ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF KAIPAD PADDY IN KANNUR DISTRICT

By

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(2012-11-146)

ABSTRACT OF THE THESIS

Submitted in partial fulfillment of the requirement for the degree of

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DECLARATION

I, hereby declare that this thesis entitled **"Economic analysis of production and marketing of Kaipad paddy in Kannur district"** is a bonafide record of the research work done by me during the course of research and that the thesis has not been previously formed the basis for the award to me of any degree, diploma, fellowship, or other similar title, of any other university or society.

Vellanikkara
01-08- 2014

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Certified that the thesis entitled **"Economic analysis of production and marketing of Kaipad paddy in Kannur district"** is a bonafide record of research work done independently by **Ms. Radhika A. M. (2012-11-146)** under my guidance and supervision and it has not previously formed the basis for the award of any degree, diploma, fellowship, or associateship to her.

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"Dedicated to the farming community in Kaipad,

striving to make our lives better"

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Radhika A. M

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Introduction

1. INTRODUCTION

Rice is the staple food of more than half of the world's population and almost 70 per cent of the world's poor residing in Asia (Diouf, 2003). The food grain production in India during 2011-2012 reached an all-time high of 259.32 million tonnes and the production of paddy during the year was 104.3 million tonnes accounting for about 29 per cent of the global production (GOI, 2012-13). Despite these achievements, the productivity of rice in India is comparatively low and ought to be raised for making the production sufficient to meet the needs of the growing population. With limited scope for expansion in area, productivity enhancement needs to be the major approach for rice which is the choicest crop of millions of farmers not only for their livelihood security but also for meeting the food security needs at the household level. Although the growth in yield of wheat and rice in major growing states of India has been slowing down, the actual yields are far below the agro-ecologically attainable yields, which suggest that there are still considerably bridgeable yield gaps in India (FAO, 2003).

Rice is the most important food crop of Kerala accounting for about 10 per cent of the net area sown and almost 100 per cent of production of cereals in the state. But paddy cultivation has witnessed a steady decline since 1980, from 8.02 lakh hectares in 1980-81 to 2.08 lakh hectares in 2011-2012. The production also showed a decreasing trend from 12.72 lakh tonnes to 5.68 lakh tonnes in the same period and the state is producing only about 12 per cent of its requirement (GOK, 2012). The approaches to bridge the gap of demand for rice to current level of production could be by the expansion of rice area (horizontal expansion), increase of yield (vertical expansion), yield gap bridging and reduction of yield losses (Chaudary, 2000). At present, rice occupies only the third position in area among the agricultural crops of Kerala and is far behind tapioca and rubber. The deficit in production is widening due to reduction in area at an alarming rate which could be attributed to large scale conversion of paddy fields for raising other crops and residential purposes. In addition to this, the scarcity of labour and

the concomitant rise in wages have increased the cost of production which are weaning away farmers from rice cultivation (Leenakumari, 2011).

One fifth of the area in Kerala state is categorised as wetland which is characterised by soils that remain water logged or submerged under water for whole or part of the year. There are about 217 wetland areas in Kerala which include the unique ecosystems like marshy and water logged areas, vast areas of paddy cultivation associated with backwaters, and lakes (Vanaja, 2013). Kaipad, like the Pokkali tract of south Kerala, is a saline prone, naturally organic rice production tract of north Kerala. Kaipad farming was evolved in a wetland ecosystem which consists of marshes, swamps, ponds and paddy fields and the Kaipad fields extend in Kozhikode, Kannur and Kasargode districts. The area is swampy and waterlogged, experiencing salinity during summer owing to nearness to sea and floods during monsoons. Normally, a single crop of rice is possible during monsoon, when salinity of the soil is comparatively low and the cultivation starts in April and ends by October. After paddy harvest, Kaipad fields are used for prawn filtration. The seedlings survive in waterlogged conditions by growing up to a height of about two metres. But as they mature, they bend over and collapse with only the panicles standing upright. While harvesting, only the panicles are cut and the rest of the stalks are left to decay in the water, which become feed for the prawns. The waterlogged condition of this region throughout the year facilitates the easy degradation of dead remains of plants and animals (Vanaja *et al.*, 2009; Jayan and Sathyanathan, 2010).

Even though there were about 2,500 ha of Kaipad paddy fields in Kannur district, large tracts of Kaipad fields suitable for traditional paddy and shrimp cultivation are left fallow for the past few years. Cultivation has declined owing to high wage cost and scarcity of labour including the family labour. Since the area is marshy and saline prone, the cultivation practices from land preparation to harvest are cumbersome and risky, which require skilled labourers. Taking into consideration the productivity of the traditional cultivars, it is extremely difficult to sustain the cultivation given the high cost of labour. There are also problems

associated with management of labour in terms of timely availability, supervision and the related aspects. Since the area is swampy, complete mechanization of operations is not possible and hence the only alternative to sustain Kaipad cultivation is to increase the production and thereby the income, for which productivity enhancement is inevitable. The traditional cultivars are characterised by susceptibility to lodging because of poor culm strength and excessive culm height, poor grain quality like awn on grains and heavy shattering of grains.

Bunds were constructed in Kaipad as a water control measure for dewatering the fields in the 20th century and this led to the development of prawn/fish culture as an important activity in Kaipad lands. As the prawns had no local market then, it was only a source of supplementary food for farmers. With the development of export market for prawns, commercial shrimp filtration become lucrative and more actors like the fish harvesters cum traders came to play and the cultivators are now more attracted towards shrimp filtration rather than rice cultivation (Nair *et al.*, 2002).Thus, increase in the spatial extent of the modern shrimp farms is exerting considerable stress on the wetlands as evident from deteriorating physico-chemical characteristics and water quality. Construction of ponds and reclamation of wetlands for establishing modern farms have not only encroached into the common property resources but have brought changes in sustainable land use pattern (Jayan and Sathyanathan 2010). The factors like shift from the ecologically fragile rice fish farming to semi-intensive fish farming and spread of mangroves have been exerting pressure on the Kaipad ecosystem, affecting the livelihood of the farmers.

Though the income from prawn culture has compensated for the loss in Kaipad paddy farming to a limited extent, some of the cultivators are keeping their land fallow, thereby causing the spread of mangroves. As in many other parts of the world, the mangrove ecosystem has diminished in its extent drastically and has acquired a threatened status in Kerala (Basha, 1991). Also the Kerala Forest Department apparently has a prospective plan to buy out the potential lands along estuaries and initiate mangrove afforestation. Thus, there is a

pronounced resource conflict rather a paired paradox whether to conserve the mangroves or Kaipad paddy tracts.

High Yielding Varieties of rice *viz.*, Ezhome-1 and Ezhome-2 suitable for Kaipad tracts of north Kerala were released by KAU in 2010.The average yield of 'Ezhome-1' and 'Ezhome-2' is 3.5 tonnes per hectare and 3.2 tonnes per hectare respectively, which is 70 per cent and 60 per cent more than that of local cultivars. These varieties differ in duration, and are having distinct morphological, qualitative traits, different mode of salinity tolerance mechanisms, and impart varietal diversity to the unique ecosystem of Kaipad. The newly developed rice cultures have all the favourable characters like tolerance to salinity, non-lodging, intermediate plant type, high yield, acceptable grain qualities, and resistance to all kinds of pests and diseases in natural Kaipad field condition. These cultures can tolerate flooded condition even immediately after sprouting and at early seedling stages. As major part of the experiment was conducted in the farmers' field with the participation of farmers in the selection programme, they have been convinced about the yield potential and suitability of the new cultures for the saline and flooded conditions of Kaipad (Vanaja *et al.*, 2009).

Further, efforts were also made by KAU to rejuvenate the Kaipad areas and a project under the Rashtriya Krishi Vikas Yojana (RKVY) titled 'Comprehensive development of Kaipad rice tracts' was one among such initiatives. In a pioneering effort, in line with the objectives of the project, a society named 'Malabar Kaipad Farmers' Society' (MKFS) was formed and registered in July 2010. The objective of the society was to increase the area under rice cultivation in the Kaipad tracts and improvement of procurement, processing, and marketing of Kaipad rice. The society was instrumental in forwarding a proposal for Geographical Indication (GI) registration and Kaipad rice is now registered in the Geographical Indications Registry (GIR) of the Government of India. The GI tag improves the market prospects of the rice variety and earns commercial benefits for farmers by enhancing its authenticity. The society now has plans to market Kaipad rice as a brand after getting the GI tag. This will also

have implications on the marketability of Kaipad rice, especially when there is increasing demand for organic rice across the world.

Lack of availability of labourers, especially skilled labourers and high wage rate prevent the paddy growers from adopting timely crop management practices. The Food Security Army (FSA) was another initiative of the above mentioned project to equip the Malabar Kaipad Farmers' Society. It is a reserve army of well-equipped agricultural labourers whose objective is to ensure food security, with a special focus on Kaipad farming in the district. The FSA had been formed in Ezhome, Pattuvam, Kannapuram and Cherukunnu grama panchayats of Kannur district having large extent of Kaipad fields. In order to promote Kaipad farming, Department of Agriculture has trained 80 members of the food security army in four panchayats of the district with 20 members from each panchayat. The FSA was formed for meeting the shortage of well-equipped and trained work force for doing farm work. The FSA has been planned to secure work throughout the year and for this the members are equipped with different training programmes on agricultural and allied activities, agricultural mechanisation, planting material production and agro-processing activities. Meanwhile, in an yet another initiative to revive the Kaipad system, the Department of Fisheries has also initiated a pilot project for restoration of Kaipad fields to the system of rotational rice and shrimp farming through the Agency for Aquaculture Development.

In spite of all the above initiatives, the farmers in Kaipad tracts face various constraints such as labour scarcity, high cost of production, low market price, fragmentation of holdings, lack of mechanisation, non- availability of seeds of improved varieties, crop loss due to lack of proper drainage facilities and deficient paddy procurement programmes. Even though the production system is naturally organic and the rice produced in Kaipad tracts is exclusively organic, the farmers are not getting any premium price for their produce because it is being marketed at the same price as that of inorganically produced rice. This assumes considerable significance in the state of Kerala, which has an organic farming

policy. These issues need to be addressed for ensuring a sustainable development of Kaipad farming.

With the above background, the present study aimed at estimating the economics of cultivation of Kaipad paddy in a comparative framework with traditional and HYV Kaipad varieties under scenarios like 'with shrimp in sequence' and 'without shrimp in sequence'. The study identified the yield gaps and the factors contributing to yield gap. The study also identified the existing marketing channels and the price spread in each of the channels. The above analyses along with the study of constraints have helped in tracing the reasons for reduced profitability of rice cultivation in Kaipad tracts. The findings of the study could provide insights into the reasons behind declining Kaipad area which in turn could form the basis for policy recommendations for increasing paddy production in the district.

The specific objectives of the study are

1) To work out the costs and returns of cultivation of Kaipad paddy.
2) To estimate the magnitude of yield gap and the factors contributing to yield gap.
3) To identify the marketing channels and price spread in the identified channels.
4) To identify the constraints in production and marketing of Kaipad paddy.
5) To document the cultural practices of Kaipad paddy cultivation.

Limitations of the study

The study has been conducted over a limited period of time in a limited area and hence the results need to be carefully applied in other situations. The results of the study are based on farm level data collected from farmers through pretested interview schedules. Farmers of the area were not maintaining any field book. So the data was collected from their memory and could suffer from recall bias. However, data was cross checked to minimize the errors and misconceptions.

Plan of thesis

The thesis is divided into five sections. The first chapter contains a brief introduction of the topic wherein the background of the research problem, objectives, scope and limitations 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

Review of past literature helps to identify the important methodologies that have been used by other researchers and also the findings from related studies. In this chapter, important past studies relevant to the present study have been reviewed and discussed. The reviews are arranged under the following headings.

2.1. Rice-fish sequential farming systems
2.2. Economics of rice cultivation
2.3. Economics of integrated farming systems
2.4. Factors affecting yield gap
2.5. Marketing channels and price spread
2.6. Constraints in production and marketing of paddy

2.1. Rice-fish sequential farming systems

Based on his study on the sustainability and eco-friendly aspects of rice-fish rotational farming, Panicker (2002) opined that rice-fish rotational farming was economically feasible in the Kuttanad region of Kottayam district. The study concluded that the returns from both fish farming and the subsequent rice crop could be substantially high due to complementary effects of organic recycling of resources and hence, the technology was commercially attractive and ecologically viable.

Sreedharan (2005) reported that Kaipad is a saline-prone naturally organic rice production tract of North Kerala where, rice cultivation and aquaculture are practiced together in coastal brackish-water marshes which are rich in organic matter. The average yield in Kaipad when the rains were favourable, according to him was about 1125 Kg per hectare. There were about 2500 hectares of Kaipad lands ten years ago. With the advent of prawn farming, shrubs began to grow and birds inhabited the area making farming non-profitable and the area has been restricted to 600 hectare.

Nambiar and Raveendran (2009) based on their study in the coastal belt of Kerala tried to unveil the fertility factors of the coastal paddy fields. A total of 32 species of filamentous marine fungi comprising of 20 Ascomycota, two Basidiomycota and 10 Mitosporic fungi were isolated from these fields and hence, the costal paddy fields were found to be ideal environment for the growth and reproduction of marine fungi. The fertility of the costal paddy fields was thus attributed to the capacity of marine fungi to degrade. Though the problem of rice shortage in Kerala could be solved to a certain extend by proper utilisation of these fertile areas, there were serious anthropogenic threats to these paddy fields.

2.2 Economics of rice cultivation

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 56 per cent in case of coconut to 18 per cent for wheat, while for 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 the 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, have adversely affected the profitability of the crop.

Suresh and Reddy (2006) examined the resource-use efficiency of paddy cultivation in the Peechi command area of Thrissur district in Kerala state by studying the resource productivity and allocative as well as technical efficiencies.

The cost of cultivation of paddy in the command area was estimated as Rs.21603 per hectare with a BC ratio of 1.34. The elasticity coefficients for chemical fertilizers, farmyard manure and human labour were significant as well as positive and the marginal returns per rupee increase for these inputs would be Rs.2.83, Rs.1.57 and Rs.1.17, respectively.

Rubinos *et al.*, (2007) made a comparative analysis of the economics of organic and conventional lowland rice farming in Magsaysay using production functions and analysis of costs and returns. The production function analysis showed that even though the yield of conventional rice farms was 23 per cent higher than the organic farms, its high input costs and lower farm gate prices lowered the net returns. Though the difference was not significant, the returns above total costs in organic farming was found to be higher than that of conventional rice farming.

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) procedure. The results revealed that the farm households complied at 47 per cent level with the technology, with a yield gap of 69 per cent and a positive gross margin. The 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 had the expected positive signs. Even though the existing 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 a study on the economics and constraints for rice cultivation in Kaithal district of Haryana. The study covered four villages and the total cost of rice production was estimated as Rs.33779 per hectare. Machine labour and human labour accounted for the major share in total variable cost incurred in the cultivation of rice. Average yield was 4.99 tonnes per hectare and the BC ratio was 1.27.

Dwivedi *et al.*, (2011) studied the economics of basmati rice production in Jammu and Kashmir and estimated the per hectare cost of cultivation in small, medium, large and all farms as Rs.20914, Rs.20960, Rs.18824 and Rs.20233 respectively. The net income per hectare earned was found to be Rs.32450, Rs. 29888, Rs.29506 and Rs.30608 for small, medium, large and all farms respectively.

Manikandan (2011) attempted a study on the impact of NREGS on the labour market with special reference to wage rate and productivity of rice in Kasaragod district of Kerala. Results of the study showed that since the 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 hectare. He suggested that works related to the improvement in productivity of rice must get the first priority under NREGA.

Srinivasan (2012) studied the economics of paddy cultivation in Kole lands of Kerala and estimated the cost of 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 the farmers were able to make some margin 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 realised, the profit was very low and it varied from Rs.63 to Rs.1532 per hectare

2.3. Economics of integrated farming systems

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 break-up of the costs showed that the expenditure on preparatory cultivation, gap filling, weed control and application of fertilizers were accounting for about 58 per cent of the total cost. Human labour was found to be the single largest input based on the cost incurred, accounting for about 50 per cent of the total cost.

A Study conducted by Padmakumar *et al.*, (1990) at the Regional Agricultural Research Station, Kumarakom indicated that in addition to rice production averaging three tonnes per hectare, fish yield ranging from 600 to 1000 kg per hectare could be obtained by simultaneous farming of rice and fish. As compared to the practice of simultaneous farming which requires several modifications to the rice fields to protect the fish from the inherent risk of pesticide applications, rotational farming of rice and fish was found to be more advantageous as it permitted better management practices for both rice and fish.

A report on status of rice-fish farming in India by Ghosh (1992) indicated that India has rice fish farms covering two million hectares, which is the largest reported area of rice-fish culture for any country. He reported that besides better land use, rice-fish culture is lucrative and economises investment on cost of crops. According to him, in Pokkali system where dikes and other earth works already existed, the capital cost for integration is quite low (US$ 5333/16 ha) and an annual investment of US$ 7500 gives a net margin of US$ 2175 with a payback period of one year.

Baruah et al., (2000) conducted a study on the feasibility of rice-fish system in Jorhat district of Assam and reported that the average fish yield from rice-fish

system was 55.12 kg per 0.11 hectare for a period of four months with an additional increase of about 17.65 per cent in rice production. The study suggested the need for encouraging the adoption of integrated rice-fish system for increasing the profitability of rice based farming systems.

Mathew (2001) conducted a study on the economics of rice fish farming system based on a random sample of 200 farmers, 100 each from traditional rice monocropping and rice integrated with fish in Kuttanad. It was found that the cost of cultivation of rice reduced by 29 per cent in rice integrated with fish, of which, reduction in labour cost alone accounted for 20 per cent. Compared to monocropping of rice, the cost of production of rice per quintal through integrated farming system with fish also exhibited a reduction of 34 per cent.

Nair et al., (2002) attempted a study on the rice-fish farming in wetlands of northern Kerala. They reported that cultivation of an acre of Kaipad rice incurred a labour cost of Rs.6384 (that includes paid out costs and imputed cost of family labour), with the expenditure on male labour accounting for about 55 per cent of total labour cost. The cost of cultivation per acre of rice in Kaipad was Rs.6713 and it was noted that 95 per cent of the cost was incurred for labour.

Panicker (2002) conducted a study on the ecological aspects and the microbial activity of rice-fish rotational farming system in the wetlands of Kuttanad, Kerala and reported that this system is a sustainable mode of agricultural practice suitable for the agro-ecosystem of Kuttanad, because it reduced pollution due to the use of pesticides and chemical fertilizers, as they were not required in this farming model. The control of weeds and pests were possible by the activity of fishes and fertilizers were also not required for paddy cultivation as the soil after fish culturing became highly fertile and free from weeds and larvae of pests, resulting in high yield of rice crop. Citing the example of rice-fish rotational farming system in Kuttanad, he also opined that the conversion of paddy fields for other purposes could be prevented by this system as the rice cultivation sequentially with aquaculture brings higher yield.

Goswani (2004) attempted a study on the economic viability of rice-fish culture practiced by the farmers of Assam using Cobb-Douglas production function and reported that a total operational cost of Rs.6441 per hectare was incurred for fish farming and paddy cultivation while, a net profit of Rs.7889 and a rate of return of 28.52 per cent were obtained from rice-fish culture. The study indicated that the rice fish culture is a viable, environment friendly, low cost, low risk additional economic activity with multiple economic benefits including increased income and greater availability of fish to rural farming community.

Dwiana and Mendoza (2006) studied the productivity, profitability and efficiency of rice monoculture and rice-fish culture systems on a comparative framework in Indonesia and found that when compared with rice monoculture, the gross revenue from rice-fish systems was higher by 42 per cent. Rice-fish systems incurred 77 per cent and 79 per cent more expenditure than rice monoculture on total costs and cash costs respectively. Because of the revenue from fish, the net revenue increased by 66 per cent and 47 per cent respectively when the total and cash costs were subtracted and the net revenue in rice-fish rotation was 2.43 times more than rice monoculture.

2.4. Factors affecting yield gap

Chaudary (2000) identified the existence of sizable yield gaps between attainable and actual farm level yields across ecologies, regions within ecologies and crop seasons in all rice growing countries in the Asia-Pacific region. He observed that the yield gap ranges from 10 to 60 per cent between attainable and economically exploitable yields depending on the ecosystem and countries. The highest yield gaps were found in adverse rice production environments including the rainfed and flood-prone areas.

Gaddi *et al.*, (2002) undertook a study with the objectives of estimating the magnitude and sources of yield gap and constraints responsible for yield gap in

cotton, based on primary data collected from 80 farmers of Dharwad and Bellary districts in Karnataka. The results showed that in the study area, the yield gap I was higher than yield gap II and the total yield gap was 1526.30 Kg/ha. The differences in technique of production or cultural practices between the farmers' fields and demonstration plots, was the major contributor to the yield gap. The major constraint identified was non-availability of labour during weeding and peak seasons.

