ADEQUACY OF PROCUREMENT PRICE FOR PADDY FARMERS IN KERALA

by

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THESIS

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DECLARATION

I, hereby declare that this thesis entitled **"ADEQUACY OF PROCUREMENT PRICE FOR PADDY FARMERS IN KERALA"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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LIST OF ABBREVIATIONS AND SYMBOLS USED

%	per cent
/	Per
B-C	Benefit- Cost
CACP	Commission for Agricultural Costs and Prices
CAGR	Compound Annual Growth Rate
et al	Co workers/ Co authors
FAO	Food and Agricultural Organisation
FCI	Food Co-operation of India
GOI	Government of India
GOK	Government of Kerala
ha	Hectare
Ha^{-1}	Per hectare
HYV	High Yielding Variety
KAU	Kerala Agricultural University
Kg/ha	Kilogram per hectare
kms	Kilometres
MFC	Marginal factor cost
mm	Milli meter
MSL	Mean Sea Level
MSP	Minimum Support Price
MT	MillionTonnes
MVP	Marginal value productivity
PDS	Public Distribution System
Rs.	Rupees
Rs/qtl	Rupees per quintal
sq km	Square Kilometre

INTRODUCTION

1. INTRODUCTION

Rice, as a cereal grain is the most widely consumed staple food in the world particularly in Asia. Rice contributes significantly towards human nutrition and caloric intake, providing more than one fifth of the calories consumed worldwide.

India has been known as land of agriculture. Agriculture forms the backbone of the Indian economy. India is the second largest producer of the rice after China and being the staple food, rice plays vital role in India's economy occupying a central position in shaping the agricultural policy (Dangwal *et al.,* 2011). World's rice demand is projected to increase by 25 percent from 2001 to 2025 to keep pace with population growth (Maclean *et al.,* 2002) and therefore meeting ever increasing rice demand in a sustainable way with shrinking natural resources is a great challenge.

The cultivation of paddy has occupied pride of place in agrarian economy of the Kerala. The lush green of paddy fields is one of the most captivating features of its landscape. It is grown in a vast array of ecological niches, ranging from regions situated 3 meters below mean sea level (MSL) as in Kuttanadu to an altitude of 1400 meter as in the high ranges. It is cultivated under 3 to 4 meters depth of water as well as in purely rainfed uplands with no standing water. In *kaipad* fields in Kattampally in Kannur district, paddy has been traditionally cultivated in fields filled with saline water. In *pokkali* fields in the Kochi area, farmers alternate the cultivation of prawn with paddy cultivation. Probably nowhere else in the world, paddy crop is cultivated under such a diversity of conditions. Palakkad and Alappuzha are the two major rice-producing districts of Kerala. While the Kuttanad region in Alappuzha is endowed with a large system of backwaters, agriculture in Palakkad benefits from irrigation projects in Malampuzha, Chulliar, Meenkara, Walayar, Pothundi, Mangalam and Parambikkulam.

Kerala is a deficient state in rice production. The deficit in rice production is increasing year after year due to reduction in rice area arising out of the large scale conversion of paddy lands for raising other crops or for residential purposes.

The area under paddy cultivation increased substantially during the first fifteen years after the State's formation – from 7,60,000 hectares in 1955–56 to 8,80,000 hectares in 1970–71. In 1965–66, rice accounted for the highest share of gross cropped area in Kerala (32 per cent of the total). There was, however, a steady decline in the area under rice cultivation from the 1980s onwards – from 8,50,000 hectares in 1980–81 to 5,60,000 hectares in 1990–91, 3,20,000 hectares in 2001–02. (Thomas, 2011). There was an overall decrease of 38.5% paddy grown area from 2002-03 to 2013-14.

There are various reasons for the decrease in area of paddy. One of the major reasons was that the rice cultivation is not profitable compared to other crops. Three major factors that affect profitability are costs of cultivation, yield levels and prices (Thomas, 2011). Higher cost of cultivation is due to increase in the cost of all inputs like labour, fertilizer and manure, weedicide etc. If the price of a particular commodity falls below a certain level, producers lose because the price may not be able to cover the actual cost of production of that commodity. Studies carried out by National Sample Survey Organization during 2002-03 reveal that 43.42 million out of 89.35 million farmer households are in debt. Average outstanding loan per farmer is highest in Punjab followed by Kerala, Haryana, Andhra Pradesh and Tamil nadu. The survey also indicates that 40 per cent of farmers want to quit farming for other income revenues. This is a real alarming situation. The administered price policy of the Government is meant to protect the interests of the farmers through announcing certain prices such as procurement price during the cropping season.(Kaul, S. *et al.,* 2009)

Procurement price is the price at which Government procures paddy from the farmers and is announced by the Government according to the recommendations of

CACP (Commission for Agricultural Costs and Prices). It acts basically as an insurance cover to cultivators against the possibility of post - harvest crash in market. It provides incentive to farmers and stimulates higher production by encouraging the use of modern inputs. It should have been set to cover cost of production (Krishna and Raychaudhuri, 1980). Paddy needs to be procured from farmers at reasonably high prices if paddy cultivation has to be a profitable activity for them (Thomas, 2011). Hence the study aimed at measuring the adequacy of procurement price of paddy in Kerala.

Considering the above aspects the present research study entitled adequacy of procurement price for paddy farmers in Kerala was formulated with the following objectives.

1.1 Objectives of the study

This study was taken up with the following objectives

1. To analyse the adequacy of procurement price of paddy in relation to its cost of production.
2. To compare the procurement price of paddy with farm harvest price.
3. To study the scale of procurement of paddy in Kerala and constraints experienced by the stake holders in the procurement.

1.2 Limitation of the study

The study has been done as part of the M. Sc. programme and is limited by time and resource constraint. A clear picture would have been obtained if the study was done after classifying area with low and high potential yield, areas growing local and high yielding variety.

1.3 Scope of the study

The area under paddy cultivation is showing a decreasing trend over the years. As rice is the indispensable food of Kerala, decline in its production is a matter of

concern. It is a situation of ignominy that the state heavily depends on neighbouring states to meet its food requirement. Paddy needs to be procured from farmers at reasonably higher prices, if paddy cultivation has to be profitable activity for them. Hence this study was taken up with an expectation that this study will give an insight to the adequacy of procurement price of paddy and the constraints faced by the farmers in the procurement.

1.4 Organization of study

The Thesis is divided in to five sections. The first chapter contains a brief introduction of the topic where in the background of the research problem, objectives, scope and limitation of the study are discussed. The second chapter reviews previous studies in related areas of the proposed study. The third chapter describes the study area and methodology followed in the study. Results are discussed in the fourth chapter and a summary of the study is presented in the fifth chapter followed by references, abstract and appendices.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

The first and foremost essential of any research work is to delve into all the aspects of the problem followed by meticulous future planning. An extensive literature survey was done to identify similar studies or studies with similar problems. It helps in defining the problem in a precise, clear and comprehensive way. Owing to this, it becomes obligatory to note the resemblances of the similar work and to get broad view of the problem. The present study has the objectives of studying the economics, resource use efficiency, procurement price policy and constraints of paddy cultivation in Kerala. For better exposition the review has been organized under the following heads:

2.1 Trends in area, production and productivity of crops.

2.2 Studies on procurement price policies.

2.3 Economics and resource use efficiency of paddy.

2.4 Economics and resource use efficiency of other annual crops and

2.5 Constraints in production of paddy

2.1 TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF SOME IMPORTANT CROPS

Gopinathan and Sundaresan (1990) observed that the declining share of labour in agricultural sector was mainly due to the shift of cultivating area from labour intensive crops to capital-intensive crops. The decline in the area under paddy is attributed to a number of factors such as the reversal of the rising trend in paddy prices, marginal increase in yield and low profitability of rice.

In order to capture the spatial and crop dimensions of agricultural stagnation, Kannan and Pushpangadan (1990) in their study analysed the growth performance of

individual crops for the state as a whole as well as across regions. Growth rates were estimated by using a kinked exponential model in order to avoid the discontinuity assumption. Their analysis showed that, during the period 1962-63 to 1974-75, seasonal crops such as paddy and tapioca had registered positive growth rates while among the perennial crops, coconut was the only one crop that showed a declining trend.

A crop specific analysis of agricultural stagnation attempted by Pushpangadan (1990) also showed that the symptoms of stagnation had been more severe among food crops, especially paddy and tapioca. His empirical analysis identified the sources of stagnation and the falling demand coupled with instability in the market, resulting in loss of income to the farmers of food.

Kalita and Baruah (1992) studied the growth rates of area, production and productivity of different types of rice in Assam using time series data from 1951-52 to 1988-89. They used linear trend and observed positive trend in production and productivity along with negative trend in area.

A study by Lalitha (1993) showed that the agricultural income of the State has been growing since the mid eighties. Compared to this, in the period between mid seventies to mid eighties, it showed a mere stagnation. This revival of growth in agriculture was mainly due to the increase in yield and shift in cropping pattern to high valued crops.

Singh *et al.,* (1993) examined the growth rates of area, production and productivity of gram in different districts of Bihar and estimated the factors affecting the area, production and productivity of gram. It was based on the district wise secondary time series data on area, production, productivity, prices, irrigated area, and annual rainfall from 1960-61 to 1989-90. Compound growth rates have been estimated. In order to study the impact of various factors on yield a Cobb Douglas type function was fitted using the output per hectare as the dependent variable and

annual rainfall, area under irrigation, current year prices (Rs./qtl.) and one year lagged prices (Rs./qtl.) as independent variables.

Thomas *et al.,* (1993) in a study on the trend and prospects of rice production in Kerala in the different seasons found that area under rice had shown a declining trend in all the three seasons, along with an increasing trend in productivity.

Ommen (1994) had highlighted the role of absentee landowners and the high prices of land that prevail in Kerala, in the decline of paddy cultivation. According to him, following the gulf boom, land prices have skyrocketed and far from being a means of production land has become a prominent commodity of exchange in the state. His study concluded that the system of absentee landlordism has paved the way for a shift of cropping area from seasonal crops such as paddy and tapioca to perennial crops which do not require personal supervision.

Relationship between the abnormal increase in land prices and decline in area under paddy had been pointed out by Venugopal (1994). He observed that after the crash of share market, investors in Kerala have turned to real estate investment and as a result of it land prices are shooting up in the State. According to his study, in order to take advantage of the rising demand for land, paddy field owners convert their wet lands to saleable plots after filling it with soil and it results in the decline of area under paddy.

Bhalla and Singh (1997) examined the contribution of Indian agriculture in the productivity frame for the period 1980-83 to 1992-95 for the states in India. The contribution of area to the output growth has drastically diminished; the expansion of gross cropped area through double cropping has increased. Cropping pattern changes were positive since low yield and low value coarse cereals were replaced by high value oilseeds as well as rice and wheat, without adversely affecting food grain output. A rise in labour productivity was another striking feature during 1980-83 to 1992-95.

Kannan and Pushpangadhan(1999) explained the agricultural stagnation that set in Kerala since the mid 70s. The study covered the period between 1962-63 and 1985-86, which seems to show that there has been two distinct phases in terms of agricultural growth. During the sixties and up to the mid 70s (1962-63 to 1974-75) there had been an overall increase in the rate of growth of area, production and yield for all the crops while in the following period 1975-76 to 1985-86 there had been a near stagnation in the growth rate of aggregate area, production and land productivity.

According to Bhalla and Singh (2001) in their study, the compound annual growth rate in the value of agricultural output in eastern India had changed drastically over time using the triennium 1970-72 as the base line. The growth rate in the value of agricultural output during the triennium 1980-82 was low i.e, below the rate of growth in population in most of the eastern Indian states.

Pillai (2001) mentioned that productivity of inputs had played an important role in the growth performance of paddy in West Bengal and Orissa, and that one-third of the output growth in Indian rice was contributed by Total Factor Productivity (TFP). TFP growth measures the increase in output that is not accounted for by the increase in basic factor inputs such as land, labour and capital.

Job and Nandamohan (2004) analysed the changes in the growth pattern of rice in Kerala across time and across seasons; between the period 1975-76 and 1998-99., and for autumn, winter and summer. Result of the study revealed that area under rice and production showed significant negative trend and positive trend in productivity. The factors responsible for the decline in area are weather, which is a short run phenomenon and price of rice.

Singh and Toor (2005) revealed that over the years gross cropped area, cropping intensity, net irrigated area and gross irrigated area had increased, whereas the net sown area had decreased.

Prakash *et al*., (2006) estimated the growth rates of food grains production in India and observed that the compound growth rate of area, production and yield of rice were respectively 1.4, 2.7 and 1.4 during the pre-green revolution period (1955-56 to 1965-66), and the growth rates have changed to 0.8, 2.5, and 1.7 in the Green Revolution period (1966-67to 1976-77), to 0.3, 0.2 and 2.8 in Post-Green Revolution/pre economic period (1977-78 to 19991-92), and to 0.7, 2.0, and 1.0 in Post economic Reform period (1992-93to 1998-99) were 0.7, 207 and 2.0. Their study further showed that future growth in food grains production would be extremely demanding and therefore more emphasis should be laid on technology-based growth in agriculture and the adoption of growth in agriculture, and the adoption of growth promoting inputs like high yielding varieties (HYV), chemical fertilizers and irrigation. These inputs should be arranged and made available in time and in adequate quantities.

The long term compound growth rate of production of food-grains between 1973 and 2011 was 2.1 per cent, which was below the national average of 2.7 per cent. The last four decades can be divided into four sub-periods: the Green Revolution period during 1973-83 the post-green revolution period between 1983-91, early reforms period of 1991-2001 and the latest-reforms decade (2001-11) to understand the temporal dimension of growth in the production of food grains. In these sub periods, the compound growth rate of food-grain output was placed at 2.86 per cent, 0.53 per cent, 3.55 per cent and 3.08 per cent, respectively. In the two sub-periods in post-reform decades, food-grains recorded impressive rates of growth of above 3 per cent (Murthy and Misra, 2011).

Kannan and Sundaram (2011), discussed the trends and patterns in agricultural growth at the national and sub-national levels in India. Data on important variables like area, production, input use and value of output were compiled for the period 1967-68 to 2007-08 from various published sources. The analysis of data revealed that the cropping pattern in India had undergone significant changes over

time. There was a marked shift from the cultivation of food grains to commercial crops. Among food grains, the area under coarse cereals declined by 13.3 per cent between 1970-71 and 2007-08.

During the 1980s, growth in area under rice was marginal at 0.41 per cent; however, growth in production and yield was above 3 per cent. During 2000-01 to 2011-12 the situation changed, whereas growth in area was 0.04 per cent, the growth in production and yield at 1.72 per cent and 1.68 per cent respectively (GOI, 2012).

According to Acharya *et al*., (2012) the analysis of growth is usually used in economic studies to find out the trend of a particular variable over a period of time and used for making policy decisions. The growth in the area, production and productivity of different crops in Karnataka was estimated using the compound growth function. Growth rates showed a significant positive growth in area under pulses, vegetables and spices and fruits and nuts while cereals showed significant negative growth.

Sharma (2013) studied trends in area, production and productivity of food grain in the northeastern states. He also estimated compound growth rate, coefficient of variation and instability index. He found that growth rate of area, production and productivity of the total food grain was found to decrease in the state of Manipur, Meghalaya and Tripura.

Chatterjee *et al.,* (2014) evaluated the overall trend in area, production and productivity of *kharif*, *rabi* and total pulses as well as their respective growth rates and instability during the period 1986-87 to 2007-08 for the sixteen major pulse growing states of India. The results showed the fact that there was a tendency to shrink *kharif* pulses area (-3.89%) more than the *rabi* pulses (-2.31%) decadally with respective growth in productivity (1.49% and 9.47% respectively).

Rather (2014) studied trends in area, production and yield of paddy in different districts of Jammu and Kashmir by using component analysis and growth rate. The aggregate results for paddy showed that in some districts the output growth was due to the yield effect; whereas in other districts the output growth was due to the area effect and thus revealing that the area and yield effects although not equal, but had contributed to total change in output growth.

2.2 STUDIES ON PROCUREMENTPRICE POLICIES

A critical assessment of government procurement of rice through compulsory levies in East and West Godavari districts of Andhra Pradesh in India between 1967-68 and 1975-76 was presented by Subbarao (1978). It focused on the following issues, that is the influence of paddy rice open market prices on the volume of procurement over time, the influence of inter-district movement restrictions on the volume of procurement and the structure of rice prices, the influence of procurement systems, such as levies on producers and millers, on the volume of procurement, factors accounting for inter-district variation in the volume of procurement and the impact of levy policies on the rice acreage/output in the state. The study revealed that a symmetric behaviour of free market prices of rice in the zoned and non-zoned districts influenced the procurement in the surplus districts. The results showed that in areas where producer levy as a system of procurement has gained importance, inter-district movement restrictions appeared to be unnecessary.

Some earlier works like Krishna and Raychaudhuri [1980] tend to suggest that procurement prices simply follow the trend of wholesale prices." However, in their formulation they have included cost of production along-with past trends in wholesale prices of wheat and paddy as determinants of procurement prices. While the cost of cultivation takes care of the trends in factor markets the lagged wholesale prices reflect the market demand and supply situation.

Singh and Singh (1981) in his study 'Critical appraisal of paddy procurement standards: a case study in Ludhiana market' examined the working of procurement grade standards for paddy prescribed by the Indian government, and identified the effectiveness of grade specification in paddy marketing in Ludhiana market, Punjab. It also studied the impact of procurement grade standards on qualitative aspects of paddy arrivals over time. The prescribed procurement grade standards for paddy and the different quality characteristics prescribed there under were not feasible and effective in price formation. The grade standards were not helpful in improving the quality of paddy arrivals. They suggested the need to prescribe more grades to cover a wide range of quality from superior to inferior in order to fix procurement prices, avoid price deductions and enable procurement organizations to pay the farmers on the basis of an overall grade.

Roy and Verma (1987) indicated a positive relationship between production and procurement. Procurement as percentage of production varied between 9 and 13 and procurement during the years 1974-1982 had been adequate, more than adequate for distribution except in 1976-77 and 1979-80, when production and procurement declined. According to them the major constraints in the operation of the public distribution system were low procurement price which is below the open market price, inadequate transport and storage facilities and lack of coordination between the state government and the central government in regard to price policy. They also suggested increase in production, provision of adequate transport facilities and more storage facilities at places where both procurement and public distribution points are located or at places with minimum transport cost as remedial measures.

The study by Singh et al., (1989) examined the role of agricultural price policy for wheat and paddy crops in the distributional pattern of farm incomes of Indian Punjab farmers. The real margin of procurement price over cost of production for wheat and paddy was found to be declining over time. Agricultural price policy

for equity, for these two crops has led to widening income inequalities among farmers over time. Lower input prices/subsidies on the major inputs together with better prices for farm products are the two linked measures that should be followed to achieve the objective of 'growth with equity'.

