase was 7.93. In the case of medium farms the increase was 7.69 percent and in the case of large farms the overall increase of sample was 7.93 percent.

The productivity of arecanut was 175 nuts per palm during pre investment period which enhanced to 190 nuts during post investment period in the case of small farms. The increase was 8.57 percent. For medium farms the productivity per palm has increased from 180 nuts to 185 nuts with an increase of 2.78 percent. In the case of large farms the productivity has increased from 180 nuts during pre

Table 5.13. Productivity of major crops before and after investment

Category	Before investment			After investment			Percentage increase		
	Coconut	Arecanut	Banana	Coconut	Arecanut	Banana	Coconut	Arecanut	Banana
Small	60	175	6.0	65	190	10.0	18.33	8.57	66.69
Medium	63	180	8.0	68	185	11.5	7.93	2.78	43.75
Large	65	180	8.0	70	190	11.5	7.69	5.56	43.75
Aggregate	63	178	7.3	68	188	10.6	7.93	5.62	45.00

Banana is in Kilogram
Coconut and Arecanut are in nut per tree per annum

FIGURE-4

PRODUCTIVITY OF COCONUT BEFORE AND AFTER INVESTMENT

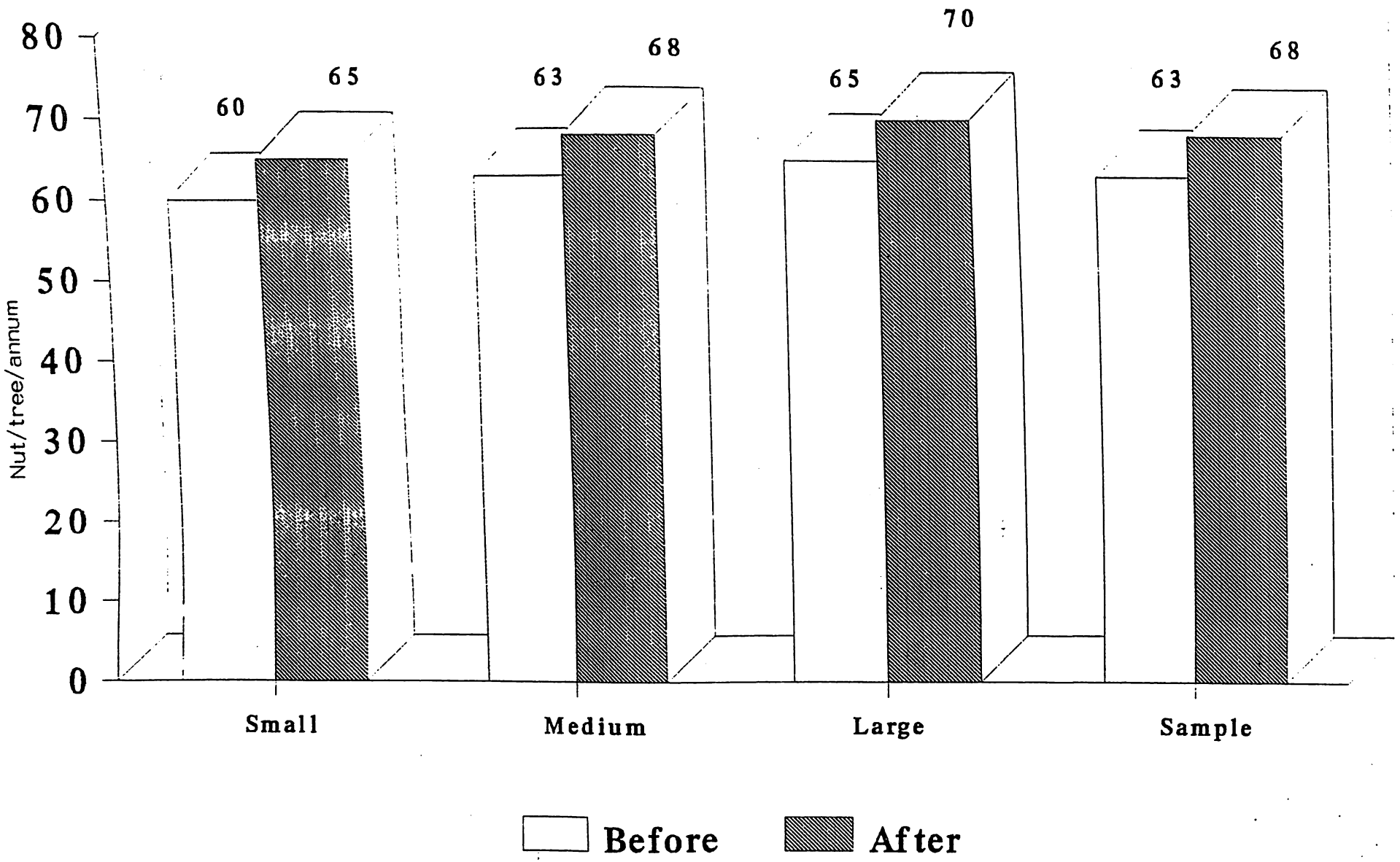


FIGURE-5

PRODUCTIVITY OF ARECANUT BEFORE AND AFTER INVESTMENT

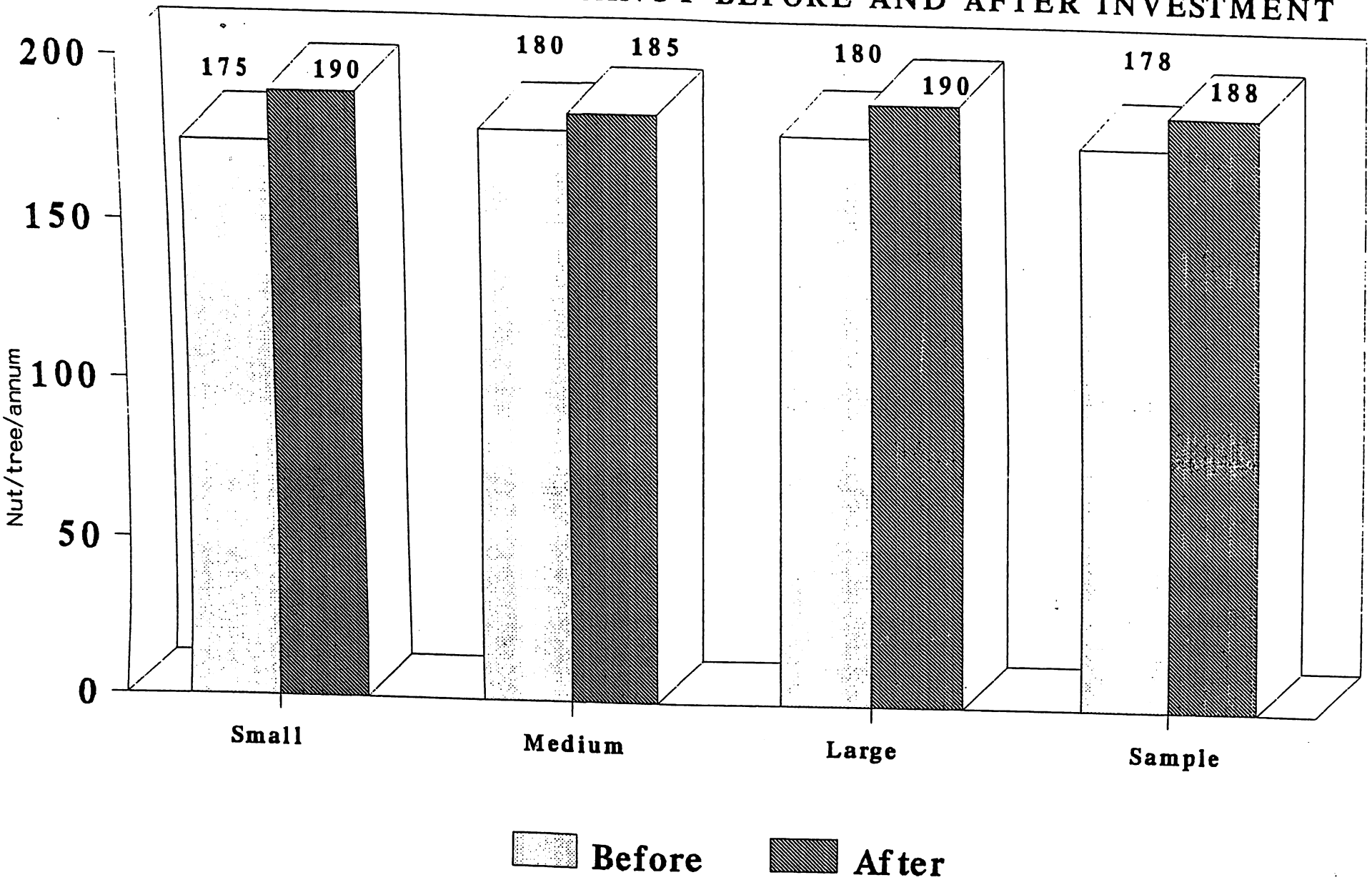
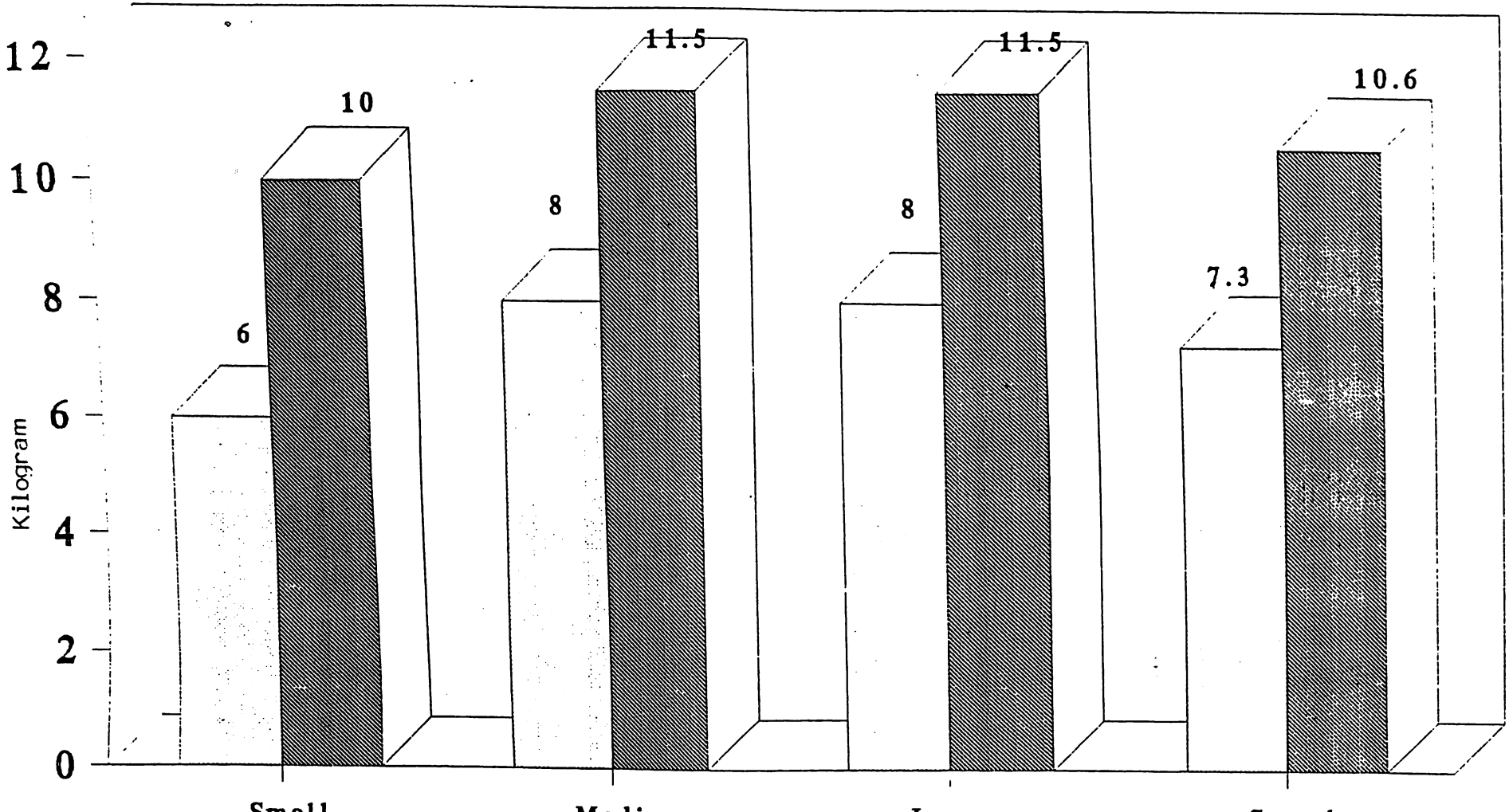