Balasubramani (2005) conducted a study on the yield gap of paddy in the Erode district of Tamil Nadu for the variety ADT-39, which had the maximum acreage in the study area during samba season. The results revealed that yield gap was prevalent among various categories of farmers and it varied from 19.10 per cent to 34.33 per cent. The yield gap analysis revealed that a maximum gap of 34.33 per cent was found among marginal farmers while 24.21 per cent gap was noticed among big farmers. The study concluded that there existed an average yield gap of 25.88 per cent when all the sample farmers were considered together. According to him, the biophysical, socio-economic, management, institutional and policy factors were responsible for yield and profit gaps. Identification of causes for such gaps and development of possible mitigation measures could only be considered as the first step in reducing the yield gap. The second and equally important step was to minimize the knowledge gap between researchers, extension staff and farmers by developing and using viable mechanisms to transfer new knowledge and techniques from researchers to farmers and collect feedback to re-orient research on issues critical to farmers.

Hengsdijk and Langeveld (2009) analysed the yield gap of major crops in the world and suggested that in more advanced economies, where crop levels approach economically attainable yield levels, deficiencies in knowledge systems were more important when compared to abiotic (water and nutrients) and biotic (weeds, pests and diseases) constraints. The biotic and abiotic constraints become more important in situations characterized by large yield gaps, suggesting that

considerable yield gains are possible by improving access to, and availability of water, nutrients and crop protection agents.

Job (2006) evaluated the gap between maximum feasible and actual yields obtained by rice farmers of Alappuzha. A three stage random sampling technique was adopted for the study and frontier production function was used to estimate the Maximum feasible yield (MFY) and yield gap. The yield gap of rice in Alappuzha was estimated as 1588 Kg per hectare with an MFY of 5447 Kg per hectare and actual yield of 3859 Kg per hectare which indicated the existence of constraints in raising the farm-level productivity.

Lekshmi *et al.*, (2006) conducted yield gap analysis of rice in Tamil Nadu by analysing 17 factors, which were perceived by farmers as contributing to the yield gap using multiple regression analysis. Out of the factors studied, high cost of agricultural inputs, non-availability of HYV certified seeds and pest incidence had positive and significant influence on the yield gap. It was also found that low fertility of soil, non-availability of human labour during peak season of planting, lack of proper supply of electricity to oil engines and micro nutrient deficiency in soil had negative influence on the yield gap of paddy.

Lobel and Cassman (2009) reported wide range of yield gaps for rice around the world ranging from 20 per cent to 80 per cent of yield potential. They pointed out that raising average yields above 80 per cent of yield potential was possible only with technologies which either substantially reduces the uncertainties faced by farmers in assessing soil and climatic conditions or that which dynamically respond to changes in these conditions.

Akintayo (2010) studied the determinants of yield gap of lowland rice production in north-central Nigeria by analysing the difference between the potential and actual yield. The study employed a multi-stage sampling technique

with a sample of 144 rice farmers. The results indicated that factors which contribute to the reduction in the magnitude of rice yield gap include increase in the frequency of contacts between farmers and extension workers, increase in fertilizer use per hectare and higher intensity of tractor use.

A study conducted by Ofori *et al.,* (2010) on the yield gap of rice production in Ghana based on FAO yield gap determinants (technical, biophysical, socio-economic and policy) from the perspective of major stakeholders *viz.,* farmers, researchers and project management, identified the main constraints to yield as poor access to credit, low market price, inadequate market access, low know-how in cropping techniques and poor extension and research support which were all policy related. The other constraints identified were poor water application, high incidence of pest, low soil fertility, unreliable water supply for all year round farming, untimely availability of inputs and services, inadequate machinery for land preparation and low seed quality.

Boling *et al.,* (2011) conducted a study on the yield gap and effect of nitrogen and water on jasmine rice in north-east Thailand. It was identified that in farmers fields there was a consistently large yield gap due to nitrogen deficiency. The nutrients levels in the field suggested that there was considerable scope for increasing yields through site specific and time specific nutrient management. The yield gap attributable to water was low because of high rainfall and shallow ground water levels.

Rao (2011) made a comparative economic analysis of the economics and sustainability of System of Rice Intensification (SRI) and traditional methods of paddy cultivation in north coastal zone of Andhra Pradesh for 2008-09 by employing yield gap analysis and reported 31 per cent yield difference between SRI and traditional methods, in which cultural practices showed an effect of 20.15 per cent followed by the effect of input use (10.85 per cent).

Ittersuma *et al.*, (2012) conducted a review on the analysis of yield gap with a focus on the local-to-global relevance of outcomes. They reported that crop production capacity can be evaluated by estimating the potential yield and water-limited yield levels as benchmarks for crop production under, irrigated and rainfed conditions respectively. The differences between the theoretical yield levels and actual farmers' yields defined the yield gaps and precise spatially explicit knowledge about these yield gaps was essential to guide sustainable intensification of agriculture.

2.5. Marketing channels and price spread

Marothia *et al.*, (2007) attempted a study on the economics and marketing of aromatic rice in Chhattisgarh and the results revealed that a large proportion of the produce was retained for home consumption and seeds while, the remaining produce were marketed through two primary marketing channels. The producer's share in consumer's rupee in channel-I was approximately 62 per cent, whereas in channel-II, it could not be worked out due to the non-traceability of the produce beyond rice mills. Susceptibility to pests and diseases, low productivity, non-availability of quality seeds, low price, small number of powerful and well-connected buyers and non-responsive attitude of regulated markets towards aromatic rice were identified as the major constraints for the farmers. Financial constraints and movement-restrictions on aromatic rice across states were the important constraints for the rice millers.

Mahesh *et al.*, (2011) in their study on innovative payment options in agricultural marketing reported that limited access to market information, low literacy level among farmers and multiple channels of distribution were detrimental to both farmers and consumers. Farmers in turn, at the end of the transaction also do not get correct payment for their produce and there were also illegal deductions, unauthorized commission charges, delayed payment as well as payments in long term instalments even running up to next season, and

unauthorised deductions in the weight of the produce while making payments to farmers. The article proposed an e-tendering model with online mode of payment that would help the farmers in receiving full and prompt payment for their produce.

A study was conducted by Rangasamy (2011) to understand the various aspects of investment in agricultural marketing, market related infrastructure and agricultural marketing system in the absence of APMC act in Kerala. Respondents of the study included marketing department officials, farmers, traders, entrepreneurs, bankers, self-help groups, co-operatives, exporters, retail traders, processing units, self-help groups of VFPCK markets, public sector organizations like HORTICORP and state government department officials from Idukki, Cochin, Kozhikode and Wayanad. The study reported that processing and value addition were highly influencing agricultural marketing infrastructure investment in Kerala. The reasons for low investment in agricultural marketing infrastructure in Kerala include lack of APMC act, reduced exports, lack of public-private partnership, less public sector investment and other factors like lack of regulatory environment for agricultural markets, lack of availability of state government subsidy schemes, ineffective state government policies, less involvement in marketing by farmers and increased involvement by traders, poor management of local self-government markets, less market development activities, lack of awareness about central government subsidy, strong trade unionism and labour problems

Tuong (2011) analysed the marketing of rice in the Mekong delta of Vietnam. The marketing channels identified were (i) Producers – Assemblers – Millers – Polishers – Wholesalers – Retailers – Consumers, (ii) Producers – Assemblers/Millers/Polishers – Wholesalers – Retailers – Consumers, (iii) Producers – Millers/ Polishers – Wholesalers – Retailers – Consumers. He reported that price spread of normal rice in the first and second channels indicated that the producers who sold their produce could realize 43.26 per cent of the

consumer's price. The rest 56.74 per cent was shared by other market functionaries. In channel III, producer's share of the consumer's price was higher than that in all the other channels discussed earlier and was about 48.70 per cent of the consumer's price. The future strategies suggested to make rice cultivation more remunerative included establishing of wholesale markets together with building storage and warehousing facilities with reserve capacity in each province and procurement centres. There was a need to reduce the taxes and fees for the traders and their business activities, which could in turn reduce the price spread and thus benefit the rice producer.

Ramesh and Vijayan (2012) studied the marketing of paddy in Cuddalore district of Tamil Nadu and found that 69.33 per cent of the sample farmers sold their produce through commission agents, 21 per cent through regulated markets and the remaining 9.67 per cent through village traders. Most of the farmers preferred commission agents as their intermediary because of the credit facilities offered by them when the farmers were in need.

Shrestha (2012) analysed the factors affecting retail-price spread of rice in Nepal using the relative price spread (RPS) model with cross section data collected from four districts. The flow of the product was traced forward and backward from the selected wholesaler respondents for selecting the farmer and the retailer respondents randomly. The results revealed that the marketing cost, wholesale and retail prices and market information to the farmer significantly influenced the marketing margin. The marketing margin was higher from farm to wholesale market as compared to wholesale to retail market. She concluded that reduction in the transportation cost, improving the market information system, and improving the role of farmer in price determination would help to reduce the marketing margin.

Ramu (2013) investigated the efficiency of marketing channels of paddy in Chittur Taluk in Kerala. The important marketing channels identified in the study

area were (i) Channel I consisting of the producers, Supply-Co, Public Distribution System and consumers; (ii) Channel II consisting of producers, local agents, main agents, local mill, retailers and consumers; (iii) Channel III consisting of producers, local agents, main agents, Kalady-mill, wholesalers, retailers and consumers; (iv) Channel IV consisting of producers, main agents, Kalady-mill, wholesalers, retailers and consumers. The study revealed that the marketing efficiency of channel I is higher than that of the other three channels because of the lowest marketing cost, price spread and the highest producer's price.

2.6. Constraints in production and marketing of paddy

Prakash and Nair (1992) conducted a study to identify the production constraints of rice 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.

Padmanabhan *et al.*, (2001) reported that increasing cost of cultivation due to large increases in prices of inputs like fertiliser, pesticides and labour unaccompanied by any commensurate increase in output price, was the major factor that contributed to the persistent pressure for replacement of rice by other more remunerative crops. Apart from diminishing returns from rice cultivation, acute shortage of labour also discouraged rice farmers from continuing the traditional occupation, as successful rice cultivation demands crop operations at the right season and time which have tempted some of the farmers to switch over to other enterprises.

Reddy *et al.*, (2001) attempted a participatory research in paddy cultivation in Kasaragod district of Kerala. Brainstorming cum data recording sessions were conducted as part of the study. Analysis of problem-cause relationship through farmer participatory approach revealed that low profitability

was mainly due to unavailability of quality seeds, imbalance in the use of fertilizers, improper plant protection measures, weed menace and high labour cost.

Thomas (2002) reported problems and prospects of paddy cultivation in Kuttanad region. The constraints identified in the study were non-availability of required number of labourers during the peak crop season, declining profitability of the crop, militant trade unionism, slow pace mechanization, lack of easy credit and proper marketing facilities, recurring crop failures and uneconomic size of holdings.

Barah (2004) in his report on "Dynamics of rice economy in India: emerging scenario and policy options", has pointed out the need to move away from "rice only" policy towards the "rice- plus" policy, keeping rice production in the centre stage. He has also pointed out the inequitable distribution in modern varieties and yield gap as the other important problems affecting the potential of rice production.

Sachchamarga and Williams (2004) conducted a study on economic factors affecting rice production in Thailand. The general objective of the study was to identify and measure the relative magnitude of the effect of key economic factors affecting Thai rice producers' planting decisions. The results suggested that rice area planted in Thailand was more responsive to changes in area planted in previous years, the amount of rainfall and the availability of agricultural labour than to changes in paddy/rice prices. The study suggested that policies to reduce rural labour shortages could do more to enhance the production of rice in Thailand than annual adjustments in the level of the guaranteed price of rice received by producers.

Devi and Ponnarasi (2009) conducted a study on the modern rice production technology and its adoption behaviour in Tamil Nadu. The reasons for

adoption of SRI technology, as reported by the respondents, were analysed using Garrett ranking. The reasons for practising SRI technology were higher grain and straw yield, reduced requirement of seeds and other inputs, increased returns to labour and high seed quality. Out of the five reasons identified by the respondents, 'higher grain and straw yield' was ranked first, as the farmers in SRI method got higher yield. 'reduced requirement of seeds' was ranked second as in the SRI technology the seed requirement was drastically reduced. The respondents ranked 'less requirement of other inputs', especially water, as the third advantage since the saving of water in rice cultivation was experienced by the farmers who adopted SRI technology. The fourth rank was given to 'increased returns to labour' as the SRI technology requires less labour for weeding, thereby increasing the efficiency. The last rank was given for 'higher seed quality'.

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 in rice production

Vanaja *et al.*, (2009) reported that the major reason 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 famers were related to pollution, eutrophication, encroachment, reclamation, mining and biodiversity loss.

Prabakar *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. Among the various reasons listed for non-adoption of labour-saving technologies by the respondents, the higher cost involved in adoption of technology was ranked first, followed by lack of skill and smaller landholdings as second and third reasons. The complacent attitude of the farmer was ranked as the fourth reason.

Basorun and Fasakin (2012) attempted to analyse the factors influencing rice production in Nigeria by selecting 146 respondents from the 21 residential quarters of the region, through proportional random sampling technique. Using a multiple linear regression model, the study discovered that the status of the rice farmers, the area of land cultivated, availability of market for the rice products, the number of labourers engaged in production and the use of agro-chemicals were crucial factors influencing production. The paper offered useful planning policies, particularly, farm mechanization, cooperative fund, regional market development and decentralization of agricultural input supply to enhance rice production and meet regional food demand.

Nirmala *et al.*, (2013) conducted a study to analyse the perceptions and constraints in cultivation of hybrid rice in Ranchi district of Jharkhand. The relative importance of the perception of farmers regarding their willingness to continue hybrid rice cultivation in the next season were prioritized using Garrett ranking technique. The results revealed that main reason to continue cultivation of hybrid rice in Ranchi district was hope of getting better yield which ranked first with a Garrett score of 71.49 followed by higher pricing ability, better taste, higher profitability, suitable for parboiling, better resistance to pests and diseases with Garrett scores of 66.56, 62.36, 53.87, 48 and 47.21 respectively. The main constraints in adoption of hybrid rice technology were high management cost, higher seed costs, lower pricing ability, high pests/disease incidence, poor

cooking quality and lower profitability with Garrett scores of 71.09, 66.45, 65.82, 62.18, 57.73 and 52.55 respectively.

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 mechanisation of rice cultivation. Socio-economic constraints identified included small size of holdings, lack of unity among farmers to adopt group mechanisation followed by the 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 mechanisation strategy where individual holdings were too small to own machines.

A study was undertaken in Mahasamund district of Chhattisgarh to identify the constraints in production, marketing and processing of the paddy by Sori *et al.,* (2014). Data were collected from the selected farmers, traders and processors through personnel interview by using pre-structured survey schedule. 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. In marketing, lack of transportation and road facility, lack of regulated market and un-remunerative price were observed as severe problems while problems perceived by processors of the study area were electricity cuts and efficiency issues of processing units.

Methodology

3. METHODOLOGY

In this chapter, a brief description of the study area and the research design followed in the present study including the sampling procedure, the method of data collection and tools of analysis are discussed. The section enables the readers to evaluate the work performed and permit them to replicate the study if needed.

3.1 AREA OF THE STUDY

The study was undertaken in Kannur district of Kerala state where there is large extent of area under Kaipad cultivation. The present study attempts a comparative economic analysis of the rice-shrimp sequential farming system in Kaipad tracts of Kannur district with households growing traditional and HYV of paddy.

3.1.1 Kannur district

Kannur, known as the land of looms and lores came into existence on 1st January 1957. As per 2011 census, the district accounts for about 7.56 per cent of the total population of the state. Kannur is the sixth most urbanized district in Kerala, with an urban population of about 65 per cent of the total population in the district. Majority of the population of the district is dependent directly or indirectly on agriculture for their livelihood. The main crops grown in the district are paddy, coconut, pepper, cashew, tapioca, arecanut and rubber.

3.1.1.1 Location

Kannur district is situated between 11° 52' 0" North latitude and 75° 21' 55" East longitude at an altitude of 344 m. The total geographical area of the district is 2968 sq.kms. Kannur district is bounded by Kasaragod district in the north, Kozhikode district in the south and Wayanad district in the south-east. In the east, the district is bounded by the Western Ghats, which forms the border with Karnataka state and the Arabian Sea lies to the west.

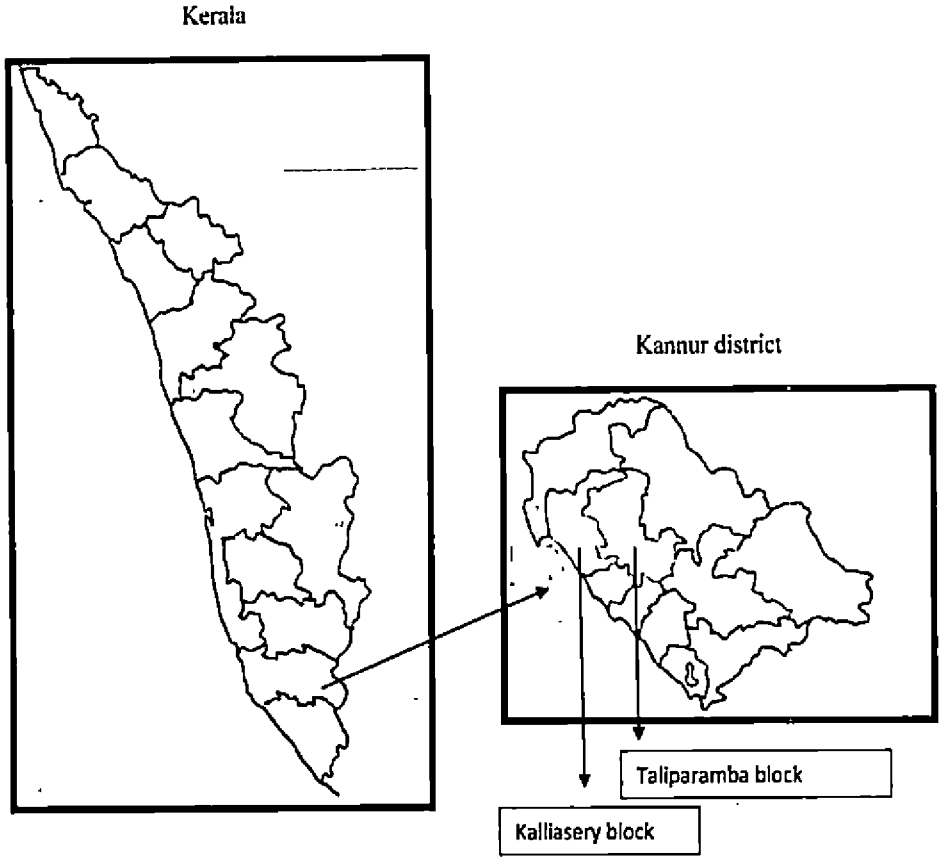
The land utilisation pattern of Kannur district in 2010-11 is presented in Table 3.1. The net area sown in the district was around 65 per cent of the geographical area and the area sown more than once was 9.8 per cent of the geographical area. While forests accounted for 16.4 per cent of the area of the district, the share of land put to non-agricultural uses was 11.33 per cent.

Table 3.1. Land utilization pattern in Kannur district

Particulars	Area in Hectares	Percentage to total geographical area
Total geographical area	297112	100.00
Forest land	48734	16.40
Land put to non-agricultural use	33684	11.33
Barren and uncultivable land	1601	0.54
Permanent pasture and grazing land	1	0.0003
Land under miscellaneous tree crops	257	0.09
Cultivable wasteland	6215	2.09
Current fallow	3202	1.07
Other fallow	2884	0.97
Marshy land	96	0.03
Still water	6395	2.15
Water logged area	388	0.13
Social forestry	71	0.02
Net sown area	193584	65.16
Area sown more than once	29279	9.8
Gross Cropped Area	222863	75.00

Source: Agricultural Statistics 2013, Directorate of Economics and Statistics, Kerala

Fig 3.1 Map of the study area



3.1.1.2 Topography and climate

The district has a humid climate with an oppressive hot season from March to the end of May. This is followed by the South-West monsoon which continues till the end of September. The months of October and November form the post-monsoon or the retreating monsoon season. The North-East monsoon which follows, extends up to the end of February, although the rain generally ceases after December. During the months of April and May, the mean daily maximum temperature is about 35° Celsius. Temperature is low in December and January at an average of about 20° Celsius. On certain days, the night temperature may go down to 16° Celsius. On the basis of past 10 years data, the maximum temperature noticed in the district was 38.8° C and the minimum was 18.2° C. The annual average rainfall is 3438 mm and more than 80 per cent of it occurs during the period of South-West monsoon.