Gulati and Sharma (1990), have explored the issues in procurement prices of wheat and paddy and their impact on open market prices etc. The authors have found from their study that procurement prices are largely influenced by movements in cost of production and lagged open market prices with occasional bonanza emanating from non-economic considerations. It was found that procurement prices have decisive influence on current market price formation with other factors like stocks with government and zoning playing only marginal roles. The authors have also found that the volume of procurement is significantly affected by level of output and difference between procurement and open market prices weekly supported by administrative measures.

The relation between prices, production and productivity is important and useful because it is the degree of responsiveness of output and production to changing prices on which effectiveness of a price policy depends. It is a known fact that price and productivity are two important components, which influence acreage under any crop. Increase in productivity supported by a price helps in increasing acreage under any crop (Ahmed and Bhowmick, 1991).

The study by Indrakanth (1992) considered the public distribution system in Andhra Pradesh and examined the State's procurement policy. Under distribution policy, producers have to surrender part of their produce at a procurement price which is lower than the market price. The paper examined whether this pushes up open market prices, how producers respond and what effect this has on domestic output.

Suhag and Nandal (1992) reported that Government intervention in agriculture through procurement policies, subsidization of farm input and supply of cheap credit had contributed to the agricultural prosperity of farmers.

Kumari and Ramachandran (1998) studied the constraints in procurement and utilisation of seed by farm households in East Godavari District, Andhra Pradesh. The crop considered was paddy and the main source of procurement of seed was from the cooperatives and neighbouring farmers. The majority of the farmer-consumers from all three categories faced problems both in procurement and utilization of inputs. High price, lack of a credit facility, and lack of proper information regarding the use of inputs, were the most commonly expressed problems by small and medium farmer consumers.

Mohanty *et al.,* (2002), analysed competitiveness of rice in major states of India and found it was least efficiently produced crop among five major crops discussed in the study. They found these results are consistent with the government policies of achieving food security in grain through high procurement price and heavy subsidization of inputs.

The study by Malik (2002) was undertaken in the districts Kaithal, Sirsa and Bhiwani of Haryana state, India, to analyse the factors responsible for the success or failure of minimum support price (MSP), the inter-crop distortion in pricing, and the crop production structure. The study revealed that wholesale and harvest prices have remained above the MSP. The growth rates of the three sets of prices (wholesale, harvest and market) in the case of all the major crops (wheat, rice and cotton) remained higher in the second period. MSP did contribute to the stabilization of the prices of important food grains. Both price and non-price factors play an important role in area allocation of wheat, paddy and cotton.

In order to achieve goals such as inter-year price stability against a bumper harvest or below-normal production, guaranteed prices to producers, reasonable prices for consumers and food supply at subsidised rates to vulnerable sections, the government has been carrying out procurement and storage (buffer stock) of foodgrains (rice and wheat) since the mid-1960s. These measures have been implemented through two important institutions, namely, the Commission for Agricultural Costs and Prices (CACP), which is entrusted with the task of suggesting MSP, and the Food Corporation of India, which carries out the task of procurement to ensure that producers do not get a price below MSP and that food grains required for maintaining a reasonable level of buffer stock and for the public distribution system are in place (Chand, 2005).

Procurement of food-grains, in particular, wheat and rice, is an open-ended operation. The Food Corporation of India (FCI) procures food-grains at the MSP, which are based on the recommendations of the Commission for Agricultural Costs and Prices (CACP). In addition, in recent years, a number of states have opted for Decentralised Procurement Scheme introduced in 1997, under which food-grains are procured and distributed by the State governments themselves. Between 2006- 07 and 2010-11, MSP of rice and wheat were hiked at an average annual rate of 14.1 per cent and 14.6 per cent, respectively. On an average, agricultural price policy has provided a margin of around 20 per cent over total costs to both rice and wheat farmers (Dev and Rao, 2007).

Thomas (2011) reported that the high costs of cultivation and the modest yield levels, the price of paddy becomes an important determinant of profitability. In Kerala, the Minimum Support Price (MSP) for paddy announced by the state government, which was only Rs. 700 per quintal in 2006 and was gradually increased in the subsequent years, rose to Rs. 1400 per quintal in 2011. He also reported that

even Rs. 1400 per quintal was not remunerative enough for a person who primarily depends on farming.

Shayequa *et al.,* (2012) examined the effectiveness of minimum support price for paddy in different regions of India and its role and contribution towards production. He found that effective implementation of the price policy has helped in improving the production and productivity of rice.

Arora (2013) observed that the average annual combined procurement of wheat and rice had increased from 38.22 MT during 2000-01 to 2006-07 to 56.99 MT during 2007-08 to 2010-11. The comfortable position of central stocks of food grains and procurement increase helps deliver more towards the food security.

Soni *et al.,* (2013) in her study on online paddy procurement system in Chhattisgarh reported that the government of Chhattisgarh has initiated a set of reforms to improve its purchase system of paddy through marketing societies by adopting a unique ICT based module to create a transparent and accountable delivery mechanism. As a part of these reforms, the government of Chhattisgarh in association with the National Informatics Centre has computerized its whole food grain supply chain from procurement of produce, to storage and transportation, to state warehousing and further transfer to fair priced shops (FPS). To address the leakages in Purchase System, the State of Chhattisgarh implemented an end-to-end information technology solution in 2007. A unique feature of Paddy Procurement in Chhattisgarh was an innovative for food security of poor and needy, paddy procurement was computerized to bring in much needed transparency and efficiency.

Apart from imposing a huge additional cost to procure, store, transport and distribute grain, increasing public procurement strangulates the domestic grain market. The private sector has been largely marginalized in traditional high contributing states like Andhra Pradesh, Punjab and Haryana. New entrants like

Chattishgarh, Odisha and Kerala are also catching up as far as procurement as a percentage of production is concerned (GOI, 2014).

Kaur *et al.,* (2014) studied the growth of market arrivals of wheat and paddy in the regulated markets of Punjab in relation to the increasing production potential of the state. An effort has also been made to examine the role of Punjab Mandi Board in creation of market infrastructure in Punjab and its likely effect on market arrivals. The results revealed that the production as well as procurement of both wheat and paddy had increased during the period 1980-2012 which may be attributed to the assured price under minimum support price programme and market development infrastructure facilities in the State. The correlates of paddy and wheat procurement with some of the production parameters and infrastructural facilities existing in the state clearly exhibited that these affect the volume of business directly or indirectly in the regulated markets.

2.3 ECONOMICS AND RESOURCE USE EFFICIENCY OF PADDY CULTIVATION.

Muraleedharan (1987) in his study on the resource use efficiency of paddy in kole lands noticed that the elasticity coefficient with respect to land, human labour, fertilizers and manures were higher than their optimum level and so it was advised to reduce the use of these inputs to optimum level.

Suseelan (1988) after analysing the problems and prospects of the paddy sector of the state economy arrived at the conclusion that improved technology was available in Kerala in order to make it self-sufficient in rice production. The reason for not realising this potential was the high cost of production. Therefore, he warns that rice production in Kerala will continue to stagnate till the cost of production in the state is equalised with the cost of production of rice in other states from which it is imported.

Joseph *et al.,* (1990) conducted an investigation on the extent of resource use and economics of rice cultivation in the Kuttanad tract of Kerala. The use of human labour in rice cultivation per season was found to be 129 man days per hectare out of which the family labour contributed only 10 per cent. The operation wise breakup of the costs showed that the expenditure on preparatory cultivation, gap filling, weed control and application of fertilizers were accounting for about 50 per cent of the total cost.

Job et al., (1991) in a study on the cost benefit analysis of rice cultivation in Kerala observed that cost of cultivation per hectare of local varieties was Rs. 5804 and Rs. 6002 respectively during virippu and mundakan seasons where as it was Rs. 6207 and Rs. 6512 hectare in the case of high yielding varieties. They observed that hired human labour was the most expensive item of input contributing more than half of the total expenditure.

Suhag and Nandal (1992) reported that net farm incomes per hectare from wheat and rice cultivation had been noticeably declining overtime in almost all the states in spite of improvements in agricultural technology. The trends of net income per hectare and per holding at 1970-71 prices found negative for both the crops in all states with only exception of rice in Tamil Nadu. They reported that the aggregate loss of rice cultivators in the seven rice cultivating states was estimated at Rs. 488.34 million per annum at 1970-70 prices. The average annual loss rate per holding of rice cultivator was the highest in Haryana (Rs. 128.86) followed by rice farmers in Bihar (Rs. 62.25), Andhra Pradesh (Rs. 54.81) and West Bengal (Rs 41.08).

Thomas *et al.,* (1993) in a study revealed that decline in profitability of rice cultivation was mainly due to the combined influence of escalation in cost of cultivation and low price of the produce.

In the study on cost structure of paddy cultivation in Kole lands in the light of cooperative credit flow by Thomas *et al.,* (1993), it was found that labour input was

the single major item of cost for both local and high yielding varieties of paddy accounting for about 70 per cent of the total cost.

Rao et al (1994) analysed the resource productivity in paddy farms of Rangareddy district of Andhra Pradesh. Primary data from watershed areas which were termed as adopters and non watershed areas termed as non adopters (of technology) was used for identifying the above factors. Cobb-Douglas production function was used to estimate resource productivity and returns to scale. Variables in the adopter farms explained 77 per cent of the variations in gross output. Regression coefficient of human labour was found to be statistically significant and positive.

Thimmappa (1994), evaluated economics of upland paddy and its competing crops. Resource efficiency of upland paddy indicated that land, manures and seeds were underutilized while, and fertilizer, human labour were over-utilized on the small farms of Sorab taluk, Shimoga district in Karnataka. Land, seed, fertilizer was found to be under- utilized while, manure and labours were over-utilized on large farms. Land and fertilizer were under-utilized in the small farms of Hangal taluk of Dharwad district and all the resource were overutilized on the large farms.

Mohandas and Thomas (1997), studied the economics of rice production in Kuttanad area of Kerala. They reported that cost of cultivation of paddy for state was Rs.13108.05 for marginal farmers (class-I), Rs.13309.72 for small farmers (class-II) Rs.13858.13 for large farmers (class-III). Rental value of own land recorded the highest expenditure in class-I and II, which accounted for 24.19 per cent (Rs.3171.30) and 22.38 per cent (Rs.3112.00) of total expenditure respectively. However, the highest item of expenditure was on fertilizer in class-III, which came to 22.39 per cent (Rs.3100.75) of the total cost. Returns realized for the class was highest in marginal farms (Rs.15,857.45), followed by small farms (Rs.15,560.00) and (Rs.15,387.50) large farmers. The net returns and input output ratio was also found to

be highest in the case of marginal farms (Rs.2748.25 and Rs.1.21), followed by small farms (Rs.2250.28 and 1.17) and large farms (Rs.1529.37 and1.11).

Vishwanath (1997), analyzed resource productivity in paddy cultivation during Kharif season which indicated that seed and human labour contributed significantly to the total output in most of the zones in Karnataka. Fertilizer contributed significantly in southern transition zone and hilly zone. In summer, seed contributed significantly to the output only in central dry zone. In most of the zones, human labour was a major contributor to the output. Fertilizer did not contribute significantly to the output but its coefficients were positive in all the zones.

Vishnudas and Lukka (2000) analysed the prices, costs, returns and productivity for 23 crops including seven cereals including paddy, five pulses, seven oilseeds and some commercial crops covered under the price support policy in India. Based on the study it was found that labour was the largest single factor used in the production of these crops. It was reported that in the total cost of production, the share of human labour varied from 18 per cent for wheat, while paddy it was around 35 per cent.

Thomas (2002) conducted a study to identify the problems and prospects of paddy cultivation in Kuttanad region. It was found that the costs for material inputs and human labour together accounted for about 83 per cent of the total paid out costs for paddy cultivation. It was concluded that rapid increase in cost of cultivation along with relatively low growth rates in farm prices of paddy, in the absence of improvement in farm technology, had adversely affected the profitability of the crops.

Jayakumar, (2003) in his study on economics of commercial production and cultivation of medicinal rice Njavara recorded cost of cultivation at cost A1 as Rs 6763.78. Cost of production per quintal was found Rs 273 per quintal in Palakkad and Rs 456 per quintal in Thrissur district.

Job and Nandamohan (2004) reported that before mid 70s rice was one of the profitable crops that got reversed on the combined effect of falling price and rising cost of production. As rice production is labour intensive, labour cost is the most important item of cost and more than 90 percent of labour used in rice cultivation is hired labour. Apart from the above, rising land value for housing and brick making industry and increasing urbanisation have contributed for the contraction of rice producing area. Rising labour cost coupled with the unmanageability and unavailability of labour had also prompted the relatively resourceful farmers to convert rice lands to be used for other relatively labour non-intensive crops.

Job (2006) has evaluated the gap between feasible and actual yields obtained by rice farmers of Alappuzha using the frontier production function for estimating the maximum feasible yield (MFY) and yield gap. The author found that rice yield gap in Alappuzha was 1588 kg ha with MFY of 5447 kg actual yield of 3859 kg ha implying of certain constraints in raising productivity at the farm level.

In a study of resource use efficiency of paddy cultivation in Peechi command area, Suresh and Reddy (2006) found positive significant elasticity coefficients for chemical fertilizers, farmyard manures and human labour. The allocative efficiency indicated that marginal returns per Rs. 1 increase under these heads would be Rs 2.83, Rs 1.57 and Rs 1.17 respectively

Basavaraja *et al.,* (2008) in his study compared the cost and returns of paddy cultivation in traditional technology and the new technology of the system of rice intensification (SRI) method and showed the contribution of resources to the productivity differences between the two methods of paddy cultivation. The study was based on input-output data from 480 paddy-growing farmers in Andhra Pradesh. Their findings showed that the average net returns were 9720 and 23 593 rupees per hectare in traditional and SRI methods of paddy cultivation.

Kachroo *et al.,* (2008) found out that working out of resource use efficiency, cost and returns, cost benefit ratio of paddy may help biological scientists, policy makers and extension workers to increase its production as well productivity. They also found that the state Jammu and Kashmir could increase their production as well as productivity by rearranging the existing level of input use and it would lead to enhancing economic efficiency. Inefficiencies in the use of various resources not only affect the productivities of crops but their cost and return structure and producer incentive as well.

Oniah *et al*, (2008) in his study on allocative efficiency of inputs used by swamp rice farmers in Nigeria found that all the resources were inefficiently utilized as the marginal value products for farm size, labour, seed, fertilizer are greater than their respective factor prices.

Fatoba *et al.,* (2009) worked out the economics of wetland rice production in Guinea Savannah of Nigeria by examining the costs and returns and estimating the technical efficiency using the Maximum Likelihood Estimation (MLE). Their study showed the presence of increasing returns to scale for the production technology and the estimated parameters of labour, fertilizer, farm size and level of compliance with recommended production package could provide the producer households positive gross margin, they were yet to attain their potential yields.

Nirmala and Muthuraman (2009) conducted study on economics and major constraints in rice cultivation in Kaithal district of Haryana. The study covered four villages of two blocks and data on constraints and cost-return aspects of rice cultivation were collected from 80 farmers. Total costs in rice production amounted to be Rs. 33778.68/ha. Average yield was 4.99 t/ha. Benefit-cost ratio worked out to be 1.27. Pests and disease incidence, lack of remunerative price and labour shortage were the major constraints in rice production.

Majumder *et al.,* (2009) in their study attempted to measure and compare resource use efficiency and relative productivity of farming under different tenure conditions in an area of Bhola district. They observed that expenses on human labour shared a major portions of expenses in the production of HYV Boro rice.

Dev and Rao (2010) have made a study with an in depth analysis of costs and returns in rice and wheat, they examined the effectiveness of agricultural price policy in enabling farmers to obtain sufficient profits to promote investment, technology and productivity and thereby to food security. In this attempted objectives were to find out the trends in the movements of costs, prices and returns in rice and wheat farming to throw light on the impact of price policy on the profitability of farming in two of the most cultivated and consumed food crops in the country. It also tried to bring out the causes that necessitated the recent increases in support prices and their relation to food security of the country.

Dwivedi *et al.,* (2011) studied the economics of basmati rice in Jammu and Kashmir and estimated the per hectare cost of cultivation in small, medium, large and all farms a Rs 20914, Rs 20960, Rs 18824 and Rs20233 respectively. The net income per hectare earned was found to be Rs 32450, Rs 29888 and Rs 30608 for small, medium, large and all farms respectively.

Manikandan (2011) attempted a study on the impact of NREGA on the labour market with special reference to wage rate and productivity of rice in Kasargod district of Kerala. Results of the study showed that since inception of NREGA, the wage rates of labourers for rice cultivation, especially that of women unskilled labourers, have increased while the rice productivity has stagnated at 2100 Kg per hectares.

Radhika (2012) in her study on economic analysis of production and marketing of Kaipad paddy in Kannur district recorded cost A1 for HYV as Rs 40754 per hectare and Rs 35737 per hectare for local variety. Average per hectare yield was

found to be Rs 2097, 2540 for traditional and HYV variety respectively. The cost of production per quintal was found Rs 1704, Rs 1597 for traditional and HYV variety respectively.

Srinivasan (2012) studied the economics of paddy cultivation in Kole lands of Kerala and estimated the cost of paddy cultivation per hectare as Rs. 45558. The cost incurred by marginal farmers was Rs. 46503 per hectare whereas it was only Rs. 27983 for small holder cultivators, indicating that the small holder cultivators incurred significantly lesser costs. Among the various categories of input-wise costs, labour costs formed the single largest component and accounted for about 65 per cent of total cost while the costs incurred on other inputs varied from 3 to 8 per cent.

Narayanamoorthy (2013) analysed the profitability of paddy cultivation in Andhra Pradesh using the data on cost of cultivation from the CACP reports. Out of the seven time points taken for analysis in the study, it was found that farmers were able to make some margins of profit only at two time points and in the remaining time points, the cost C2 was found to be higher than value of the crop output. Even at the two time points when profits were realized, the profit was very low and it varied from Rs. 63 to Rs. 1532 per hectare.

Grover (2014) conducted a study to bring out various aspects of rice cultivation in Punjab. The gross return from per hectare production of rice was Rs. 54585. The total variable costs of cultivation per hectare were found Rs 17657, leaving behind Rs 36927 as returns over variable costs. The regression analysis has brought out scope to increase of insecticides/ pesticides, manures/ fertilizers and irrigation for improving the rice yield in Punjab.

Makadia *et al.,* (2014), in his study on economics and resource use efficiency of SRI and traditional method of paddy cultivation in Gujarath found Cost-C2 for SRI and traditional method was Rs43790 and 40985 per ha, respectively. Average per hectare yield of SRI and traditional method was reported to 51.25 and 41.25 qtl,

respectively. The return per hectare over operating cost-A for SRI and traditional method was to the tune of 49758 and 33865, respectively. In SRI method, resource use efficiency of human labour contributed positive and significant while for traditional method manure and fertilizer found positive and significant towards paddy production.