FIGURE-6
PRODUCTIVITY OF BANANA BEFORE AND AFTER INVESTMENT



investment period to 190 nuts during post investment period. When we consider sample as a whole the increase was 5.62 percent. The productivity of banana of small farmers were 6 kg per bunch which became 10 kg per bunch. For medium farmers during pre investment period 8 kg per bunch became 11.5 kg per bunch during post investment period and for large farmers 8 kg per bunch during pre investment period became 11.5 kg per bunch during post investment period (Fig. 5.6).

5.6 Income generation

The productivity of any credit can be assessed by the parameters of changes in cropping pattern, cropping intensity and finally the changes in income. In order to find the impact of irrigation on farm income, the gross income from the various crops grown in the period prior to and after acquiring facility were worked out and compared. The results are given in Tables 5.14, 5.15, 5.16 and 5.17.

5.6.1 Income pattern of small category of farm

The average gross income per farm from all crops increased considerably (Table 5.14). The effect of better management in coconut is usually manifested after a minimum period of three years. However the change in gross income of this crop is estimated with the available information. In the case of other crops especially for banana a very high increase was noticed. The effect on other tree crops was also marked. Pre investment income from coconut for small farm was Rs.5,622 which rose to Rs.6,473, an increase of 15.14 per cent. From arecanut it was Rs.8,346 which became Rs.9,039, an increase of 8.30 per cent . From banana it was Rs. 523 during pre investment period which became Rs.3,668, an increase of 601.34 per

Table 5.14. Income pattern of small sized sample farmers

Crops	Pre investment income (1991-1992)	Post investment income (1993-1994)	Change in income
Coconut	5622.00 (37.69)	6473.00 (32.36)	851.00 (15.14)
Arecanut	8346.00 (55.95)	9039.00 (45.19)	693.00 (8.30)
Banana	523.00 (3.51)	3668.00 (18.34)	3145.00 (601.34)
Others	427.00 (2.85)	822.00 (4.11)	395.00 (92.50)
Total	14918.00 (100.00)	20002.00 (100.00)	5084.00 (34.07)

Figures in parentheses are percentage

cent. From other crops an income of Rs.427 were obtained during the pre investment period which became Rs.822 during post period. The gross income from all the crops together was Rs.14,918 during pre investment period which became Rs.20,002 during post investment period. The percentage change in total income was 34 per cent.

5.6.2 Income pattern of medium category of farm

In medium category of farm change in income due to irrigation facilities was to the tune of Rs.925, Rs.582, Rs.6,644 and Rs.1,210 from coconut, arecanut, banana and other tree crops respectively. The total additional income generated was estimated at Rs.9,362, an increase of 36 per cent as shown in Table 5.15.

5.6.3 Income pattern of large category of farm

In large size farm also there was a substantial increase in gross income due to introduction of minor irrigation. It was found to be maximum as in the case of banana to an extent of 600 per cent (Rs.10,894) followed by other tree crops (Rs.2,986). The table 5.16 shows that coconut yielded 8.28 per cent and arecanut showed 3.57 per cent additional income.

5.6.4 Income pattern of an average farm

Income pattern of sample farmers is given in Table 5.17. Total gross income of the sample as a whole increased by 38.44 per cent from Rs.22,560 to Rs.64,132 during post investment period (1993-94). Change in income denoted was Rs.1,176, Rs.655, Rs.5,686 and Rs.1,155 respectively from coconut, arecanut, banana and other tree crops.

Table 5.15. Income pattern of medium sized sample farmers

Crops	Pre investment income (1991-1992)	Post investment income (1993-1994)	Change in income
Coconut	10310.00 (39.65)	11235.00 (32.04)	925.00 (8.97)
Arecanut	14247.00 (54.80)	148229.00 (42.29)	582.00 (4.09)
Banana	1102.00 (4.24)	7746.00 (21.24)	6644.00 (60.29)
Others	341.00 (1.31)	1551.00 (4.43)	1210.00 (13.36)
Total	26000.00 (100.00)	35361.00 (100.00)	9362.00 (36.00)

Figures in the parentheses are percentages

Table 5.16. Income pattern of large sized sample farmers

Crops	Pre investment income (1991-1992)	Post investment income (1993-1994)	Change in income
Coconut	13533.00 (38.18)	14654.00 (28.65)	1121.00 (8.28)
Arecanut	19557.00 (55.18)	20256.00 (39.61)	699.00 (3.57)
Banana	1814.00 (5.12)	12708.00 (24.85)	10894.00 (600.00)
Others	541.00 (1.52)	3527.00 (6.89)	2986.00 (551.00)
Total	35445.00 (100.00)	51145.00 (100.00)	15700.00 (44.29)