3.1.1.2 Demographic features

The population of Kannur district as per the 2011 census is 25,23,003. The density of population is 852 persons per square km and the sex ratio in the district is 1133 females per 1000 males. During the last decade, literacy rate in the district has increased from 92.59 per cent in 2001 to 95.41 per cent in 2011. According to 2011 census data, the total number of workers in the district was 8,24,116, comprising of 6,94,209 main workers and 1,29,907 marginal workers. Among the different categories of main workers in the district, cultivators and agricultural labourers account for 4.38 per cent and 8.53 percent respectively. Female participation in the work force in the district is around 26.06 percent (Panchayat Level Statistics, 2011, Kannur).

3.1.2 Description of selected panchayats

The two traditional Kaipad areas in Kannur district *viz.*, Taliparamba and Kalliassery blocks were purposively selected for the study. Two panchayats, one

each from a block, *viz.*, Pattuvom from Taliparamba block and Ezhome from Kalliasery block were identified. The basic details about the panchayats are presented in Table 3.2. The geographical area as well as the population in Ezhome panchayat was comparatively more than that of Pattuvom.

Table 3.2. Basic details of selected panchayats

Particulars	Ezhome	Pattuvom
Area (square Km)	21	16.85
Total population (Number)	18479	15003
Density of population (per square Km.)	880	890
Sex ratio (females per 1000 males)	1121	1150
Effective literacy rate (per cent)	91.09	87.2

Source: Gram Panchayat Vikasana Rekha, 2012-2017

The panchayat-wise area according to the type of land is presented in Table 3.3. As evident from the table, wetland accounted for about 45 per cent of the total area in Ezhome panchayat while it was less than one-third of the total area in Pattuvom panchayat. Almost half of the area in Pattuvom was dryland whereas in Ezhome it covered around 42 per cent of the area.

Table 3.3. Panchayat-wise area according to type of land

Panchayat/ Area in (cents)	Wetland	Dryland	Purampoke	Total
Pattuvom	130484	203734	81153	415371
	(31.41)	(49.05)	(19.54)	(100)
Ezhome	207864	197333	61920	467117
	(44.50)	(42.24)	(13.26)	(100)

(Source: Panchayat Level Statistics, 2011, Kannur)
Note: Figures in parentheses indicate per cent to row totals

The cropping patterns in the selected blocks are presented in Table 3.4. It could be observed from the table that coconut was occupying the highest area in both the blocks. While paddy was the second important crop in Kalliasery block accounting for about 9 per cent of the total cropped area, it accounted for about 5 per cent of the total area in Taliparamba.

Table 3.4. Cropping pattern in selected Blocks (2011-12)

Crop	Area in Hectares	
	Kalliasery	Taliparamba
Paddy	907 (9.1)	1023 (5.1)
Pulses	48 (0.5)	41 (0.2)
Arecanut	364 (3.6)	2910 (14.4)
Pepper	146 (1.5)	746 (3.7)
Jack	447 (4.5)	1275 (6.3)
Mango tree	509 (5.1)	891 (4.4)
Plantain	140 (1.4)	548 (2.7)
Vegetables	132 (1.3)	323 (1.6)
Coconut	6859 (68.8)	10510 (52.1)
Teak	100 (1.0)	460 (2.3)
Others	224 (2.2)	1355 (6.7)
Gross Cropped Area	9972 (100.0)	20172 (100.0)

Source: Agricultural Statistics 2013, Directorate of Economics and Statistics, Kerala.

Note: Figures in parentheses indicate per cent to column totals

3.2 Sampling design

The present study is based on primary data collected from a sample of 150 farmers. Kannur district was purposively selected for the study because the district had the largest area under Kaipad paddy. The two traditional Kaipad areas in Kannur district *viz.,* Taliparamba and Kalliassery blocks were selected for the study because these blocks accounted for the largest share in area under Kaipad paddy among the blocks of Kannur district. Two panchayats having maximum

area under Kaipad paddy *viz.*, Pattuvom from Taliparamba block and Ezhome from Kalliasery block, were selected. The farmers in the study area were categorised into five groups on the basis of farming practices followed and 30 farmers each were randomly selected from each group. The five categories of sample farmers were as follows:

1) 30 farmers growing traditional variety.
2) 30 farmers growing traditional variety and shrimp in sequence.
3) 30 farmers growing HYV (Ezhome-l/Ezhome-2).
4) 30 farmers growing HYV (Ezhome-1 / Ezhome-2) and shrimp in sequence.
5) 30 paddy farmers from non-saline areas.

ln each of the five categories, l5 farmers were randomly selected from each of the panchayat. A sample of 30 farmers was randomly selected from each group, thus making a total sample size of 150 farmers.

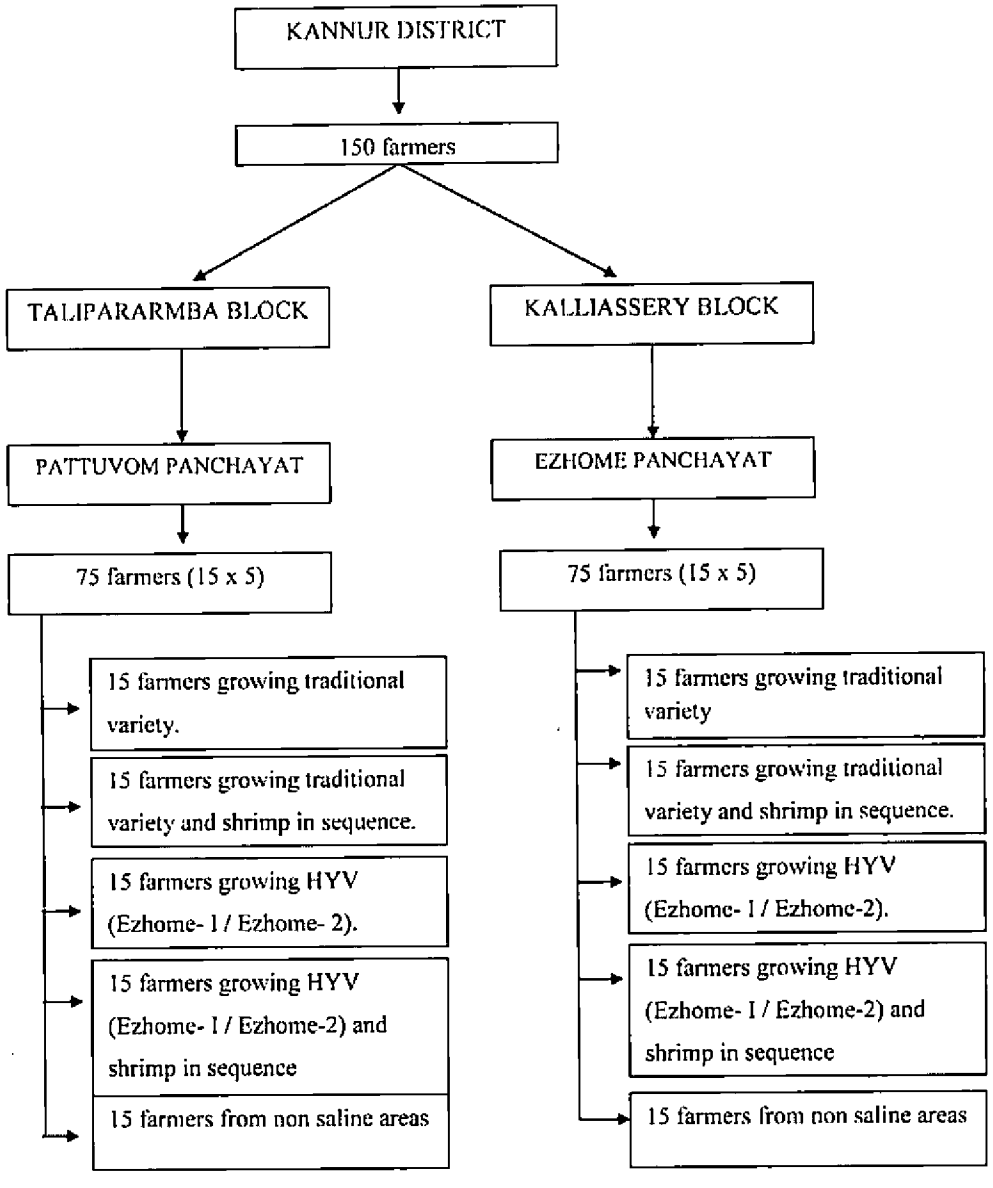


Fig 3.2. Distribution of samples

3.2.1 Collection of data

Farm level data was selected from the respondents by personal interview method using a well-structured interview schedule. Information about socio-economic condition of the farmers, yield, cost and returns from paddy, marketing details and problems encountered by farmers in production and marketing of paddy were collected. Secondary data was also collected from various published and unpublished sources.

3.3 Analyses of data

3.3.1 Method of Estimation of Cost

3.3.1.1 Cost Concepts: The cost concepts used by Commission on Agricultural Costs and Prices (CACP) of Government of India for farm management studies are cost A_1, A_2, B_1, B_2, C_1, C_2, and C_3 (CSO, 2008).These concepts are used in the present study and the important concepts are defined as follows:

The structure of different costs and their components

(i) Cost A_1 includes:

1. Value of human labour (casual and permanent)
2. Value of hired bullock power
3. Value of owned bullock power
4. Value of owned machine power
5. Value of hired machine power
6. Value of seeds (both farm produced and purchased)
7. Value of manures (owned and purchased)
8. Value of fertilizers
9. Value of plant protection chemicals
10. Value of weedicides
11. Irrigation charges
12. Land revenue cess and other taxes
13. Depreciation on farm implements and farm buildings
14. Interest on working capital
15. Miscellaneous expenses

(ii) Cost A_2 = Cost A_1 + Rent paid for leased in land

(iii) Cost B_1= Cost A_1 + Interest on the value of owned fixed capital assets (excluding land)

(iv) Cost B_2= Cost B_1 + Rental value of owned land (less land revenue) and rent paid for leased in land

(v) Cost C_1 = Cost B_1 + Imputed value of family labour

(vi) Cost C_2 (Cost of Cultivation) = Cost B_2 + Imputed value of family labour

(vii) Cost C_3 = Cost C_2 + 10 percent of cost C_2 (to account for managerial input of the farmer)

3.3.1.2 Criteria for imputation of various input costs:

The criteria for imputation of various input costs are summarized in Table 3.5

Table 3.5. Imputation criteria for various input costs

Sl.No.	Items	Criteria
1	Family Labour	On the basis of statutory wage rate or the actual market rate, whichever is higher.
2	Owned Animal Labour	On the basis of cost of maintenance, which includes cost of green and dry fodder and concentrates, depreciation on animal and cattle shed upkeep labour charges and other expenses.
3	Owned Machinery Charges	On the basis of cost of maintenance of farm machinery, this includes diesel, electricity, lubricants, depreciation, repairs and other maintenance expenses.
4	Implements	Depreciation and charges on account of minor repairs.
5	Farm Produced Manure	Evaluated at rates prevailing in the village.
6	Rent of owned land	Estimated on the basis of prevailing rents in the village for identical type of land or as reported by the sample farmers subject to the ceiling of fair rents given in the land legislation of the concerned State.
7	Interest on owned fixed capital	Interest on present value of fixed assets charged at the rate of 10% per annum.
8	Interest on working capital	Interest is charged at the rate of 7.5% per annum on the working capital for the period of crop.
9	Payments in kind	Payments in kind are evaluated at the prices prevailing in the village at the time such payments are made.
10	Main products and by-products	Imputed on the basis of post-harvest prices prevailing in the selected villages.

Farm Assets		
11	Owned and self cultivated land	Evaluated at rates prevalent in the village, taking into account the differences in type of soil, distance from the village, source of irrigation available etc.
12	Farm buildings	Evaluated at rates prevailing in the village
13	Implements and other farm machinery	Evaluated at market prices
14	Livestock	Evaluated at market prices

3.3.2 Yield gap:

Yield gap is defined as the difference between the maximum yield possible under farmer's conditions and actual farmer's yields. The yield gap has two components, the first of these, Yield gap I (YG I) is mainly owing to the factors that are generally not transferable, such as environmental conditions and some of the built in technologies that are available at the research stations. This component of the gap (YG I) cannot be narrowed down and is not exploitable (Duwayri and Tran, 1999). The second component of yield gap, yield gap II (YG II) is mainly the result of differences in management practices and arises when farmers use sub-optimal doses of inputs and cultural practices. YG II is manageable and can be narrowed down by deploying more efforts on research and extension services as well as by appropriate government intervention, particularly on institutional issues.

3.3.2.1 Yield gap analysis

The methodology developed by International Rice Research Institute (IRRI) to study the yield gap of rice was used in the present study (Datta *et al.*, 1978). The important concepts in this analysis are,

(i) Potential yield (Yp)

It is the per hectare yield realized at the research station. This yield is considered to be the maximum absolute production potential of the crop, since the research stations conduct experiments on scientific lines and are equipped with all the requisite resources including the technical input.

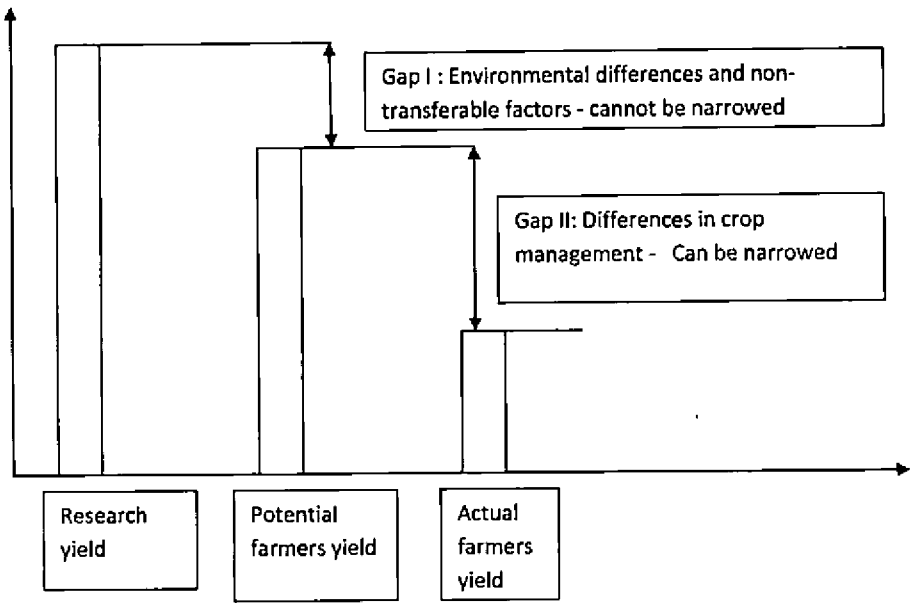


Fig 3.3. Components of yield gap (Duwayari and Tran, 1999)

(ii) Potential farm yield (Yd)

It is the per hectare yield realized on demonstration plots, wherein the agronomic practices are undertaken by the farmer himself but under the supervision of agricultural extension workers. Demonstration trials are more or less research station trials conducted by the farmer under the same resource conditions but under the characteristic agro-climatic conditions as that of the farmer. So, the potential farm yield is considered to be the attainable yield by the average farmer. In the study, the maximum yield attained among the sample farmers is considered as the proxy for potential farm yield.

(iii) Actual yield (Ya)

It is the per hectare yield realized by the farmers on their farms with their own resources and management practices.

(iv) Total yield gap (TYG)

It is the difference between the potential yield (Yp) and the actual yield (Ya). This total yield gap is comprised of Yield Gap I and Yield Gap II.

$TYG = Yp - Ya$

(v) Yield gap I (YG I)

It is the difference between the potential yield (Yp) and the potential farm yield (Yd).

$YG\ I = Yp - Yd$

(vi) Yield gap II (YG II)

It is the difference between the potential farm yield (Yd) and the actual yield (Ya).

$YG\ II = Yd - Ya$

(vii) Index of yield gap (IYG)

It is the ratio of the difference between the potential yield (Yp) and the actual yield (Ya) to the potential yield (Yp), expressed in percentage.

$IYG = [(Yp - Ya) / Yp] * 100$

(viii) Index of realized potential yield (IRPY)

It is the ratio of the actual yield (Ya) to the potential yield (Yp), expressed in percentage.

$IRPY = [Ya / Yp] * 100$

(ix) Index of realized potential farm yield (IRPFY)

It is the ratio of the actual yield (Ya) to the potential farm yield expressed in percentage.

$IRPFY = [Ya / Yd] * 100$

3.3.2.2 Factors affecting yield gap

3.3.2.2 .1 Model specification of log- linear yield gap functions for farms growing high yielding and traditional varieties :

In the case of farms growing HYV and traditional varieties, yield gap functions were fitted separately for each of these groups. Yield gap (Yield gap II) in Kilogram per hectare was fitted as a function age of the farmer, experience in rice farming, seed rate, labour use and a dummy variable for education. The specified yield gap function is as follows:

$$Y = b_0 X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} e^{ui}$$

$$\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + u_i$$

Where,

Y = Yield gap in kilogram per hectare

X_1 = Age in years

X_2 = Experience in rice farming (years)

X_3 = Seed rate in Kg/ha

X_4 = Labour use in man days

X_5 = Education dummy (= 0, if below SSLC,=1, if SSLC or above)

b_0 is the intercept, b_1, b_2, b_3, b_4, b_5 are the elasticity coefficients of the respective variables and u_i is the error term

3.3.2.2.2 Model specification of log- linear yield gap function for all farms of Kaipad:

Yield gap function was also fitted for all sample farms of Kaipad (HYV and traditional variety). Yield gap (Yield gap II) in Kilogram per hectare was fitted as a function age of the farmer, experience in rice farming, seed rate, labour use and two dummy variables, one for education and another one for variety. The specified yield gap function is as follows:

$$Y = b_0 X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} e^{ui}$$

$$\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + u_i$$

Where,

Y = Yield gap in kilogram per hectare

X_1 = Age in years

X_2 = Experience in rice farming (years)

X_3 = Seed rate in Kg/ha

X_4 = Labour use in man days

X_5 = Dummy for variety (= 0 if traditional variety, = 1 if HYV)

X_5 = Education dummy (= 0 if below SSLC, =1 if SSLC or above)

b_0 is the intercept, b_1, b_2, b_3, b_4, b_5, b_6 are the elasticity coefficients of the respective variables and u_i is the error term

3.3.3 Marketing channel

Marketing channel is the path by which the agricultural products move from the producer to the final consumer through different intermediaries. Intermediaries may be village merchants, brokers, traders, processors, wholesalers, commission agents, retailers etc. For the estimation of marketing cost and marketing margin, price spread, producer's share in consumer's rupee and efficiency of the marketing channels, the methodology described by Acharya and Agarwal (1987) was used.

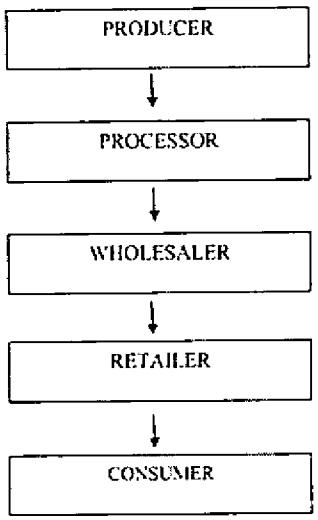


Figure 3.4. Marketing Channel

3.3.3.1 Marketing cost

It is the expense incurred towards the operations or functions carried out by the farmer and intermediaries at different stages of marketing.

3.3.3.2 Marketing margin

It is the profit of various intermediaries or middlemen involved in moving the produce from the producer to the consumer.

3.3.3.3 Price spread

Price spread is defined as the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of the commodity expressed as a percentage of the consumer's price. The price spread includes the marketing cost and the marketing margin. In the present study, price spread in marketing of paddy was estimated by the concurrent margin method.

Price spread is calculated as, Price spread = Consumer price – Producer price.

3.3.3.4 Producer's share in consumer's rupee

The farmer's share in consumer's price was calculated with the help of the formula,

$$P_s = \frac{P_p}{C_p} \times 100$$

Where,

P_s = Producer's share in consumer's rupee (Percentage)

P_p = Producer's price

C_p= Consumer's price

3.3.3.5 Shepherd's formula

The economic efficiency of markets is calculated using the marketing costs, margins and price spread by employing the Shepherd's formula as follows

$$ME = \frac{V}{I}$$

Where,

ME = Marketing efficiency

V= Consumer's price

I = Total marketing cost

3.3.4 Constraints in production and marketing of Kaipad paddy

To identify the various constraints faced by Kaipad farmers, Garrett ranking technique was used. As the first step in constraint analysis, major

problems faced in production and marketing were identified. The respondents were then asked to rank the identified problems and the major constraints were identified by Garrett ranking technique. In this method the rank assigned to different constraints were transformed into percentage using the formula:

$$\text{Per cent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

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

N_j= Number of factors ranked by j^{th} individual

Here 0.5 is subtracted from each rank because the rank is an interval on a scale and its midpoint best represents the interval. Then, the percentage positions were transformed into scores on a scale of 100 points referring to the table given by Garrett and Woodworth (1969). From the scores so obtained, the mean score level was derived and constraints were ranked based on the mean score level.