Muazu *et al.,* (2015) conducted a study to determine the distributions of six main energy sources (i.e. human, fuel, machinery, seeds, fertilizer and pesticides) used in wetland paddy cultivation in Malaysia. The average paddy yield was found to be 7625 kg/ha with total energy input of 16,440 MJ/ha, energy output/input ratio of 7.76 and energy intensity of 2.16 MJ/kg. Out of the total energy input used in the cultivation cost of fertilizer, fuel, pesticides and machinery accounted for 60, 17, 4 and 3% respectively and cost of seed, human labor and organic fertilizer contributed 15, 0.25 and 0.22% respectively. The benefit-cost ratio and total cost of production were 1.37 and 657/ha respectively. The fitted regression model revealed a direct relationship of yield with fuel, machinery, fertilizer, pesticides and seed energy expenditures and an inverse relationship of yield with the human energy expenditure.

2.4 ECONOMICS AND RESOURCE USE EFFICIENCY OF OTHER ANNUAL CROPS

Sharma (1996) in his study, 'Impact of selected aspects of labour and land on per acre productivity", fitted a linear production function and analysed the impact of nine independent variables on productivity. He observed that in predominantly rice-growing districts, other factors remaining constant, unit increase in human labour per acre tended to reduce marginal labour productivity and also observed wider variation in productivity per acre and also in human labour in respect of wheat and millet growing districts as compared to rice-growing areas.

Mishra and Sahu (1994) did micro level study covering two agro climatic regions namely Vindhyan and Malwa plateau in Madhya Pradesh. They analysed

costs and returns, estimated resource use efficiency and optimum level of resource allocation on gram cultivation for two years. Cobb- Douglas production function was fitted to the data to study the resource use productivity in the gram. Their study revealed that the relative shares of human labour, bullock labour and purchased inputs were higher in Vidhyan plateau than those in Malwa plateau. But fixed costs share in total cost was found to be higher in Malwa plateau.

Douglas (2008) studied the efficiency of agricultural productivity enhancement program (APEP) and he found that for APEP farmers, the MVP/MFC for labour, seed, and animal draught was 0.68, 0.92, and 0.22 respectively and was over utilized by non APEP farmers.

The study on resource use efficiency analysis in cowpea by Omonoa *et al.,* (2010) found that the marginal value products of all the resources used are less than their prices (MVP less than MFC), indicating underutilization of resources.

Essilfie *et al.,* (2011) in his study estimated the farm level efficiency in small scale maize production in Ghana and found that the MVP of inputs, fertilizers and labour for maize farmers were less than their MFC, i.e. the MVP/MFC is less than one. For input seed, the MVP is greater than it's MFC. They concluded that maize farmers could optimize their output and profit by increasing seed use and decrease fertilizers and labour use.

2.5 CONSTRAINTS IN PRODUCTION OF PADDY

Prakash and Nair (1992) carried out a study to identify the production constraints of paddy cultivation and measure the validity of identified constraints in Kuttanad, Onattukara, Pokkali and Kole tracts of Kerala. Floods, low profitability and high cost of FYM were identified as the important constraints in the zone.

A study on the economics and major constraints in rice cultivation in Kaithal district of Haryana was conducted by Nirmala and Muthuraman (2009) covering four

villages of two blocks and data on constraints and cost return aspects of rice cultivation were collected from 80 farmers. Pests and disease incidence, lack of remunerative price and labour shortage were identified as the major constraints.

Vanaja *et al.,* (2009) reported that the major reasons why the farmers of kaipad area have moved away from rice cultivation has been unfavourable characters of the locally available cultivars.

Jayan and Sathyanathan (2010) have attempted a study in the water logged areas of Kerala and found that the major issues faced by paddy farmers were related to pollution, eutrophication

Prabhakar *et al.,*(2011) assessed the impact of labour scarcity in agriculture. Garrett ranking technique was used to rank the reasons for labour scarcity and reasons for non-adoption of labour- saving technologies. The results showed among the various reasons quoted for labour scarcity in agriculture, the higher wages in other locally available jobs was ranked first because the higher wage rate prevailing in the non-agricultural sector attracted the labourers.

Ravikumar and Sudeesh (2013) worked out the economics of paddy cultivation in Palakkad district of Kerala based on primary data collected from paddy cultivators from three villages of Chittur. The constraints identified were shortage of labour, high wage rate, lack of water storage, natural calamities, lack of water and low price of the produce. Nearly 70 per cent of the farmers reported shortage of labour alone as the prime problem. The future strategies suggested include providing subsidy for paddy cultivation, introduction of high yielding varieties, seeds and mechanization.

Regina *et al.,* (2013) undertook a study to identify the major constraints in mechanization of rice cultivation. Socio- economic constraints identified included small size of holdings, technological constraint of non availability of machines,

trained operators and lack of initiative and responsibility in upkeep of machinery. They suggested the need for awareness programmes apart from focus on a group mechanization strategy where individual holdings were too small to own machines.

A study was undertaken in Mahasamund district of Chattishgarh to identify the constraints in production, marketing and processing of the paddy by Sori *et al.,* (2014) results of the study revealed that heavy infestation of insect pests, problem of high weed occurrence and high labour cost were the major constraints in paddy production as perceived by the farmers.

METHODOLOGY

3. METHODOLOGY

This chapter sketches out briefly the characteristics of the study area, the methods adopted in the selection of samples and various statistical tools and techniques utilized in analyzing the data. Selection of an appropriate methodology among the methodologies available is essential to bring out meaningful conclusions from the study. Based on the review of literature given in the previous chapter an appropriate methodology was selected for each aspect of the study. The details are presented under the following heads.

3.1 Description of the study area
3.2 Sampling procedure
3.3 Sources of data
3.4 Variables and their measurement, and
3.5 Statistical tools for the analysis of data

3.1 DESCRIPTION OF THE STUDY AREA.

A general awareness about the characteristics of the study area is vital to understand the background of research. The physical and economic environments of the region are the major determinants of cropping pattern and crop production It provides the background for analysis, interpretation and discussion of the results and helps in drawing inferences. Recognizing this, a profile of the two regions comprising resource inventory such as topography, rainfall, land use pattern, soil type, cropping pattern and sources of irrigation, are presented in this chapter.

3.1.1 Location

Alappuzha, district lies between North latitude 90° 05' and 90° 52' East longitude 76° 17' and 76° 48'. The total geographic area of Alappuzha is 1414

square kilometers which constitutes 3.64 per cent of the total state area. The average elevation is 1 metre and is flanked by 2,195 square kilo metres of Vembanad Lake, where one can witness the magnificent union of six major rivers which spread out extensively before joining the 80 km coast line of the district. The name Alappuzha is derived from the geographical position and physical features of the place. It means the land between the sea and network of rivers flowing into it. The district is bounded on the north by Ernakulam district, on the east by Kottayam district and Pathanamthitta district, on the South by Kollam district and on the west by Laccadive Sea. Alappuzha is the ninth largest city in Kerala with an urban population of 2109160. The population density is 1492 persons per square kilometers and retains first position in the state. The literacy rate is 93.4% which earns third position in the state.

Palakkad, previously known as Palakkattussery, is situated in the south west coast of India. The district is between 10° 21' and 11° 14' North latitude and 76° 02' and 76° 54' East longitude. The district is bounded on the North by Malappuram district, in the east by Coimbatore district of Tamil Nadu, in the south by Trichur district and in the west by Trichur and Malappuram districts. Palakkad is the seventh most populous town in Kerala and lies near the Palakkad Gap. The total geographical area of Palakkad district is 4480 sq.k.ms representing 11.53% of the state's geographical area with the share of population is 8.2%. The literacy rate of the district is lower than the state.

3.1.2 Topography

The Alappuzha district is a sandy strip of land intercepted by lagoons, rivers and canals. There are neither mountains nor hills in the district except some scattered hillocks lying between Bharanikkavu and Changannur blocks in the eastern portion of the district. Cherthala, Ambalappuzha, Kuttanad and Karthikappally lie fully in low land region. There is no forest area in this district.

Being one of the interior districts of the State, Palakkad is unique in many respects. The continuity of majestic Western Ghats, which stretches over 1000 km, is broken at Palakkad, known as Palakkad gap with a width of 32 km. On either side of the gap are the giant Nilgiris and Anamalais. The climate of the district is greatly influenced by this gap as it enables the north east winds to blow spreading its wings right up to the coast through out the breadth of the Ghat. Topographically, the district can be divided into two regions, the low land comprising the midland and the highland formed by the hilly portion. The soil is laterite in the hill and mid regions. Midland is thick with Coconut, Arecanut, Cashew, Pepper, Rubber and Paddy cultivation. The eastern region of the district has high mountains, extensive ravines and dense forests. In the Southern part, there are number of orange estates. To the west of this region are the plains broken here and there by some isolated hills and drained mainly by Bharathapuzha and its tributaries. There is extensive paddy cultivation in this tract. There are several hills scattered here and there in the river plains also. There is no low land region in this district.

3.1.3 Climate and Rainfall

The climate of Alappuzha district is moist and hot in the coast, and it is slightly cooler and drier in the interior of the district. The average monthly temperature of this district is approximately 18 ^{0}C. It also gets the benefit of two outstanding monsoons. The average rainfall in the district is 2763 mm.

The Palakkad district has got two types of climates. Ottappalam, Alathur and Mannarkkad are having a climate similar to that of other districts of Kerala, whereas Palakkad and Chittur are having rather a dry climate like that of Tamil Nadu. . Since the district gets the benefit of south west and north-east winds, rainfall is heavy in both the seasons. The average rainfall in this district is 2638 mm.

3.1.4 Soil Type

The soil of Alappuzha district may be classified as sandy, peaty, alluvial and laterite. Sandy soil covers the western portion of Cherthala, Ambalapuzha and Karthikappally taluks. Coconut is grown in almost all places in this area. Peaty and kari soil occur as a small belt on the eastern regions of Cherthala and Ambalapuzha and on the western portions of Kuttanad. The soil is of poor fertility and of low yields. To the east of peaty soil lies the belt of the alluvial soil which covers the residuary portions of Kuttanad, northern portions of Karthikappaly, Chengannur and the north western sector of Mavelikkara. Chengannur and Mavelikkara taluks are covered by laterite soil which is formed by weathering mainly of acidic rocks under alternate wet and dry tropical conditions.

There are three types of soil. They are laterite soil seen in Ottappalam, Alathur, Chittur and Palakkad taluks, Virgin forest soil of Mannarkkad taluk and black soil in Chittur and Attappady Valley which is used for the cultivation of Cotton.

3.1.5 Land Utilization Pattern

The Table 1 shows the land utilization pattern in Alappuzha, Palakkad and Kerala state. Total geographical area in Alappuzha district is 1, 41, 011 hectares which constitute 3.62 per cent of the total geographical area of Kerala. The net sown area under Alappuzha district is 84, 705 hectares which accounts 60.06 per cent of the total geographical area of the district. It is the only district in the state which does not have forest area. Out of the net area sown, 25.87 per cent is sown more than once in Alappuzha.

Table 1. Land utilization pattern of Alappuzha and Palakkad districts in 2013-14

Type of land	**Alappuzha (area in ha)**	**Palakkad (area in ha)**	**Kerala (area in ha)**
Total geographical area	141011	447584	3886287
Forest	0	136257	1081509
Land put to non agricultural use	22567	45231	405826
Barren and uncultivable land	29	1795	13655
Permanent pastures and Grazing land	0	0	8
Land under miscellaneous tree crops	72	698	2521
Cultivable waste	15064	23794	97069
Fallow other than current fallow	2670	14152	57346
Current Fallow	3363	12746	70976
Marshy land	33	0	197
Still water	12143	15340	99673
Water logged area	332	0	3654
Social forestry	33	379	2859
Net area sown	84705	197192	2050994
Area sown more than once	21914	104520	567676
Total cropped area	106619	301712	2616670

The total geographical area of Palakkad district is 447584 hectares which constitute 11.51 per cent of the total geographical area of Kerala. Out of this area under forest is

136257 hectares which accounts 30.44 per cent of the total geographical area of the district. Out of the net area sown, 53 per cent is sown more than once in Alappuzha.

3.1.6 Cropping Pattern

The district has a prominent place in crop production. The principal crops are paddy, tapioca, coconut, rubber, pepper, banana, mango and cashew. About 70 per cent of the work force is engaged in agriculture. Coconut gardens extend to about 75,454 hectares. About three hundred and forty three million coconuts are produced every year. The five major crops: paddy, tapioca, coconut, rubber, pepper - are cultivated in an area of 1,73,847 hectares. Small and marginal farmers constitute more than 95% of the farming community and the average per family holding is 0.21 hectare. There is an Oil Palm Plantation at Bharatheepuram near Anchal, in an area of 4000 hectares, under the Oil Palm India Ltd., a state government undertaking. The Rehabilitation Plantations, another State Government undertaking, is located at Kulathupuzha near Thenmala.

Palakkad district is called the “Granary of Kerala”. Major portion of the cultivable area is used for raising food crops. About 80 percent of the rural population of this district are agriculturists or agricultural labourers. The gross paddy cropped area comes to 111029 hectares. Palakkad is the only district in the state where Cotton and Groundnut are cultivated. Area under fibre cotton cultivation is 1472 hectare and groundnut is 1346 hectares. Coconut and other oil seeds occupy a prominent position among the crops covering 57991 hectares and it is one of the major source of income to the cultivators. Paddy, Cereals and millets are cultivated in 115697 hectares and it is the major agricultural activity of the district and are cultivated in vast areas of the district covering 29991 hectare, which is about 65 percent of the corresponding area of the state. The climate in the district is suitable for the cultivation of horticultural crops such as Mango, Jack fruit, Pappaya etc. and the area under cultivation of fresh fruits is 41105 hectares. Plantation crops such as Rubber, Tea, Coffee are planted in a

big way in midland and highland regions. The area under plantation crops is 35475 hectares, in which rubber occupies more than 70 percent. More and more area are brought under plantation crops. Major cultivation of Cotton in the state is concentrated in Palakkad district which occupies an area of 1472 hectares.

3.1.7 Water Source

The three important rivers flow through the Alappuzha district are Manimala , Pampa and Achancoil river. The villages of Manimala, Mallappally, Kaviyoor, Kalloppara, Thalavadi, Kozhimukku and Champakulam lies in the course of the river Manimala, which has a length of 91.73 kms. and drainage area of 802.90 sq. kms. The river Pamba, which has its origin at Peerumedu, after traversing a distance of 177.08 kms. itself in the Vembanad lake. The catchment area of this river is 1987.17 sq. kms. and has a marginal length of 74.02 kms. The Achancovil river on entering this district at about three miles from the west of Kaipattoor adopts a westerly course till it reaches Chennithala. After that it takes a southwesterly course and joins Pamba at Veeyapuram. The catchment area of this river is 1155.14 sq.kms. and has a marginal length of 32.19 kms. The important lakes flowing through the Alappuzha district are Vembanad Lake and Kayamkulam Lake. The Vembanad lake stretching from Alappuzha to Cochin borders Cherthala, Ambalapuzha and Kuttanad taluks of this district. Kayamkulam lake lies in both Alappuzha and Kollam districts.

The most important river in the Palakkad district is the Bharathapuzha. The tributaries of Bharathapuzha are Malampuzha, Walayar, Mangalam, Meenkara, Ayalure, Pothundy and Kanjirapuzha. There are also two tributaries of the Cauvery in Attappady hill range.viz. Bhavani and Siruvani. The other important river flows through the district is Korapuzha. Kunthipuzha and Nellipuzha are two tributaries from Attappady and join the Bharathapuzha at Kuttippuram.

Palakkad and Alappuzha are the two major rice-producing districts of Kerala. While the Kuttanad region in Alappuzha is endowed with a large system of

backwaters,agriculture in Palakkad benefits from irrigation projects in Malampuzha, Chulliar,Meenkara, Walayar, Pothundi, Mangalam and Parambikkulam.Within Palakkad district, Chittur, Alathur, Kuzhalmannam, Kollengode, Nenmara and Palakkad are the blocks in which paddy production is concentrated.

3.1.8 Demography

According to 2011 census, Alappuzha district has a population of 21,21,943 with 10,10,252 men and 11,11,691 women with a population density of 1492 persons per km^2. There are 1,86,022 persons under six years of age in Alappuzha district. The literacy rate of Alappuzha stands at 96.26% out of which 8,95,476 are males and 9,68,082 are females. Alappuzha has a decadal population growth of 0.61%. Alappuzha has a sex ratio of 1100.

As per provisional reports of Census India, population of Palakkad in 2011 is 131,019; of which male and female are 63,833 and 67,186 respectively. Total literates in Palakkad city are 112,479 of which 56,065 are males while 56,414 are females. Average literacy rate of Palakkad city is 94.20 percent of which male and female literacy was 96.83 and 91.73 percent.

3.1.9 Administration

The two administrative systems prevailing in the Alappuzha district are revenue and local self-government. Under the revenue system, the district is divided into two revenue divisions, 6 taluks and 91 villages. The two revenue divisions are Alappuzha division comprising Cherthala, Ambalapuzha and Kuttanad taluks consisting of 47 villages and Chengannur division comprising Karthikapally, Chengannur and Mavelikkara taluks consisting of 44 villages. Under the local self-government system, the district is divided into 5 statutory towns and 12 development blocks consisting of 71 panchayaths.

For the purpose of administration the district is divided in to two revenue divisions - Ottapalam and Palakkad and 5 taluks viz Alathur, Chittur, Palakkad, Ottapalam and Mannarkkard. There are 163 villages in the district. The district has 91 Panchayaths. The district is divided into 13 Community Development Blocks for the effective implementation of various developmental activities.

3.2 SAMPLING PROCEDURE

3.2.1 Selection of the Area of Study

The districts of Alappuzha and Palakkad are selected purposively for collecting data, as these are the two major paddy growing regions of Kerala state.

3.2.2 Selection of Respondents and Sampling Techniques

Multistage random sampling technique was used for the selection of respondents. From Alappuzha and Palakkad districts, two blocks from each district were selected randomly. From each block, one panchayath was selected randomly. From the list of paddy farmers selling paddy to procurement agencies, 15 respondents was selected randomly from each panchayath thus making the total size of respondents to 60. The details of cost of production were collected from the respondents.