Figures in parentheses are percentages

Table 5.17. Income pattern of an average sample farmer

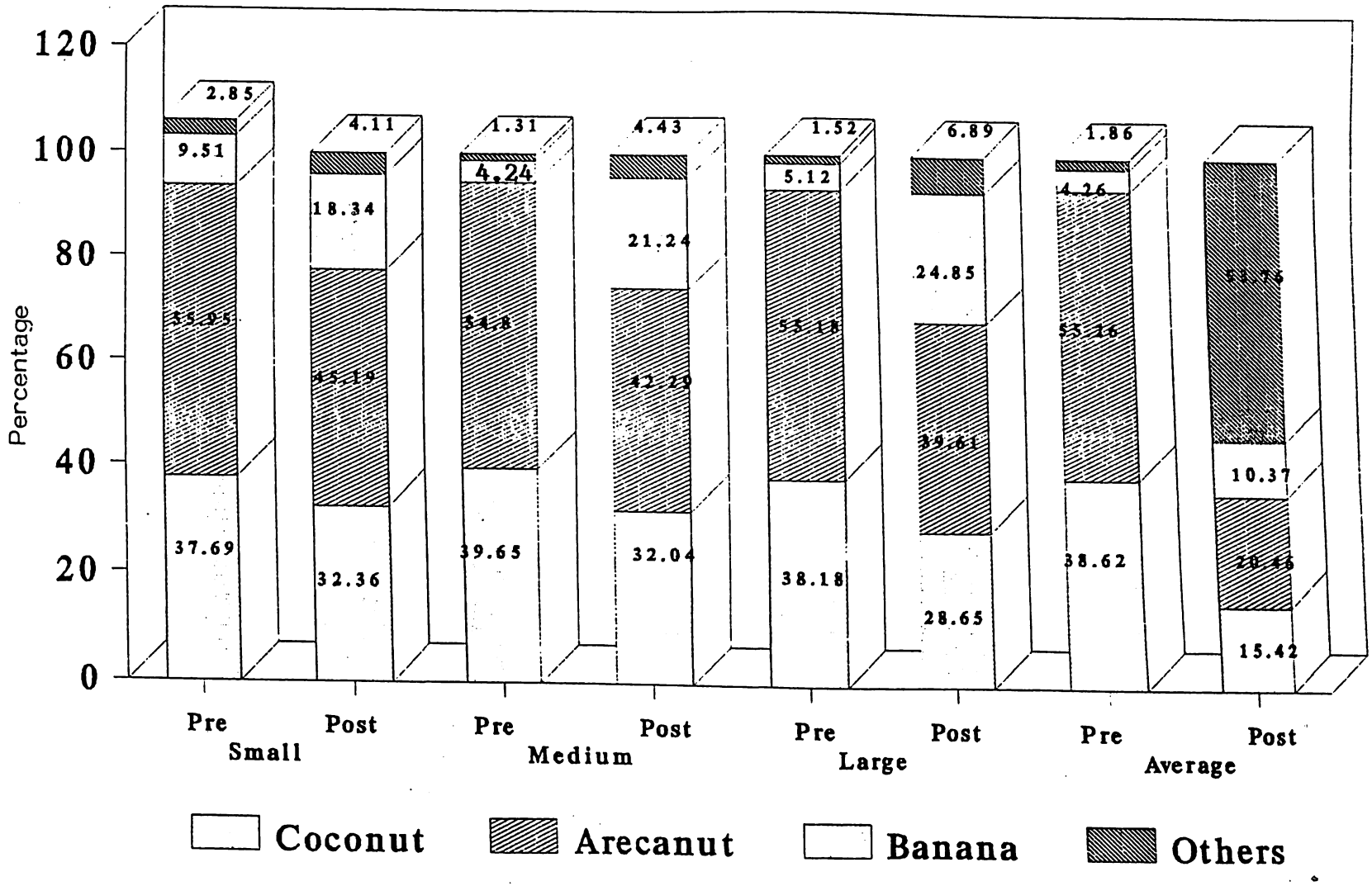
Crops	Pre investment income (1991-1992)	Post investment income (1993-1994)	Change in income
Coconut	8713.00 (38.62)	9889.00 (15.42)	1176.00 (13.50)
Arecanut	12467.00 (55.26)	13122.00 (20.46)	655.00 (5.25)
Banana	962.00 (4.26)	6648.00 (10.37)	5686.00 (591.00)
Others	418.00 (1.86)	1573.00 (53.75)	1155.00 (276.00)
Total	22560.00 (100.00)	64132.00 (100.00)	8672.00 (38.44)

Figures in parentheses are percentages

FIGURE-7

CROPWISE INCOME PATTERN

Sample farmers



It was by and large, evident that the bank finance has helped the farmers in raising their income by improvements in the existing cropping pattern through better management of land by using more critical inputs. Most of the borrowers reported that irrigation has improved the productivity of their farms.

5.7 Incremental income

Incremental income (the additional net income from the farm) was worked for each category of sample farmers. The pre investment net income from the farm was substracted from the post investment net income. The results are given in Table 5.18. It was found that for a small farmer average incremental income was Rs.2550.27 for a medium farmer it was Rs.3941.10 and for a large farmer Rs.8743.30. The average incremental income steadily increased with farmer group category. On an average the incremental income was estimated to Rs.5713.

5.8 Impact on employment

Impact on employment was assessed cropwise in all the category of farms. In the present study eight hours of work per day was considered as a man day unit. The prevailing wage rate was rupees 50 per day. For coconut and arecanut harvesting charges is one of the major labour cost items. Usually 8 to 10 times coconut crop is harvested in the study area. Prevailing harvesting charges is Rs.2.50 per coconut tree for one harvest and thus Rs.50, the prevailing wage rate, is considered equivalent to one man day. The harvesting charge for an arecanut tree in the study area is one rupee per tree. The crop is harvested twice in an year. Here also the harvesting charges is converted to man days and added with labour employment.

Table 5.18. Incremental income generated by sample farms

Size group	Incremental income
Small	2550.27
Medium	3941.10
Large	8743.30
Sample	5713.00

5.8.1 Perfarm labour use pattern

The results of the labour employment during pre investment and post investment period are given in Tables 5.19 and 5.20. the results showed that per-form labour use was highest for large category of farms during both pre investment and post investment periods (Table 5.19). In large sized farm 60 man days, includ-ing 14 family labour days and 46 hired labour days were utilised during pre invest-ment period, which rose to 122 man days per year (31 family labour and 91 hired labour days) during post investment period (Table 5.20).

Medium sized farms employed 44 man days including 11 family labour during pre investment period (Table 5.19) which became 86 man days (23 family labour and 63 hired labour during post investment period (Table 5.20). Thus a significant increase in labour employment is visible.

A small farmer has employed 23 man days (4 family labour and 19 hired labour) annually during pre investment period (Table 5.19). Due to more intensive cropping and by cultivation of crops like banana labour employment has increased to 48 man days during post investment period (Table 5.20). This includes 15 family labours and 33 hired labours.

5.8.2 Per hectare labour use pattern

Per hectare labour use was also calculated for each category of farms and the results are given in Tables 5.21, 5.22 and 5.23. It was found that small category of farm for all the crops together employed 47 family labour and 140 hired labour

Table 5.19. Classwise labour use pattern during preinvestment period (per farm)

Crops	Category of farmers							
	Small		Medium		Large		Aggregate	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut (bearing)	3	10	6	18	8	26	6	18
Coconut (non-bearing)	0	1	1	2	1	3	1	2
Arecanut (bearing)	1	6	3	10	4	14	3	10
Arecanut (non-bearing)	0	1	0	1	0	1	0	1
Banana	0	1	1	2	1	2	1	2
Total	4	19	11	33	14	46	11	33

Table 5.20. Classwise labour use pattern during postinvestment period (per farm)

Crops	Category of farmers							
	Small		Medium		Large		Sample	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut (bearing)	6	15	8	27	10	40	8	27
Coconut (seedling)	3	6	4	13	5	20	4	16
Arecanut (bearing)	3	8	6	13	9	18	6	13
Arecanut (seedling)	1	2	2	4	2	4	2	4
Banana	2	2	3	6	5	9	3	6
Total	15	33	23	63	31	91	23	66

during pre investment period which became 90 family labour days and 185 hired man days (Table 5.21). The percentage changes in family labour and hired labour days were 91 per cent and 32 per cent respectively.

Per hectare labour employment for a medium category in the sample is still higher which accounted for 210 labour days during pre investment period of which includes 57 family labour days and 153 hired labour days. During post investment period the labour employment has increased to 300 labour days (85 family labour day and 215 hired labour days) (Table 5.22). Thus the increase in family labour days and hired labour days were to the extent of 49 per cent and 41 per cent respectively.

Labour use pattern for large category of farm also showed a remarkable progress. The total labour days employed for a large farmer was 219 man days during the pre investment period (57 family labour and 162 hired labour) which became 318 labour days (91 family labour and 227 hired labour for post investment period (Table 5.23). The percentage increase in family labour and hired labour days were 60 and 40 respectively.

Cropwise analysis showed that on an average employment generation was more in coconut cultivation. During the post investment period an additional 110 labour days were utilised for maintenance of 1 hectare of coconut garden. It was 90 for arecanut garden followed by banana. Seventy five labour days were utilised for one hectare of banana cultivation.

5.8.3 Creation of additional employment

Additional employment created on each category of farms for each crop

Table 5.21. Classwise, Periodwise labour use pattern of small farmers (per hectare)

Crops	Pre investment period		Post investment period		Percentage change	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut	15	55	30	80	100	45
Arecanut	12	50	25	65	108	30
Banana	20	35	35	40	75	14
Total	47	140	90	185	91	32

Table 5.22. Classwise, periodwise Labour use pattern of medium farmers (per hectare)

Crops	Pre investment period		Post investment period		Percentage change	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut	18	58	25	85	39	47
Arecanut	14	55	30	70	114	45
Banana	25	40	30	60	20	50
Total	57	153	85	215	49	41

Table 5.23. Classwise, periodwise Labour use pattern of large farmers (per hectare)

Crops	Pre investment period		Post investment period		Percentage change	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut	17	60	22	90	29	50
Arecanut	15	57	34	72	127	26
Banana	25	45	35	65	40	44
Total	57	162	91	227	60	40

is worked out and are given in Table 5.24. The analysis showed that additional labour employment was created more in large sized farms (62) man days followed by medium sized farms (42) and small sized farm (25) man days. In small category of farms 16 man days were more utilised than pre investment period for the cultivation of coconut. In the case of Arecanut cultivation additional employment created was 6 days and for banana cultivation an additional employment of 3 man days were observed. Thus in a small sample farm due to investment in minor irrigation a total of 25 man days were additionally created.