Results and Discussion

4. RESULTS AND DISCUSSION

The results of the analyses carried out on different aspects are discussed as it is highly essential to understand the problem and to make policy suggestions and are presented under the following headings.

4.1 Socio-economic characteristics of the sample farmers

4.2 Economics of cultivation of paddy in Kaipad region

4.3 Yield gap analysis

4.4 Marketing of paddy in Kaipad

4.5 Constraints in Kaipad farming

4.6 Documentation of Kaipad farming

4.1 Socio-economic characteristics of the sample farmers

A brief description of the socio-economic characteristics of the respondent farmers with respect to age, gender, education, experience, family size, land holdings, annual income and sources of income has been included in this section.

4.1.1 Age

One of the major factors influencing the adoption of technologies and risk taking behaviour is the age of the farmer. The age-wise distribution of the sample respondents is presented in Table 4.1. It could be observed from the table that majority of the farmers in all the categories other than the two sample groups growing HYV were in the age group of 60 or more. In the case of respondents growing traditional Kaipad variety with or without shrimp in sequence and those from the non-saline areas, 60 per cent or more were found to have crossed the age of 60 years. Thus, it could be inferred that the farmers adopting HYV were comparatively younger when compared to those growing traditional varieties. There were no farmers aged less than 30 years in any of the five sample categories. This could be attributed to the reluctance of youngsters in taking up farming as a profession in the Kaipad tracts, which is one of the major problems affecting agriculture, especially rice cultivation in Kerala.

Table 4.1.Age-wise distribution of sample respondents

Category of farmers	Age profile (Years)				Total
	<30	30-45	45-60	>60	
Growing traditional variety	0 (0.0)	5 (16.7)	7 (23.3)	18 (60.0)	30 (100)
Growing traditional variety and shrimp in sequence	0 (0.0)	2 (6.7)	6 (20)	22 (73.3)	30 (100)
Growing HYV	0 (0.0)	6 (20)	14 (46.7)	10 (33.3)	30 (100)
Growing HYV and shrimp in sequence	0 (0.0)	8 (26.7)	12 (40)	10 (33.3)	30 (100)
Growing Paddy in Non-saline areas	0 (0.0)	3 (10)	7 (23.3)	20 (66.7)	30 (100)
Total	0 (0.0)	24 (16)	46 (31)	80 (53)	150 (100)

Note: Figures in parentheses indicate per cent to row totals

4.1.2 Gender

The gender-wise classification of the sample farmers are presented in Table 4.2. It could be observed from the table that majority of the respondents in the categories growing traditional Kaipad variety without shrimp in sequence and HYV with shrimp in sequence, were male farmers. In the category of farmers growing HYV without shrimp in sequence, 50 per cent each were male and female respectively. About two third of respondents were female in the case of respondents growing traditional variety with shrimp in sequence. More than 50 per cent of respondents from the non-saline areas were female farmers. In the overall sample of 150, the male and female farmers formed 50 per cent each. It was observed that in the Kaipad tracts many females were involved in growing paddy either individually or as members of various groups.

Table 4.2.Gender-wise classification of sample respondents

Category of farmers	Gender		Total
	Male	Female	
Growing traditional variety	19 (63.3)	11 (36.7)	30 (100.0)
Growing traditional variety and shrimp in sequence	10 (33.3)	20 (66.7)	30 (100.0)
Growing HYV	15 (50.0)	15 (50.0)	30 (100.0)
Growing HYV and shrimp in sequence	17 (56.7)	13 (43.3)	30 (100.0)
Growing Paddy in Non-saline areas	14 (46.7)	16 (53.3)	30 (100.0)
Total	75 (50.0)	75 (50.0)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

4.1.3 Educational Background

The literacy level of the sample farmers are presented in Table 4.3. Even though all the farmers were literates, majority were having education only up to the ninth standard level.

Table 4.3. Educational status of sample respondents

Category of farmers	Educational status of farmers				Total
	Upto 9^{th}	SSLC	HSC	Graduate	
Growing traditional variety	24 (80.0)	1 (3.3)	2 (6.7)	3 (10.0)	30 (100.0)
Growing traditional variety and shrimp in sequence	20 (66.7)	6 (20.0)	2 (6.7)	2 (6.7)	30 (100.0)
Growing HYV	20 (66.7)	6 (20.0)	2 (6.7)	2 (6.7)	30 (100.0)
Growing HYV and shrimp in sequence	18 (60.0)	6 (20.0)	4 (13.3)	2 (6.7)	30 (100.0)
Growing Paddy in Non-saline areas	27 (90.0)	2 (6.7)	0 (0.0)	1 (3.3)	30 (100.0)
Total	109 (72.7)	21 (14.0)	10 (6.7)	10 (6.7)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

The farmers having education up to ninth were found to be more among those growing traditional variety rather than HYV. The farmers who were graduates were either 10 per cent or less in all the five sample categories.

4.1.4 Experience in farming

The details on the experience of sample respondents in farming are presented in Table 4.4. As evident from the table, the farmers were categorised into three groups based on their experience in farming as having less than 10 years, 10-30 years and greater than 30 years. It could be observed that 80 per cent or more of the farmers in all the categories were having experience between 10 and 30 years. In the case of farmers growing traditional variety without shrimp in sequence, 20 per cent had experience of more than 30 years. In the overall sample, about 89 per cent were found to be having experience between 10 and 30 years.

Table 4.4. Farming experience of the sample respondents

Category of farmers	Years of Experience			Total
	<10	10-30	≥30	
Growing traditional variety	0 (0.0)	24 (80.0)	6 (20.0)	30 (100.0)
Growing traditional variety and shrimp in sequence	2 (6.7)	25 (83.3)	3 (10.0)	30 (100.0)
Growing HYV	0 (0.0)	28 (93.3)	2 (6.7)	30 (100.0)
Growing HYV and shrimp in sequence	0 (0.0)	29 (96.7)	1 (3.3)	30 (100.0)
Growing Paddy in Non-saline areas	0 (0.0)	27 (90.0)	3 (10.0)	30 (100.0)
Total	2 (1.3)	133 (88.7)	15 (10.0)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

4.1.5 Family size

The size of the family would play a definite role in determining the availability of family labour and the expenditure on consumption incurred by the family. The classification of sample respondents according to their family size is presented in Table 4.5. It could be observed from the table that the size of the

family of majority (80 per cent or more) of the respondents were between two and four members, and hence the possibility for the availability as well as utilisation of family labour as a substitute for hired labour was very limited in the study area. The distribution of families with size more than 4 members was more or less similar in all the categories of sample farmers.

Table 4.5. Details on the family size of sample respondents

Category of farmers	Family size (numbers)			Total
	2-4	5-6	7 and above	
Growing traditional variety	24 (80.0)	5 (16.7)	1 (3.3)	30 (100.0)
Growing traditional variety and shrimp in sequence	26 (86.7)	3 (10.0)	1 (3.3)	30 (100.0)
Growing HYV	26 (86.7)	4 (13.3)	0 (0.0)	30 (100.0)
Growing HYV and shrimp in sequence	25 (83.3)	3 (10.0)	2 (6.7)	30 (100.0)
Growing Paddy in Non-saline areas	26 (86.7)	4 (13.3)	0 (0.0)	30 (100.0)
Total	127 (84.7)	19 (12.7)	4 (2.7)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

4.1.6 Land Holdings

The classification of sample respondents based on the size of their operational holdings is presented in Table 4.6. As evident from the table, majority of the farmers were having marginal holdings and it ranged from 80 per cent in the case of farmers growing traditional variety without shrimp in sequence to 60 per cent in the case of farmers in non-saline areas.

About one fourth of respondents in the categories of farmers growing traditional variety along with shrimp in sequence, HYV without shrimp in sequence and HYV along with shrimp in sequence were operating in small sized holdings. Contrary to other categories of sample farmers, 30 per cent of the respondents from non-saline areas had large farms.

Table 4.6.Details on the size of holdings of sample respondents

Category of farmers	Classes of holdings							
	Marginal (<0.5 ha)		Small (0.5-1 ha)		Large (≥1 ha)		All holdings	
	Number	Size (in ha)	Number	Size (in ha)	Number	Size (in ha)	Number	Size (in ha)
Growing traditional variety	24 (80)	0.28	3 (10)	0.71	3 (10)	1.07	30 (100.0)	0.40
Growing traditional variety and shrimp in sequence	21 (70.0)	0.26	8 (26.7)	0.69	1 (3.3)	1.0	30 (100.0)	0.40
Growing HYV	22 (73.3)	0.22	7 (23.3)	0.62	1 (3.3)	1.0	30 (100.0)	0.37
Growing HYV and shrimp in sequence	19 (63.3)	0.28	7 (23.3)	0.80	4 (13.3)	1.13	30 (100.0)	0.57
Growing Paddy in Non-saline areas	18 (60.0)	0.29	3 (10.0)	0.63	9 (30.0)	1.53	30 (100.0)	0.77
All Categories	104 (69.3)	0.26	28 (18.7)	0.67	18 (12.0)	1.32	150 (100.0)	0.50

Note: Figures in parentheses indicate per cent to row total

Among the marginal holdings, the average size of holding ranged from 0.22 hectares for sample farms growing HYV without shrimp in sequence to 0.29 ha in the case of paddy farms in non-saline areas. The average holding size for all the marginal holdings which accounted for 69.3 per cent of the total sample holdings was 0.26 hectare. About 19 per cent of the total sample holdings were small, with an average size of 0.67 hectare. The average holding size for all the large holdings which accounted for 12 per cent of total holdings was 1.32 hectare. The farms growing HYV without shrimp in sequence had the smallest holding size in all the classes of holdings and the overall average holding size of these farms was 0.34 hectare while it was highest for sample farms from non-saline areas (0.77 ha). The average holding size of 150 sample farms was 0.50 hectare.

The details on the ownership of holdings of sample respondents are presented in Table 4.7. It could be observed from the table that about 75 per cent of the respondents were cultivating on their own land and it varied from 93.3 per cent in the case of farmers growing traditional variety and shrimp in sequence to 60 per cent for farmers growing HYV and shrimp in sequence. The percentage of total sample who have leased-in land varied from 6.7 per cent in farms growing traditional variety and shrimp in sequence to 40 per cent in the case farms with HYV paddy and shrimp in sequence. The average size of own land for all sample categories was 0.46 hectare, while it was 0.61 hectare for the leased in land. The average size of own land was highest in the case of farms in non-saline areas. While considering the sample farms in Kaipad area, the average size of the own land ranged from 0.32 hectare for the farms growing HYV without shrimp in sequence to 0.59 hectare in farms raising HYV with shrimp in sequence. The average size of leased-in land for all the sample farms was 0.61 hectare. The average leased-in area was found to be highest in non-saline areas, while it ranged from 0.35 hectare in farms growing traditional variety and shrimp in sequence to 0.59 hectare in farms growing traditional variety without shrimp in sequence.

Table 4.7. Details on the ownership of holdings of sample respondents

Category of farmers	Own land		Leased-in land		Total land	
	Number	Average size (in ha)	Number	Average size (in ha)	Number	Average size (in ha)
Growing traditional variety	23 (76.7)	0.34	7 (23.3)	0.59	30 (100.0)	0.40
Growing traditional variety and shrimp in sequence	28 (93.3)	0.41	2 (6.7)	0.35	30 (100.0)	0.40
Growing HYV	21 (70.0)	0.32	9 (30.0)	0.39	30 (100.0)	0.37
Growing HYV and shrimp in sequence	18 (60.0)	0.59	12 (40.0)	0.52	30 (100.0)	0.57
Growing Paddy in Non-saline areas	22 (73.3)	0.64	8 (26.7)	1.1	30 (100.0)	0.77
All Categories	112 (74.7)	0.46	38 (25.3)	0.61	150 (100.0)	0.50

Note: Figures in parentheses indicate per cent to row totals

4.1.7 Annual Income

The classification of the sample respondents according to their average annual income is presented in Table 4.8. It could be observed from the above table that the average annual income of majority of the sample farmers was below Rs.50,000. The percentage of sample farmers with income less than Rs.50,000 was as high as 86.7 per cent in the categories growing traditional Kaipad variety as well as HYV along with shrimp in sequence. Though majority of the farmers work also as farm labourers, their labour is in demand only during periods of main operations of a single season and hence, they are only seasonally employed or remain unemployed for the rest of the season. With the exception of farmers growing HYV, none of the other farmers had an average annual income of more than Rs.2,00,000.

Table 4.8. Classification of sample respondents according to average annual income

Category of farmers	Average annual income (in Rupees)				Total
	< 50000	50000-100000	100000-200000	> 200000	
Growing traditional variety	26 (86.7)	4 (13.3)	0 (0.0)	0 (0.0)	30 (100.0)
Growing traditional variety and shrimp in sequence	19 (63.3)	7 (23.3)	4 (13.3)	0 (0.0)	30 (100.0)
Growing HYV	22 (73.3)	3 (10.0)	0 (0.0)	5 (16.7)	30 (100.0)
Growing HYV and shrimp in sequence	26 (86.7)	3 (10.0)	0 (0.0)	1 (3.3)	30 (100.0)
Growing Paddy in Non-saline areas	25 (83.3)	2 (6.7)	3 (10.0)	0 (0.0)	30 (100.0)
Total	118 (78.7)	19 (12.7)	7 (4.7)	6 (4.0)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

4.1.8 Occupational Status

The distribution of the sample respondents according to the source of income is presented in Table 4.9. As evident from the table, agricultural and allied activities formed the major source of income for all categories of sample farmers.

About 97 per cent of the sample farmers from non-saline areas derived their income from the farms. Among the sample respondents cultivating HYV without shrimp in sequence and HYV along with shrimp in sequence, public sector was the major source of income for 10 per cent and 6.7 per cent of the farmers respectively. The percentage of self-employed farmers ranged from 3.3 per cent to 13.3 per cent. With the exception of all other categories, only the respondents growing HYV without shrimp in sequence were employed in public sector and it was less than 10 per cent of the total respondents in the respective categories.

Table 4.9.Distribution of sample respondents according to the source of income

Category of farmers	Income source				Total
	Farm income	Public sector	Private sector	Self employed	
Growing traditional variety	25 (83.3)	0 (0.0)	2 (6.7)	3 (10.0)	30 (100.0)
Growing traditional variety and shrimp in sequence	22 (73.3)	0 (0.0)	4 (13.3)	4 (13.3)	30 (100.0)
Growing HYV	26 (86.7)	3 (10.0)	0 (0.0)	1 (3.3)	30 (100.0)
Growing HYV and shrimp in sequence	24 (80.0)	2 (6.7)	1 (3.3)	3 (10.0)	30 (100.0)
Growing Paddy in Non-saline areas	29 (96.7)	0 (0.0)	0 (0.0)	1 (3.3)	30 (100.0)
Total	126 (84.0)	5 (3.3)	7 (4.7)	9 (6.0)	150 (100.0)

Note: Figures in parentheses indicate per cent to row totals

4.2 Economics of cultivation of paddy in Kaipad region

4.2.1 Estimation of cost

The cost of cultivation of Kaipad paddy was estimated using the cost concepts *viz.*, Cost A, Cost B and Cost C. These were worked out for all the five categories of sample respondents and in the present study, Cost A_1 and Cost B_1 are same because farmers included in the sample did not use any fixed assets other

than land for cultivation. The labourers bring their own implements to the field and the wages paid included the rent for the implements also.

Table 4.10.Cost of cultivation of paddy in Kaipad and non-saline regions (Rs./ha)

Category of Respondents / Cost	Growing traditional variety	Growing traditional variety and shrimp in sequence	Growing HYV	Growing HYV and shrimp in sequence	Growing paddy in Non-saline areas
Cost A_1	35737	32125	40574	44180	31986
Cost A_2	36670	32449	42754	44180	32687
Cost B_1	35737	32125	40574	44180	31986
Cost B_2	41370	39513	45594	51690	37313
Cost C_1	57500	54865	62107	54395	42644
Cost C_2	63133	62253	67128	61904	47970
Cost C_3	69446	68478	73841	68095	52767

The cost of cultivation of paddy in Kaipad and non-saline areas are presented in Table 4.10. The average cost incurred for paddy cultivation in non-saline areas adjacent to Kaipad was less when compared to that for the Kaipad areas. Even though limited quantity of inputs are used in Kaipad, the indigenous methods practiced are more labour intensive and thus the cost of cultivation tends to be higher in Kaipad when compared to non-saline areas. The highest cost of cultivation (Cost C_2) was found in the case of farmers growing HYV without shrimp in sequence. The average cost for growing HYV without shrimp in sequence was higher than the costs incurred for growing traditional varieties without shrimp in sequence, which could be attributed to the higher labour use for harvest in the case of HYV. As the grain and straw yield was higher for HYV when compared to the traditional varieties, more human labour was needed for the harvesting which in turn increased the cost of cultivation of HYV in Kaipad. Among the farmers growing HYV, the costs incurred by farmers growing HYV without shrimp in sequence was lesser than that of farmers growing

HYV and shrimp in sequence up to cost B_2. The trend reversed after Cost B_2 and Cost C_1, C_2 and C_3 were found to be lower in the category of farmers growing HYV and shrimp in sequence. This reversal of cost trend could be attributed to the fact that the imputed value of family labour is included in cost C_1 calculation. The reduction in cost of cultivation in rice-shrimp sequential farming system could be attributed to the reduced cost incurred for weeding as the weed growth was minimal in such plots. Most of the farmers were employing family labour for weeding. The reason for the reversal of cost pattern was due to imputation of family labour cost, which was less for rice-shrimp sequential farming system. In the category of farmers growing traditional variety, the average cost incurred by farmers growing paddy without shrimp in sequence was slightly higher than those growing paddy with shrimp. This was also because of the reduced cost incurred for weeding in rice shrimp sequential farming systems. Among the farmer respondents practising rice-shrimp sequential farming, average costs were slightly higher for farmers growing traditional variety when compared to those growing HYV.

The cost of production of paddy in Kaipad and non-saline tracts are given in Table 4.11. The average cost of production of the respondents from non-saline areas adjacent to Kaipad was less when compared to that of the respondents from Kaipad areas. The one reason for this was that the yield realised in non-saline areas was comparatively higher. The other reason could be the fact that the cost of cultivation was relatively less in non-saline areas as the cultivation was less labour intensive and there was also increased scope for mechanisation in such areas. The cost of production of farmers growing HYV was lesser than the costs incurred for growing traditional varieties. This could be attributed to the increased yield potential of Ezhome-1 and Ezhome-2. Among the farmer respondents practicing rice-shrimp sequential farming, average cost of production per quintal up to cost B_2 was higher for farmers growing HYV owing to increased fertility and higher labour use. This trend reversed from Cost C_2 onwards.

Table 4.11. Cost of production of paddy in Kaipad and non-saline regions (Rs. /Quintal)

Cost / category of respondents	Average yield/ha	Cost A_1	Cost A_2	Cost B_1	Cost B_2	Cost C_1	Cost C_2	Cost C_3
Growing traditional variety	2097	1704	1749	1704	1973	2742	3010	3312
Growing traditional variety and shrimp in sequence	2324	1382	1396	1382	1700	2360	2678	2946
Growing HYV	2540	1597	1683	1597	1795	2445	2643	2907
Growing HYV and shrimp in sequence	2709	1631	1631	1631	1908	2008	2285	2514
Growing Paddy in Non-saline areas	2585	1237	1264	1237	1443	1649	1855	2041

Among the farmers growing HYV, the average cost of production incurred by farmers growing HYV without shrimp in sequence was lesser than that of farmers growing HYV and shrimp in sequence upto B_2 and then from Cost C_1 onwards, cost of production of HYV without shrimp in sequence became greater than the cost of production of HVV along with shrimp. This is because of lower imputed value of family labour cost in rice-shrimp sequential farming system incurred for weeding as the weed growth was comparatively less in such farms.