3.3 SOURCES OF DATA

The study was conducted using both primary data and secondary data on cost of production of paddy. Primary data on cost of production of paddy for the last season was collected from the respondents by personal interview method using a well structured and pretested questionnaire. Data on the age, educational status, occupation, annual income, farming experience pattern, family size, land holding size, variety used and all operations of paddy cultivation were collected. Secondary data on cost of production, area, production and productivity of paddy for last twelve

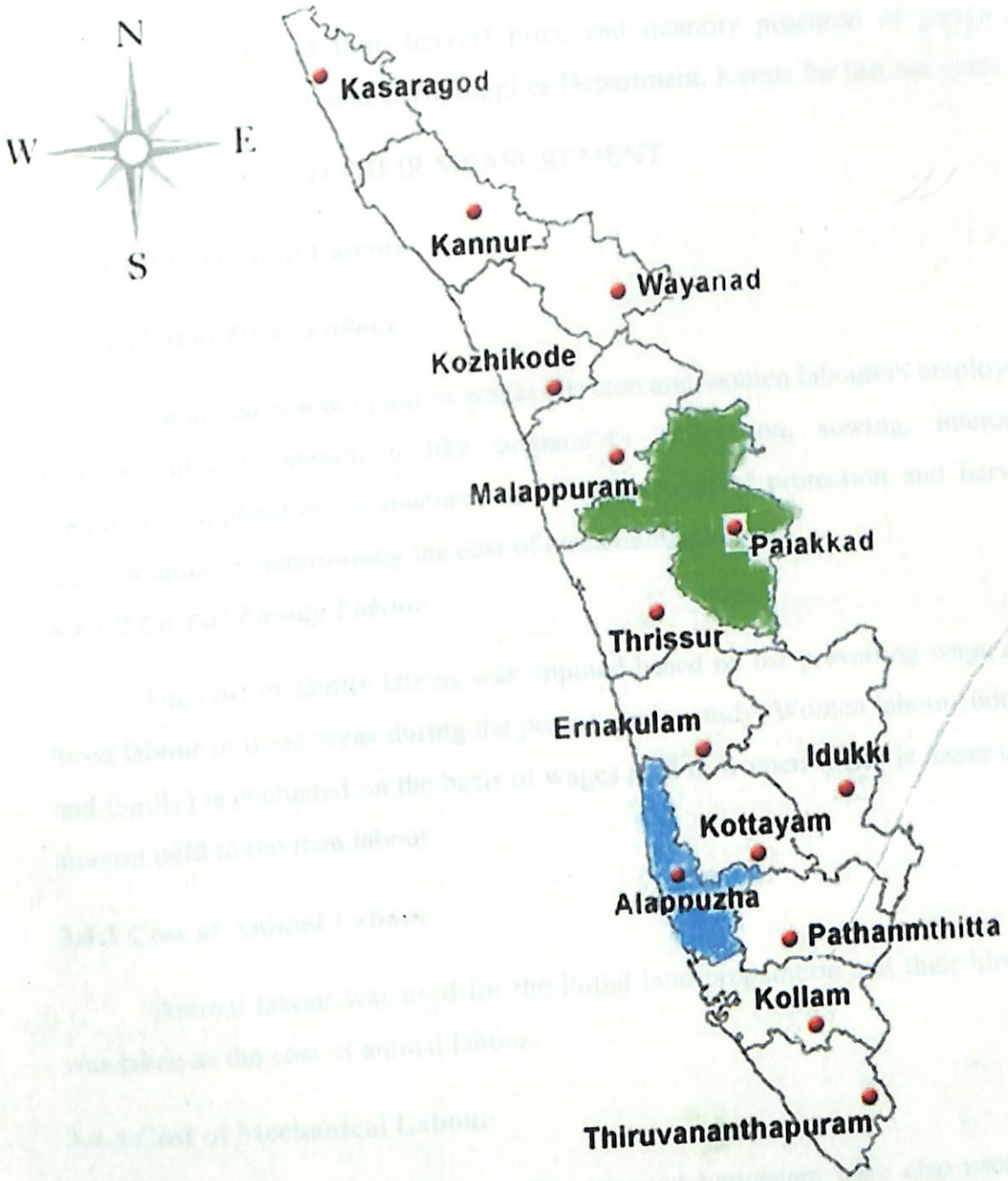

Figure 1. Map of Kerala demarcating the study area –Alappuzha and Palakkad

years were collected from Department of Economics and Statistics. Data on procurement price and farm harvest price and quantity procured of paddy were collected from the Food and Civil Supplies Department, Kerala for last ten years.

3.4 VARIABLES AND THEIR MEASUREMENT

3.4.1 Cost of Human Labour

3.4.1.1 Cost of Hired Labour

The actual amount paid as wages for men and women labourers employed for various cultural operations like preparatory cultivation, sowing, intercultural operations, application of manures and fertilizers, plant protection and harvesting were included in determining the cost of hired human labour.

3.4.1.2 Cost of Family Labour

The cost of family labour was imputed based on the prevailing wage rate for hired labour in these areas during the period, under study. Women labour (both hired and family) is evaluated on the basis of wages paid to women which is lesser than the amount paid to the men labour.

3.4.2 Cost of Animal Labour

Animal labour was used for the initial land preparation and their hire charge was taken as the cost of animal labour.

3.4.3 Cost of Mechanical Labour

In addition to animal labour, tractors and harvesters were also used and its hire charges paid was taken as the cost of mechanical labour.

3.4.4 Cost of Seeds

Purchased seeds were evaluated on the basis of their purchase price and same price was used for evaluating farm produced seeds.

3.4.4 Cost of Manures and Fertilizers

Farm produced manure is evaluated as per the prevailing locality rates and purchased ones are evaluated on the basis of purchase price.

3.4.5 Cost of Plant Protection Chemicals

The cost of plant protection chemicals were estimated at their market price.

3.4.6 Cost of Irrigation

This cost involves labour cost for irrigating the field, electricity charges, diesel cost, and other irrigation structures used for irrigating paddy.

3.4.7 Interest on Working Capital

Interest has been charged at the rate of 10% per annum on the working capital, cash and kind expenses excluding items in respect of which payments are generally made after harvest (ie land tax incurred during the period of cultivation.

3.4.8 Interest on Fixed Capital

The present value of assets, equipments form the fixed capital. Interest on this can be calculated in the same way as in case of interest on working capital. Interest on fixed investments (excluding land) was estimated at rate of 11 per cent annum being the lending rate of commercial bank for long term loans.

3.4.9 Rental Value of Owned Land.

It is taken on the basis of prevailing rent at which differ with locations

3.4.10 Land Revenue

Land revenue paid was reckoned at the actual payments in the study area.

3.4.11 Miscellaneous Expenses

This include the expenditure incurred for post harvest operations like drying, packing storing and transportation cost.

3.5 STATISTICAL TOOLS FOR THE ANALYSIS OF DATA

Appropriate tools are employed to analyze the data collected. The tools are

3.5.1 Compound Annual Growth Rate

Trend analysis in area, production, productivity, farm harvest price, procurement price, scale of procurement of paddy was studied using compound annual growth rate. Student's t test was used to find significance of growth rates.

Compound Growth Rate in area, production, productivity, farm harvest price, procurement price, scale of procurement of paddy was estimated using exponential function and it is given as

$$Y = c \times e^{bx}$$

or after transformation,

$$\text{Log } Y = A + bX$$

Where

X is the time variable,

Y is the variable for which growth rate is calculated

b is the regression coefficient of Y on X.

The Compound Annual Growth Rate percentage (CAGR %) = b x100

3.5.2 Percentages and Averages

Percentages and averages were used to examine the distribution of socio economic characteristics of farmers such as age, educational status, land holding, annual income and farming experience. It was also used in cost of cultivation and cost of production analysis.

3.5.3 Cost of Cultivation

Cost of cultivation of a commodity is the sum total of cost incurred on various inputs that are used in the production of commodity. Accurate identification of these inputs and the quantity used is crucial for the realistic assessment of the cost of cultivation. A B C cost concept was used to calculate cost of cultivation of paddy for the year 2014-15.

3.5.3.1 ABC cost concepts

Cost A1 includes

a) Cost of hired human labour
b) Cost of machine labour
c) Cost of seed
d) Cost of manures, fertilizers and soil ameliorants
e) Cost of plant protection chemical
f) Cost of irrigation
g) Land revenue
h) Interest on working capital
i) Depreciation

Cost A2

This includes the items under Cost A1 and the rent paid for leased in land.

Cost B1

This includes the items under Cost A1 and the interest on fixed capital.

Cost B2

This includes Cost B1 and the rental value of owned land.

Cost C1

This comprises the cost B1 and imputed value of family labour.

Cost C2

This comprises the cost B2 and imputed value of family labour.

Cost C3

This is the sum of cost C2 and 10 per cent of cost C2 to account for managerial input of the farmer.

3.5.4 Cost of production

Cost of production is the cost of producing one quintal of paddy. Cost of production of paddy per quintal is estimated by dividing the cost of cultivation per hectare (after deducting the value of by- product per hectare from the cost of cultivation per hectare) by the quantity of paddy produced per hectare.

3.5.5 Returns

To assess the economics of paddy cultivation, costs have to be related to the returns. Gross returns were the total value of products at the market price. Net returns were derived by subtracting the total costs from the gross income.

3.5.6 Benefit – Cost Ratio

The production efficiency is revealed by the B-C ratio. It was calculated by dividing the total benefits by total expenditure incurred for production.

3.5.7 Resource Use Efficiency

Resource use efficiency in agriculture sector is done to examine how efficiently the farmers are using their resources in production process. It is very important because our resources are limited.

An efficient farmer allocates his land, labour, water, and other resources in an optimal manner to maximize his income, at least cost, on sustainable basis. While some farmers may attain high physical yield per unit of land at a high cost, some others may achieve maximum profits per units used. (Haque, 2006). To know the efficiency of resources used in the farm, it is necessary to know marginal product rather than average product. Cobb- Douglas production function has been fitted to the collected data in order to describe the relationship between the output and various inputs used for the production of paddy. From the production function, elasticities of production of inputs were worked out which, in turn, have been used to calculate their marginal value products at their geometric means. Marginal productivity is the measure of the increase in total product, for the addition of one unit of a particular resource above its mean level while other resources are held constant at their respective mean levels. A significant difference between marginal value product and market price of individual inputs would indicate whether farmers are using, on an average, their factors of production efficiently or inefficiently

3.5.8 Specification of the Model

Cobb-Douglas function has been selected for functional analysis since this model provides a compromise between (a) adequate fit of the data (b) computational

manageability and (c) sufficient degrees of freedom unused to allow for statistical testing. The estimated values of the regression coefficients and R^2 were tested for statistical significance.

The Cobb- Douglas production function is given by

$Y = a. X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} e^u$

In log linear form the above function can be written as

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + U$

Where

Y = Returns (Rs/ ha)
X_1 = Cost of human hired labour (Rs/ ha)
X_2 = Cost of machine labour (Rs/ ha)
X_3 =Cost of seed (Rs/ ha)
X_4 = Cost of fertilizer (Rs/ ha)
X_5 = Cost of plant protection Chemicals (Rs/ ha)
a = constant
$b_1, b_2 \ldots\ldots b_5$ s are partial regression coefficients or production elasticities of respective inputs
e^u - Stochastic error term

The Cobb-Douglas production function was estimated by using OLS method assuming the error term (e) to be independently and normally distributed.

3.5.9 Marginal Productivity Analysis

The marginal value product (MVP), marginal factor cost (MFC) and the ratio between these two were recorded out for each input to understand the efficiency of input use.

Marginal product = $b_i \times \bar{Y} / \bar{X}_i$

Where,

$\bar{Y}$ = Geometric mean of returns

$\bar{X}_i$ = Geometric mean of the i^{th} variable

b_i = the regression coefficient of the i^{th} variable

the marginal value product of each resource was calculated by the price of the product.

The formula used for the purpose was:

Marginal value product of $X_i = b_i \times P_y \times \bar{Y} / \bar{X}_i$

Where,

P_y = Price of paddy.

The input is used efficiently if the ratio between MVP and MFC is one. A ratio greater than one would indicate that under utilization of resource and a ratio less than one would indicate that over utilization of resource. Since the farmers used various forms of inputs ranging from simple to complex ones, it was not possible to arrive at the MFC of each input. So marginal input cost was considered as price of one unit of the input used in production process.

3.5.10 Extent of adoption of farmers

Application level of the fertilizers among farmers in the study area was felt necessary to understand their adoption level. Adoption level of this was measured using recommendation in Package of Practice Recommendation by KAU (2011).

$$\text{Average extent of adoption by farmers} = \frac{\text{Adopted level}}{\text{Recommended level}} \times 100 \text{ (Dhondyl, 1997)}$$

Adoption of technology has an important bearing on the level of productivity.

3.5.10 Garett's Ranking Technique

Garrets ranking method was employed to indicate constraints associated with paddy procurement and were identified in consultation with farmers. The respondents were asked to rank paddy procurement constraints. The individual's rank was converted into percent position by using the formula as given below (Garret and Woodworth 1971).

Percent position = $100X (R_{ij} – 0.5) / N_j$

R_{ij} = Rank given for i th factor by j th individual

Nj = No. of factors ranked by the j th individual

The estimated percentage position of each rank was converted into scores. Thus for each constraint, the scores of various respondents were added together and the mean score was calculated. The mean scores for all the constraints were arranged in descending order. The constraint with the highest mean value was considered as most important constraint.

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

This chapter deals with results and discussions based on the analysis of data using appropriate techniques. The results and discussions are presented under following heads keeping the objectives of the study in mind.

4.1. Trends in area, production and productivity.

4.2. Trends in procurement price, farm harvest price and scale of procurement.

4.3. Adequacy of procurement price of paddy in relation to its cost of production using secondary and primary data.

4.4. General socio-economic characteristics of the respondents.

4.5. Economics of production

4.6. Resource use efficiency

4.7. Extent of adoption

4.8. Constraints and suggestions in procurement.

4.1 TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA

Rice is grown in three distinct seasons in Kerala. They are Autumn (July to October) Winter (November to February) and Summer (March to June). According to report of Government of Kerala 2014, paddy is being cultivated largely in winter seasons (45%) and least in summer seasons (23%). District wise analysis of paddy area during the year 2013-14 in Kerala revealed that Palakkad districts occupies first place in autumn and winter seasons and Alappuzha in summer season. (GOK, 2014)

4.1.1 Trend in Area

Even though rice is the main food of the people of Kerala, the state is in deficit in its production. Estimated requirement of rice for the state is 35-40 lakh tonnes per year and it produces less than one fifth of its requirement (Kumari, 2011). The insufficiency in rice production is increasing year after year due to diminution in area of rice arising out of the large scale conversion of paddy land for raising other crops or for residential purposes. `

Table 2. Trends in area, production and productivity of paddy in Kerala

Year	Area (ha)	Production (MT)	Productivity (Kg/ha)
2002-03	311000	689000	2218
2003-04	287000	570000	1984
2004-05	290000	667000	2301
2005-06	276000	630000	2285
2006-07	264000	642000	2435
2007-08	229000	528000	2308
2008-09	234000	590000	2520
2009-10	234000	598000	2557
2010-11	213000	522000	2452
2011-12	208000	569000	2733
2012-13	197000	508000	2577
2013-14	199611	564325	2827
CAGR	-4.27*	-1.88*	2.38*

Table 1 and Figure 1 depicts the trends in area, production and productivity of paddy for the period from 2002-03 to 2013-14. The area under paddy, the major food crop of Kerala occupied 3.11 lakh hectares during the agricultural year 2002-03. There after there was decrease in paddy cultivation and reached to 2.29 lakh hectares during 2007-08 and by 2013-14 it reached 1.99 lakh hectares. The decline in the latter half was less (13 per cent) when compared to the first half (26 per cent) of period of the study. The decline in area was more prominent when compared to production which was to the extent of 4.27 per cent per annum which was significant at one per cent probability level. The marginal increase in area towards the end of study period is remarkable in the context of steady decline in the state throughout the 1990's and 2000's which may be on account of the recent initiatives to revive paddy cultivation.

Srinivasan (2012) in her study reported that in recent years that the farmers are increasingly becoming unwilling to cultivate their lands either leaving them as fallows or converting for other uses. The studies by George and Mukherjee (1986) and Balakrishnan, (2008) reported that emergence of small, unviable and fragmented holdings as a result of implementation of land reforms had contributed to non agricultural use of land even to real estate. While Unni (1983) observes an increase in the area under coconut where rice has been losing during 1960-61 to 1978-79, a continous expansion of area under rubber mostly at the expense of coconut which in turn leads to the spread of area under coconut to areas that were previously under rice were found in later periods (Kannan, 2011).

4.1.2 Trend in Production

A more or less similar trend pattern in area is also perceptible in paddy production. During the past years the production of rice in Kerala attained in its peak level in 6.89 lakh tonnes in 2002-03. The production of paddy has declined from 6.89 lakh to 5.64 lakh tonnes during the period 2002-03 to 2013-14, showing an

aggregate decrease of 18.1 per cent. Thus within 12 years, there was a decrease of nearly 1.24 lakh tonnes of rice. The production also showed a deceleration trend with a lesser magnitude to the extent of 1.88 compound annual growth which was also statistically significant at one per cent level. It was observed that negative growth rate of the production is not as much as that of the area which is due to the increase in productivity. An increasing trend in production of paddy is evident from the analysis between the years 2012-13 to 2013-14. Jeromi, (2003) also reported decline in the production of rice at 2 per cent per annum in the 1980's and at 2.9 per cent per annum in the 1990's.

4.1.3 Trend in Productivity

The productivity of the state hovered between 1984 kg per hectare in 2003-04 to 2827 kg per hectare in 2013-14 and witnessed an annual increment of 2.38 per cent. A fluctuating trend is visible between the years during the study period. It is worth noticing the contribution of increase in productivity towards production which may be due to the widespread use of high yielding varieties and better management. The findings of Kannan and Pushpangadan, (1990) showed a yield stagnation since mid seventies which is not in conformation with the present study. The reason for yield stagnation was reported as ill conceived development of critical factors such as water management and land development.

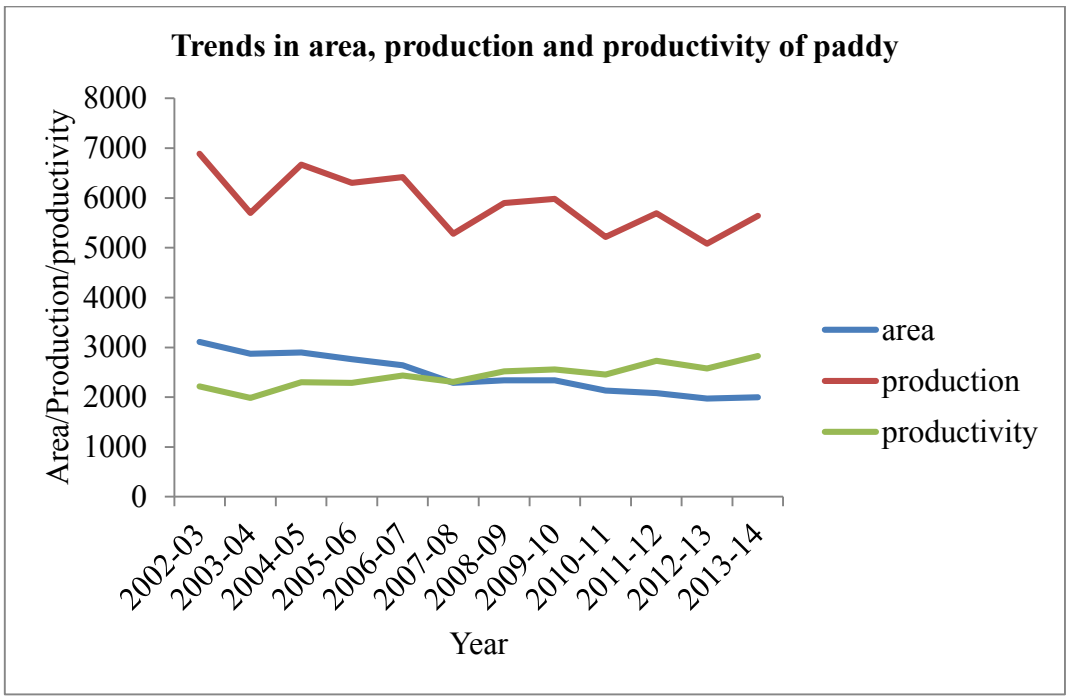

Figure 1. Trends in area, production and productivity of paddy

A study by Job and Nandamohan (2004) revealed that area under rice and production showed significant negative trend and positive trend in productivity, this is in agreement with the present study. According to the reports of department of economics and statistics 2004-05, due to the lack of awareness about modern high yielding seeds and other inputs of cultivation, a good percentage of farmers still resort to conventional cultivation practices. This leads to low productivity, production and there by low income. This also to a certain extends detracts the farmers from paddy cultivation. Reports of government of Kerala, 2010 revealed that food grains produced in the state account for only 15 percent of the total consumption of food grains. It is high time that we should take necessary steps in order to overcome such situation, otherwise it will turn as a threat to a sustainable life.