The total additional man days created in a medium sized farm was 42 man days of this 25 additional man days were used for cultivation and maintenance of coconut. Arecanut and banana cultivation contributed to an additional employment of 7 and 6 man days respectively. The trend was noticed in the case of large category of farms. Out of the total of 62 additional man days coconut garden generated 37 man days, followed arecanut 14 man days and banana 11 man days.

Per hectare analysis shown in Table 5.25 revealed that additional labour employment created was found to be maximum in large sized farms (109 man days) followed by medium sized farms (100 man days) and small category of farms (88 man days).

Among the crops, it was observed that coconut accounted for 45 additional man days followed by maintenance of arecanut (34 man days) and banana (30 man days) in large sized farms. The analysis also showed that in medium sized farms, banana cultivation accounted for maximum additional labour employment to an extent of 35 man days followed by maintenance of coconut (34 man days) and arecanut (31 man days). In the case of small category of farms, the maximum

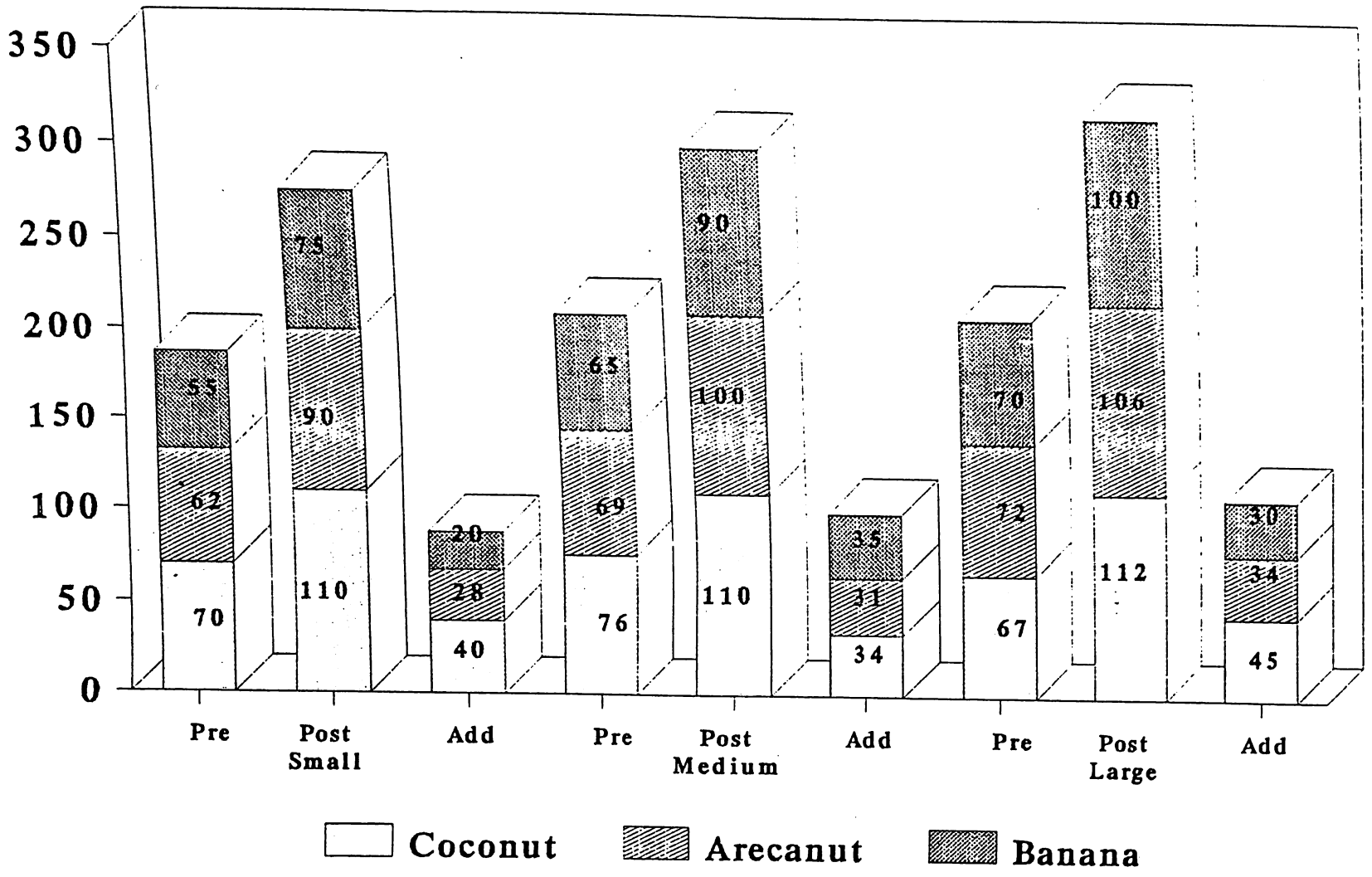
Table 5.24. Creation of additional labour employment (per farm)

Crops	Category of farmers							
	Small		Medium		Large		Aggregate	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Coconut bearing	3	5	2	9	2	14	2	9
Coconut non-bearing	3	5	3	11	4	17	3	14
Arecanut bearing	2	2	3	3	5	4	3	3
Arecanut non-bearing	1	1	2	3	2	3	2	3
Banana	2	1	2	4	4	7	2	4
Total	11	14	12	30	17	45	12	33

Table 5.25. Classwise, periodwise labour use pattern of sample farmers (per hectare)

Labour use	Small			Medium			Large		
	Pre investment	Post investment	Additional employed	Pre investment	Post investment	Additional employed	Pre investment	Post investment	Additional employed
Coconut	70	110	40	76	110	34	67	112	45
Arecanut	62	90	28	69	100	31	72	106	34
Banana	55	75	20	65	90	35	70	100	30
Total	187	275	88	200	300	100	209	318	109

FIGURE-8
CROPWISE LABOUR PATTERN
Sample farmers



number of additional labour employment was created for coconut (40 man days) followed by arecanut and banana.

The net result of irrigation is that labour use increased in all category of farms due to changes in area and cropping pattern. Per hectare growth in employment has also significantly improved. It cannot be said that minor irrigation is labour saving technology contrary to some studies (Rageena,, 1982; Sreelatha, 1990), it was observed that minor irrigation is labour using technology which create additional or incremental employment due to cumulative effects on cropping pattern, area, intensity of cropping.

Cropwise data shows that creation of employment is more in coconut followed by arecanut and banana. However, more disaggregated cropwise data are needed, to exactly distinguish how much labour days creation is taking place in the cultivation of one or more crops. Nevertheless the study points to the fact that man days per hectare on all major crops have substantially increased. In short, minor irrigation had its impact on cropping pattern which acts favourable for employment creation.

5.9 Farm expenditure

Farm expenditure incurred by different category of farms were studied for both pre investment period and post investment period. For calculating farm expenses major operations in the cultivation of crops were first identified. Thus for coconut major items of costs were land preparation, manure and manuring, fertilizer and its application, ploughing, channel making for irrigation, other field works, repair and maintenance and harvesting charges. Similarly for arecanut also all the

above cost items were included and cost incurred per plant per year was calculated for each category of farm during pre investment period and post investment period. For banana, operational expenses included are land preparation, planting materials and planting, manure and manuring, fertilizer and its application, interculture operation, propping and all other costs. In this way cost per plant during pre investment period and post investment period were estimated.

5.9.1 Cost of cultivation/maintenance of crops

The cost of cultivation per plant/tree for coconut, arecanut and banana were estimated and are presented in Table 5.26. The analysis showed that the cost of cultivation per plant of these crops among different category of farms had increased substantially during post investment period.

In the case of coconut the increase was found to be maximum in the case of medium sized farms to an extent of 16.44 per cent followed by large farms (10.53 per cent) and small farms (10.34 per cent). In the case of arecanut the largest change was noticed in small farms (14.29 per cent) followed by large farms (11.63 per cent). In all the size groups cost of banana cultivation has increased substantially and it was found to be maximum in medium farms to an extent of 30 per cent followed by small sized farms (25 per cent) and large farms (17.39 per cent).

The increase is partially due to improved usage of chemical fertilizer and manure, increase in harvest cost etc. in the case of coconut and arecanut. Land preparation, fertilizer and manure and its application, planting material and cropping material cost had contributed for the hike in cost of cultivation of banana during post investment period.

Table 5.26. Classwise, periodwise cost of cultivation/maintanence of crops (per plant)

Labour use	Category of farmers								
	Small			Medium			Large		
	Pre investment	Post investment	Percentage change	Pre investment	Post investment	Percentage change	Pre investment	Post investment	Percentage change
Coconut	72.50	80	10.34	73	85	16.44	76	84	10.53
Arecanut	35.00	40	14.29	42	45	7.14	43	48	11.63
Banana	16.00	20	25.00	20	26	30.00	23	27	17.39

5.9.2 Expenditure for small sized farms

Farm expenditure for small farm as shown in Table 5.27 reveals that a small farm on an average incurred a total expenditure of Rs.7847 during pre investment period which became Rs.13797 during post investment period with a substantial increase of Rs.5950 (59.50 per cent). Cropwise analysis showed that out of total expenditure of Rs.7847 during the pre investment period the maximum expenditure was accounted for arecanut cultivation 63.75 per cent of total expenditure, followed by coconut with 31.06 per cent. The same trend was noticed during post investment period also. The analysis also showed that banana accounted for 5.19 per cent of total expense during pre investment period and it was increased to 20.31 per cent.