4.2.2 Estimation of Income measures

The average income per hectare from paddy and shrimp in Kaipad and non-saline tracts are presented in Table 4.12. It is evident from the table that the average yield of paddy in sample farms growing traditional Kaipad variety without shrimp in sequence was 2097 Kg/ha and average yield in sample farms growing HYV without shrimp in sequence was 2540 Kg/ha. Thus, it is clear that the average yield of Ezhome-1 and Ezhome-2 were significantly higher than the traditional varieties. Among the farmer respondents practicing rice-shrimp sequential farming, traditional variety on an average yielded 2324 Kg/ha while it was 2709 Kg/ha for the HYV variety. The yield of paddy in farms growing shrimp in sequence with paddy was found to higher than the farms without shrimp in farms growing traditional as well as HYV of paddy. This shows that growing shrimp in the second season had a favourable effect on the yield of paddy in the following season. The average yield of the respondents from non-saline areas adjacent to Kaipad was 2585 Kg/ha

The average income from paddy was Rs.40752/ha for sample respondents growing traditional Kaipad variety without shrimp in sequence. The farmers growing HYV without shrimp in sequence were earning an income of Rs.51105/ha from paddy. Among the farmer respondents practicing rice-shrimp sequential farming, the farmers growing traditional variety were getting on an average an income of Rs.42245/ha and farmers growing HYV were getting an income of Rs.59241/ha from paddy. The average income of the respondents from

non-saline areas adjacent to Kaipad was Rs.50079/ha. The average income from shrimp for sample respondents practicing rice-shrimp sequential farming was Rs.2500/ha irrespective of the variety of paddy grown.The average income from paddy was highest in the farms growing HYV and shrimp in sequence while it was lowest in the farms growing traditional varieties without shrimp in sequence. Within the farms growing traditional and HYV varieties, the average income from paddy was found to be high in the case of farms following paddy-shrimp sequential farming, which could be attributed to the high productivity of paddy in these farms. The difference in average income between farms growing paddy without shrimp in sequence and paddy with shrimp in sequence was found to be high in farms growing HYV as compared to the farms growing traditional variety. The average productivity and income for farms in non-saline areas was in between that from farms growing traditional and HYV of Kaipad paddy.

Table 4.12. Average income from paddy and shrimp in Kaipad and non-saline regions (Rs./ha)

Category of respondents	Average yield of paddy (Kg/ha)	Average Income from paddy	Average Income from fish
Growing traditional variety	2097	40752	0
Growing traditional variety and shrimp in sequence	2324	42245	2500
Growing HYV	2540	51105	0
Growing HYV and shrimp in sequence	2709	59241	2500
Growing Paddy in Non-saline areas	2585	50079	0

Table 4.13 depicts the various income measures conventionally used in economic analysis. The highest average gross income of Rs.61741/ha was obtained by farmers growing HYV and shrimp in sequence while it was lowest for the farmer respondents growing traditional variety without shrimp in sequence.

Table 4.13. Estimates of different measures of income (Rs. /ha)

Particulars	Traditional variety	Traditional Variety and shrimp in sequence	HYV	HYV and shrimp in sequence	Paddy in Non-saline areas
Gross income (GI)	40752	44745	51106	61741	50079
Farm Business income (GI- Cost A1)	5015	12620	10532	17561	18094
Family labour income (GI- cost B2)	-618	5232	5511	10052	12767
Net income at Cost C3 (GI- Cost C3)	-28694	-23733	-22735	-6354	-2688
Benefit Cost Ratio (GI : C3)	0.59	0.65	0.69	0.91	0.95
Benefit Cost Ratio at explicit cost level (GI : A1)	1.14	1.39	1.26	1.40	1.57

Gross income of the respondents from non-saline areas adjacent to Kaipad was more when compared to that of farmers growing traditional Kaipad variety but was less than those growing HYV. This is because traditional varieties were poorly yielding when compared to varieties in non-saline areas whereas HYV were superior to both the traditional as well as varieties grown in non-saline areas. Farm business income was higher in rice-shrimp sequential farming when compared to rice monocropping. This is because the farmers practicing sequential farming were getting an additional income of Rs.2500/ha irrespective of the variety of paddy grown.

The highest farm business income was found in the category of farmers from non-saline areas followed by the farmers growing HYV and shrimp in sequence. Among the respondents practicing rice-shrimp sequential farming, HYV yielded more farm income than traditional varieties. The farm business income was lowest in the case of farmers growing the traditional variety without shrimp in sequence without fish in sequence. This could be attributed to the poor yield, labour intensive cultivation practices followed while growing traditional varieties and the unfavourable characteristics of these varieties.

Family labour income was estimated to be negative in the category of farmers growing traditional Kaipad variety. This is because of the reason that the cultivation practices from land preparation to harvest in Kaipad are not only cumbersome but also of risky nature which need skilled labourers. Hence, most of the works were carried out by skilled hired labour in this sample category. Kaipad farming is strenuous and laborious and so the family labour involvement in Kaipad farming was found to be less. Family labour income was highest in respondents growing paddy in non-saline areas which required less labour and effort as compared to cultivation in Kaipad.

The net income and Benefit Cost Ratio indicated that farming is a loss making business in Kaipad region, especially when the value of the family labour, the land value and the managerial cost were imputed and accounted in the cost. BC ratio at explicit cost level worked out to be more than one in all the sample

categories and was found to be highest in non-saline areas. This implies that after taking into account all the variable costs or paid out costs, farming is profitable in Kaipad. But the profitability in Kaipad region is less than the non-saline area because the farmers were being paid the same price as that of paddy produced in non-Kaipad regions and were not presently getting any premium price for the naturally organic GI tagged rice that they produce. The profitability was found to be higher in the case of farmers growing HYV when compared to the traditional ones. The lowest BC Ratio was found for farmer respondents growing traditional Kaipad variety without shrimp in sequence without fish in sequence. Compared to rice monocropping, rice-shrimp sequential farming was found to be more beneficial.

4.3 Yield gap analysis

4.3.1 Magnitude of the yield gap

The results of the estimated yield gaps of paddy for different categories of sample respondents in Kaipad region are presented in Table 4.14. For traditional varieties, yield gap II without shrimp in sequence was calculated. The analysis revealed that in the case of farmers growing traditional Kaipad variety without shrimp in sequence, the magnitude of yield gap II was 820 Kg. The magnitude of yield gap observed in farmers cultivating traditional variety and shrimp in sequence was 1426 Kg. The delay in mound formation and sowing activities in these regions arising out of the conflicts between the bund owners and paddy farmers might be adversely affecting the yield of the crop. The differences in management practices between individual farms were also contributing to the yield gap II.

Among the respondent farmers growing Ezhome-1 without shrimp in sequence, the magnitude of yield gap I and yield gap II were 167 Kg and 75 Kg respectively. Thus, the total yield gap in the case of Ezhome 1 was 747 Kg and it was about 21 per cent of the potential yield. In the category of respondents growing Ezhome-2 without shrimp in sequence, the magnitude of yield gap I and

yield gap II is 75 Kg and 772 Kg respectively. The total yield gap when Ezhome-2 is grown without shrimp in sequence comes to around 847 Kg and it accounts for about 26 per cent of the potential yield.

The magnitude of yield gap observed in farms cultivating HYV and shrimp was slightly lesser than the yield gap observed in farms growing HYV without shrimp in sequence which could be attributed to the increased productivity of such farms resulting from shrimp filtration. In the category of farmers growing Ezhome-1 and shrimp in sequence, the magnitude of yield gap I and yield gap II are 375 Kg and 226 Kg respectively. For the category of farmers growing Ezhome 2 along with shrimp, the magnitude of yield gap I and yield gap II was 283 Kg and 214 Kg respectively. Thus, the variety-wise total yield gap of Ezhome-1 and Ezhome-2 in the category growing HYV and shrimp in sequence was 601 Kg and 497 Kg respectively. The yield gap accounts for 22 per cent 16 per cent of the potential yield of Ezhome-1 and Ezhome-2 respectively. The share of yield gap II in the total yield gap was found to be 38 per cent and 43 per cent respectively for Ezhome-1 and Ezhome-2 with shrimp in sequence while it was 78 and 91 per cent for Ezhome-1 and Ezhome-2 without shrimp in squence. Ezhome-1 is a long duration variety and Ezhome-2 is a medium duration variety. Hence, if their sowing and other cultivation practices are delayed the reproductive stage of the crop will coincide with higher salinity phase of the soil leading to the formation of chaffy grains. If management practices are not carried out in time, it leads to higher yield gap.

4.3.2 Indices of Yield Gaps

The results of the estimated indices of yield gaps of paddy in different category of sample respondents in Kaipad regions are presented in Table 4.14.

Table 4.14. Estimated yield gaps and yield gap indices of paddy in Kaipad

Category of Respondents	Potential yield (Kg/ha)	Potential farm yield (Kg/ha)	Actual yield (Kg/ha)	Yield gap I (Kg)	Yield gap II (Kg)	Total yield gap (Kg)	IYG	IRPY	IRPFY
Growing traditional variety	-	2917	2097	-	820	820	-	-	71.90
Growing traditional variety + shrimp	-	3750	2324	-	1426	1426	-	-	61.98
Growing HYV (Ezhome-1)	3500	3333	2753	167	580	747	21.34	78.66	82.58
Growing HYV (Ezhome 2)	3200	3125	2353	75	772	847	26.46	73.54	75.30
Growing HYV and shrimp in sequence (Ezhome-1)	3500	3125	2718	375	226	601	22.36	77.64	86.96
Growing HYV and shrimp in sequence (Ezhome-2)	3200	2917	2703	283	214	497	15.53	84.46	92.67

Note: IYG -Index of yield gap, IRPY-Index of realised potential, IRPFY – Index of realized potential farm yield

The index of yield gap denotes the extent of unrealised yield potential. The indices of yield gap worked out for the category of farmers growing HYV without shrimp in sequence reveals that the unrealised yield potential of Ezhome-1 was 21.34 and it was 26.46 for Ezhome-2 and the index of realised potential yield was 78.66 and 73.54 respectively. This shows that about 25 per cent of the potential yield is left untapped. This may be due to difference in environmental conditions at the field level compared to the controlled environment in research trials. This 25 per cent is fully exploitable as the research and yield trials of Ezhome-1 and Ezhome-2 were carried out in farmers fields in a participatory manner. The indices of realised potential farm yield were 82.58 and 75.30 for Ezhome-1 and Ezhome-2 respectively.

The variety-wise indices of yield gap worked out for the category of farmers growing HYV and shrimp in sequence reveals that the unrealised yield potential of Ezhome-1 was 22.36 and 15.53 for Ezhome-2 and the index of realised potential yield was 77.64 and 84.46 respectively. The index of realised potential farm yield was 86.96 and 92.67 for Ezhome-1 and Ezhome-2 respectively.

4.3.3 Factors affecting yield gap – Regression analysis

Log-linear regression models were fitted to find out the factors affecting yield gap in farms growing traditional varieties and HYV separately and also for all farms of Kaipad (combined sample of traditional and HYV farms) and the estimates are presented in Tables 4.15, 4.16 and 4.17.

It could be observed from Table 4.15 that for the fitted log-linear yield gap function in the case of traditional farms, the R^2 value was 0.21 which implies that the included variables in the model could explain only 21 per cent of the variation in yield gap. This could be attributed to the fact that in Kaipad fields, yield is very much dependant on many environmental and climatic factors including the quantum and distribution of rainfall, tidal inflows and outflows, characterisitcs of soil and water including Electrical conductivity, pH etc. The timing of the

management practices including the opening and closing of bunds were reported to be influencing the yield. All these effects and the related varaibles were not captured or included in the fitted model. The F value was found to be significantat five per cent level of probability. All the estimates of the elasticity cofficients had signs as per the *apriori* expectation.

Table 4.15. Estimates of the log-linear model for yield gap II for traditional variety

Variable	Unit	Co-efficent	't' value	Probability value
Constant	-	7.454 ***	3.082	0.003
Age	Years	1.167 **	2.079	0.043
Experience	Years	-0.297	-1.187	0.240
Seed rate	Kg/ha	-0.247	-1.380	0.174
Labour use	Man days	-0.640 *	-1.867	0.067
Education dummy	=0 if below SSLC, =1 if SSLC/above	-0.036	-0.140	0.890
R^2 = 0.210, F value = 2.765, Significance of F= 0.0273, N=60				

Note: *** denotes significant at 1 % level of probability, ** denotes significant at 5 % level of probability and *denotes significant at 10 % level of probability

Age was found to influence yield gap positively at five per cent level of significance. Among the 60 farmers growing traditional variety, 40 (66.7 per cent) were aged 60 or more. Only seven farmers (11.7 per cent) were in the age category of 30 to 45 years and the remaining 13 (21.6 per cent) were aged between 45 and 60 years. The average age of 60 farmers in the category growing traditional varieites was 62 years. When age increases, farmers are usally reluctant to adopt new technologies including HYVs and they will be orthodox with inclination towards their traditions. Labour use in mandays was negatively influencing the yield gap in traditional farms at 10 per cent level of significance. Labour accounted for more than 90 per cent of the cost of cultivation of paddy in Kaipad as cultivation practices in Kaipad were labour intensive. High labour

wages and scarcity of labour were reported to be the major constraints by farmers. The labour use in the sample farms growing traditional varieties ranged from 94 man days to 288 man days per hectare, with an average labour use of 159 mandays. Farms which were able to follow timely management practices using hired as well as family labour could have obtained higher yield and thereby experienced lesser yield gap.

It could be observed from Table 4.16 that the R^2 value for the fitted log-linear yield gap function in the case of farms growing HYV was 0.39 which implies that the included variables in the model could explain 39 per cent of the variation in yield gap. The F value was found to be significant at five per cent level of probability and all the elasticity estimates had signs as per the *apriori* expectation.

Table 4.16. Estimates of the fitted log-linear model for yield gap II for HYV

Variable	Unit	Co-efficent	't' value	Probability value
Constant	-	5.594*	1.872	0.0707
Age	Years	0.301	0.475	0.6378
Experience	Years	-0.138	-0.546	0.5889
Seed rate	Kg/ha	-0.617 **	-2.429	0.0211
Labour use	Man days	-0.388	-0.847	0.4037
Education dummy	=0 if below SSLC, =1 if SSLC/above	-0.822***	-3.763	0.0007
$R^2 = 0.393$, F value = 4.01, Significance of F= 0.0063, N= 60				

Note: *** denotes significant at 1 % level of probability, ** denotes significant at 5 % level of probability and *denotes significant at 10 % level of probability

Seed rate was found to be significantly reducing yield gap at five per cent level of significance. The average seed rate in the sample farms in this category was 70 Kg/ha. In Kaipad, salinity of the soil affects the germination of seeds and tidal waves wash away the seeds. The birds feed on the seeds sown in the field and it was also reported that the bird menace has increased in recent years.

Because of these reasons it could be inferred that in farms where higher seed rates were followed, even when the above constraints were present, the plant population would have been maintained because of higher seed rate, which could have resulted in reduced yield gap. The coefficient of education dummy was negative and significant at one per cent level. This implies that with increase in education level, awareness as well as willingness to accept modern technologies and new varieities would increase and thereby contribute to reduction in yield gap

For the fitted log-linear yield function for all farms (both high yielding and traditional) in the Kaipad region, the F value was highly significant and R^2 value was 0.26 and all the regression coefficents had the *aprori* expected signs. Age was found to be positively influencing yield gap at 10 per cent level of probability. While seed rate and education were negatively influencing yield gap at five per cent level of probability, the dummy for variety was found to be highly significant at one per cent level of probability.

Table 4.17. Estimates of the log-linear model for yield gap II for all farms of Kaipad

Variable	Unit	Co-efficient	't' value	Probability value
Constant	-	7.561***	3.972	0.0002
Age	Years	0.798*	1.879	0.0635
Experience	Years	-0.191	-1.051	0.2962
Seed rate	Kg/ha	-0.311**	-2.067	0.0416
Labour use	Man days	-0.361	-1.270	0.2076
Variety	=0 traditional, =1 HYV	-0.505***	-3.048	0.0030
Education dummy	=0 if below SSLC, =1 if SSLC or above	-0.420**	-2.414	0.0179
R^2=0.263, F value = 5.24, Significance F= 0.0001, N=120				

Note: *** denotes significant at 1 % level of probability, ** denotes significant at 5 % level of probability and *denotes significant at 10 % level of probability

Out of the 120 farmers surveyed in Kaipad region, 50 per cent (60 farmers) were aged more than sixty years and in that 50 per cent, two-third were growing traditional variety. 21 farmers belonged to the age group of 30-45 and out of them, two-third were growing HYV while in the age group from 45-60, about two third of the 39 farmers were growing HYV. So it could be inferred from this majority of farmers growing HYV were comparatively young when compared to farmers growing traditional variety. Hence, it could be concluded that the farmers who are aged are more inclined towards traditional varieties and reluctant to adopt new techonogies and hence the yield gap increases with age. Seed rate followed by the farmer could reduce the yield gap as it helps in maintaining the optimum population of plants even when some seeds sown are lost due to salinity, tidal flows and bird attack. The yield gap was found to be less in the case of farmes growing HYV. In the study area about 66 per cent of farmers growing HYV were between 30 and 60 years and majority of them were having an experience from 10 to 30 years. They were young farmers having experience in farming and they adopted newer technologies and reaped a higher yield. When compared to the category of farmers growing traditional varieties, in the category of farmers growing HYV, more number of farmers were educated upto SSLC, higher secondary or degree level, which could be contributing to reduction in yield gap because of increased awareness about crop management practice.

4.4 Marketing of paddy

Agricultural marketing involves all the activities concerned with the movement of produce from the farm to ultimate consumer through different marketing channels. At each stage of marketing expenditure is incurred towards the operations carried out and the intermediaries or the person involved fixes a certain amount of profit or margin.

4.4.1 Selling behaviour of paddy farmers in Kaipad region

The selling behaviour of the farmers in Kaipad region is presented in Table 4.18. It is evident from the table that 66 per cent of the sample farmers in Kaipad region were not marketing their produce. Eventhough the production system in Kaipad tracts is naturally organic and the rice produced is exclusively organic, the farmers were not getting any premium price for their produce because it was being marketed at the same price as that of inorganically produced rice. Majority of the farmers kept their produce for family consumption realising the nutritional and cooking quality of rice produced in Kaipad tracts and hence the marketable surplus was very low. Exactly 20 per cent of the farmers reported that they were selling their produce to local millers. About 9 per cent of farmers relied on local traders for selling their produce. Since the farmers were getting immediate cash payment, they preferrred selling to local agents and millers. The rest five per cent of the total sample respondents sold their produce directly to consumers.

Table 4.18. Selling behaviour of farmers in Kaipad region

Sl.No.	Particulars	No of farmers	Percentage to total
1	Local trader	14	9.33
2	Rice miller	30	20.0
3	Consumer	7	4.67
4	None	99	66.0
	Total	150	100.0

4.4.2 Marketing channel

The chain of intermediaries through whom the commodity moves from the producer to the consumer constitutes the marketing channel. It could be understood from the Figure 4.1 that the intermediaries functioning in marketing of paddy in Kaipad region were village level agents or local agents, rice millers,

padasekhara-samithis and retailers. The four marketing channels identified in Kaipad region were

Channel I : **Farmer → Rice Millers → Retailers → Consumer**

Channel II : **Farmer → Local agent → Rice Millers → Retailer → Consumer**

Channel III : **Farmer → Local agent → Padasekhara-samithis → Consumer**

Channel IV : **Farmer → consumer**

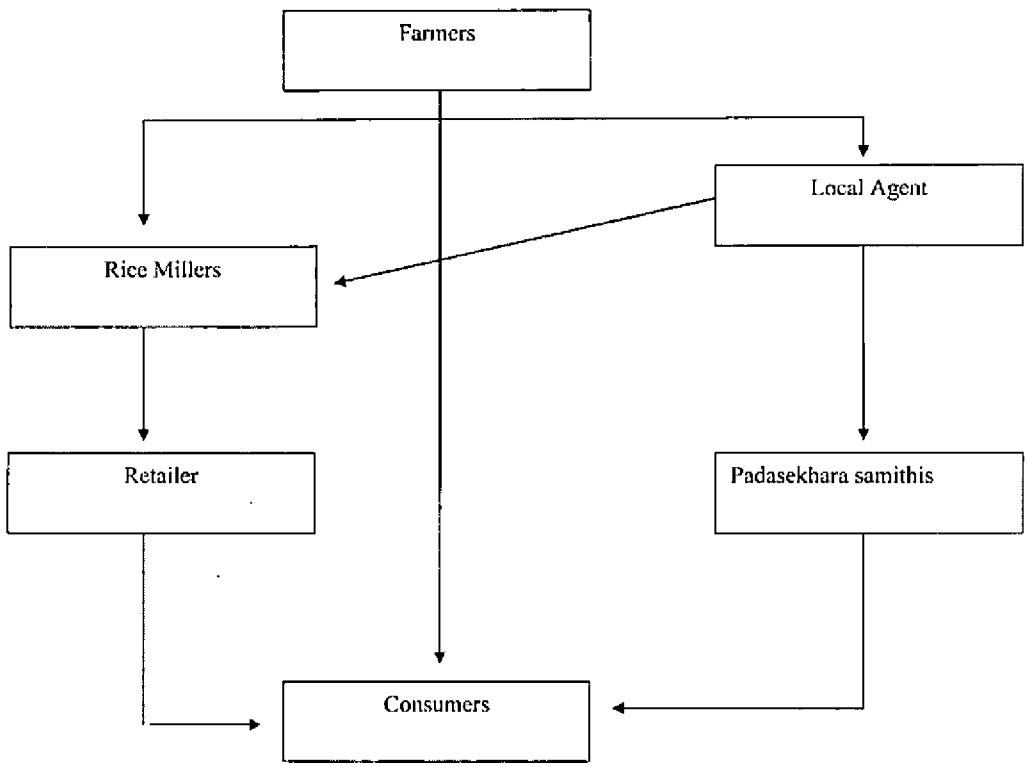


Figure 4.1 Marketing channel for Kaipad paddy

The four identified marketing channels were compared on the basis of marketing cost incurred, profits or margin earned by the major intermediaries, price spread, producer's share in consumer's rupee and efficiency and the results are presented in Table 4.19.