4.2 TRENDS IN PROCUREMENT PRICE, FARM HARVEST PRICE AND SCALE OF PROCUREMENT OF PADDY

The Commission for Agricultural Costs and Prices (CACP) recommends procurement prices for 24 agricultural commodities. In its recommendations the CACP takes into account not only a comprehensive overview of the entire structure of the economy of a particular commodity but also a number of other important factors. This is reflected in the list of factors that go into the determination of support prices - cost of production; changes in input-output prices, open market prices, demand and supply; inter-crop price parity; effect on industrial cost structure, general price level, cost of living; and the international price situation. Based on the recommendations made by the CACP the government announces support prices. The objectives of price policy are two-fold one is to assure the producer that the price of his produce will not be allowed to fall below a certain minimum level, and other is to protect the consumer against an excessive rise in prices (Gulati and Sharma, 1990)

Procurement price is price announced by the government of India to provide incentive to the farmers. It is fixed by the Commission for Agricultural Costs and

Prices (CACP) before harvesting season. Actual procurement prices should be far in excess of those recommended by the CACP. The mean excess of procurement prices actually announced by the government is over cost of cultivation (Cost A2 + family labour). It is argued that procurement price should cover at least the paid out expenses including the imputed value of family labour. The paid out expenses include actual expenses paid either in cash or kind such as hired human labour and bullock labour, cost of seeds, manures, fertilisers, pesticides, interest paid on capital, depreciation and repair charges. The excess of actual procurement prices over the cost of cultivation would reveal the level of incentives given to the producers (Gulati and Sharma, 1990)

Trend analysis of procurement price, farm harvest price and scale of procurement is presented in Table 2. The data collected were subjected to regression analysis and their growth rates were computed. The time period considered for this analysis is from 2004-05. Since 2004 the government of Kerala has started the fixation of procurement price.

It is found that procurement price of paddy increased from Rs 700 per quintal during 2004-05 to Rs 1900 per quintal during 2014-15. The farm harvest price increased from Rs 592 per quintal during 2004-05 to Rs 1587 per quintal during 2013-14. The analysis shows that there has been acceleration in the rate of growth of both procurement and farm harvest price. On comparing the trend analysis of farm harvest price and procurement price of paddy it was found that there was higher significant growth rate for procurement price (10.94 per cent) than farm harvest price (7.25 per cent).

Table 3. Trends in procurement and farm harvest price of paddy

Year	Farm harvest price (Rs/qtl)	Procurement price (Rs/qtl)	Scale of procurement (MT)
2004-05	592	700	52163.6
2005-06	599	707	139592.8
2006-07	640.7	850	226105.3
2007-08	709.9	950	251314.0
2008-09	884.8	1100	354298.7
2009-10	945.8	1200	389246.3
2010-11	1085.4	1350	392921.5
2011-12	1183.1	1500	560824.3
2012-13	1209.6	1700	358464.2
2013-14	1587.4	1850	535583.8
CAGR	7.25**	10.94**	(20.03)**

** Significance at 1 per cent level

The trend analysis of procurement price and scale of procurement of paddy revealed that there was a sharp increase in scale of procurement of paddy at the rate of 20.03 per cent per annum with increase in its procurement price. Thus it is clear that rise in procurement prices of cereals pushes up their scale of procurement. Since the state has to depend fully on imports from other states to meet its consumption needs, there is a need to increase the scale of procurement of paddy. The graphical representation is given in Figure 3 and Figure 4.

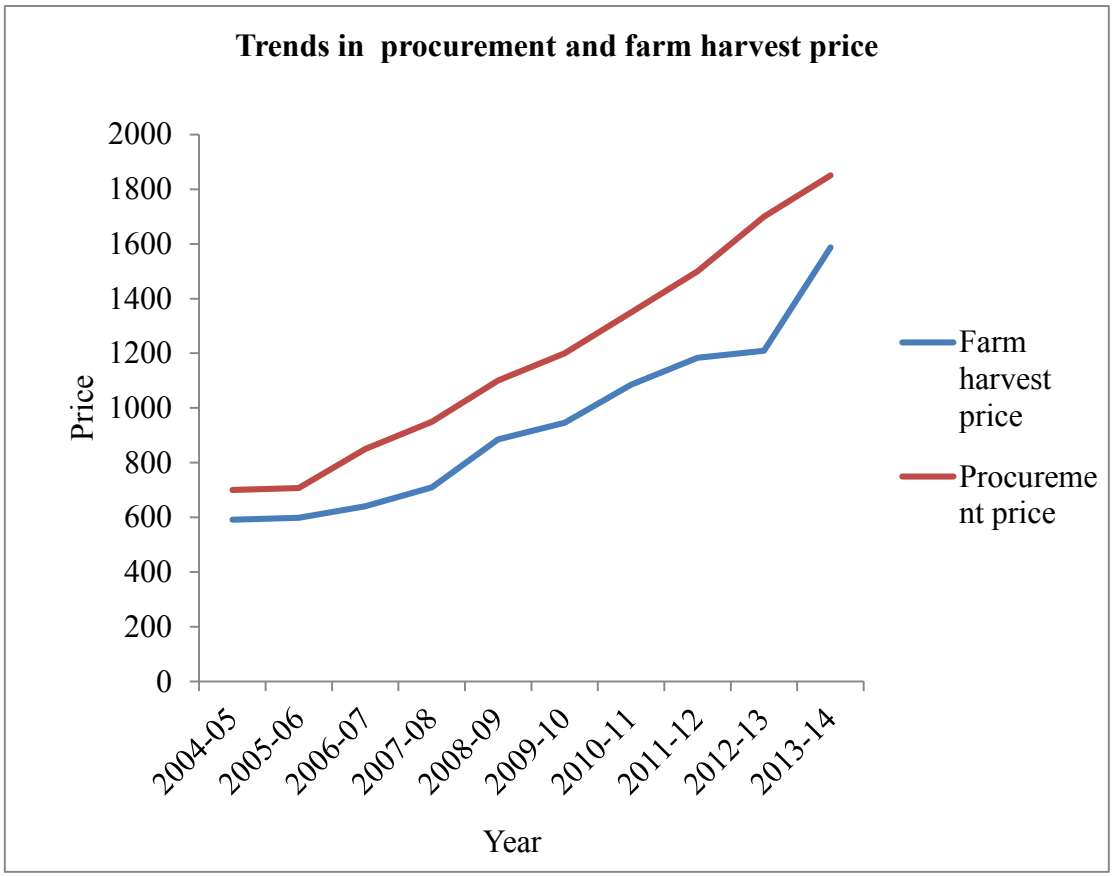

Figure 3. Trends in procurement and farm harvest price of paddy in Kerala

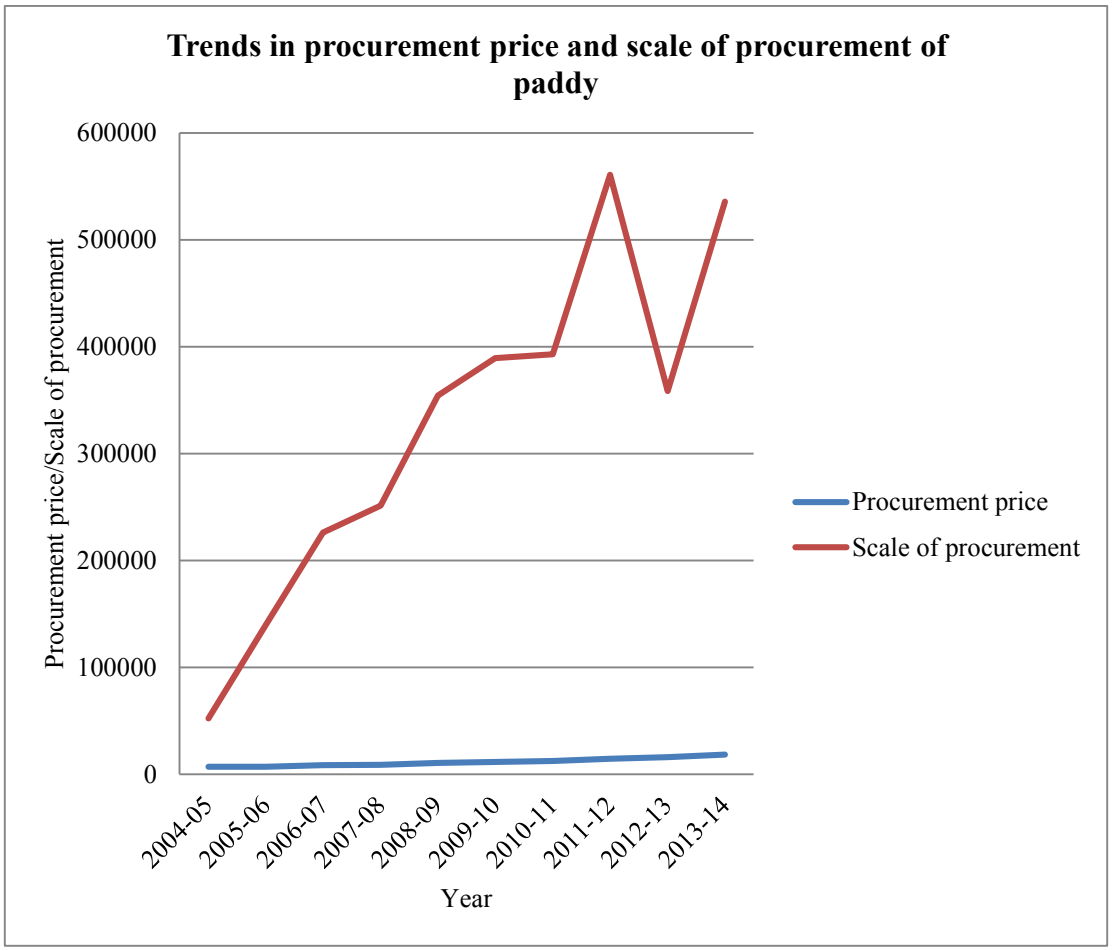

Figure 4. Trends in procurement price and scale of procurement of paddy

4.3 ADEQUACY OF PROCUREMENT PRICE OF PADDY IN RELATION TO ITS COST OF PRODUCTION USING PRIMARY AND SECONDARY DATA

Adequacy of procurement price of paddy in relation to its cost of production was calculated by finding the ratio of procurement price of paddy and its cost of production. If the ratios are one and above one, it shows that they are adequate with respect to cost of production.

4.3.1Adequacy of Procurement Price of Paddy in Relation to its Cost of Production in Secondary Data

4.3.1.1 Autumn Season

Season wise analysis was done to find the adequacy of procurement price in relation to its procurement price. Adequacy of procurement price in relation to cost of production in autumn season is presented in the Table 3.

Analysis on adequacy of procurement price in relation to cost of production for the period of 2004-05 to 2013-14 in autumn season (Table 3) revealed that at cost A, procurement price of paddy was adequate in all the years except 2007-08 where it was 0.96 and the ratio was maximum (1.59) during 2011-12. At cost B inadequacy was seen in all the years except 2006-07 where it was 1.31. The procurement price was also inadequate in all the years at cost C. At cost B and cost C the minimum ratio recorded was 0.31 which implied that only 31 per cent of the cost of cultivation was covered by the procurement price.

Table 4. Adequacy of procurement price of paddy in relation to its cost of production at various cost concepts using secondary data (autumn season)

Year	Procurement price (Rs/qtl)	Cost A (Rs/qtl)	Adequacy	Cost B (Rs/qtl)	Adequacy	Cost C (Rs/qtl)	Adequacy
2004-05	700	469	1.49	1107	0.63	1497	0.47
2005-06	707	545	1.30	1207	0.59	1244	0.57
2006-07	850	595	1.43	651	1.31	1467	0.58
2007-08	950	986	0.96	3041	0.31	3099	0.31
2008-09	1100	729	1.51	2076	0.53	2140	0.51
2009-10	1200	796	1.51	2432	0.49	2504	0.48
2010-11	1350	970	1.39	2782	0.49	2869	0.47
2011-12	1500	942	1.59	2802	0.54	2908	0.52
2012-13	1700	1277	1.33	3634	0.47	3736	0.46

Source: GOK

4.3.1.2 Winter Season

Analysis was done to find adequacy of procurement price in relation to cost of production in winter season and is given in Table 4.

The analysis on adequacy in winter season revealed that at cost A procurement price was found adequate in all the years in the study period. At cost A the ratio was maximum (1.42) during 2011-12 and the ratio was minimum during 2007-08 which was 1.18. At cost B and cost C the ratio was inadequate in all the years. The minimum ratio of 0.38 was recorded at cost B and cost C during 2007-08. It implied that only 38 per cent of cost of cultivation was covered by procurement price at cost B and cost C

Table 5. Adequacy of procurement price of paddy in relation to its cost of production at various cost concepts using secondary data (winter season)

Year	Procurement price (Rs/qtl)	Cost A (Rs/qtl)	Adequacy	Cost B (Rs/qtl)	Adequacy	Cost C (Rs/qtl)	Adequacy
2004-05	700	509	1.38	1178	0.60	1437	0.49
2005-06	707	581	1.22	1479	0.48	1524	0.46
2006-07	850	638	1.33	1512	0.56	1557	0.55
2007-08	950	804	1.18	2474	0.38	2530	0.38
2008-09	1100	816	1.35	2240	0.49	2293	0.48
2009-10	1200	962	1.25	2520	0.48	2600	0.46
2010-11	1350	1077	1.25	3212	0.42	3294	0.41
2011-12	1500	1054	1.42	2913	0.51	3023	0.50
2012-13	1700	1314	1.29	3439	0.49	3553	0.48

Source: GOK

4.3.1.3 Summer season

Analysis was done to find adequacy of procurement price in relation to cost of production in summer season and was given in Table 5.

Analysis on adequacy of procurement price in relation to cost of production for the period of 2004-05 to 2013-14 in summer season (Table 5) revealed that procurement price of paddy was adequate at cost A and inadequate at cost B and cost C in all the years. At cost A the ratio was maximum (1.46) during 2008-09 and 2012-13. A minimum ratio of 0.47 was recorded at cost B and 0.46 at cost C during the period 2007-08.

Table 6. Adequacy of procurement price of paddy in relation to its cost of production at various cost concepts using secondary data (summer season)

Year	Procurement price (Rs/qtl)	cost A (Rs/qtl)	Adequacy	cost B (Rs/qtl)	Adequacy	cost C (Rs/qtl)	Adequacy
2004-05	700	673	1.04	1163	0.60	1198	0.58
2005-06	707	536	1.32	1272	0.56	1375	0.51
2006-07	850	597	1.42	1235	0.69	1270	0.67
2007-08	950	686	1.38	2017	0.47	2068	0.46
2008-09	1100	756	1.46	1909	0.58	1965	0.56
2009-10	1200	892	1.35	2105	0.57	2167	0.55
2010-11	1350	986	1.37	2254	0.60	2325	0.58
2011-12	1500	1058	1.42	2720	0.55	2807	0.53
2012-13	1700	1164	1.46	2984	0.57	3076	0.55

Source: GOK

The analysis made so far revealed that cost of production is not covered by the procurement price at cost B and cost C, it indicated that procurement price is not sufficient to cover the expenses on rent paid for leased in land and imputed value of family labour. On comparing the adequacy at cost C of various seasons, it can be noted that a better position is obtained for summer season where maximum of 67 per cent and minimum of 46 per cent of the cost of production was covered by the procurement price in the year 2006-07 and 2007-08 respectively. This is due to the fact that cost of production recorded relatively low during summer season

4.3.2 Adequacy of Procurement Price in Relation to Cost of Production Using Primary Data

The cost of production was estimated using primary data and also used to understand the adequacy of the procurement price. It revealed that the procurement price of paddy was inadequate at cost B2, cost C2 and cost C3 on estimated the cost of production of paddy which is presented in the Table 6.

Table 7. Adequacy of procurement price in relation to cost of production of paddy using primary data

Cost components	Alappuzha		Palakkad		Overall	
	Cost (Rs/qtl)	Adequacy	Cost (Rs/qtl)	Adequacy	Cost (Rs/qtl)	Adequacy
Cost A1	1173.21	1.62	1299.17	1.46	1234.96	1.54
Cost A2	1272.88	1.49	1457.30	1.36	1363.24	1.39
Cost B1	1179.81	1.61	1305.42	1.46	1241.38	1.53
Cost B2	2213.78	0.86	2501.12	0.76	2346.08	0.81
Cost C1	1437.01	1.32	1555.67	1.22	1495.21	1.27
Cost C2	2470.99	0.77	2751.38	0.69	2599.92	0.73
Cost C3	2718.08	0.70	3026.52	0.63	2859.91	0.66

The analysis carried out using primary data for the year 2014-15 revealed that procurement price of paddy was adequate with respect to cost A1, cost A2, cost B1, cost C1. The results obtained using the primary data and secondary data are comparable. In both cases the inadequacy was reflected when rental value of family labour was taken in to account. Actually cost C2 in primary data analysis corresponds to cost C in secondary data analysis. At cost C2 procurement price was

more adequate where it was 73 per cent at overall level. But at cost C it varied between 31-67 per cent for the various seasons of the study period. It was less than 50 per cent for the most of the years. It is worth noticing that at cost C1, the procurement price was found to be sufficient to cover cost of production where all the fixed and variable costs except rental value on land was considered. Even at cost C3 where 10 per cent of C2 is considered as management costs, 66 per cent coverage was seen in both the districts. But for Alappuzha more coverage was noticed than Palakkad for all the ratios.

There was a difference in adequacy of procurement price using secondary data and primary data and this may be attributed by the following reasons.