5.9.3 Expenditure for medium sized farms

Farm expenditure for medium sized farms as shown in Table 5.28 reveals that the farm incurred a total expenditure of Rs.15321 during pre investment period and Rs.26085 during post investment period. The addition in expenditure was of Rs.10,764. It is observed that banana alone accounted for more than 50 per cent of the additional expenditure followed by arecanut and coconut.

5.9.4 Expenditure for large sized farms

The farm expenditure for large sized farm was Rs.21667 during pre investment period and Rs.38194 during post investment period recording an increase in expenditure to the tune of Rs.16527. The results are given in Table 5.29. Here also more than 50 per cent of the additional expenditure was incurred by planting additional acres of banana.

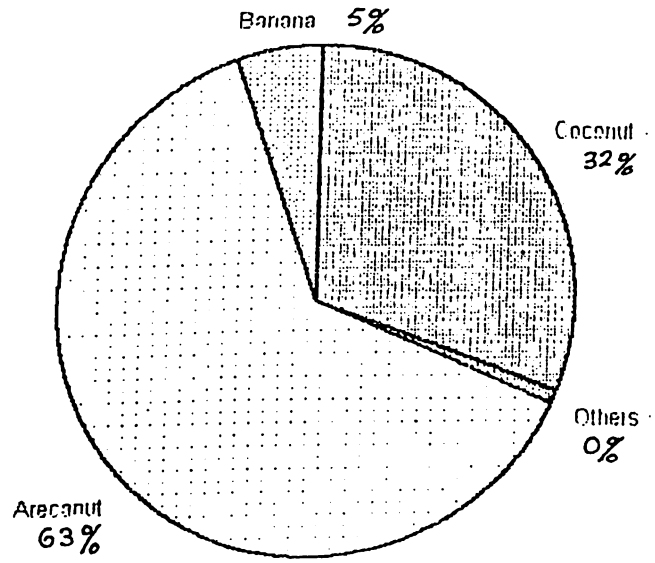
Table 5.27. Periodwise farm expenditure for small sized sample farms (Rupees)

Crops	Pre investment	Post investment	Change in expenditure
Coconut	2437 (31.06)	3800 (27.54)	1363 (22.90)
Arecanut	5003 (63.75)	7196 (52.15)	2193 (36.86)
Banana	407 (5.19)	2801 (20.31)	2394 (40.24)
Total	7847 (100.00)	13797 (100.00)	5950 (100.00)

Figures in parentheses are percentages to total

FIGURE-9

FARM EXPENDITURE OF SMALL SIZED FARMERS: Pre investment



Post investment

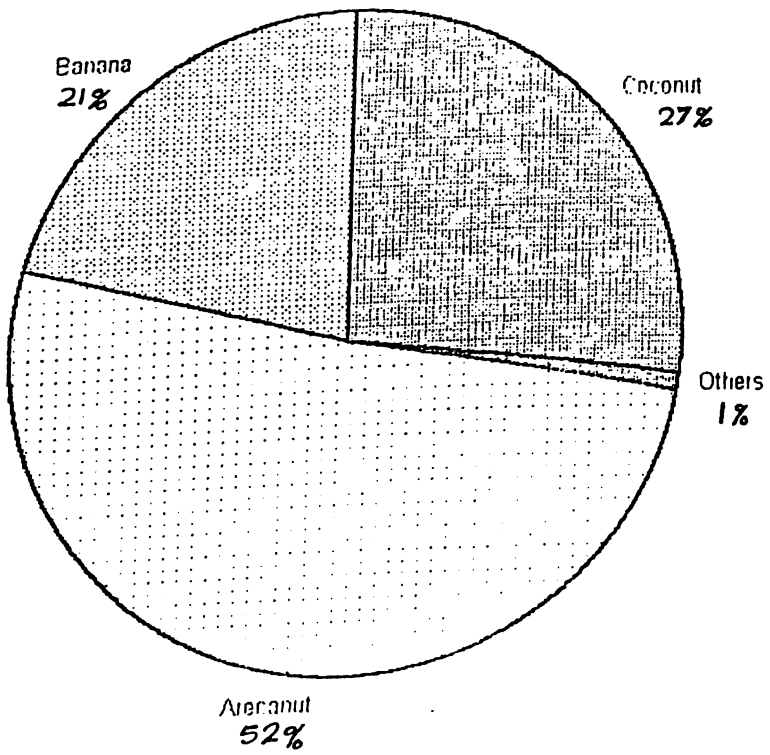


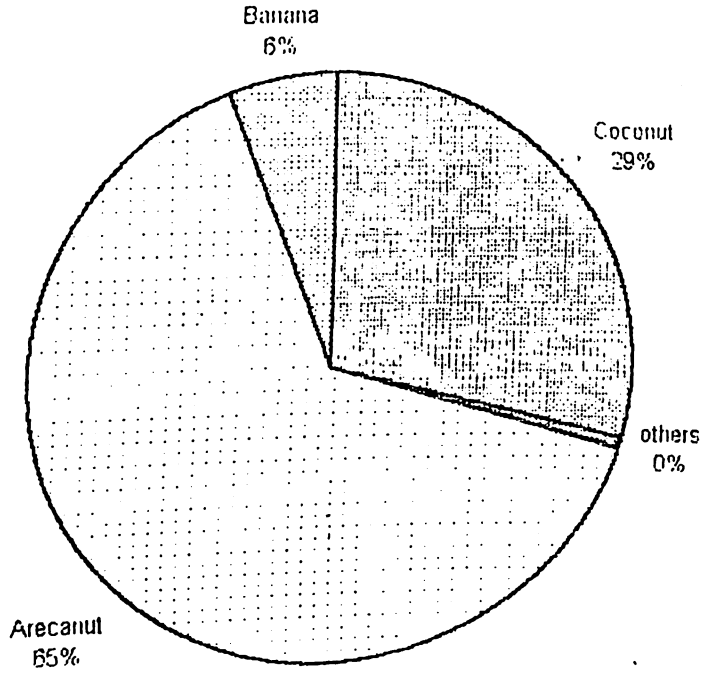
Table 5.28. Periodwise farm expenditure for medium sized sample farms (Rupees)

Crops	Pre investment expenditure	Post investment expenditure	Change in expenditure
Coconut	4436 (28.95)	6867 (26.33)	2431 (22.58)
Arecanut	9941 (64.88)	12996 (49.82)	3055 (28.38)
Banana	890 (5.82)	6122 (23.47)	5232 (48.61)
Others	54 (0.35)	100 (0.38)	46 (0.43)
Total	15321 (100.00)	26085 (100.00)	10764 (100.00)

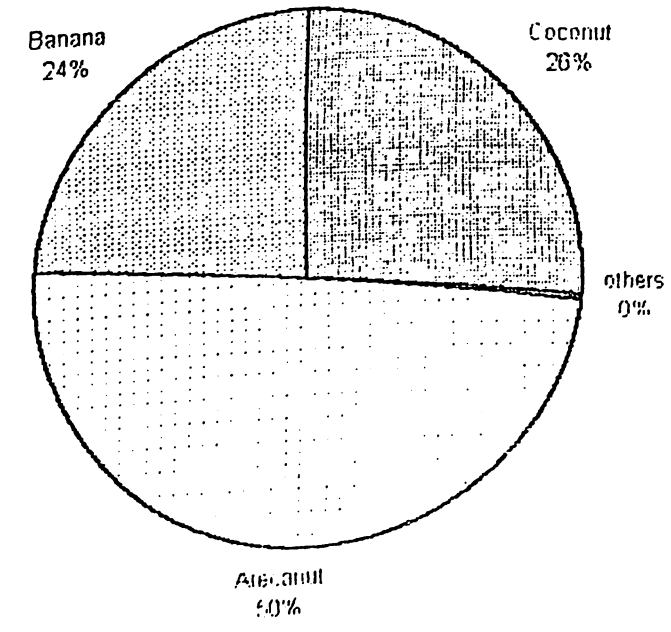
Figures in parentheses are percentages to total

FIGURE-10

FARM EXPENDITURE OF MEDIUM SIZED FARMERS: Pre investment



Post investment



5.9.5 Expenditure for an average farm

Farm expenditure for the sample as a whole was also estimated and is presented in Table 5.30. The results indicates that during pre investment period out of the total expenditure incurred, arecanut accounted for the large share with 63.88 per cent followed by coconut with 29.70 per cent. During post investment period the total expenditure incurred for all crops was estimated at Rs.22605, 50.02 per cent of which was incurred by arecanut, followed by coconut (26.14 per cent) and banana (23.33 per cent). The analysis also showed that banana crop alone shared 47.01 per cent of total additional expenditure incurred per farm followed by arecanut (31.23 per cent) and coconut (21.29 per cent).

5.10 Assessment of Economic feasibility

Financial appraisal of a farm investment such as sinking of well, purchase of pumpset and accessories etc. involves assessment of the profitability of the investment in terms of net benefit. When a bank considers financing a proposal for investment made by a cultivator appraisal has to be conducted by the bank, in such a way as to satisfy broadly points of view of the financing bank itself as well as those of the cultivator. From the farmers angle, the proposed investment would be worthwhile, if the benefit expected from the investment throughout the useful life of the asset acquired exceeds its cost while from the bankers as well as social angle the incremental benefit accrued to a borrower is adequate enough to enable him to pay back the loan together with interest during the period of the loan.