Table 4.19. Marketing cost, marketing margin, price Spread and efficiency in different marketing channels of paddy (Rs./Kg)

Particulars	Channel I	Channel II	Channel III	Channel IV
Price realised by farmer	19.27	17.6	27.14	28.5
Marketing cost	0.57	0.11	0.11	0.02
Processing charge	0	0	0	3.83
Net price received by farmer	18.7	17.49	27.03	24.65
Purchasing price of local agent	0	17.6	27.14	0
Cost incurred by local agent				
Weighing & Unloading charges	0	0.9	0.7	0
Gunny bag	0	0.1	0	0
Processing charge	0	0	0	0
Transportation charges	0	0.3	0.35	0
Local agent total cost	0	1.3	1.05	0
Local agent total margin	0	1.1	1.81	0
Purchasing price of miller	19.27	20	0	0
Cost incurred by miller				
Weighing & Unloading charges	0.35	0.35	0	0
Processing charge	11	11	0	0
Transportation charges	0	0	0	0
Rice miller total cost	11.35	11.35	0	0
Income from by products	1.6	1.6	0	0
Millers total margin	2.98	2.25	0	0
Selling price of miller	32	32	0	0
Purchasing price for retailers (for .6 kg avil)	32	32	0	0

Cost incurred by retailers				
Transportation charges	1.5	1.5	0	0
Retailers margin	1.5	1.5	0	0
Purchase price of Padasekara-samithi	0	0	30	0
Cost incurred by Padasekhara-samithi	0	0	0	0
Consumer price	35	35	30	28.5
Price spread				
Total marketing cost	13.42 (38.34)	14.26 (40.74)	1.16 (3.87)	3.85 (13.51)
Marketing margin	2.88 (8.22)	3.25 (9.29)	1.81 (6.03)	0 (0)
Price spread	16.3 (46.57)	17.51 (50.03)	2.97 (9.90)	3.85 (13.51)
Producers share in consumer's Rupee	53.43	49.97	90.10	86.49
Sheperds index	2.61	2.45	25.86	7.40

Note: Figures in parenthesis indicate total marketing cost, margin and price spread expressed as per cent of the respective consumer prices

4.4.3 Marketing cost

From Table 4.19, it is evident that the marketing cost was highest in channel II and it accounted for 40.74 per cent of the consumer price in that channel while it was lowest in channel III, accounting for only 3.87 per cent of the consumer price. The higher cost in channels I and II could be attributed to the higher number of intermediaries including millers and the cost incurred for processing in these channels. The cost incurred for marketing was lowest in channel III because there were no intermediaires in this channel as the farmers were selling paddy directly to padasekhara-samithis as seeds, without incurring any cost on processing.

4.4.4 Marketing margin

It is evident from Table 4.19 that the marketing margin was highest in channel II (Rs.3.25/Kg) whereas it was zero in channel IV as the farmers were

directly selling to consumers in this channel without the involvement of any intermediary. The share of marketing margin in consumer price ranged from 6.03 per cent in channel III to 8.22 per cent in channel I.

4.4.5 Price spread in different marketing channels

Price spread in different marketing channels of paddy are tabulated in Table 4.19. Price spread refers to the difference between the price paid by the ultimate consumer and the price received by the farmer. It includes the cost involved in moving the product from the point of production to point of consumption and the profits of various market functionaries associated with the movement of the produce from the producer to the consumer, ie., the marketing cost and the marketing margin. While comparing the price spread in different channels, it was found to be highest in channel II where as it was lowest in channel III. The price spread was high in channel I and II because the number of intermediaries were more in these channels while it was comparatively very low in channels III and IV as there were either few or no intermediaries in these channels. The price spread was about 50 per cent of the consumer price in channel II while it was only 9.9 per cent in channel III. Hence, the prodcuer's share in consumer's rupee was about 90 per cent in channel III and it was only about 50 per cent in channel II.

4.4.6 Marketing Efficiency

From Table 4.19 it could be observed that channel III had the highest marketing efficiency of 25.86 while it was lowest in channel II (2.45). The important determinant of efficiency is the marketing cost which ususally increases with the length of the marketing channel. Of the four marketing channels identified in the study region, channel III was more efficient owing to its shorter length and lower marketing cost. In this channel, farmers were marketing the produce as seeds incurring only lesser marketing cost as compared to other channels. It was found that only few farmers were able to explore the benefits of this channel. Eventhough there were no intermediaries between farmer and

consumer in channel IV, a higher marketing cost and a lower consumer price have caused the Shepherd's index to be lower in channel IV when compared to channel III.

4.5 Constraints in Kaipad farming

The Kaipad farmers face several constraints in production and marketing of paddy. The constraints were listed and then ranked based on the responses by the paddy growers during the sample survey. The ranks were then converted to mean score (Garret ranking) for getting a real picture of the constraints prevailing in the study area.

4.5.1 Constraints faced by Kaipad farmers in paddy production

The constraints faced by Kaipad farmers in the production of paddy were identified and are presented in the Table 4.20. High wage cost and scarcity of labour were identified as the major constraints for production of paddy in Kaipad region. For farmers practicing paddy without shrimp in sequence, the major constraint was high wage cost while scarcity of labour was identified as the second major constraint. The mean scores for the constraint 'high labour cost' were 69.85 and 67.66 respectively for farmers growing traditional and HYV without shrimp in sequence while the corresponding values for the constraint 'scarcity of hired labour' was 65.67 and 66.39 respectively The category of farmers practicing rice-shrimp sequential farming identified 'scarcity of labour' as the major constraint followed by the constraint 'high wage cost'. The mean score for the constraint 'scarcity of hired labour' were 68 and 67.33 respectively for farmers growing traditional and HYV without shrimp in sequence whereas, those for the constraint 'problem of high wage cost' were 661.61 and 65.33 respectively. Labour accounts for more than 90 per cent of the cost of cultivation in Kaipad. Since the area is swampy, complete mechanization of operations is not possible and the cultivation practices from land preparation to harvest are cumbersome and of risky nature requiring skilled labourers. Thus, high labour cost and scarcity of skilled labour are the major constraints in cultivation of paddy in Kaipad tracts.

Table 4.20. Constraints faced by Kaipad farmers in paddy production

Sl. No	Constraints/ Category	Rank			
		Growing tradition al variety	Growing traditional variety and shrimp in sequence	Growing HYV	Growing HYV and shrimp in sequence
1	High wage cost	1 (69.85)	2 (61.61)	1 (67.66)	2 (65.33)
2	Scarcity of hired labour	2 (65.67)	1 (68.00)	2 (66.39)	1 (67.33)
3	Mangrove penetration	3 (47.63)	3 (45.25)	5 (44.26)	3 (46.50)
4	Varieties prone to lodging	6 (41.40)	-	-	-
5	Weed problem	5 (43.78)	7 (36.17)	4 (44.63)	8 (27.40)
6	Problems related to mechanization	4 (45.75)	5 (40.43)	6 (39.00)	6 (34.67)
7	Lack of infrastructure facilities	8 (36.93)	6 (37.40)	8 (35.00)	7 (29.50)
8	Problems related to harvesting and threshing	7 (41.23)	8 (33.67)	3 (45.36)	5 (35.86)
9	Conflicts between fish farmers and rice farmers	8 (39.67)	4 (42.48)	7 (35.22)	4 (44.80)
10	Attack of birds and rodents	10 (22.76)	9 (24.70)	9 (24.76)	9 (24.55)

Note: Figures in parentheses indicate Garret score of the respective constraint

'Mangrove penetration' was identified as the third important constraint by all the categories of farmers with the exception of those growing HYV without shrimp in sequence for which it was ranked as the fifth constraint. The spread of

mangroves have been exerting pressure on the Kaipad ecosystem, affecting the livelihood of the farmers. Some of the cultivators are leaving their fields fallow leading to the spread of mangroves in Kaipad fields. Once mangroves have spread in the fallow fields, it becomes extremely difficult to continue farming in fields adjacent to them. Further, the spread of mangrove roots act as a barrier and prevent entry of fishes to the field. Moreover plastic and other non degradable wastes are being trapped in between their roots which in turn affect the fertility of fields. The crown of mangroves provides resting sites for birds, which feed on the seeds sown as well as the crop which is ready for harvest.

The other constraints identified in the area were weed infestation, lack of mechanisation initiatives, lack of infrastructural facilities, problems related to harvesting and threshing, conflicts between fish farmers and rice farmers and attack of birds and rodents. The traditional varieties possess unfavourable characteristics like awns and are prone to lodging . Farmers complained that they were unable to access the HYV recently released by KAU. The infrastructural facilities mainly with respect to irrigation and drainage were very poor in various 'Padasekharams' of the district. The channels, bunds and rivulets need to be improved for better water management in the area and more incentives need to be provided for specific operations like mound preparation and harvesting to make Kaipad farming more remunerative. Despite the fact the paddy fields in a bund area are under the ownership of many farmers, the right to catch fishes from these fields goes to the owner of bund or 'Mancha'. Even though farmers are getting 'chemmeen panam' from the bund owners for forgoing the fishing rights, this amount is meagre and most of the time the farmers have to fight with the bund owners for timely and effective closing and opening of these bunds. The delay in closing of bunds lead to delay in planting. Since the varieties cultivated in the area are either medium or long duration varieties, if the planting is delayed the reproductive phase of the crop will coincide with high salinity phase of the soil, which ultimately leads to the formation of chaffy grains. Reaping in Kaipad is strenuous as the labourers have to stand in knee-deep water for hours, the crop

stems are also razor sharp and hence the farmers are not getting enough labour for timely harvest. The problem of attack of birds has also increased with the spread of mangroves.

4.5.2 Constraints faced by farmers in marketing of Kaipad paddy

The constraints in marketing of paddy were also ranked based on the information obtained from the producers in Kaipad region and the results are presented in Table 4.21.

Table 4.21. Constraints faced by farmers in marketing of Kaipad paddy

Sl. No	Constraints /category	Mean score	Rank
1	Low price	66.16	1
2	More distance to marketing society	51.20	3
3	Transport charges	37.17	7
4	Transport losses	37.25	6
5	Non availability of storage yards	44.30	4
6	Lack of processing units for value addition	41.93	5
7	Marginal holdings leading to lesser production (Family consumption)	55.34	2

It is evident from the table that low price realisation for the produce, with a mean score of 66.16, was the foremost constraint faced by the farmers in marketing of paddy. Farmers were not getting any premium price for their organic produce evethough it was naturally organic. 'Marginal holdings leading to lesser production' with a mean ssore of 55.34 was identified as the second major constraint. Since majority of the farms were marginal holdings, the quantum of

production was comparatively low and the marketable surplus was also low as the farmers kept a major share of production for their own consumption. The villages were not having sufficient number of marketing societies and storage yards and have only very few processing units. Hence, the farmers were forced to incur higher transport charges for marketing and in turn results in losses during transport.

4.6 Documentation of Kaipad farming

The paddy-shrimp cultivation system traditionally being followed in the Northern districts of Kerala state is known as Kaipad farming. The water logged Kaipad ecosystem consists of marshes, ponds and paddy fields, experiencing flood during monsoon and salinity in summer season. During monsoon, when salinity is very low, one crop of paddy is taken up, while shrimp is grown during rest of the year. Paddy cultivation in Kaipad ecosystem is characterized by indigenous methods of cultivation with salinity tolerant local varieties and increased reliance on monsoon and sea tides. The fish farming followed in Kaipad is traditional capture based shrimp filtration, which begins after paddy harvest in October. The uniqueness of the production process in Kaipad is that neither fertilizers nor plant protection chemicals are used both in rice and fish farming. For the organization of this farming, water control systems are essential and the water flow is controlled by construction of strong bund and sluice wooden gate called as 'Manchas' which regulate the inflow and outflow of water to fields during rice and fish farming.

4.6.1 Paddy cultivation in Kaipad

4.6.1.1 Land preparation and mound formation

Agricultural operations for rice cultivation in Kaipad begin in mid-April. At the time of low tide, saline water is completely drained and the bunds are closed. The fields are then left to fully dry under the sun for about a month, which according to the farmers helps in boosting the fertility of the soil and there by the

Plate 1. Preparation of mounds

(a) Mound preparation in progress

(b) View of mounds

yield. After one month, small mounds of about one and a half feet diameter and two feet height are formed along lines in the field. These mounds are locally known by the name 'Potta' or 'Kuthire'. The mound formation has to be completed before the onset of south-west monsoon and it helps production in many ways. The salinity in the upper soil gets washed off easily and the seeds germinate very quickly. As the soil get loosened by this operation, penetration of the root system into the soil becomes easier. When the mounds are formed, it is also taken care that the upper layer of the soil forms the base of the mound, so that the fertile upper layer of this soil will not be lost in the initial shower during the south-west monsoon. Ploughing undertaken at the time of mound formation also helps to check the weed growth.

4.6.1.2 Traditional varieties of Kaipad

At present, the popularly grown traditional varieties of paddy in Kaipad tracts are 'Kuthir' and 'Orkayama'. But during earlier days, many other varieties *viz*,. 'Orthadiyan', 'Choveriyan,' 'Kuttusan', 'Orpandi' etc were cultivated Most of these varieties possessed awns which protected the seeds from bird attacks. Orkayama seeds are not sown in mounds, instead the salinity resistant seeds of this variety are raised in nurseries in non-saline areas adjacent to fields and are transplanted in June-July in Kaipad fields.

4.6.1.3 Pre-soaking of seeds

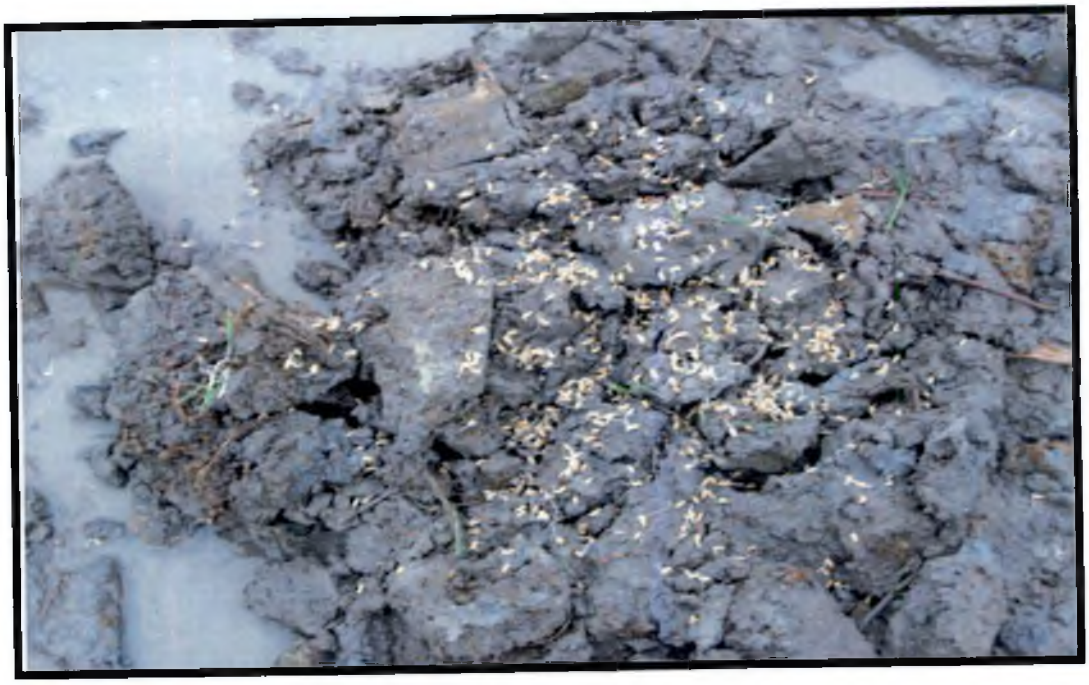
During earlier periods, before sowing farmers used to soak the seeds of 'Kuthir' in water, wrap in leaves of plantain, teak or bael tree and gather them in specially made coconut leaf baskets. This process was locally known as 'Pothi Kettu'. Presently the seeds are tied in gunny bags, soaked in rivers or lakes for 24 hours and then dried in shade. Pre-germinated seeds stay without losing their viability for 3 to 4 days. With the onset of monsoon, the pre-germinated seeds are sown in mounds and within a short time span the seeds grow as seedlings. Thus, when the rainwater is drained there is no chance for the birds to feed on the seeds.

Plate 2. Traditional varieties of Kaipad

(a) Seeds of 'Orkayama'

(b) Seeds of 'Kuthir'

Plate 3. Seeds and sowing



(a) Seeds broadcasted on the mounds

(b) Farmer covering the seeds with layer of mud

Plate 4. Nursery on mounds

(a) Seedlings in their early stages

(b) Seedlings ready for transplanting

Plate 5. 'Orkayama' seedlings raised in non-saline nurseries

Plate 6. Transplanting of 'Orkayama' seedlings

(a) Farmer transplanting 'Orkayama' seedlings in the main field

(b) 'Orkayama' seedlings in main field

Some farmers guard the fields at night to protect the germinating seeds from nocturnal birds.

4.6.1.4 Dismantling of seedlings

Within one month, the seedlings in the mounds go up to a height of one and a half feet and after 45 days of growth, the seedlings become mature enough for transplantation. The seedlings on the mounds are dismantled with root soil by male labourers and are spread uniformly in the field by female labourers. The transplanting helps to provide more space for growth of seedlings, thereby enabling the seedlings to explore the fertility of soil from more area and also helps in checking weed growth. One or two hand weedings are done in some areas while no other intercultural operations are required.

4.6.1.5 Fertile organic fields

Fertilizers or plant protection chemicals are not applied in Kaipad tracts and the high fertility of the fields is attributed to the leftover stubbles and post-harvest vegetation including submerged macrophytes. Daily tidal inflows and outflows also play a key role in increasing the fertility of the soil. The roots of mangroves in the fringes of the fields play a major role in enhancing the aeration of the fields. Organic matter including forest wastes from mountains and remnants of sea creatures coming along with river water and the excreta of migratory birds resting on mangroves add to the fertility of the soil.

4.6.1.6 Harvest of paddy – a laborious task

When the crop reaches the milking stage, farmers cautiously guard the fields from attack of birds. The crop is usually ready for harvest from the end of September to mid-October. 'Orkayama' variety needs two more weeks for harvest when compared to other local varieties and this time lag helps to prevent breeding between two varieties if cultivated adjacently. Reaping in Kaipad is strenuous as the labourers have to stand in knee-deep water for hours and the leaf blades are

Plate 7. Dismantling of seedlings

(a) Workers engaged in dismantling of seedlings

(b) Female labourer dismantling the mound with root soil

Plate 8. Spreading of seedlings in the field

(a) Female labourer spreading seedlings uniformly in the field

Plate 9. Seedlings in the mainfield

(a) Seedlings at milking stage

(b) Seedlings at the harvest stage

Plate 10. Paddy at the harvest stage

(a) Workers engaged in the harvesting operation

(b) Left over stubbles in field after harvest

also razor sharp. During harvest, panicles along with small portion of culm are harvested leaving the rest in the field. When the soil salinity increases these leftovers degrades in soil. The harvested produce is threshed in mud flats seen in the fields and the grains are brought to the banks of Kaipad in country boats through the small rivulets. These rivulets are essential for both fish and rice farming. Silt used to be dug out from the rivulets every year to deepen them thus reinstating the water reservoir that was already in place. This work was being done in a participatory manner by the farmers having fields adjacent to the rivulets. Since most of the fields are left fallow in the recent years, there is less concern about the management of rivulets, which have made them ineffective thereby, adversely affecting not only the flow of water but also the fertility of the soil.