First of all, the study was confined to locations with high productivity and with 100 per cent coverage by high yielding varieties like Uma and Jyothi. Secondly, crop losses were less due to favourable climatic conditions during this year. Thirdly, in the present study the average productivity was found 5341.97 Kg per hectare but the average productivity of Kerala is only 2827 Kg per hectare. Eventhough the results of the study are appreciable, the procurement price is applicable for state as a whole and also for farmers growing local varieties. Moreover, the state is having high competitiveness of crops and for people who depend on farming; the present procurement price is not adequate to sustain them in paddy cultivation.

4.4 GENERAL SOCIO–ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

A brief idea about the social and economic conditions of the farmers in the study area was felt necessary to have a better understanding of their farming activities. Therefore an attempt was made to examine the following socio-economic parameters viz family size, age, education and occupational status, size of holding and family income of the respondent farmers.

4.4.1 Age

The respondents were classified in to different age groups such as less than 45 years, 45-55 years, 55-65 years and above 65 years and the details are presented in Table 7.

Table 8. Distribution of respondents based on their age

Age group (years)	Alappuzha	Palakkad	Overall
Less than 45	4 (13.33)	2 (6.66)	6 (10.00)
45-55	2 (6.66)	9 (30.00)	11 (18.33)
55-65	16 (53.33)	14 (46.66)	30 (50.00)
>65	8 (26.66)	5 (16.66)	13 (21.66)
Total	30 (100)	30 (100)	60 (100)
Average age	59	58	59

(Figures in parentheses denote percentages to total)

At the overall level 50 per cent of the farmers were in the age group of 55-65 followed by age group above 65 (21.66 per cent). Only 10 per cent were found less than 45 years of age. It indicates that younger generations are less involved in paddy cultivation. The same pattern was noticed in Alappuzha. But in Palakkad, even though the majority falls in the age group of 55-65 years (46.66 per cent) it was followed by 45-55 years with 30.00 per cent of the farmers. Average age of respondents in Alappuzha and Palakkad were 59 and 58 respectively.

4.4.2 Education

The distribution of respondents based on their education is shown in Table 8. The study revealed 100 per cent literacy in the study area. None of the farmers were illiterate and almost all of them had minimum secondary level of education.

Table 9. Distribution of respondents based on their education

Educational status	Alappuzha	Palakkad	Overall
Secondary school	15 (50.00)	20 (66.66)	35 (58.33)
Higher secondary school	11 (36.66)	9 (30.00)	20 (33.33)
Graduate	3 (10.00)	1 (3.33)	4 (6.66)
Post graduation	1 (3.33)	0 (0)	1 (1.66)
Total	30 (100)	30 (100)	60 (100)

(Figures in parentheses denote percentages to total)

At the overall, majority (58.33 per cent) of the farmers were having secondary school education followed by higher secondary level (33.33 per cent). Almost similar trend was seen in both locations. In Alappuzha qualifications of 13.33 per cent of respondents were above graduation and it was only 3.33 per cent in Palakkad.

4.4.3. Occupation

The distribution of respondents based on their occupation is furnished in Table 9. At overall level 85 per cent of respondents depended either exclusively on farming or as the main occupation.

Table 10. Distribution of respondents based on their occupation

Occupation	Alappuzha	Palakkad	Overall
Agriculture alone	15 (50.00)	10 (33.33)	25 (41.66)
Agriculture as main occupation	11 (36.66)	15 (50.00)	26 (43.33)
Agriculture as subsidiary occupation	4 (13.33)	5 (16.66)	9 (15.00)
Total	30 (100)	30 (100)	60 (100)

(Figures in parentheses denote percentages to total)

In Alappuzha 50 per cent of the respondent farmers were depending upon agriculture alone for their livelihood, whereas it was 33.33 per cent in Palakkad. Agriculture was only a subsidiary occupation for about 13.33 per cent and 16.66 per cent of the respondents in Alappuzha and Palakkad respectively where their main occupation was government services, business etc.

4.4.4 Annual Income

The distribution of the sample respondents according to their average annual income is presented in Table 10. It was noticed that at aggregate level majority (41.66 per cent) of the farmers were having annual income less than one lakh followed by 1-2 lakhs (21.66 per cent). This indicates that level of income from agriculture is comparatively low. A similar pattern was seen in both locations. But with regard to higher levels of income, Alappuzha farmers were in a better position with 23.32 per cent having more than 4 lakhs. It was only 13.32 per cent in Palakkad. Average annual income of respondents in Alappuzha and Palakkad were Rs 265333 and Rs 239777 respectively.

Table 11. Distribution of respondents based on their annual income

Annual income (Rs)	Alappuzha	Palakkad	Overall
<1 lakh	12 (40.00)	13 (43.33)	25 (41.66)
1-2 lakhs	6 (20.00)	7 (23.33)	13 (21.66)
2-4 lakhs	5 (16.66)	6 (20.00)	11 (18.33)
4-6 lakhs	5 (16.66)	2 (6.66)	7 (11.66)
>6 lakhs	2 (6.66)	2 (6.66)	4 (6.66)
Total	30 (100)	30 (100)	60 (100)
Average annual income	265333.00	239777.00	252555.00

(Figures in parentheses denote percentages to total)

4.4.5 Farming Experience

Table 11 gives the distribution of farmers in five groups according to the farming experience in Alappuzha and Palakkad district. At the aggregate level it is noticed that majority (58.32 per cent) of the farmers were having farming experience above 15 years. Same trend was noticed in Alappuzha and Palakkad. Relatively new entrants into farming with experience less than 5 years were 10 per cent and 6.66 per cent in Alappuzha and Palakkad respectively. Average farming experience of respondents in Alappuzha and Palakkad were 16 and 18.63 respectively.

Table 12. Distribution of respondents based on their farming experience

Experience (in years)	Alappuzha	Palakkad	Overall
Up to 5	3 (10.00)	2 (6.66)	5 (8.33)
5-10	5 (16.66)	2 (6.66)	7 (11.66)
10-15	7 (23.33)	6 (20.00)	13 (21.66)
15-20	9 (30.00)	13 (43.33)	22 (36.66)
Above 20	6 (20.00)	7 (23.33)	13 (21.66)
Total	30 (100)	30 (100)	60 (100)
Average farming experience	16.00	18.63	17.32

(Figures in parenthesis denote percentage to total)

4.4.6 Family Size

The distribution of the respondents based on their family size is presented in the Table 12. It was found that 55 per cent of the farmers belonged to medium size family group consisting of 5 members. The large and small family size constituted 23.33 and 21.66 per cent respectively. The same pattern was seen in Alappuzha and Palakkad with regard to medium sized family which was the major category. But in the case of Alappuzha next category was small sized families (26.66 per cent) and for Palakkad it was families with more than 5 members (26.66 per cent). Average family size for respondents were found 4.93 and 5.16 respectively for Alappuzha and Palakkad

Table 13. Distribution of respondents based on their family size

Family size	Alappuzha	Palakkad	Overall
Small (<5)	8 (26.66)	5 (16.66)	13 (21.66)
Medium (5)	16 (53.33)	17 (56.66)	33 (55.00)
Large (>5)	6 (20.00)	8 (26.66)	14 (23.33)
Total	30 (100)	30 (100)	60 (100)
Average family size	4.93	5.16	5.05

(Figures in parentheses denote percentages to total)

4.4.7 Land Holding Size

The frequency distribution of the households based on the size of holding is presented in Table 13. Here land holding size referred to the area under paddy cultivation by the farmers of Alappuzha and Palakkad. It was noticed that 41.66 per cent of the farmers were having land holding above 4 hectare at the overall level. It was observed that the holding size of 60 per cent of the respondents in Alappuzha was above 4 hectare followed by 30 per cent with about 2 to 4 hectare. In the case of Palakkad 40 per cent of the respondents were under 2 to 4 hectare and 23.33 per cent with more than 4 hectares. A disparity can be noticed between the two locations, more number of respondents in Palakkad were having less than 2 hectare (36.66 per cent) when compared to Alappuzha (10 per cent). Average size of holding was found 4.65 hectares in Alappuzha and 2.62 hectares in Palakkad.

Table 14. Distribution of respondents based on their land holding size

Size of the holding (ha)	Alappuzha	Palakkad	Overall
<2 ha	3 (10.00)	11 (36.66)	14 (23.33)
2 to <4 ha	9 (30.00)	12 (40.00)	21 (35.00)
≥4 ha	18 (60.00)	7 (23.33)	25 (41.66)
Total	30	30	60
Average size of holding	4.65	2.62	3.63

(Figures in parentheses denote percentages to total)

4.4.8 Variety

Distribution of area of respondents according to variety used for cultivation of paddy is presented in Table 15. At the overall level Uma was cultivated in 68.29 per cent of the total area followed by Jyothi (28.04). Matta was cultivated only in 3.27 per cent of the total area. In Alappuzha Uma is cultivated in 67.43 per cent and Jyothi in 32.57 per cent of the total area. Variety Matta was not used in Alappuzha district. In Palakkad Uma, Jyothi and Matta varieties covered 69.83 per cent, 21.11 per cent and 9.05 per cent respectively.

Table 15. Distribution of area of respondents according to variety

Variety	Alappuzha	Palakkad	Overall
Uma	94.00 (67.43)	54.92 (69.83)	148.92 (68.29)
Jyothi	45.50 (32.57)	16.60 (21.11)	62.1 (28.04)
Matta	-	7.12 (9.05)	7.12 (3.27)
Total	139.4 (100)	78.64 (100)	218.04 (100)

(Figures in parentheses indicate percentages to total)

4.5 ECONOMICS OF PADDY CULTIVATION

To assess the economics of paddy cultivation, costs have to be related to the returns. A brief description of the cultivation practices shall help in the better understanding of cost and returns incurred in the cultivation of the paddy.

4.5.1 Cost of Cultivation

The cost of cultivation per hectare of paddy includes two parts ie., variable costs and fixed costs. The variable cost is more sensitive to changes in the agricultural sector in technology, input and output prices etc and it mainly enters into the decision making process regarding resource allocation. Cost of cultivation was worked out using ABC cost concepts and is presented in Table 15.

4.5.1.1 Variable Cost

The key items coming under variable costs are hired human labour, machine/bullock labour, seed, irrigation, manures and fertilizers, lime, plant protection chemicals and interest on working capital.

4.5.1.1.1 Human Labour

The largest single item in the cost of cultivation of paddy was found to be hired human labour. Maintenance of outer bunds, dewatering (particularly in Alappuzha), clearance and levelling of land for sowing, construction of ridges, sowing, transplanting, weeding, manuring and application of fertilizer, spraying pesticides and weedicides, reaping, threshing, and winnowing are the major agricultural labour requirement operations involved in paddy farming. Out of these operations, repair of outer bunds and dewatering are done jointly by all of the farmers who cultivate in a 'padasekharam' under the supervision of an elected Padasekharam Cornmitee. Outer bund repair costs are shared by the farmers on the basis of the proportion of area they cultivate. Human labour was found to be predominantly wage labour and in cases where family labour was used, their wages were imputed at the rates prevailing in the village during the relevant periods.

The cultivators in the sample farms have mostly used hired labour. Wage rate for women and men were Rs 300, Rs 750 per day respectively in Alappuzha and Rs 250-300, Rs 500 per day respectively in Palakkad. But in Alappuzha, labour charge for operations like fertilizer application, sowing, application of plant protection chemicals were found as Rs 2125 per hectare which is given irrespective of number of labours. Along with the application of weedicide hand weeding is also practiced for removal of weeds from the field. Among the various operations involved in paddy cultivation, ploughing, ridge making, sowing, manuring and spraying of pesticides are done exclusively by male labourers. Female labourers were used for clearing fields before sowing, weeding and transplanting.

The average expenditure on human labour accounted to Rs 26478.59 in Alappuzha and in Palakkad accounted to Rs 27781.21. Cost of hired labour contributed more to the cost A ie., 41.36 per cent in Alappuzha and 40.91 in Palakkad. Nirmala and Muthuraman (2009) estimated the cost of cultivation of paddy in Haryana and found that human labour cost was the second major contributor

(19.72 per cent) to the total cost A. It shows slight deviation from the current study since the labour cost is high in Kerala.

4.5.1.1.2 Machine Labour

Machine labour is engaged mainly for soil preparation which can be carried out either by using animal labour or tractor or tiller and also for harvesting. At present in all the padasekharams in the study area electrically run pump sets are used for the purpose of dewatering (particularly in Alappuzha), in the place of manually operated wheels. Similarly for plouhging, power tillers and tractors are extensively used in both the districts. Traditional methods of ploughing exist in negligible areas and it was predominantly found more in Alappuzha than Palakkad. Next to hired human cost, tractor or tiller ploughing cost contributed the lion share to the total cost of cultivation. Hiring charge paid for tractor or tiller which comes in the range of Rs 750-1200 in Alappuzha and Rs. 600-900 in Palakkad. Machinery was found to be hired by the respondents in both the districts. Alappuzha farms used tractors 3.8 hours per ha for ploughing as against 7.5 hours per ha by Palakkad farms. Machine harvesting is followed in both the districts. The cost of harvesting ranges from Rs 1800 to 2400. The total cost incurred on machine labour was Rs 16416.97 in Alappuzha and Rs 12185.66 in Palakkad. In Alappuzha district machine labour contributed 25.64 per cent to cost A and 17.94 per cent in Palakkad. Nirmala and Muthuraman (2009) reported 25.27 per cent contribution of machine labour cost to the total cost of cultivation of rice in Kaithal district of Haryana. These results were in harmony with the current study.

Table 16. Estimation of cost of cultivation of paddy (Rs/ha)

Sl no:	Components	Alappuzha	Palakkad	Overall
1	Hired labour	26478.59 (41.36)	27781.21 (40.91)	27129.9 (41.12)
2	Animal labour	350.00 (0.54)	320.00 (0.47)	335.00 (0.50)
3	Machine labour	16416.97 (25.64)	12185.66 (17.94)	14301.32 (21.68)
4	Seed	5320.00 (8.31)	4045.80 (5.95)	4682.90 (7.09)
5	Farm yard manure and chemical fertilizers	2805.85 (4.38)	3805.00 (5.60)	3305.42 (5.01)
6	lime	1991.98 (3.11)	7916.00 (11.6)	4953.99 (7.51)
6	Plant protection chemicals	4214.491 (6.58)	5089.70 (7.49)	4652.09 (7.05)
7	Land tax and irrigation cess	200.00 (0.31)	200.00 (0.29)	200.00 (0.30)
8	Interest on working capital	5757.788 (8.99)	6114.34 (9.00)	5936.06 (8.99)
9	Other expenses	475.00 (0.74)	450.00 (0.66)	462.5 (0.70)
	Cost A1	64010.66 (100)	67907.71 (100)	65959.18 (100)
10	Rent paid for leased land	5437.59	8265.51	6851.55
	Cost A2	69448.25	76173.22	72810.73
11	Interest on fixed capital	359.80	326.50	343.15
	Cost B1	64370.46	68234.20	66302.33
12	Rental value of owned land	50975.61	54235.00	52150.90
	Cost B2	120783.70	130733.70	125304.80
13	Imputed value of family labour	14033.30	13080.80	13557.08
	Cost C1	78403.76	81315.00	79859.41
	Cost C2	134817.00	143814.50	138861.90
	Cost C3	148298.70	158196.00	152748.00