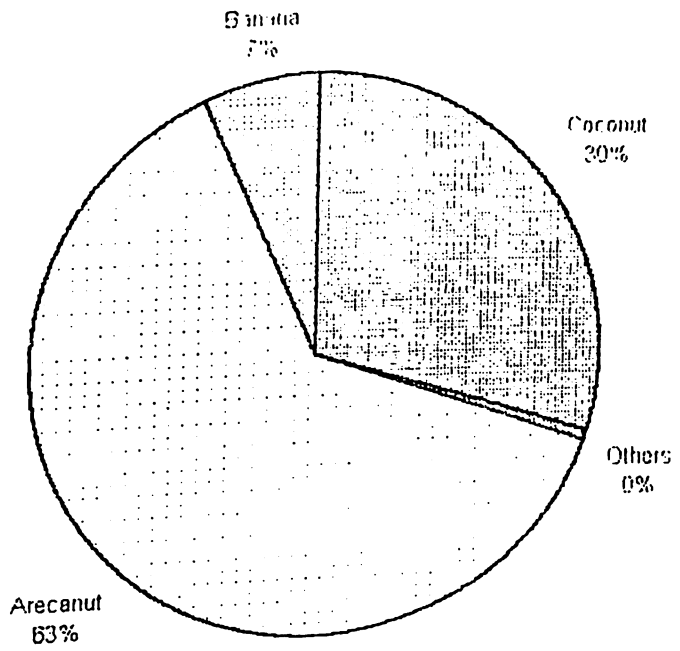
Table 5.29. Periodwise farm expenditure for large sized sample farms (Rupees)

Crops	Pre investment	Post investment	Change in expenditure
Coconut	6433 (29.67)	9447 (24.73)	3014 (18.24)
Arecanut	13678 (63.13)	18535 (48.54)	4857 (29.39)
Banana	1451 (6.70)	9953 (26.06)	8502 (57.44)
Others	105 (0.48)	259 (0.68)	154 (0.93)
Total	21667 (100.00)	38194 (100.00)	16527 (100.00)

Figures in parentheses are percentages to total

FIGURE-11

FARM EXPENDITURE OF LARGE SIZED FARMERS Pre investment



Post investment

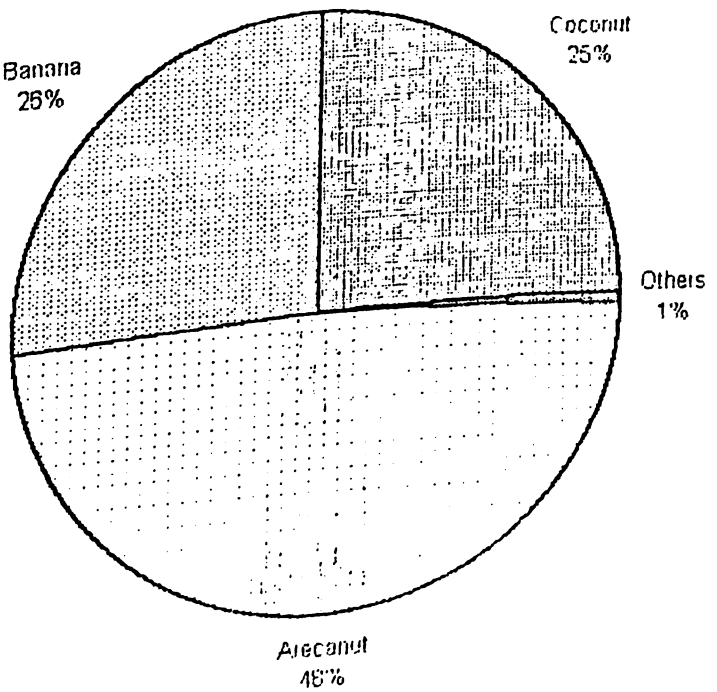


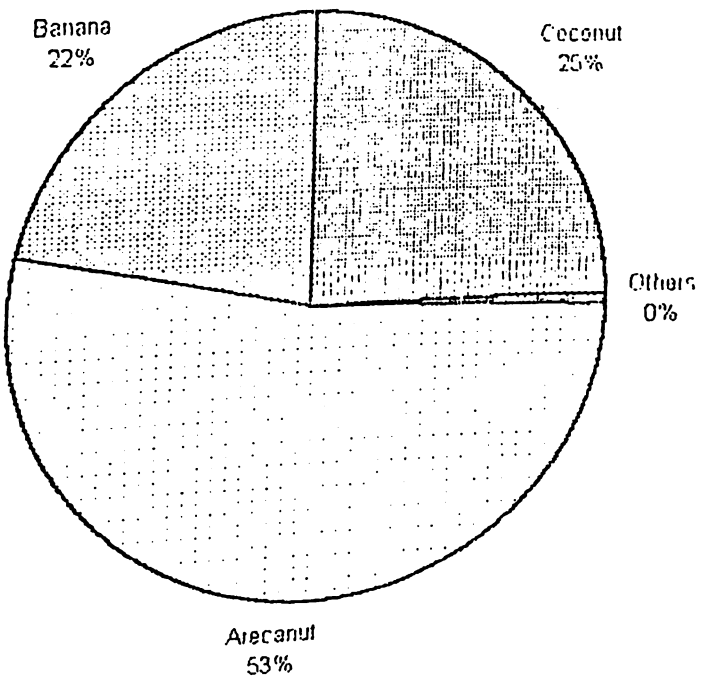
Table 5.30. Periodwise farm expenditure for an average sized farm (Rupees)

Crops	Pre investment	Post investment	Change in expenditure
Coconut	3869 (29.70)	5905 (26.14)	2036 (21.24)
Arecanut	8322 (63.88)	11305 (50.02)	2983 (31.20)
Banana	768 (5.89)	5275 (23.33)	4507 (47.01)
Others	67 (0.53)	120 (0.53)	53 (0.55)
Total	13026 (100.00)	22605 (100.00)	9579 (100.00)

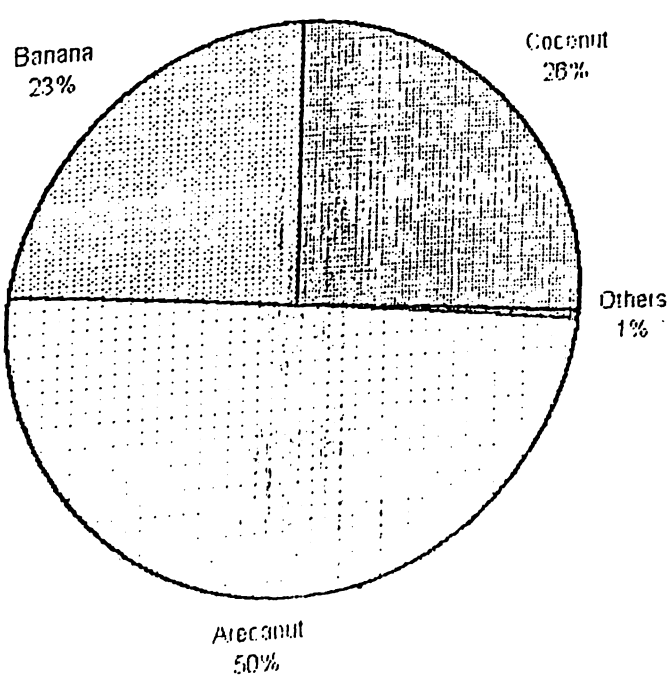
Figures in parentheses are percentage to total

FIGURE-12

FARM EXPENDITURE OF AVERAGE SIZED FARMERS Pre investment



Post investment



The economic feasibility of 120 farmers were worked out. One hundred and thirteen out of 120 farmers passed the test. Category wise it was found that 50 out of 56 small farmers (89.28 per cent), 41 out of 42 medium farmers (97.6 per cent) and all the 22 large farmers had the economic feasibility. Table 5.31 gives bankwise and holding size wise number of farmers with economic feasibility.

Lack of adequate return as expected from their farms, non farm debt, farm expenditure hike etc. appear to be the reasons for unattainment of economic feasibility in the case of some farmers.

5.11 Assessment of Repayment capacity

A project may be technically feasible and economically viable. But, unless the borrower has sufficient repayment capacity the financing institution cannot consider the project as feasible. The repayment of loan depends on the amount of surplus income available with the borrower after providing a cushion for the family expenses and pre existing liabilities etc. Hence the repayment capacity of borrower should be judged by taking into account their total income and total expenditure.

In the present study repayment capacity was worked out on the basis of income derived from the farm and non farm activities as a whole. The results are given in Table 5.32. The analysis shows that out of 120 farmers 103 farmers only had repayment capacity (85.83 per cent). Category wise analysis showed that 46 small farmers, 37 medium farmers and 20 large farmers had the repayment capacity.