4.6.2 Fish culture in Kaipad fields

4.6.2.1 Prawn filtration : Conventional techniques

In October, after the harvest of paddy Kaipad fields are used for prawn filtration. The prawn filtration is locally known as 'Chemmeen Kettu' or ' Chemmeen Kandi. The major activity before prawn filtration is strengthening of the bunds and 'Manchas', which are reinforced with sticky mud and weed called *Cyperus pangroei*. According to the farmers, these weeds strengthen the bunds and a part of it decomposes and becomes the feed for fishes and thus attracts prawn and small fishes. After the reinforcement of the bunds, wooden sluice gates are fixed and the number of sluice gates depends on the size of the bunds. This maintenance works are completed by the end of December. When the water of the canal reaches the highest level, the tidal water enters the field with maximum force along with fingerlings of acqua creatures enter the fields through the tidal currents. The number of prawns entering the fields depends on the strength and duration of currents and majority of them enters by the end of December.

Plate 11. Post-harvest operations

(a) Transportation of harvested paddy through rivulets in country boat

(b). Workers engaged in threshing of harvested produce

Plate 12. Arrangements for prawn filtration

(a) Bunds constructed for prawn filtration

(b) Manchas and shade house for facilitating prawn filtration

4.6.2.2 Mechanism involved in prawn filtration

During the tidal inflow a conical shaped net with an opening at the end is fixed inside the sluice gate valves. This net lets in prawn and fish with tidal flow, but it would not let them out. After the tide, the net is removed and filter is kept at the mouth of the sluice to prevent the prawns and fishes from flowing out. Fields are kept under water for 2 to 3 months for allowing the prawns and fishes to grow. They feed on leftover of harvested crop and supplementary foods are not added in the fields.

4.6.2.3 Early stages of prawn filtration

Prawn filtration begins by February and continues till April. Fish filtration begins on 'Ekadasi' day *i.e.* the eleventh day from full moon or new moon and ends in the 'Panchami day *i.e.* three to four days after the full moon or new moon. Fish harvest is done during the tidal outflow from dusk to dawn and the harvest during desk is locally known as 'Andhi' and that in the dawn is called 'Pulari'. Thus in each month, shrimp fitration is taken up for 14 to 15 days during a lunar cycle and on these days, a net is placed on 'Mancha' outlet and prawns are filtered. To attract the fishes in the field towards the net, lanterns are fixed in the 'Manchas'. The days when more catch is experienced is locally known as 'Thakham'. This practice is usually continued till April.

4.6.2.4 "Kandikalakkal"-The final harvest of the season

On the last day of filtration, to increase the catch, the owner allows anybody with any technique to fish in the field on the condition that half of the catch should be given to him. This practice is known as 'Kandikalakkal' meaning, churning the field. After 'Kandikalakkal' the bunds are closed and from that day onwards any one can fish from the private paddy fields. This open access continues till mound making. During the harvest days, fishes are collected and graded in the bunds. A small hut is constructed on the bund for the workers to stay during night. The graded fishes are taken to market in the morning.

Plate 13. Mechanism of prawn filtration

(a) Conical shaped net to filter the fishes

(b) Harvested prawns kept for drying in shade

4.6.2.5 Composition and fluctuation of catches in Kaipad

About 75 per cent of total catch of fish is accounted by prawns and is usually accounted by four main varieties of prawns *viz.*, Black tiger shrimp, Indian white shrimp, Speckled shrimp and Kadal shrimp. The average count and price of four major shrimps caught in Kaipad are presented in Table. 4.22 . Of the total catch of shrimps, around 50 per cent will be 'Kadal shrimp' which is very small. About 30 per cent and 15 per cent of the catch are accounted by Indian white shrimp and medium sized speckled shrimp respectively. Tiger shrimp which is expensive and biggest among the four usually accounts only for 2 to 3 per cent of the catch. The balance 25 per cent of the total catch is contributed by small fishes and crabs. Even though there is fish filtration during the monsoon months also, the catches during these months are very low

Table 4.22. Average count and price of different shrimps in Kaipad

Name	Black tiger Shrimp	Indian white Shrimp	Speckled Shrimp	Kadal Shrimp
Count (No/Kg)	20	200-250	400	900
Price (Rs/Kg)	350-400	150	80-100	400

4.6.3 The puzzle: Ownership of bunds

Despite the fact the paddy fields in a bund area are under the ownership of many farmers, the right to catch fishes from these fields goes to the owner of bund or 'Mancha'. These bunds were constructed during early 20th century by the big tenants to control the water inflow and till now the ownership of these bunds are vested with their family members. Even though farmers are getting 'chemmeen panam' from the bund owners for forgoing the fishing rights, this amount is

meagre to support their family needs during the second crop season. And most of the times the farmers have to fight with the bund owners for getting this amount.

Farming in Kaipad tracts is a sustainable one which takes into account the conservation of bio-diversity and harmony of nature. Even though the saline prone Kaipad fields are spread in Kannur, Kasaragod and Kozikode districts, majority of these tracts are left fallow, especially in recent years. People belonging to Ezhome, Pattuvom, Kannapuram and Cherukunnu Panchayaths of Kannur district are now the major producers of Kaipad rice.

4.6.4 Issues of mangroves

Mangroves were seen on the fringes of Kaipad fields. They provided breeding sites for the fishes and prawns and their prop roots helped in mineral recycling. As many of the cultivars moved out of Kaipad farming due to the low profitability of Kaipad farming, a major portion of them are left fallow. This led to the large scale spread of mangroves in Kaipad fields. Once mangroves have grown in the fallowed fields, it is extremely difficult to continue farming in fields adjacent to them. The crown of mangroves provides resting and nesting place for migratory birds making Kaipad fields an ideal habitat for migratory birds. They depend on Paddy crop for food. The spread of mangrove roots act as a barrier and prevent entry of fishes to the field. Moreover plastic and other non degradable wastes are being trapped in between their roots which in turn affect the fertility of fields. But any attempt to cut down mangroves for rice farming causes opposition from the forest department and environmental conservationists. Thus the public interest in favour of conservation of mangroves and mangrove afforestation is adversely affecting the Kaipad farmers.

4.6.5 Geographical Indication

Kaipad rice is now registered in the Geographical Indications Registry (GIR) of the Government of India. Application was made by Malabar Kaipad Farmers' Society (Registration Number 249/10), and was facilitated by Kerala

Plate 14. Mangrove spread in fields restricting cultivation

Agricultural University. It was the initiative of College of Agriculture, Padanakkad through its intellectual property cell that led to the granting of the GI certification. The GI tag improves the market prospects of the rice variety and earns commercial benefits for farmers by enhancing its fame, authenticity and marketability. Thus, registration of Kaipad rice as a GI could promote the economic prosperity of Kaipad farmers as GI provides a brand identity to the product and opens a new avenue for Kaipad farmers to export their produce. The society now has plans to market organic Kaipad rice as a brand. As per the plan, the society will procure Kaipad paddy from whole Kaipad area, process it and sell it as branded organic rice in domestic as well as export markets. Organic rice which is healthier and tasty, is the most demanded one compared to non-organic rice. Hence, organic Kaipad rice is equally acceptable for low income consumers and high income consumers.

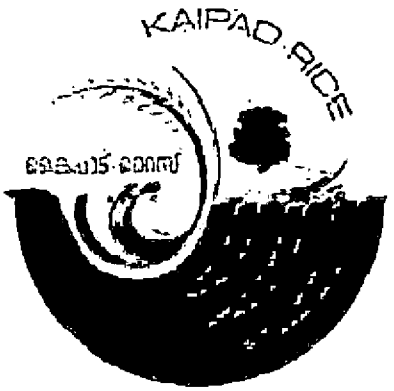


Fig 4.2. Logo of Kaipad rice

4.6.5.1 Description of Kaipad rice

Kaipad rice belongs to organic rice group whose kernel is red in colour. The range of morphological traits of popular Kaipad cultivars is, height of plant 132-145cm, duration 125-145 days, grains panicle -1 74 to 215, length of grain 8.1 to 8.9 mm, breadth of grain 3.0 to 3.3mm, and 1000 grain weight 25.6 to 32.6g. All are with medium sized grains and with red kernel colour. Regarding

physic- chemical traits and cooking qualities, milling percentage ranges from 74.8 to 76.9, head rice recovery from 62.0 to 68.9%, volume expansion from 2.8 to 3.5, and kernel elongation 1.40 to 1.52 with very tasty cooked rice.

Regarding nutritive quality, the range of content of various nutritive factors is, iron 59.8 to 303mg/kg, Calcium 154 to 218 mg/kg, Crude fiber (% by wt.) 10.6 to 12.3, Zn 12.0 to 21.1 mg/kg, Potassium 8359 to 14075 mg/kg, Magnesium 628 to 969 mg/kg, Phosphorus 161 to 214 mg/kg, Starch 23.4 to 24.9 mg/kg, Total carbohydrate 83.0 to 83.9 mg/kg,Total sugar 0.5 to 0.6 mg/kg, Protein (% by wt.) 0.3 to 0.4, and fat (% by wt.) 1.5 to 1.8.

4.6.5.2 Uniqueness of Kaipad rice:

- Kaipad rice is produced from saline tolerant cultivars grown in naturally organic production system called Kaipad. The produce is purely organic with excellent cooking qualities. The rice is having volume expansion ranging from 3.2- 3.5, non sticky nature, red kernel colour, and with delicious taste.
- Nutritive value of Kaipad rice is excellent with good content of iron (59.8 to 303 mg/kg), calcium (154 to 218 mg/kg), and potassium (8359 to 14075 mg/kg).
- Due to the unique and complex combination of agro- climatic conditions prevailing in the region of Kaipad rice tracts, rice produced in this region are having distinctive and naturally occurring characteristics, which have won the patronage and recognition of both low income consumers and high income consumers. If it is grown in some other regions, the characteristic qualities get diluted.
- As there is no pest and disease incidence in Kaipad rice tracts, no chemical plant protection is followed. Farmers are following the unique natural way of cultivation practices, as the tract is suited for natural organic rice production. This clearly indicates that Kaipad rice and related products are free from hazardous chemicals

(Source: GI Journal No. 52, 10 October 30, 2013)

Summary and Conclusion

SUMMARY AND CONCLUSION

The present study entitled "Economic analysis of production and marketing of Kaipad paddy in Kannur district" was conducted in Kaipad tracts of Kannur district. The objectives of the study were to work out the costs and returns of cultivation of Kaipad paddy, to estimate the magnitude of the yield gap and the factors contributing to the yield gap, to identify the marketing channel and the price spread in different channels, to identify the constraints in production and marketing of paddy and to document the cultural practices in Kaipad.

Kannur district was purposively selected for the study since the district had maximum area under Kaipad paddy. The two traditional Kaipad areas in Kannur district *viz.*, Taliparamba and Kalliassery blocks were selected for the study. Two panchayats having maximum area under Kaipad paddy *viz.*, Pattuvom from Taliparamba block and Ezhome from Kalliasery block were selected. The farmers in the study area were categorised into five groups on the basis of farming practices followed as farmers growing traditional variety, farmers growing traditional Kaipad and shrimp in sequence, farmers growing HYV (Ezhome-1/Ezhome-2), farmers growing HYV (Ezhome-1/Ezhome-2) and shrimp in sequence and paddy farmers from non-saline areas adjacent to Kaipad. From each of the five categories, 15 farmers were randomly selected from each of the Panchayat. Thus, 30 farmers were randomly selected from each group, making a total sample size of 150 farmer respondents.

The socio-economic characteristics of the respondent farmers with respect to age, gender, education, experience, family size, land holdings, annual income and sources of income were analysed. Majority of the farmers in all the categories other than those growing HYV were in the age group of 60 or more while the farmers adopting HYV were comparatively younger when compared to those growing traditional varieties. In the overall sample of 150, the male and female farmers formed 50 per cent each. Many females were involved in growing paddy either individually or as members of various groups in Kaipad. Even though all the farmers were literates, farmers who were graduates were either 10 per cent or

less in all the sample categories. 80 per cent or more of the farmers in all sample categories were having experience between 10 and 30 years. Family size of majority of the respondents was between two and four members, limiting the availability of family labour. Majority of the farmers were having marginal holdings and the average holding size of all farms was 0.50 ha. 75 per cent of the respondents were cultivating on their own land and the rest have leased-in lands. The average size of own land was 0.46 ha, while it was 0.61 ha for the leased-in land. Agricultural and allied activities formed the major source of income for all categories of sample farmers With the exception of farmers growing HYV, none of the other farmers had an average annual income of more than Rs.2,00,000.

The average cost incurred for paddy cultivation in non-saline areas adjacent to Kaipad was Rs.47970 per hectare and was lesser than the cost incurred in Kaipad. The highest cost of cultivation of Rs.67128 per hectare was incurred for the HYV. Among the farmers growing HYV, the cost incurred for growing HYV without shrimp in sequence was lesser than that of growing HYV and shrimp in sequence up to cost B_2. The cost B_2 was Rs.45594 per hectare and Rs.51690 per hectare for paddy without shrimp in sequence and paddy-fish sequential farming respectively. The trend revered after cost B2 and cost C_1, C_2 and C_3 were found to be lower for growing HYV and shrimp in sequence. Cost C_1, C_2 and C_3 were Rs.62107, Rs.67128 and Rs.73841 for paddy without shrimp in sequence and Rs.54395, Rs.61904 and Rs.68095 for paddy-shrimp sequential farming. In the category of farmers growing traditional variety, the average cost incurred by farmers growing paddy without shrimp in sequence was slightly higher than those growing paddy and shrimp in sequence. Among the farmer respondents practising rice-shrimp sequential farming, average costs were slightly higher for farmers growing traditional variety.

The average costs of production of the respondents from non-saline areas adjacent to Kaipad were less compared to that of respondents from Kaipad areas. The cost of production of farmers growing HYV was lesser than the costs incurred for growing traditional varieties. Among the farmer respondents

practicing paddy-shrimp sequential farming, average cost of production per quintal was higher for farmers growing HYV. Among the farmers growing HYV, the average cost of production/kg incurred by farmers growing HYV without shrimp in sequence was lesser than that of farmers growing HYV along with shrimp up to B_2. Cost B_2 was Rs.1795 and Rs.1908 for paddy without shrimp in sequence and paddy–shrimp sequential farming respectively. From Cost C_1 onwards, cost of production of HYV without shrimp in sequence became greater than the cost of production of HVV and shrimp in sequence. Cost C_1, C_2 and C_3 were Rs.2445, Rs.2643 and Rs.2907 for paddy without shrimp in sequence and Rs.2008, Rs.2285 and Rs.2514 for paddy-shrimp sequential farming

The average yield of paddy in sample farms growing traditional variety without shrimp in sequence was 2097 Kg/ha and average yield in sample farms growing HYV without shrimp in sequence was 2540 Kg/ha. Among the farmer respondents practicing rice-shrimp sequential farming, traditional variety on an average yielded 2324 Kg/ha while it was 2709 Kg/ha for the HYV variety. The average yield in non-saline areas adjacent to Kaipad was 2585 Kg/ha. The yield of paddy in farms growing shrimp was found to be higher than the farms without shrimp in both the categories of farms growing traditional and Kaipad paddy.

The average income from paddy was Rs.40752/ha for sample respondents growing traditional Kaipad variety without shrimp in sequence. The farmers growing HYV without shrimp in sequence were earning an income of Rs.51106/ha from paddy. Among the farmer respondents practicing paddy-shrimp sequential farming, the farmers growing traditional variety were getting an average an income of Rs.42245/ha and farmers growing HYV were getting an income of Rs.59241/ha from paddy. The average income from shrimp for sample respondents practicing paddy-shrimp sequential farming was Rs.2500/ha irrespective of the variety of paddy grown.

The average income from paddy was highest in the farms growing HYV and shrimp in sequence while it was lowest in the farms growing traditional varieties without shrimp in sequence. Within the farms growing traditional and HYV varieties, the average income from paddy was found to be high in the case

of farms following paddy-shrimp sequential farming. The difference in average income between farms growing paddy without shrimp in sequence and paddy as well as shrimp was found to be high in farms growing HYV as compared to the farms growing traditional variety. The average productivity and income from farms in non-saline areas was in between that from farms growing traditional and HYV of Kaipad paddy.

The highest average gross income of Rs.61741/ha was obtained by farmers growing HYV and shrimp while it was lowest for those growing traditional variety without shrimp in sequence. Gross income of the respondents from non-saline areas adjacent to Kaipad was more when compared to that of farmers growing traditional Kaipad variety but was less than those growing HYV. Farm business income was higher in paddy-shrimp sequential farming when compared to paddy without shrimp in sequence. The highest farm business income was found in the category of farmers from non-saline areas followed by the farmers growing HYV with shrimp in sequence. Among the respondents practicing rice-shrimp sequential farming, HYV yielded more farm income than traditional varieties. The farm business was lowest in the case of farmers growing the traditional variety without shrimp in sequence. The family labour income turned out to be negative in the category of farmers growing traditional variety.

The net income and Benefit Cost Ratio indicated that the farming is a loss making business in Kaipad region, especially when the value of the family labour, the land value and the managerial cost were accounted in the cost. BC ratio at explicit cost level worked out to be more than one in all cases and was highest in non-saline areas. This implies that taking into account all the variable costs or paid out costs without shrimp in sequence, farming is profitable in Kaipad. But the profitability in Kaipad region is less than the non-saline area because the farmers were being paid the same price as that of paddy produced in non-Kaipad regions and they were not getting any premium price for their naturally organic GI tagged rice. The profitability was found to be higher in the case of farmers growing HYV when compared to the traditional ones. The lowest BC Ratio was found for farms growing traditional Kaipad variety without shrimp in sequence.

Compared to paddy without shrimp in sequence, paddy-shrimp sequential farming was more beneficial.

For farmers growing traditional Kaipad variety without shrimp in sequence, the magnitude of yield gap II was 820 Kg. The magnitude of yield gap observed in farms cultivating traditional variety with shrimp in sequence was 1426 Kg. Among the farmers growing Ezhome-1 without shrimp in sequence, the magnitude of yield gap I and yield gap II were 167 Kg and 580 Kg respectively. Thus, the total yield gap in the case of Ezhome-1 was 747 Kg and it was about 21 per cent of the potential yield. In the category of respondents growing Ezhome-2 without shrimp in sequence, the magnitude of yield gap I and yield gap II were 75 Kg and 772 Kg respectively. The total yield gap when Ezhome-2 was grown without shrimp was 847 Kg, accounting for about 26 per cent of the potential yield.

The magnitude of yield gap observed in farms cultivating HYV along with shrimp was slightly lesser than yield gap observed in farms growing HYV without shrimp in sequence. In the category of farmers growing Ezhome-1 with shrimp in sequence, the magnitude of yield gap I and yield gap II is 375 Kg and 226 Kg respectively. For the category of farmers growing Ezhome-2 with shrimp in sequence, the magnitude of yield gap I and yield gap II was 283 Kg and 214 Kg respectively. Thus, the variety-wise total yield gap of Ezhome-1 and Ezhome-2 in the category growing HYV with shrimp in sequence were 601 Kg and 497 Kg respectively, accounting for 22 per cent and 16 per cent of the potential yield of Ezhome-1 and Ezhome-2 respectively. The share of yield gap II in the total yield gap was found to be 38 per cent and 43 per cent respectively for Ezhome-1 and Ezhome-2 with shrimp in sequence while it was 78 per cent and 91 per cent for Ezhome-1 and Ezhome-2 without shrimp in sequence.

The indices of yield gap worked out for the category of farmers growing HYV without shrimp in sequence revealed that the unrealised yield potential of Ezhome-1 was 21.34 and was 26.46 for Ezhome-2 and the index of realised potential yield was 78.66 and 73.54 respectively. This shows that about 25 per cent of the potential yield is left untapped. The indices of realised potential farm

yield were 82.58 and 75.30 for Ezhome-1 and Ezhome-2 respectively. The variety-wise indices of yield gap worked out for the category of farmers growing HYV with shrimp in sequence revealed that the unrealised yield potential of Ezhome-1 was 22.36 and for Ezhome-2 it was 15.53 and the index of realised potential yield was 77.64 and 84.46 respectively. This shows that around 23 percent of the potential yield is left untapped. The index of realised potential farm yield was 86.96 and 92.67 for Ezhome-1 and Ezhome-2 respectively when grown with shrimp in sequence.

Log-linear regression models fitted to find out the factors affecting yield gap in farms growing traditional varieties revealed that age was influencing yield gap positively at five per cent level of significance while labour use in man days was found to be negatively influencing the yield gap at 10 per cent level of significance. In the case of farms growing HYV, seed rate and education were significantly reducing yield gap at five per cent and one per cent level of significance respectively. For the fitted log-linear yield function for all farms, age was found to be positively influencing yield gap at 10 per cent level of significance while the seed rate and education were negatively influencing yield gap at five per cent level of probability.