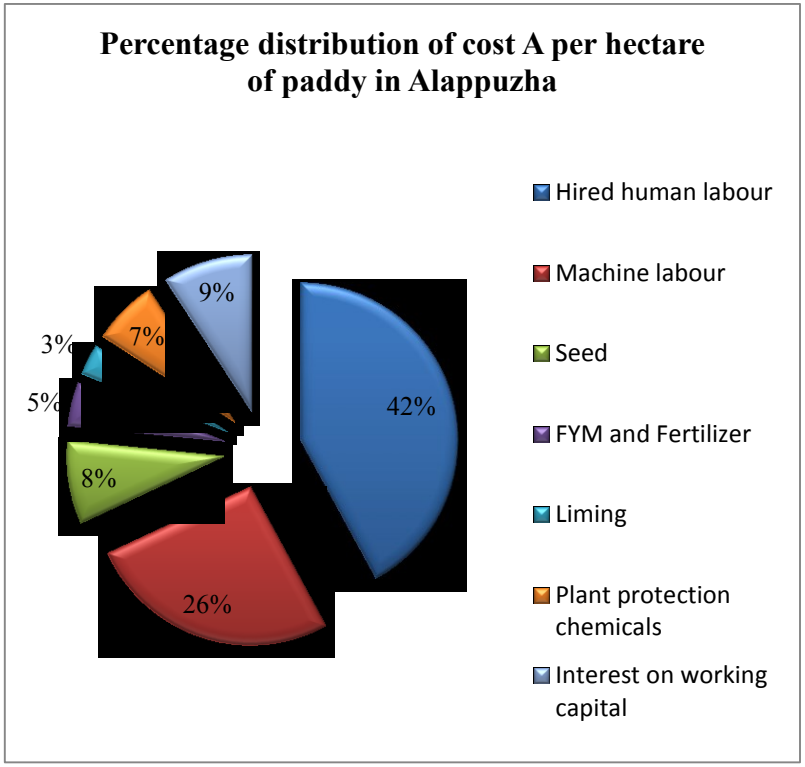

Figure 4. Percentage distribution of cost A per ha of paddy in Alappuzha

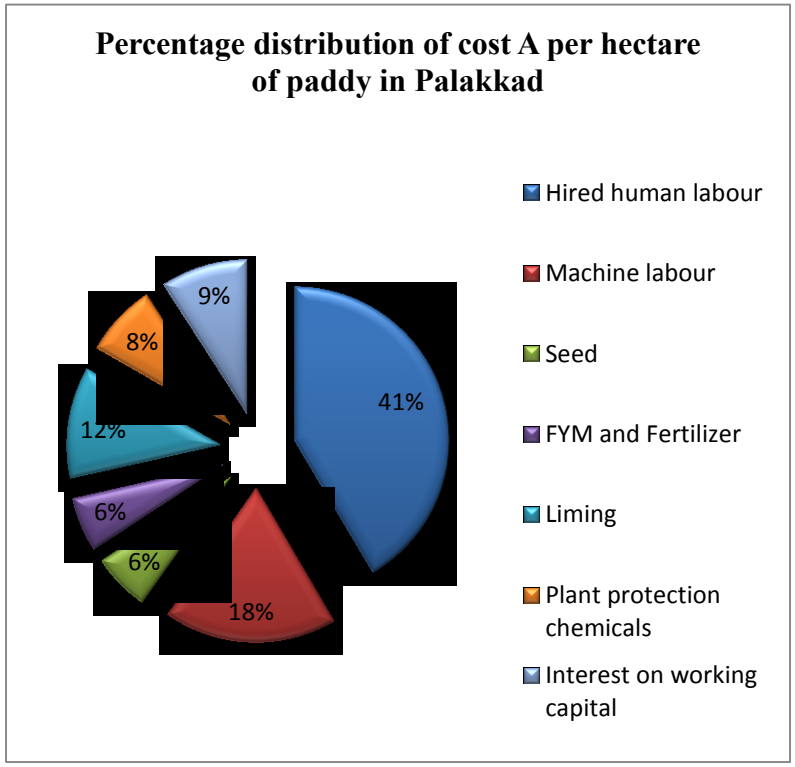

Figure 5. Percentage distribution of cost A per ha of paddy in Palakkad

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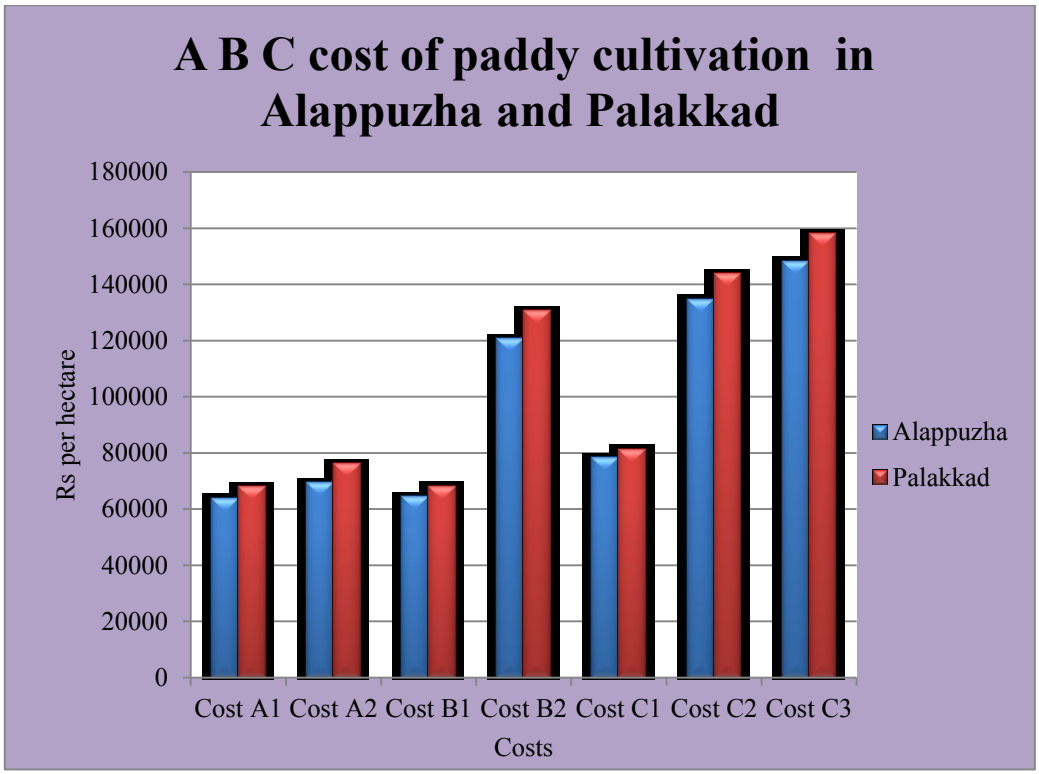

Figure 6. A B C cost of paddy cultivation in Alappuzha and Palakkad

4.5.1.1.3 Seed

Generally cultivators in the study area get the seeds from Krishibhavan or from National Seed Corporation. Only a few members used previous season's stocked seed for cultivation. Government of Kerala is providing 40 kg of seeds as subsidy to paddy farmers through Krishibhavan. There was no uniformity with regard to the seed variety and seed rate used. In Alappuzha varieties of paddy which can withstand flood water for few days were usually cultivated. Uma, Jyothi and Matta were used by the farmers in the study area. Of these Uma occupy the maximum area in Alappuzha. Punja is the crop which is raised in Alappuzha in October – November.

In sample farms in Alappuzha, 125 to 150 kg of seeds were used for sowing and in Palakkad 100 to 125 kg of seeds used for sowing. The price of the seed in the study area was ranged from Rs 32-38 per kg. Both owned and purchased seed are valued at market price. The cost of seed amounted to Rs 5320 and Rs 4025 per hectare in Alappuzha and Palakkad respectively. Since the seed rate used was more, the expenditure on seed was higher in Alappuzha. Srinivasan (2012) reported that the farmers in kole land of Kerala are tempted to use more seeds because of the fear of seed germination problems and survival of plants due to the acidity and other toxicity. High seed rate in the Alappuzha have been observed in some of the earlier studies as well (Johnkutty and Venugopal, 1993). In terms of percentage, the cost of seed was 11 and 6 to cost A for Alappuzha and Palakkad respectively.

4.5.1.1.4 Manures and Fertilizers

Scientific application of fertilizers and manures is an important aspect in paddy cultivation. Certain differences were noticed on application of manures and fertilizers in Alappuzha and Palakkad. Due to the non availability of farm yard manures, it was not used by the farmers in Alappuzha but in Palakkad few farmers use farm yard manure who owns cattles. Paddy farms in Palakkad district cultivating green manure crops during the fallow season in order to reduce their dependence on

organic manures from outside and it was not practiced by the farmers of Alappuzha. Chemical fertilizers used in the study area were factamfose, urea and potash. Average cost of fertilizers in Alappuzha and Palakkad were found Rs 2805.85 and Rs 3805 per hectare respectively. Average cost of liming was found 1991.98 and Rs 7916 per hectare respectively for Alappuzha and Palakkad. Application of lime was seen more in Palakkad but in Alappuzha farms they use lime in alternate years. For the estimation of costs, the organic manures and chemical fertilizers are valued at their respective market price.

4.5.1.1.5 Plant Protection

Expense on plant protection is another component of total costs. Not many differences were noticed on plant protection measures in Alappuzha and Palakkad district. Weeds were the main problem that troubles the farmers in Alappuzha and Palakkad. The uniformity in sowing and use of same seeds with similar duration reduced the attack of pests and diseases in Alappuzha and Palakkad. Average cost for plant protection chemicals in Alappuzha and Palakkad amounted to Rs 4214.49 and Rs 7916 per hectare respectively.

4.5.1.1.6 Irrigation

Instead of irrigation dewatering is practiced in Alappuzha . Dewatering was done by private contractors who take up the work in auction. Usually individual farmers have to pay Rs. 700 to Rs. 1200 per hectare as dewatering charges (Nerma). Majority of the selected cultivators in Palakkad district depend mainly on canal for irrigation. The canal irrigation is cheaper and was found to have negligible cost.

4.5.1.2 Fixed Costs

Items normally included under the category of fixed costs are, land revenue, rent and depreciation on farm buildings, machinery, equipments and implements

The basic land revenue charged from the cultivators accounted to Rs 200 per hectare in Alappuzha and Palakkad. The basic land revenue charged from the cultivators was Rs 98.80 during the period 2007-08. A few paddy farmers have used leased in land for paddy cultivation and the rent per hectare was Rs.11000-24000 in Alappuzha and in 20000-25000 in Palakkad. The rent of leased in land was found be increasing over the years. Thomas (1999) reported per hectare rent amounting to Rs 4500 to Rs. 6000 in Kuttanad taluk. There were no farm buildings mainly or exclusively used for agriculture purposes by the respondent farmers in the study area. Depreciation of farm machinery was not included as most of the farm implements used were hired by paying rents (except *thoomba*, *manvetti*).

Cost of cultivation at cost A for paddy worked out to be Rs 67907.71 per hectare at the overall level in which hired human labour contributed about 41.12 per cent followed by machine labour (21.68 percent). The cost of hired human labour, Rs 26478.59 and Rs 27781.21 per ha for Alappuzha and Palakkad respectively, contributed more to cost A in both districts , but the use of machine labour was higher in Alappuzha (25.6 per cent) than in Palakkad district (18 per cent).

At overall level, cost of cultivation at cost A_2 amounted to Rs 72810 per hectare which is taken by the considering rent paid for leased in land. Cost A2 was Rs 69448 per hectare in Alappuzha and 76173 in Palakkad. Cost B1 worked out by adding interest on fixed capital to the cost A1 and at overall level it came as Rs 66302.33. In Alappuzha and Palakkad cost B1 was found to be Rs 64370.46 and Rs 68234.20 per hectare respectively. Cost B2 worked out by adding rent paid for leased in land and rental value of owned land to the cost B1. At overall level cost B2 was found as Rs 125304.80 per hectare. Cost C1 and cost C2 were calculated by adding imputed value of family labour on cost B1 and cost B2 respectively. Cost C3 worked out by adding cost C2 with 10 per cent of cost C2. The cost of cultivation at cost C1, cost C2 and cost C3 worked out as Rs 79859.41, Rs 138861.90 and Rs 152748.0 per hectare respectively at the aggregate level. Invariably at various cost concepts the

farmers in Palakkad were incurring more costs than Alappuzha. It was due to two reasons, firstly the cost of land preparation was more in Palakkad in mundakan cultivation which requires more number of human labourers and secondly, use of lime was seen more in Palakkad.

4.5.2 Returns

Estimation of average yield, gross returns and net returns from paddy in Alappuzha and Palakkad is presented in the Table 16. Average yield of paddy at aggregate level was recorded as 5341.97 Kg per hectare. Average yield of paddy was recorded more in Alappuzha. District wise analysis of productivity of paddy by the Department of Economics and Statistics during the year 2013-14 revealed that productivity was higher in Alappuzha. The average gross returns obtained by the paddy farmers were Rs 100939.80. The gross returns obtained by paddy farmers in Alappuzha and Palakkad district were Rs 102803.44, Rs 99076.17 respectively. Net returns obtained from Alappuzha and Palakkad were recorded as 38792.78 and 31168.46 respectively.

Table 17. Yield and returns from paddy

Components	Alappuzha	Palakkad	Overall
Average yield of paddy (kg/ha)	5456.96	5226.98	5341.97
Gross returns (Rs/ha)	102803.44	99076.17	100939.80
Cost of cultivation (Rs/ha)	64010.66	67907.71	65959.18
Net returns (Rs/ha)	38792.78	31168.46	34980.62

4.5.3 Returns per rupee of expenditure

In order to go in for an economic activity, one has to compare costs and its returns. Returns per rupee of expenditure gives the return per rupee invested on cultivation. Returns per rupee of expenditure of paddy for the districts Alappuzha and Palakkad are presented in the Table 17.

Table 18. Returns per rupee of expenditure of paddy based on different cost concepts

Costs	Alappuzha	Palakkad	Overall
Cost A1	1.60	1.46	1.53
Cost A2	1.48	1.30	1.38
Cost B1	1.59	1.45	1.52
Cost B2	0.85	0.76	0.80
Cost C1	1.31	1.21	1.26
Cost C2	0.76	0.69	0.73
Cost C3	0.69	0.62	0.66

Returns generated per rupee invested were found to be highest in Alappuzha district. It was found to be 1.60 in Alappuzha and 1.46 in Palakkad on cost A1 basis. It is attributed to less use of hired labour and lime in paddy fields of Alappuzha than Palakkad. In Alappuzha and Palakkad, cultivation of paddy was found profitable at cost A2, cost B1 and cost C1. Returns per rupee of expenditure of paddy were found less than one at cost B2, cost C2 and cost C3. Returns per rupee of expenditure of paddy at cost B2 were 0.85, 0.76 respectively for Alappuzha and Palakkad and the ratio were less than one. It indicates that returns covered only 85 per cent of cost of cultivation in Alappuzha and 76 per cent in Palakkad. It implied that paddy cultivation is not profitable when considering rental value of owned land, rent paid for leased in land and management input. In Alappuzha and Palakkad returns per rupee of expenditure of paddy was found 0.76, 0.69 respectively at cost C2 and 0.69 and 0.62 respectively at cost C3. So it can be concluded that paddy cultivation was

not profitable after considering rent paid for leased in land, rental value of owned land and imputed value of family labour.

4.5.3 Cost of Production of Paddy

An attempt is made here to work out the cost of production per quintal of paddy. This is a principal measure of the efficiency of cultivation. The cost of production of paddy per quintal in Alappuzha and Palakkad farms are given in Table 10.

Cost of production of paddy per quintal is estimated by dividing the cost of cultivation per hectare (after deducting the value of by- product per hectare from the cost of cultivation per hectare) by the quantity of paddy produced per hectare. The value of the by-product is not taken in the present study because due to machine harvesting in Alappuzha and Palakkad, the straw will be broken in to tiny pieces which in this form cannot be marketed. Considering cost C3 the cost of production was Rs 2859.91 per quintal and for Alappuzha and Palakkad Rs 2718.08 and Rs 3026.52 per quintal respectively.

Table 19**.** Cost of production of paddy per quintal

Costs	**Alappuzha (Rs/qtl)**	**Palakkad(Rs/qtl)**	**Overall (Rs/qtl)**
Cost A1	1173.21	1299.17	1234.96
Cost A2	1272.88	1457.30	1363.24
Cost B1	1179.81	1305.42	1241.38
Cost B2	2213.78	2501.12	2346.08
Cost C1	1437.01	1555.7	1495.21
Cost C2	2470.99	2751.38	2599.92
Cost C3	2718.08	3026.52	2859.91

Cost of production per quintal at cost A1 was found more in Palakkad and it was recorded as Rs 1299.2 and Rs 1173.21 per quintal in Alappuzha. Invariably at all costs in the cost of production in Palakkad is more than Alappuzha.

4.6 RESOURCE USE EFFICIENCY

Resource use efficiency means how efficiently the farmer can allocate their resources in the production process. Since the availability of the resources is very limited, efficiency of resource allocation is very important. Cobb – Douglas production function was used to estimate the effects of various inputs for the production of paddy. Five independent variables namely cost on hired human labour, machine labour, seed, fertilizer and plant protection chemicals were taken as independent variables and returns was taken as dependent variable. The results of the functional analysis are given in the Table 19.

Table 20. Estimated production elasticities and related statistics of Cobb- Douglas production function model

Explanatory variable	**Alappuzha**	**Palakkad**
Human labour cost	0.20	0.11
Machine labour cost	0.22 (2)	-0.22
Seed cost	0.32 (5)	-0.004
Fertilizer cost	0.35	1.53 (1)
Plant protection chemicals cost	0.18 (7)	-0.40
Adjusted R^2	0.98	0.98
Returns to scale	0.97	1.01

(Figures in parenthesis indicates per cent level of significance)

The coefficient of determination adjusted R^2 of the model was 0.98 for respondents in both locations. It indicates that about 98 per cent of the variations had

been explained by the explanatory variables, which were included in the model. The regression equation fitted for Alappuzha and Palakkad is given in Table 20.

Table 21. Fitted regression equations

Districts	**Equation fitted**
Alappuzha	$Y = 0.20\ X_1 + 0.22\ X_2 + 0.32\ X3 + 0.35\ X_4 + 0.18\ X_5$
Palakkad	$Y = 0.11\ X_1 - 0.22\ X_2 - 0.004\ X3 + 1.53\ X_4 - 0.40\ X_5$

Where

Y = Returns (Rs/ ha)

X_1 = Cost of human hired labour (Rs/ ha)

X_2 = Cost of machine labour (Rs/ ha)

X_3 =Cost of seed (Rs/ ha)

X_4 = Cost of fertilizer (Rs/ ha)

X_5 = Cost of plant protection Chemicals (Rs/ ha)

In Alappuzha, out of five variables considered the elasticity coefficients of machine labour cost, seed cost and plant protection cost were found to be significant. The production elasticity of machine labour was found 0.22 which indicated that one per cent increase in the expenditure of machine labour would increase gross return by 0.22 per cent which was found significant at 2 per cent level. Similarly, coefficient for seed cost was found 0.32 which was found significant at 5 per cent level, indicated that one per cent increase in the expenditure of seed cost would increase gross returns by 0.32 per cent. Regression coefficient for cost of plant protection chemicals was found 0.18 which was also found significant at 7 per cent level. In Palakkad, only fertilizer cost was found to be significant which implied that a one per

cent increase in the expenditure on fertilizer would increase the returns by 1.53 per cent. All these variables had exhibited positive relationship with production.

In this study, the scale of production was estimated by summation of all the production co-efficients which is a direct measure of returns to scale. In Alappuzha and Palakkad the returns to scale obtained were 0.97 and 1.01 respectively which means that production function exhibit constant returns to scale. Returns to scale are said to be constant if we increase all factors (*i. e.,*scale) in a given proportion and the output increases in the same proportion (Ahuja, 2013).

4.6.1 Allocative Efficiency of Inputs

Allocative efficiency is a measure of how an enterprise uses production inputs optimally in the right combination to have maximum profits. (Inoni, 2007 as mentioned by Douglas, 2008).

Table 22. Allocative efficiency of inputs

	Alappuzha				Palakkad			
Particulars	Geometric mean	Coefficient	MVP	MVP/ MFC	Geometric mean	Coefficient	MVP	MVP/MFC
Gross return	392562				220409.30			
Machine labour cost	62308.4	0.22 (2)	1.41	1.41	-	-	-	-
Seed cost	24903.5	0.32 (5)	4.59	4.59	-	-	-	-
Fertilizer cost	-	-	-	-	26133.41	1.53 (1)	12.92	12.92
Plant protection chemical cost	15085.6	0.18 (7)	4.77	4.77	-	-	-	-

(Figures in parentheses indicate per cent level of significance)

In order to test the allocative efficiency, the ratio of marginal value product (MVP) to the ratio of marginal factor cost (MFC) for each input was computed and tested for equality. The marginal value productivity of a particular resource represents the additional to gross returns in value term caused by an additional unit of that resource, while other inputs are held constant. To calculate MVP, geometric mean of returns per hectare, geometric mean of independent variables, elasticity coefficient was used. Allocative efficiency of inputs in Alappuzha and Palakkad district were presented in Table 21

It was observed that in Alappuzha, the ratio of (MVP/MFC), 'k' of machine labour cost, seed cost, plant protection chemicals cost were above one. Hence it can be inferred that these inputs were underutilized and adjustment can be done to make to an optimum level. In Palakkad 'k' value for fertilizer alone was found to be above one. It indicated fertilizer was found underutilized.

4.7 EXTENT OF ADOPTION

Extent of adoption of farmers of Alappuzha and Palakkad districts was analyzed and is presented in the Table 22.

Adoption level of seed rate, manures, N P and K were measured in comparison with Package of Practices Recommendations by KAU (2011). Generally, for paddy recommended seed rate is 80-100 kg per hectare for broadcasting. But seed rate may be enhanced from 80-100 kg per hectare to 125 kg per hectare for Kuttanad. The average adoption rate was 16.6 and 21.67 per cent more than the recommended seed rate in Alappuzha and Palakkad respectively.

A fertilizer dose of N: P_2O_5: K_2O: of 90:45:45 kg per hectare is recommended for the paddy. From the table it can be observed that all the farmers in the study area were using fertilizers. In Alappuzha, the recommendations were followed in the case of nitrogen but an under adoption to the extent of about 10 per cent and 14 per cent

was noticed for phosphorous and potash. For Palakkad the adoption rate was 102.56, 98.44 and 86.89 per cent respectively for N P K. Average adoption rate of FYM by adopted farmers in Palakkad was only 26.67 per cent of the recommended rate. In Alappuzha the farmers were not using farm yard manure (FYM) at all and in Palakkad only 20 per cent used FYM.