Table 5.31. Classification of respondents on the basis of economic feasibility

Region	Small	Medium	Large	Aggregate
Palakkad PCARDB	15 (30.00)	21 (51.22)	10 (45.45)	46 (40.70)
Mannarghat PCARDB	8 (16.00)	3 (7.32)	4 (18.18)	15 (13.27)
Alathoor PCARDB	10 (20.00)	7 (17.08)	1 (4.55)	18 (15.94)
Chittoor PCARDB	5 (10.00)	5 (12.19)	5 (22.73)	15 (13.27)
Ottappalam PCARDB	12 (24.00)	5 (12.19)	2 (9.09)	19 (16.82)
Total	50 (100.00)	41 (100.00)	22 (100.00)	113 (100.00)

Figures in the parentheses are percentages to total

Table 5.32. Classification of respondents on the basis of repayment capacity

Region	Small	Medium	Large	Aggregate
Palakkad PCARDB	15 (32.60)	18 (48.65)	9 (45.00)	42 (40.78)
Mannarghat PCARDB	9 (19.57)	3 (8.11)	4 (20.00)	16 (15.53)
Alathoor PCARDB	7 (15.22)	7 (18.92)	1 (5.0)	15 (14.56)
Chittoor PCARDB	3 (6.52)	4 (10.81)	4 (20.00)	11 (10.68)
Ottappalam PCARDB	12 (26.09)	5 (13.51)	2 (10.00)	19 (18.45)
Total	46 (100.00)	37 (100.00)	20 (100.00)	103 (100.00)

Figures in the parentheses are percentages to total

5.12 Problems faced by borrowers

Major problems in availing loans from PCARDB identified while conducting pilot survey were lending procedure, requirement of various documents/certificate, lack of supervision and guidance, untimely disbursement of loan, cost of credit and improper behavior of bank officials. The response of respondents regarding these problems were collected while conducting survey. Each constraints were ranked and percentages were worked out and are given in Table 5.33.

The analysis showed that 60 per cent of the farmers considered requirement of various documents/certificates as the most important problem for availing long term loan. The same was identified as the second and third important problem by another 23.33 per cent and 16.67 per cent of the respondents respectively. About 29 per cent of respondents reported untimely disbursement of loan as their major problem while 10.83 per cent considered existing lending procedure as their major problem.

Untimely disbursement of loan was the second important problem according to 46.67 per cent of the respondents. The same was identified as the third and the fourth important problem by another 22.5 and 1.67 per cent of the respondents respectively.

Existing lending procedure was remarked as the third important constraint in 61.62 per cent of the respondents and also as the fifth major one by 26.69 per cent of respondents.

Table 5.33. Major problems in availing minor irrigation loan

	Rank					
	I	II	III	IV	V	VI
Lending procedure	13 (10.83)	30 (25.00)	59 (49.17)	18 (15.00)	-	-
Require of various documents/certificates	72 (60.00)	28 (23.33)	20 (16.67)	-	-	-
Lack of supervision and guidance	-	-	-	-	-	120 (100.00)
Untimely disbursement of loan	35 (29.17)	56 (46.67)	27 (22.50)	2 (1.67)	-	-
Cost of credit	-	4 (3.33)	10 (8.33)	74 (61.67)	32 (26.67)	-
Improper behaviour of bank officials	-	2 (1.67)	4 (3.33)	26 (21.66)	88 (73.33)	-

Figures in the parentheses are percentages to total

Summary

SUMMARY

The present study on Economic impact of minor irrigation in Palakkad district was undertaken on the basis of data pertaining to two period 1990-91 and 1993-94. The study aimed at examining the economic impact of minor irrigation in terms of additional income and employment generation, economic feasibility, repayment capacity and changes in cropping pattern.

The study was based on a sample of beneficiaries of minor irrigation scheme by five Primary Co-operative Agriculture and Rural Development banks in Palakkad district. Primary data were generated through a sample survey of Primary Co-operative Agriculture and Rural Development Banks in Palakkad district. From the list of farmers who availed minor irrigation loans from these banks, around 120 farmers were selected, based on probability proportional to the size of total beneficiaries in each bank. Data were collected by personal interview method using a pretested and well structured schedule. This was supplemented by information collected from various secondary sources including bank records. The collected data were tabulated and analysed using suitable statistical tools.

The sample farmers were classified into three categories on the basis of total area possessed by them. Of the total 120 sample farmers 46.66 per cent were small category, 35 per cent medium farmers and 18.34 per cent large farmers. Ninety percent of the beneficiaries depended on nonfarm income. Majority of the nonfarm income earning members as regards the small category, were employed in private sector, whereas in the medium category they were employed in Government. In large farmer category most of the nonfarm income earning members were

involved in business. Thus out of the total sample, only 10 per cent depended solely on agricultural income for their livelihood.

The annual average family income was Rs.24227 for small farmers, Rs.31240 for medium farmers, Rs.43773 for large farmers and Rs.30265 for sample as a whole.

The analysis showed that majority of small and large farmer households had a family size of 5 to 6 members where as most of the medium sample farmer households had more then 6 members in the family. Among the borrower farmers only 23 farmers (19.17 per cent) were above 55 years, whereas majority of farmers were in the age group of 35 to 55 (73.33 per cent).

All the respondents were literate. Out of the 120 farmers surveyed 10.83 per cent were graduates, 56.67 per cent were undergraduates and 32.50 per cent had only formal schooling.

Major crops grown by the sample farmers were found to be coconut, arecanut and banana. Consequent to installation of irrigation system, there was a favourable shift in cropping pattern towards commercial crops, especially banana. The cropping intensity in the sample farms increased from 68.42 per cent to 96.05 per cent, following irrigation development. Production and productivity etc. were worked out in the case of coconut, arecanut and banana. For the sample farm average productivity of coconut increased from 63 nuts per palm per year to 68 nuts per palm per year and that of arecanut 178 nuts per palm per year to 188 nuts per palm per year. In banana per bunch average weight was 7.3 kg per bunch before irrigation which increased to 10.6 kg per bunch after irrigation availability. Even though the

entire increase in production cannot be attributed to irrigation, it definitely played a significant role, through the efficient utilisation of production inputs.

The income generated and changes in income generation on each category of farmers was studied. The incremental income in small farmer group was Rs.5084, medium group Rs.9362 and large group Rs.15700. For the sample as a whole it was Rs.8672.

Impact of the scheme on employment generation was also assessed. Labour use in all farms significantly increased. The extent of increase was estimated to 25, 42 and 62 labour days per farm per year for small, medium and large category farmers respectively. Per hectare analysis revealed that additional labour employment created was found to be maximum in large farms followed by medium sized farms and small sized farms. The economic feasibility tests yielded positive results in majority of (94.16 per cent) sample farms. However 5.84 per cent were found to be non-viable. The repayment capacity of sample respondents were also analysed and results showed that out of 120 sample respondents, 103 respondents had the repayment capacity.

The constraint analysis showed that 60 per cent of sample respondents considered requirement of the various documents/certificates as the most important problem followed by untimely disbursement of loans.

On the whole it can be informed that minor irrigation scheme had a definite positive impact on total farm income of the farmer, through a favourable shift in cropping pattern, increase in cropping intensity and improved productivity of crops.

References

REFERENCES

Anand, O. P. 1960. Some aspects of optimum benefits from utilization of irrigation potential in Chambal Valley Projects. *Indian J. Agric. Econ.* 133(4):54

Agricultural Refinance and Development Corporation.1982. Minor irrigation in Bhojpur district, Bihar. An expost evaluation study. *Evaluation study series (12).* NABARD, New Delhi. pp.64-65

Arunachalam, R. and Palaniswami, K. 1991. Utilization and repayment of co-operative crop loan. *Indian Coop. Rev.* 29(2):180-185

Bagi, F.S. 1980. Irrigation, Farm Size and Economic Efficeincy. An analysis of farm level data in Haryana (India). *Financing Agriculture.* 22(4):512.

Baghyalakshmy, K. 1985. Impact of minor irrigation scheme - A case study Mattathur village. B.Sc.[C&B] thesis, Kerala Agricultural University, Vellanikkara, Trichur.

Banakar, B.and Suryaprakash, S. 1987. Borrowing and utilization pattern of crop production credit in Karnataka - A case study. *Prajan* 16(1):77-83

Bank of Baroda, 1918. Evaluation cum study of minor irrigation and recovery of advances under the project. A study taken up in Ramnagar I & II Blocks, Murshidabad District, West Bengal. *Evaluation report*(3): Bank of Baroada: 33-36.

Bank of India, 1977. Impact of bank finance - A study of minor irrigation in Shadsagar taluka, Mehboobnagar district, Andhra Pradesh, p.100.

Chakravarty, S.K. 1972. A recent change in savings investment direction of the small cultivators in West Bengal - A case study in Hooghly district. *Indian J. Agric. Econ.* 27(1):64-74.

Chauhan, Y.S., Prasad, V., Singh, R.I. and Senger, S.D.S. 1978. Lift irrigation project: its impact on cropping pattern, level of investment and income on farms. *Indian J. Agric. Econ.* 33(4):257.

Das, P.K. 1984. Estimating production costs and returns forcoconut in Kerala. *Journal of Plantation crops*. 12(2):152-159

Dasgupta, H.K. and Das, R.K. 1972. Saving potential of small farmers in Banarpal block of Dhankamal District in Orrissa. *Indian J. Agric. Econ.* 27(1):90

Deole, C.D. and Anthurkar, B.W. 1972. Income and saving of se-lected households in Agriculture under the command area of Puna. *Indian J. Agric. Econ.* 27(2):85.

Dhawan,K.C. and Kahlon, A.S. 1978. Appraisal and evaluation of irrigation projects on the small farms in Punjab. *Indian J. Agric. Econ.* 33(4):264.

Farm Information Bureau. 1995. Farm Guide. Farm Information Bureau, Government of Kerala.

George, M.V. and Rajasekharan, P. 1985. Coconut in Kerala - supportive price mechanism needed. The Economic Times 16th December 1985.

Government of India, 1991. Seventh Plan Document. 1985-90.Ministry of Finance, New Delhi - 1. pp.32-46

Indira,P. 1985. Impact of minor irrigation loans on the cropping pattern in Chittoor Block. B.Sc.[C&B] thesis Kerala Agricultural University, Vellanikkara, Trichur.