About 66 per cent of the sample farmers in the Kaipad region were not marketing their produce. Majority of the farmers kept their produce for family consumption realising the quality of their produce and hence the marketable surplus was very low. Exactly 20 percent of the farmers reported that they were selling their produce to local millers. About 9 percent of farmers relied on local traders for selling their produce. As they were getting immediate cash payment, they were selling their produce to local agents and millers.

The four marketing channels identified were, (i) farmer-rice millers-retailers-consumer (ii) farmer -local agent, rice miller- retailer - consumer (iii) farmer -local agent- Padasekhara-samithis- consumer (iv) farmer-consumer. The marketing cost was highest in channel II (Rs.14.26) and it accounted for about 40.74 per cent of the consumer price while it was lowest in channel III (Rs.1.16), accounting for 3.87 per cent of the consumer price. The marketing margin ranged

from Rs.3.25/Kg in channel II to Rs.1.81/ Kg in channel III and the corresponding shares in consumer prices were 9.29 per cent and 6.03 per cent respectively. There was no marketing margin in channel IV as there were no intermediaries in this channel. The price spread was highest (Rs.17.51) in channel II and lowest in channel III (Rs.2.97) and the corresponding shares in consumer prices were 50.03 per cent and 9.90 per cent respectively. The marketing efficiency in channel III was highest (25.86) and lowest in channel II (2.45). The producer's share in consumer's price was 90.1 per cent in channel III while it was 49.97 per cent in channel II.

Various constraints in production and marketing of paddy were identified and ranked using Garret's ranking technique. Among the various constraints faced by farmers, high wage cost and scarcity of hired labour were ranked as the major ones. Low price realized for the produce was the foremost constraint faced in marketing of paddy.

Policy suggestions

Labour accounts for more than 90 per cent of the cost of cultivation in Kaipad and labour cost and labour scarcity are the major constraints in cultivation. Efforts need to be made for promoting mechanisation in Kaipad and more incentives need to be provided for specific operations like mound preparation and harvesting to make Kaipad farming more remunerative. This will also attract younger generations to Kaipad cultivation. Linking paddy cultivation to programme under Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) through appropriate policies needs to be taken up as a priority area.

The three northern districts of Kerala together are estimated to be having 4,100 ha of Kaipad tract. On an average yield gap II without shrimp in sequence was accounted at 600 Kg /ha. If this yield gap is bridged through efficient management practices, an additional production of about 36 tonnes could be realised. Presently about 2500ha of Kaipad fields are left fallow now. According to study, considering an average Kaipad rice production of 2.5 tonnes per hectare

per year, there is potential of production and marketing of approximately 8750 tonnes a year if the whole area is brought to cultivation.

Kaipad rice is now registered in the Geographical Indications Registry (GIR) of the Government of India. GI provides a brand identity to the product and opens a new avenue for Kaipad farmers including possibility of exporting their produce. The 'Malabar Kaipad Farmers' Society' (MKFS) should take initiatives to market Kaipad rice as a brand and also to obtain organic certification for their produce. Now that the farmers are selling the produce at 20 Rs/Kg the realised incomes comes to around 50000 Rs/ha. If the farmers could get the benefit of GI tag and manage to sell their produce at a premium price of about Rs. 60, they could get three times the income realised now.

The group-farming method of cultivation is an alternative option. JLG groups can be trained and motivated to take up cultivation in fallow lands. Fallowed lands affect the adjacent lands by affecting their yield rates by spread of mangroves and pest and bird attacks, leading to fallowing of adjacent lands. Therefore strict regulations should be implemented to avoid fallowing of Kaipad fields such that either the farmer should cultivate the field or he should lease it to JLG groups or other interested farmers.

Awareness programmes and field demonstration to promote the use of HYV seeds (Ezhome-1/ Ezhome-2) by highlighting the yield benefits and faster disbursal of seeds to poor farmers of Kaipad through Padasekara-samithis and Agriculture Department should be promoted.

Lack of facilities for value addition is an important problem in the Pattuvom panchayat. There is ample scope for enhancing the income of farmers through value addition by diversifying the products. Processing units and storage facilities should be established in Pattuvom panchayat as a first step.

An effective institutional arrangement to control the bunds surrounding Kaipad should be mooted up. Local vigilantism with the involvement of Local Governments and NGOs may help in the effective control over the bunds.

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APPENDIX I

Survey-questionnaire for Kaipad farmers

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
KAU (P.O)
Vellanikara , Thrissur
Department of Agricultural economics
Economic analysis of production and marketing of Kaipad paddy in Kannur district

Survey-questionnaire for Kaipad farmers

Block: Panchayat:

I Socio economic profile of farmers:

1. Name of the farmer:

2. Age:

3. Gender:

4. Address:

5. Phone no:

6. Educational qualification:

class	Upto 9th	SSLC	HSC	Graduate	Diploma	Post graduate	others
code	1	2	3	4	5	6	7

7. Experience in farming (years):

8. Annual income:

Income	< 25000	25000-50000	50000-75000	75000-100000	100000-200000	>200000
code	1	2	3	4	5	6

Appendices

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6. Educational qualification:

class	Upto 9th	SSLC	HSC	Graduate	Diploma	Post graduate	others
code	1	2	3	4	5	6	7

7. Experience in farming (years):

8. Annual income:

Income	< 25000	25000-50000	50000-75000	75000-100000	100000-200000	>200000
code	1	2	3	4	5	6

II. Family details:

Sl No	Member	Relationship with respondent	Age	Education	Occupation	
					Primary	Secondary

III. Land details:

	Garden (ha)	Wetland (ha)	Dryland (ha)	Total area (ha)
Owned				
Leased in				
Leased out				
Total				

Rental value of land/yr/ha (leased in land):

Land revenue of leased out land:

Value of land/ha:

IV. Crop particulars:

Season		Crop	Variety	Area	Main product		By-product	
					Qty (Kg)	Value (Rs)	Qty (Kg)	Value (Rs)
Wetland	Season I							
	Season II							
	Season III							

V. Details of non crop activities:

Sl No	Activities	Area/No	Annual maintanence expenses	Gross returns
1	Shrimp farming			
2	Livestock activities			
3	Poultry			
4	Self employment			
5	Others			

VI. Source of seeds:

Sl no	Source	variety	Qty	Price (Rs/kg)

VII. Indigenous or traditional practices followed in Kaipad farming

Sl no	Practices	Do they follow the practice (yes/no)	Reason if yes	Cost/ Price
1	Closing bunds at end of April			
2	Mound preparation & Strengthening of boundary / bunds			
3	Land preparation including opening of water outlets of bunds			
4	Sowing of pregerminated seedlings			
5	Dismantling of mounds (after 40 days)			
6	Weeding			
7	Fertilizer application			
8	Pest and disease management			
9	Any other intercultural operation			

10 Are you practicing mechanization in Kaipad fields

11 If yes for which all operations:

Operation	Cost involved

12 If No what is the reason:

13 What is the unique quality of your produce:

14 Cooking quality:

15 Is it used for medicinal purpose:
16 If yes for what all diseases:

17 What are the main factors affecting yield in Kaipad tracts (in order of preference):
1.
2.
3.
4.

18 No of extension visits to the area

19 Do you face any problem due to mangrove penetration in fields

20 If yes what are the problems

21 Do you think it is necessary to infringe the Kaipad fields with mangroves

VIII. Cost of cultivation:

Crop: Bullock power cost(Rs/pair/day): Yield:

Season: Machine power cost (Rs/hr/ha): Main product:

Variety Wage rate (Rs/day): By product:

Area: (1) Male : (2) Female

Sl no	Operation	Qty	Rate/ unit	Bullock power	Machine power	Human labour	Total labour cost	Total cost	Remarks
Cultivation practices									
1	preparation of mounds (potta)								
2	Boundary strengthening								
3	Land preparation including Opening of water outlets of bunds								
4	Sowing of pre germinated seeds on mounds								
5	Dismantling of mounds and planting of seedlings								
6	Removal of weeds in field								
7	Harvesting								
8	Post harvest handling (Winnowing and drying)								
9	Other intercultural operation if								

	any								
Prawn filtration									
1	Reinforcement of bunds								
2	Fixing and removal of nets during tides								
3	Labour for fishing								

IX. Marketing of paddy:

1 Total production:
2 Marketed surplus:
3 To whom do you sell:
Local trader/ Govt. /private trader/marketing society/others
4 Price received/kg
5 Mode of payment
6 To whom do you think they sell the produce:
7 Who are the other intermediaries through whom your produce reach the final consumer

8 Price at which the final intermediary sell the produce to the end consumer
9 When do you sell produce:
10 Storage of grains(if produce is not sold immediately)
a)Time period
b)Method of storage
c)Remarks if any
d)storage cost

11 Do you process your produce before selling
12 If yes in what form do you sell
13 Qty processed
14 Cost of processing
15 Price received for the produce after processing
16 Loading and unloading charges
17 Transport charges:
18 Other charges if any

X. Constraints in Production and Marketing

(i) Ranking of production constraints:

Sl no	Problem	Occurrence of problem (yes / no)	Extent of problem (5 point scale)	Rank
1	High wage cost			
2	Scarcity of hired labour			
3	Mangrove penetration			
4	Varieties prone to lodging			
5	Weed problem			
6	Mechanization			
7	Infrastructure facilities			
8	Problems related to harvesting and threshing			
9	Conflicts between fish farmers and rice farmers			
10	Attack of birds and rodents			

(ii) Ranking of marketing constraints:

Sl no	Problem	Occurrence of problem (yes / no)	Extent of problem (5 point scale)	Rank
1	Low price			
2	More distance to marketing society			
3	Transport charges			
4	Transport losses			
5	Non availability of storage yards			
6	Lack of processing units for value addition			
7	Marginal holdings leading to lesser production (Family consumption)			

XI suggestion to improve Production and marketing of Kaipad system of cultivation

1.

2.

3.

APPENDIX II

Survey-questionnaire for farmers from non-saline areas

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
KAU (P.O)
Vellanikara , Thrissur
Department of Agricultural economics
Economic analysis of production and marketing of Kaipad paddy in Kannur district

Survey-questionnaire for farmers from non-saline areas

Block: Panchayat:

I Socio economic profile of farmers:

1. Name of the farmer:

2. Age:

3. Gender:

4. Address:

5. Phone no:

6. Educational qualification:

class	Upto 9th	SSLC	HSC	Graduate	Diploma	Post graduate	others
code	1	2	3	4	5	6	7

7. Experience in farming (years):

8. Annual income:

Income	< 25000	25000-50000	50000-75000	75000-100000	100000-200000	>200000
code	1	2	3	4	5	6

II. Family details:

Sl No	Member	Relationship with respondent	Age	Education	Occupation	
					Primary	Secondary

III. Land details:

	Garden (ha)	Wetland (ha)	Dryland (ha)	Total area (ha)
Owned				
Leased in				
Leased out				
Total				

Rental value of land/yr/ha (leased in land):

Land revenue of leased out land:

Value of land/ha:

Source of irrigation:

IV. Crop particulars:

Season		Crop	Variety	Area	Main product		By-product	
					Qty (Kg)	Value (Rs)	Qty (Kg)	Value (Rs)
Wetland	Season I							
	Season II							
	Season III							
Dryland	Season I							
	Season II							
	Season III							
Garden land	Season I							
	Season II							
	Season III							

V. Details of non crop activities:

Sl No	Activities	Area/No	Annual maintanence expenses	Gross returns
1	Shrimp farming			
2	Livestock activities			
3	Poultry			
4	Self employment			
5	Others			

VI. Source of seeds:

Sl .No	source	Variety	Qty	Price (Rs/kg)

VII. Cost of cultivation:

Crop: bullock power cost(Rs/pair/day): Yield:

Season: Machine power cost (Rs/hr/ha): Main product:

Variety Wage rate (Rs/day): By product:

Area: (1) Male :

(2) Female

	operation	Qty	rate/unit	Bullock power		Machine power		Human labour		Total labour cost	Total cost	Remarks
				No of pairs	Cost	No of hours	Cost	M	F			
1	**Nursery**											
	Field preparation											
	Seed treatment											
	Seeds and sowing											
	Fertilizers											
	PP chemicals											
	Weeding											
	irrigation											
2	**Main field**											

	Appln of FYM								
	Field preparation(plo ughing and puddling)								
	Seeds and sowing								
	Manures and manuring								
	Fertilizers								
	Plant protection								
	Weeding								
	Irrigation (Nos)								
	Harvesting and threshing								
	Marketing charges								
	Other charges								

VIII. Details of machinery used:

Sl no	Operation	Machinery	Hours	Rate/hr	Total cost
1	Land preparation				
2	Transplanting				
	Weeding				
3	Plant protection				
4	Harvesting				
5	Threshing				
6	Others (specify)				

If not practiced what is the reason:

IX. Marketing of paddy:

season		Total Prod	Storage cost	Processing cost	Marketed qty	Marketed to	Price/ kg	Transport charges
Wetland	S I							
	S II							
	S III							
Dryland	S I							
	S II							
	S III							
Garden land	S I							
	S II							
	S III							

X. Constraints in Production and Marketing

Ranking of production constraints:

Sl no	Problem	Occurrence of problem (yes / no)	Extent of problem (5 point scale)	Rank
1	Presence of problem soil			
2	Low quality of irrigation water			

3	Inadequate supply of quality seeds			
4	Imbalance in use of fertilizers			
5	Excessive weed growth			
6	Occurance of pests			
7	Outbreak of diseases			
8	Excessive lodging			
9	Non availability of suitable variety			
10	Lack of technical knowledge			
11	Others if any			

Ranking of marketing constraints:

Sl no	Problem	Occurrence of problem (yes / no)	Extent of problem (5 point scale)	Rank
1	Low price			
2	More distance to marketing society			
3	Transport charges			
4	Transport losses			
5	Non availability of storage yards			
6	Lack of processing units for value addition			
7	Marginal holdings leading to lesser production (Family consumption)			

XI No of extension visits to the area:

XII. Suggestions to improve Production and marketing of Kaipad system of cultivation

1.

2.

3.

APPENDIX III

Survey-questionnaire for market intermediaries

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Market intermediary survey

1. Name:

2. Address:

3. Type of market intermediaries:

Village merchant/ Wholesaler/ Retailer/ Exporter

4. Transactions made:

a. Purchase of produce : Time:

b. Sale of produce : Time:

5. Paddy transacted during the year:

S.No.	Season	Place		Distance	Total quantity transacted	Purchase price	Remarks
		From	To				
1.	Season I						
2.	Season II						
3.	Season HI						

6. Expenditure:

S.No.	Particulars	Amount (Rs)	Remarks
1.	Transport cost		
2.	Weighing and watching charges		
3.	Taxes		
4.	Commission charges		

5.	Loading and unloading charges		
6.	Others		
	SELLING PRICE (Rs./Quintal)		

7. Storage of .Rice / Paddy

a. Quantity stored :

b. Method of storage :

c. Storage expenditure incurred:

8. Constraints faced in buying it from .producers/traders

9. Problems faced in marketing of paddy

10. Give suggestions to overcome the problems

APPENDIX IV

Survey-questionnaire for Paddy processors

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Economic analysis of production and marketing of Kaipad paddy in Kannur district

Paddy processing - unit level survey

1. Name of the person :

2. Name of the unit :

3. Address for communication :

Phone Number :

4. Ownership pattern;

I. Proprietorship II. Partnership III. Private Ltd. Company

IV. Government Owned V. Cooperative

5. Year of establishment :

6. Location of the unit from, the city (Kms):

7. Processing capacity of unit/day :

8. Nature of the unit

i. Processor ii. Processor cum distributor

9. What is the outturn of your factory?

10. Whether your factory functions throughout the year.

Yes/No

11. Reasons for non-functioning of the factory throughout the year

a. Shortage of raw materials

b. Water scarcity and power cuts

c. Labour scarcity

d. Other reasons specify

12. How many labours are employed in your unit.

Male: Female: Children:

13. Wage rate of labourers of various categories in your firm.

14. What is the processing method followed.

15. Details on purchase of paddy

Season	Variety	Quantity purchased (Kgs)	Source and place of purchase	Purchase price (Rs./Kg)
I				
II				
III				

16. Which parameters you look for in the purchase of paddy? (Specify Quality characteristics)

17. Give details of the transportation charges incurred

From which place	Quantity	Mode of transport	Transportation	Loading charges	Unloading charges

18. Any loss if any during transportation. (Quantity and value).

19. Do you have storage facility?

20. What is the method of storage being followed?

21. What is the storage expense incurred.

22.1s there any loss during processing ? (Quantity.

23. Is there any loss during storage ? (Quantity)

24. What is the processing cost incurred (Rs./Qtl of paddy)

25. What is the hulling capacity (tonnes/day)

26. What is the rice recovery in Kgs?

27. To whom you sell rice : Wholesale / Retail / Others

28. Husk Quantity (Kgs): Price:

29.Brawn quantity (Kgs.): Price:

30. Rice quantity (Kgs) : Price:

ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF KAIPAD PADDY IN KANNUR DISTRICT

By

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THESIS

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ABSTRACT

The present study entitled "Economic analysis of production and marketing of Kaipad paddy in Kannur district" was conducted with the objectives of working out the costs and returns of Kaipad paddy cultivation, estimating the magnitude and the factors contributing to the yield gap, identifying the marketing channels and the price spread in different channels, finding out the constraints in production and marketing of Kaipad paddy and documenting the cultural practices of Kaipad paddy cultivation.

The study was based on both primary and secondary data. The study was conducted in Kaipad tracts of Kannur district and primary data were collected by means of formal interviews from farmers, traders and market-intermediaries. The farmers in the study area were categorised into five groups on the basis of farming practices followed as farmers growing traditional variety, farmers growing traditional Kaipad and shrimp in sequence, farmers growing HYV (Ezhome-l/Ezhome-2), farmers growing HYV (Ezhome-1 / Ezhome-2) and shrimp in sequence and paddy farmers from non-saline areas adjacent to Kaipad. From each of the five categories, 15 farmers were selected from each of the Panchayat. A sample of 30 farmers was randomly selected from each group, thus making a total sample size of 150 farmers.

Cost-return structure was worked out both for Kaipad and conventional paddy production using percentage analysis and cost concepts. The cost of cultivation (Cost C_2- Rs.67128) was highest in the case of farmers growing HYV without shrimp in sequence. The cost of production of HYV was higher than the costs incurred for growing traditional varieties and the average income from the HYV was more than the income from traditional varieties. The highest average gross income of Rs.61741/ha was obtained by farmers growing HYV and shrimp in sequence while it was lowest for the farmer respondents growing traditional variety without shrimp in sequence. Family labour income was estimated to be negative in the category of farmers growing traditional variety. The net income and Benefit Cost Ratio indicated that the farming is a loss making business in

Kaipad region, especially when the value of the family labour, the land value and the managerial cost were accounted in the cost.

Yield gap was estimated and factors contributing to the yield gap were analysed using regression analysis. Among the farmers growing Ezhome-1without shrimp in sequence, the total yield gap was 747 Kg, which was 21 per cent of the potential yield whereas for farmers growing Ezhome-2 without shrimp in sequence, the total yield gap added to 847 Kg and it accounted for about 26 per cent of the potential yield. When Ezhome-1 and Ezhome-2 were grown with shrimp in sequence, the total yield gap was 601 and 497 respectively. The share of yield gap II in the total yield gap was found to be 38 per cent and 43 per cent respectively for Ezhome-1 and Ezhome-2 with shrimp in sequence, while it was 78 and 91 per cent for Ezhome 1 and Ezhome 2 without shrimp in sequence.

In farms growing traditional varieties age was influencing yield gap positively while labour use in man days was found to be negatively influencing the yield gap. In the case of farms growing HYV, seed rate and education were significantly reducing yield gap. For the fitted log-linear yield function for all farms, age was found to be positively influencing yield gap while the seed rate and education were negatively influencing yield gap.

The four marketing channels identified were, (i) farmer – rice miller – retailers -consumer (ii) farmer - local agent - rice miller- retailer - consumer (iii) farmer - local agent - Padasekhara-samithis - consumer (iv) farmer - consumer. The price spread was estimated as Rs.16.3 in channel I, Rs.17.51 in channel II, Rs.2.97 in channel III and Rs.3.85 in channel IV respectively. The marketing efficiency was found to be highest in channel III.

Various constraints in production and marketing of paddy were identified and ranked using Garret's ranking technique. Among the various constraints faced by farmers, high wage cost and scarcity of hired labour were the major ones. Low price realized for the produce was the foremost constraint faced in marketing of paddy.

Since labour cost accounted for the major share in cost of cultivation and labour scarcity was the major constraint, efforts have to be made for mechanisation in Kaipad cultivation. The production must be increased by bridging the yield gap and thereby increasing the marketable surplus. Taking advantage of the GI status of Kaipad paddy, efforts are to be made for marketing it as a premium priced branded organic produce.