Table 23. Extent of adoption

Items	Alappuzha					Palakkad				
	Seed rate (Kg ha^{-1})	**N**	**P**	**K**	**FYM (Kg ha^{-1})**	**Seed rate (Kg ha^{-1})**	**N**	**P**	**K**	**FYM (Kg ha^{-1})**
No. of farmers	30 (100)	30 (100)	30 (100)	30 (100)	-	30 (100)	30 (100)	30 (100)	30 (100)	6 (20)
Recommended level (Kg/ ha)	125	90	45	45	5000	100	90	45	45	5000
Average adopted rate by sample farmers(Kg/ha)	145.83	89.70	40.80	38.70	-	121.67	92.30	44.30	39.10	1333.33
Average extent of adoption by sample farmers(%)	116.66	99.67	90.67	86.00	-	121.67	102.56	98.44	86.89	26.67

(Figures in parentheses represent the percentages to the total number of sample)

4.8. CONSTRAINTS AND SUGGESTIONS IN PROCUREMENT FROM FARMERS AND PROCUREMENT AGENCY.

4.8.1 Constraints

Identifying and knowing the constraints for farmers in procurement of paddy is very important in finding the effectiveness of procurement. There by it helps the economists/policy makers in suggesting suitable policy measures. It helps the scientific community in advocating changes in post harvest management of paddy.

Garrett's ranking method was employed to indicate constraints associated with paddy procurement and were identified in consultation with paddy farmers in the study area. The respondents were asked to rank paddy procurement constraints. When the constraints were provided to farmers, they ranked according to the order in which they felt most serious. The individual's ranks were converted into percent position by using the Garret scoring technique. Constraints of the respondents in procurement of paddy were presented in the Table 23. It was found that major constraints among the paddy farmers selling paddy to procurement agency was that the amount of procurement available only in installments and difficulty as amount is not available in time. Farmers also had problem on inadequate time of procurement of paddy. Yet another problem faced by the respondent farmers in the study area was the restriction on quantity of procurement and quality of produce for procurement. Procurement agency was procuring paddy up to limit of 5500 Kg per hectare. Famers were forced to sell the remaining quantity of paddy produced in the open market with lesser price.

The major constraints faced by the paddy procurement agency were lack of infrastructural facilities in procurement, lack of skilled labours, delay in fund transfer.

Table 24. Constraints of the respondent farmers in procurement of paddy

Sl. No	Constraints	Alappuzha		Palakkad	
		Garrett's score	Rank	Garrett's score	Rank
1	Amount of procurement available only in installments	72	1	69	1
2	Difficulty as amount is not available in time	63	3	65	2
3	Time of procurement is not proper	66	2	62	3
4	Restrictions on quantity of procurement	51	4	50	4
5	Restrictions on the quality of produce for procurement	43	5	48	5
6	Place of procurement is not convenient	42	6	40	6
7	Problem related to delay in the announcement of procurement price	30	7	32	7
8	Procurement agency is not suitable	20	8	20	8

4.8.2 Suggestions

Based on the major constraints some suggestions can be made to improve the effectiveness of procurement. The government should take necessary steps so that the proceeds on procurement can be made available without any delay which is needed for sustaining paddy production. The entire amount should be given soon after procurement in a single installment. Further the restriction in quantity should be removed and delay in procurement should be avoided. The prescribed quality could not be maintained by the farmer due to lack of storage, drying and infrastructural facilities which are essential in times of delay in procurement. Moreover the procurement agencies should be equipped with facilities and funds.

Plate 1. Meeting with farmers

Plate 2. Meeting with officials

Plate 3. Farmers protest in Supplyco

SUMMARY

5. SUMMARY

In Kerala paddy has occupied a pride of place in the agrarian economy. The lush green of paddy fields is one of the most captivating features of Kerala's landscape. It is grown in a vast array of ecological niches, ranging from regions situated 3 meters below mean sea level as in Kuttanad to an altitude of 1400 m as in the high ranges.

Farmers are reluctant to pursue paddy cultivation due to high cost of cultivation, low productivity and low price of paddy which lowers the profitability when compared to other crops. In order to avoid such situations Government has announced a remunerative price for crops through the mechanism of procurement.

Procurement price is the price at which the Government procures commodities from farmers. It acts basically as insurance to cultivators against the possibility of post harvest crash in market prices. It provides incentive, to farmers and stimulates higher production by encouraging the use of modern inputs. Paddy needs to be procured from farmers at reasonably high prices so as to cover cost of production including all fixed and variable costs.

Considering the above aspects the present research study entitled adequacy of procurement price of paddy farmers in Kerala was formulated with the following objectives.

1. To analyse the adequacy of procurement price of paddy in relation to its cost of production.
2. To compare the procurement price of paddy with its farm harvest price.
3. To study the scale of procurement of paddy in Kerala and constraints experienced by the stake holders in the procurement.

The study was conducted during 2014-15 and districts of Alappuzha and Palakkad were selected purposively for collecting data, as these are the two major

paddy growing regions of Kerala. The study was based on both secondary and primary data. Secondary data on cost of production, area, production and productivity for last ten years were collected from Department of Economics and Statistics and data on procurement price, farm harvest price and quantity procured of paddy for the last ten years were collected from and Food and Civil Supplies Department, Kerala. A multistage random sampling technique was adopted for collecting primary data and the sample size was 60. The sample consisted of farmers selling paddy to procurement agencies.

The salient findings of the study are given below

1. Trend analysis on area, production and productivity during the period 2002-03 to 2013-14 revealed that area and production showed a significant negative growth rate of 4.27 and 1.88 per cent per annum respectively and the productivity showed a positive significant growth rate of 2.38 per cent per annum.

2. Comparing the trend analysis of farm harvest and procurement price of paddy, there was more significant growth rate for procurement price (10.94 per cent) than farm harvest price at the rate of 7.25 per cent per annum.

3. The trend analysis of procurement price and scale of procurement revealed that there was a sharp increase in the growth rate of scale of procurement of paddy at the rate of 20.03 per cent annum with increase in its procurement price.

4. Season wise analysis was done to find the adequacy of procurement price in relation to its cost of production using secondary data. Analysis on adequacy of procurement price in relation to cost of production for the period of 2004-05 to 2013-14 in autumn season revealed that at cost A procurement price of paddy was adequate in all the years except 2007-08. At cost B inadequacy was seen in all the years except 2006-07. The procurement price was also inadequate in all the years at cost C. The analysis on adequacy in winter season and summer season revealed that at cost A

procurement price was found adequate in all the years in the study period. At cost B and cost C the ratio was inadequate in all the years.

5. Similarly the measurement of adequacy using primary data revealed that the procurement price of paddy was inadequate at cost B2, cost C2 and cost C3 on estimating the cost of production of paddy. The results using the primary data and secondary data are comparable. In both cases, the inadequacy was reflected when rental value on land and imputed value of family labour were taken in to account. The extent of adequacy was more in the case of primary data analysis.

6. The socio-economic parameters viz family size, age, education and occupational status, size of holding and family income of the respondents were analysed. At the overall level 50 per cent of the farmers were in the age group of 55-65. Only 10 per cent were found less than 45 years of age. It indicates that younger generations are less involved in paddy cultivation. The literacy was 100 per cent among the respondents. At the overall level, majority (58 per cent) of the farmers were having secondary school education followed by higher secondary level (33 per cent). The occupational status of the respondent farmers revealed that at overall level 85 per cent of respondents depended either exclusively on farming or as the main occupation.

7. Majority (43 per cent) of the farmers were having annual income less than one lakh followed by 1-2 lakhs (22 per cent). This indicates that level of income from agriculture is comparatively low. Fifty nine per cent of the farmers were having a farming experience of above 15 years. Relatively new entrants into farming with experience less than 5 years were few. The frequency distribution of the households based on the size of holding revealed that 42 per cent of the farmers were having land holding of above 4 hectare at the overall level. The varieties cultivated by the farmers were Uma, Jyoti and Matta with 68.4, 28.3 and 3.3 per cent respectively

8. Cost of cultivation at cost A for paddy was worked out to be Rs 65959.18 per hectare at the overall level in which hired human labour contributed to about 41.12 per cent followed by machine labour (21.68 percent). The use of machine labour was higher in Alappuzha (25.6 per cent) than in Palakkad district (17.94 per cent). The cost of cultivation in Alappuzha was higher than Palakkad for all costs in the A B C cost concepts.

9. Average yield of paddy was 5457 and 5227 Kg per hectare for Alappuzha and Palakkad respectively. Average yield of paddy was recorded more in Alappuzha. Net returns obtained from Alappuzha and Palakkad were Rs 38792.78 and Rs 31168.46 respectively and the average came to Rs 34980.62

10. Returns generated per rupee invested were found to be higher in Alappuzha district at all concepts. It was found 1.6 in Alappuzha and 1.46 in Palakkad on cost A1 basis, where the paid out costs alone are considered. This may be due to less use of lime and fertilizers by the farmers in Alappuzha than Palakkad. Paddy cultivation was profitable at cost C1 but when rental value of owned land, imputed value of family labour and management input was included the B-C ratio was 0.69 and 0.62 for Alappuzha and Palakkad respectively.

11. Cost of production per quintal at cost A1 was found more in Palakkad and it was recorded as Rs 1299.2 and Rs 1173.21 in Alappuzha.

12. Cobb – Douglas production function is used to estimate the effects of various inputs for the production of paddy using five independent variables namely cost of hired human labour, machine labour, seed, fertilizer and plant protection chemicals and returns as the dependent variables. About 98 per cent of the variations had been explained by the explanatory variables, which were included in the model. In Alappuzha, out of five variables considered the elasticity coefficients of machine labour cost, seed cost and plant protection chemicals cost are found significant. In

Palakkad, only fertilizer cost was found to be significant. All these variables had exhibited positive relationship with production.

13. In this study, the scale of production was estimated by summation of all the production co-efficients which is a direct measure of returns to scale. In Alappuzha and Palakkad the returns to scale obtained were 0.97 and 1.01 which means that production function exhibit constant returns to scale.

14. From the allocative efficiency analysis it was observed that the ratio of (MVP/MFC), 'k' of machine labour cost, seed cost, plant protection chemicals cost in Alappuzha and cost of fertilizer in Palakkad were above one. Hence it can be inferred that usage of these inputs were not optimal and can be increased further.

15. Extent of adoption of farmers of Alappuzha and Palakkad districts was analyzed and adoption level of seed rate, manures, N P and K were measured in comparison with Package of Practices Recommendations KAU (2011). Average adoption of seed rate was found more than the recommended rate by 16.6 and 21.67 in Alappuzha and Palakkad respectively. On examining the extent of adoption of N P K, the recommended dose of nitrogen was followed but for P and K an under adoption was seen. Average adoption rate of FYM by adopted farmers in Palakkad was only 26.67 per cent of the recommended rate. In Alappuzha the farmers were not using FYM at all and in Palakkad only 20 per cent used FYM.

16. Garrett's ranking method was employed to indicate constraints associated with paddy procurement and were identified in consultation with paddy farmers in the study area. It was found that major constraints among the paddy farmers selling paddy to procurement agency was that the proceeds of procurement available only in instalments and difficulty as amount was not available in time. Moreover procurement was not effected in time. Yet another problem faced was the restriction on quantity of procurement and quality of produce for procurement. Procurement

agency was procuring paddy up to limit of 5500 Kg per hectare. Famers were forced to sell the remaining quantity of paddy produced in the open market with low price.

17. The major constraints faced by the paddy procurement agency were lack of infrastructure facilities for procurement, lack of skilled labours, and delay in fund transfer.

Rice being the staple food of Kerala, the decreasing trend in area and production is a matter of concern. Procurement price of paddy is inadequate with cost of production while considering rent on leased land, rental value of owned land and management inputs. It is appreciable that the cost of production is atleast at cost A is covered by the procurement price. The excess of procurement prices over the cost of production would reveal the level of incentives given to producers. The state is having high competitiveness of crops and for people who depend on farming, the present procurement price is not adequate to sustain them. For this there is a need to increase the procurement price of paddy in relation to cost of production such that farmers get sufficient profits to promote investment, technology and productivity and there by provide food security.

5.1 Policy options

The estimated requirement of rice for the state is 35-40 lakh tonnes per year and it produces less than one fifth of its requirement. This insufficiency in rice production is increasing year after year due to diminution in area of rice arising out of the large scale conversion of paddy land for raising other crops or for residential purposes. In order to avoid this situation, production of paddy should be increased.

To ensure the food security in Kerala, the agricultural price policy should shift focus on exploiting the agricultural potential of low productivity regions. Since wide fluctuations in yield, price of output and price of inputs are noticed efforts should be made to enhance the profitability of paddy cultivation by regulating the prices and

providing incentives like subsidy. Cost effective machines in paddy cultivation should be introduced in order to meet the hike in wage rate of labourers and reduce the cost of cultivation.

The procurement mechanism should be strengthened by giving thrust to disburse the proceeds of procurement in time, lifting the restrictions in the quantity of procurement and providing the scientific storage facilities so as to maintain the quality of the produce. Moreover the procurement agencies should be equipped with facilities and funds. Assurance of a remunerative price regime is essential for sustained rice production and for meeting the food security of the state.

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APPENDIX

APPENDIX-I

INTERVIEW SCHEDULE FOR DATA COLLECTION FOR THE THESIS ENTITLED ADEQUACY OF PROCUREMENT PRICE FOR PADDY FARMERS IN KERALA

1. **Name and address of the farmer:**

Village :

Panchayath : **Taluk :**

Block : **District :**

Address : **Phone No. :**

2. **Family details**

Name of the member	Sex	Age	Relationship with head	Education	occupation		Annually
					Primary	Secondary	

3. **Holding size**

Particulars	Autumn	Winter	Summer
Total area cultivated			
Area leased in			
Area leased out			

4. **Cropping pattern**

Crop	HYV/Local	Type			Total
		Bearing	Non-bearing	Serile	

5. Agricultural machinery and implements

Implements	Number	Year of purchase	Purchase value	Present value

6. Taxes

1. **Land revenue**
2. **Water tax**
3. **Others (specify)**

7. Cost of cultivation of paddy

A. Ploughing

Items	Bullock pair	Total hours	rate	Tractor/tiller	Total hours	rate
Ploughing						
Levelling						

B. Construction of bunds and channels

Items	hired		Family		Rate	
	Men	women	Men	women	Men	Women
Bunds						
Channels						

C. Seeds and Sowing

Source:

Variety:

Quantity of Seeds:

Total Value:

Sowing of seed	**Hired**	**Family**	**Wage rate**
Men			
Women			

D. Manures and Fertilizers

Manure	**Quantity**	**Value**	**Application Charge**
FYM			
Green Leaf Manure			
Others (specify)			

E. Fertilizers

Fertilizers	**Quantity**	**Value**	**Application Charge**

F. Plant protection

Chemical	**Quantity**	**Time of Application**	**Value**	**Application charge**

G. Irrigation

Source:

Method of irrigation:

Cost of irrigation:

H. Harvesting cost

Harvesting	Total hours	Rate
Machine		
Labour		

I. Post harvest handling

Particulars	Hired		Family		Rate		Total
	Men	Women	Men	Women	Men	Women	
Transportation cost							
Winnowing							
Drying							

8. Constraints faced by the farmers in procurement of paddy

Sl. No	Constraints	Rank
1	Amount of procurement available only in installments	
2	Difficulty as amount is not available in time	
3	Time of procurement is not proper	
4	Restrictions on quantity of procurement	
6	Place of procurement is not convenient	
7	Problem related to delay in the announcement of procurement price	
8	Procurement agency is not suitable	

9. Constraints faced by the procurement agencies in procurement

10. Suggestions regarding improvement of procurement of paddy

APPENDIX II

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "scores"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

ADEQUACY OF PROCUREMENT PRICE FOR PADDY FARMERS IN KERALA

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Abstract of the thesis

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ABSTRACT

The study entitled "Adequacy of procurement price for paddy farmers in Kerala" was conducted at Alappuzha and Palakkad districts. The objectives of the study were to analyze the adequacy of procurement price of paddy in relation to its cost of production, to compare the procurement price of paddy with its farm harvest price and to study the scale of procurement of paddy in Kerala and constraints experienced by the stakeholders in the procurement.

The study was based on both secondary and primary data. Secondary data on cost of production, farm harvest price, procurement price and quantity of paddy procured for the period of ten years from 2003-04 to 2013-14 were collected from Department of Economics and Statistics and Food and Civil Supplies Department, Kerala. Primary data on cost of production of paddy was collected from 30 farmers selected from both the districts using a structured interview schedule.

Trend analysis on area, production and productivity was done to have an understanding of rice scenario of Kerala. Even though area and production showed a significant negative growth rate of 4.27 and 1.88 per cent per annum respectively, the productivity showed a positive significant growth rate of 2.38 per cent per annum. Comparing the trend analysis of farm harvest and procurement price of paddy, there was more significant growth rate for procurement price (10.94 per cent) than farm harvest price at the rate of 7.25 per cent per annum. The study also revealed that there was a sharp increase in the growth rate of scale of procurement of paddy at the rate of 20.03 per cent annum with increase in its procurement price. Season wise analysis was done to find the adequacy of procurement price in relation to its cost of production. Analysis on adequacy of procurement price in relation to cost of production for the period of 2004-05 to 2013-14 in autumn season revealed that at cost A procurement price of paddy was adequate in all the years except 2007-08. At cost B inadequacy was seen in all the years except 2006-07. The procurement price

was also inadequate in all the years at cost C. The analysis on adequacy in winter season and summer season revealed that at cost A, procurement price was found adequate in all the years in the study period. At cost B and cost C the ratio was inadequate in all the years. Similarly the measurement of adequacy using primary data revealed that the procurement price of paddy was inadequate at cost B2, cost C2 and Cost C3 on estimating the cost of production of paddy.

Cost of cultivation and cost of production were found higher in Palakkad district with B-C ratio of 1.47 than Alappuzha district with a B-C ratio of 1.60. Hired labour contributed more to cost A followed by machine labour in both the districts. Cobb- Douglas production function was used to study resource use efficiency. By calculating resource use efficiency, machine labour cost, seed cost and plant protection chemicals cost are found under utilized in Alappuzha and only fertilizer was found under utilized in Palakkad. The major constraints faced by the paddy farmers selling paddy to procurement agency was the amount for procurement available only in installments and difficulty as amount is not available in time.

Rice being the staple food of Kerala, the decreasing trend in area and production is a matter of concern. It is appreciable that the cost of production is atleast at cost A is covered by procurement price. The state is having high competitiveness of crops and for people who depend on farming, the present procurement price is not adequate to sustain them. Moreover the receipts due to farmers on account of procurement should be made available without any delay. Assurance of a remunerative price regime is essential for sustained rice production for meeting the food security of the state.