Jakhade, K. and Gadgil, V. 1970. *An Analysis of Economic Feasibility and Repayment Capacity of Farms Investments* - A report. Indian Institute of Management, Bangalore, p.33

Miglani, S.S., Jaswant, S. and Jogindher, 1972. Income distribution in relation to farm size and irrigation. *Indian J.Agric. Econ.* 27(1):85.

Mishra,R.S., Gupta, S.K. and Kalway, A.K. 1982. Impact of agricultural finance on farm income and employment pattern in Jabalpur district of M.P. *Agricultural Banker.* 5(1):17-19.

Mishra,R.S., Gupta, S.K. and Malaviya, M.L. 1981. Effect of minor irrigation scheme on employment pattern and recovery position of farmers financed by State Bank of India. A case study of Jabalpur district, M.P. *Agricultural Banker.* 4(4):12-15.

Nagarajappa, D.R. 1971. An enquiry into the economic impact of village isolation in the Thungabhadra project area. Unpublished M.Sc. (Agri) Thesis submitted to UAS, Bangalore.

Naik,S. 1986. Impact of minor irrigation loan - A case study of the Kasaragode, Primary Co-operative Agriculture Development Bank Ltd. B.Sc.[C&B] thesis. Kerala Agricultural University, Vellanikkara, Trichur.

Nair, N.K. and Narayana, D. 1983. Linking irrigation with development. The Kerala Experience. Data Base of Kerala Economy. Directorate of Economics and Statistics, Trivandrum. p.152

Palaniswami, K. 1984. *Irrigation water management - The determinants of canal water distribution in India a micro analysis.* Agricole publishing academy, New Delhi - 1. pp.25-35

Palaniswamy, P. 1989. Role of co-operatives in crop loan - A study of the Konganapuram (salem dt.) agricultural service co-operative society. *Agricultural Banker* 12(1):33-35

Paramasivaih, N.T. 1973. Economic analysis of impact of size of holdings of farm operationsand organization in Thungabhadra project area. Unpublished M.Sc. (Ag) Thesis submitted to VAS, Bangalore.

Patel, A.S. 1981. Irrigation: its employment impact in the command areas of medium irigation projects in Gujarath. *Indian J. Agric. Econ.* 36(4):20-30.

Patel, A.S. and Patel, H.F. 1984. Economic impact of efficiency of water use. A case study of Dantiwala Canal irrigation project in Gujarat. *Indian J. Agric. Econ.* 13(2):57.

Patil, T.Y. and Hinge, B.J. 1969. Economics of Rural Electrification. *Indian J. Agri. Econ.* 24(1):194.

Pillai, S.B. 1982. Impact of agricultural long term loan on the socio economic life of farmers in Aurangabad Taluk of Aurangabad, Maharashtra. *Land Bank Journal*. 20(11):62.

Radhakrishna, D. 1964. A study of regional productivities of regional productivities of agricultural inputs. *Indian J. Agric. Econ.* 19(1):237-242.

Radhakrishnan, V. and Mukundan, K. 1988. Supply and utilization of short-term co-operative agricultural credit in Palghat district. *Indian J. Agric. Econ.* 43(3):429

Rageena, S. 1982. Impact of minor irrigation in Trichur district. Unpublished M.sc (Ag.) thesis submitted to Kerala Agricultural University, Vellanikkara, Thrissur.

Rai, K.N., Grover, D.K. and Nandal, D.S. 1972. Investment and saviang pattern in irrigated and unirrigated zones of Haryana State. *Indian J. Agri Econ.* 27(3):75-82.

Ramanna, R., Hirematu, K.K. and Chadrashekhar, G.S. 1971. Evaluation of the High yielding varieties programme in Mysore State. Unpublished Mimco, Department of Agri. Economics, university of Agri. Sciences, Bangalore.

Rao, P.R. 1963. Irrigation and cropping intensity in India. *The Econ. Weekly.* 15(46):1902-05.

Reddy, C.R. 1982. Co-operative pumpset financing and impact of farm loan. *Co-operative Perspective.* 17(1):20-25.

Sadishi, J.M. 1978. Economic Impact of increased water supply on small farms in Iran. *Indian J. Agric. Econ.* 33(2):62-70.

Santha, A. M. 1982 Socio economic study of farmers in Puzhakkal block in the command area of Peechi irrigation project. Unpublished M.sc (Ag.) thesis Kerala Agricultural Univerisity, Vellanikkara, Trichur.

Sevak,R.S. 1966. Intensive Developement approach to agriculture development. Role of irrigation and cropping pattern in agricultural development. *Indian J. Agric. Econ.* 21(4):96-104.

Shah, S.H. 1963. Cropping pattern in relation to irrigation. *Indian J. Agric. Econ.* 18(1):154-160.

Shah, S.L. and Agarwall, R.C. 1970. Impact of new technology on the levels of income, patterns of income distribution and savings of farmers in Central U.P. *Indian J. Agri. Econ.* 25(3):110-115.

Siddappa, M. and Radhakrishnnan, V. 1977. *Analysis of economic feasibility and repayment capacity of farm investments.* Indian Institute of Management, Bangalore. p.30-35

Singh, S.B. and Patel, H.N. 1972. Income and investment in agriculture. *Indian J. Agric. Econ.* 27(2):88.

Singh, R.I., Singh, J.P. and Prasad, V. 1978. Flow of bank credit. The impact on croping pattern, farm income and employment (a case study). *Indian J. Agric. Econ.* 33(4):151.

Sinha, A.K. 1978. Impact of lift irrigation on cropping patternand crop yields. Based on a fice village survey in Bhiwani (Haryana) . *Indian J. Agric. Econ.* 33(1):77-92.

Sisodia, J.S. 1978. An economic analysis of a Farm Development Programme. A case study of Chambal Command Area Development Project, M.P. *Indian J. Agric. Econ.* 33(1):93-99.

Sreelatha, S. 1990. A study on impact of pumpset loan on income generation, cropping pattern and cost of cultivation. B.Sc.[C&B] thesis, Kerala Agricultural University, Vellanikkara, Trichur.

Srinath, Vital. 1969. The economic impact of well irrigation in Mysore State. Indian Institute of Socio-economic studies, Bangalore.

Srinivasan, M. 1957 pattern of employment of hired labour in agriculture in certain villages of Coimbatore Taluk. *Indian J. Agric. Econ.* 12(2):97-108.

Subramanian, S.R. 1990. Regional Disparities in Agricultural Financing Techniques and Estimation, Lecture delivered in summer institute on Agricultural Financial Management at University of Agricultural Sciences, Hebbal. 21-5-90 to 9-6-90.

Suryanarayana, P. and Chiranjeeoulu, P. 1985. A study of utilization of farm credit. *Indian Coop. Rev.* 22(4):425-432

Umarasiya, P.N. and Arora, V.P.S. 1981. Impact of pumpset loans in the farm economy. *Financing Agriculture.* 13(2):14-17.

Union Bank of India. 1982. An evaluation study of minor irrigation scheme, Nirmal (Andhra Pradesh) - A study undertaken by project monitoring and evaluation cell, Agriculture Development Department. Union Bank of India: 36-37.

Venkataraman, L.S. and Prahaladachar, M. 1980. Growth rate and changes in agriculture in six states, 1950-1975. *Indian J. Agric. Econ.* 35(2):72-84.

Vaikuthe, L.D. 1991. Agricultural co-operative credit utilization and recovry performance (A case study of K.C.C. bank, Dharward). *Indian Coop. Rev.* 29(1):39-43

Vijayakumari, T.B. 1986. A study on the economic impact of the minor irrigation scheme financed by the Cochin Co-operative Agriculture and Rural Development Bank Ltd. B.Sc.[C&B] thesis Kerala Agricultural University, Vellanikkara, Trichur.

Viswanath, M. 1970. A comparable study of irrigated and unirrigated crops in Dohari Street Block, Asaryash, U.P. *Agric. sit. India.* 24:19-26.

Waghmore, R.E. and Maral, M.D. 1972. Comparative studies in capital investment and net income on irrigated and unirrigated farms in a Deccan region of Maharashtra. *Indian J. Agri Econ.* 27(3):86.

ABSTRACT

A study was conducted in Palakkad district to assess the economic impact of minor irrigation finance from Primary Co-operative Agriculture and Rural Development banks. The impact was assessed on the basis of changes in certain key parameters like cropping pattern, farm income, crop productivity and employment generation. The economic feasibility and repayment capacity of these beneficiaries were also examined. The sample farmers consisted of 54 small farmers (total holding size less than 2.5 acres), 42 medium farmers (holding size less than 4.5 acres) and 22 large farmers (holding size greater than 4.5 acres). The dependence on agriculture as the only source of income was very rare (10 per cent of sample farmers).

Though no new crop was introduced as a result of irrigation, there was an increase in area under traditional crops like coconut, arecanut and banana, with highest rate of increase in banana. This resulted in 27.63 per cent increase in cropping intensity. The traditional crops like coconut arecanut in the farm registered on an average increase of 7.93, 5.62 and 45.00 per cent in production respectively. The average sample farm income registered an increase of 38.44 per cent on account of these changes.

Labour use in sample farm showed an average increase in the tune of 45 labour days per year, owing to the adoption of scientific agronomic practices and irrigation. Majority of the irrigation loans were found to be economically feasible. But a few of these failed to possess adequate repayment capacity.

The study yielded results to stress the positive impact of minor irrigation loans on the income of all categories of farmers and these loans were proved to be economically viable.