# CHAPTER - I
## INTRODUCTION

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CHAPTER - 1

INTRODUCTION

Land and water resources are sustainer of life support system on the earth. The beginning of agriculture in these gifted resources marks the beginning of civilized society. The agricultural practices enabled people to establish permanent settlements and expand urban based societies. Almost 80 per cent of mankind's diet is provided by the seeds of less than a dozen plant species. Over the years man has invented new machines and techniques to increase the amount and variety of crop production.

By one measure at least, agriculture ranks as one of the extraordinary success stories of the past decades. Roughly one quarter of the Earth’s terrestrial surface is now under cultivation with more land converted to crop production. In many regions - including Europe, North America, Australia and recently Brazil, China and India – humanity has also become adept at raising yields through using inputs like fertilizers and pesticides. Yet in many developing countries with low productivity rates and growing population, agriculture continues to expand into marginal and fragile lands.

1.1 Natural Endowments and Resource Management

Increasing pressure on nature is not in the interests of farmers or the global community as a whole. The very sustainability of agriculture depends on such factors as water supply, soil fertility and stability and genetic resources from nature for improving crop strains which are in turn provided by freshwater, forests, biodiversity and other healthy ecosystems. At the global level, agricultural production has been increasing steadily,
outstripping world population growth by a widening margin since the 1960s. However, the world agricultural growth (for all products) has actually been slowing down: from three per cent per annum in the 1960s to two per cent per annum in 2000 (FAO, 2009). In a study carried out by the International Food Policy Research Institute, in the first two decades of 21st century, the global demand for cereals was projected to increase by 41 percent and animal protein by 63 percent (Rural Poverty Report, 2001). It was also reported that food production is unlikely to keep pace with the jump in demand leading to a doubling of ‘food gap’. In such a situation, as many as 150 million children in developing countries ie; one out of four pre-school children will be malnourished in 2020 AD. It is in this context that production strategies need to be visualized and organized. Essentially, the world needs technologies that cut cost of production and distribution so that the food is affordable to the poor.

A critical look at the state of the affairs revealed that a piecemeal approach to research and development giving emphasis to commodity or commodity-centric approach is the cause of the crisis. It is against this background that the concept of sustainable integrated farming gains relevance. Fairly recent lines of scientific enquiry, such as farming system concept (Norman, 1980) and agro ecosystem concept (Conway, 1985) provide the theoretical framework for this thinking. The agro-eco system concept goes beyond soil types to define land types, while farming system concept introduces the perception of farmer participation as a major variation from commodity centric approach to development. Since farming is the biological process of transformation of solar energy into biomass involving major resources, land and water, a resource based approach that facilitates scientific and optimal utilization of production potential of natural and human resources is the primary consideration of this concept.
Full utilization of production potential through intensification and diversification will not only provide income and employment but will also ensure livelihood security to the people who subsist on them.

Economic development requires a food surplus, that is, an excess of output above producers’ consumption needs. In contrast to the Malthusian doctrine of stagnation (Malthus, 1798) caused by continued population growth on a stable or declining land base, Boserup (1965) suggests that the development of agriculture and creation of a food surplus are stimulated by population pressure on the land. The process of searching for ways to increase land productivity not only raises input requirements, but also helps fuel overall improvements in agriculture. The origin of Boserupian view has historical roots in diverse economic and social theory and may be traced to the work of Adam Smith and Karl Marx as well. The present study relies on the theoretical framework developed by Boserup which suggests productivity enhancement technologies as the child of a continued population growth. The study finds the coastal agro-eco system of Kerala as an experimented lab of such arguments.

1.2 Resource base in India

India had been exporter of cereals till 1910. Agriculture remained primitive till independence. The partition of India dealt a further blow to the prevailing situation. In the years that followed, cereals came to be imported in large quantities. Since independence, the Indian government has been emphasizing the importance of agricultural development. The sector has been given the top priority in the First Five Year Plan. The first approach to agricultural development was Extensive Cultivation. The available resources and technology were dispersed over the widest possible area with the hope of producing the fairest possible spread of benefits. Later in 1960’s a new strategy called Intensive Agricultural District
Programme (IADP) was launched. The IADP package included better inputs and implements and thereby a new technology was experimented on the Indian soil. In the Kharif season of 1966 the New Agricultural Strategy (NAS) was introduced with which the government started the success story of the High Yielding Varieties Programme (HYVP).

From a nation dependent on food imports to feed its population, India today is not only self-sufficient in grain production, but also has a substantial reserve. The progress made in agriculture during the last four decades has been one of the biggest success stories of independent India. Agriculture in India, the prominent sector of the economy, is the source of livelihood of almost two thirds of the workforce in the country. The contribution of agriculture and allied activities to India's economic growth in recent years has been no less significant than that of industry and services. The importance of agriculture to the country is best summed up by the statement: "If agriculture survives, India survives".

1.3 Status of Rice as the Staple Food

Rice, *Orizya sativa*, was originated in the remote foothills lying along the border regions that divide South and South-East Asia. Rice occupies a position of overwhelming importance in the global food system. Over one-third of the world’s population, predominantly in Asia, depends on rice as a primary dietary staple. The Asian rice growing region is bounded by Japan on the east and Pakistan on the west. Within the region, rice dominates not only production and consumption patterns, but is also inextricably woven into the social and economic fabric of life. Rice is also of paramount importance in the political arena. The importance of rice in both rural and urban economic development subjects the rice economy to political pressures that are often detrimental to efficient growth.
India ranked first in area under paddy with 41.85 million hectare under plough and second in terms of production to the tune of 89.13 million tonnes during the year 2010-11. But, the yield levels in India were low at 2.13 tonnes per hectare compared to other major rice producing countries. Rice is consumed both in urban and rural areas and its consumption is growing due to high income elasticity of demand. To meet the growing demand, a rapid increase in rice production is needed. But, there is little scope to increase the area under cultivation and hence to meet the growing demand, an improvement in the efficiency of production acts as a technological breakthrough. The Green Revolution of 1960’s was oriented towards high input usage particularly fertilizers, irrigation and plant protection chemicals. As a result of excessive use of these inputs the cost of cultivation has escalated. This is more so in irrigated crops like paddy. The spectacular increase in production of rice was restricted to irrigated belts of the country. The skewed distribution of green revolution results and increased costs of cultivation have given alarming signals to the future needs of food security.

In Kerala, the food crops, especially rice, lost the prominence they once enjoyed and have become less remunerative compared to the more patronized commercial crops. Paddy (rice) cultivation in low-lying tracts has of late, become un-remunerative and unattractive. Sub-division and fragmentation of these lands due to partition and change of ownership due to land reforms, scarcity of critical inputs, especially labour and quality seeds, un-favourable price structure, a hostile monsoon and frequent infestation by pests and diseases have made rice cultivation non-viable in this area. The state which had produced over 50 per cent of its requirement of rice annually at 14 lakh tonnes during the early seventies from an area of around 9 lakh hectares has now only 2.08 lakh hectares under rice with an
annual production of 5.68 lakh tonnes, which is only less than one fifth of the domestic requirement (Economic Review, 2013).

1.4 Plans and Strategies

To solve the problem and meet the challenges, the most suitable and appropriate strategy seems to be, to increase the production per unit area and per unit of time, since the scope for bringing further area under cultivation is very much limited. Therefore it is absolutely essential to optimize the efforts on all fronts viz. irrigation potential; cropping system; integrated rice based farming system and efficient management of monetary and non-monetary critical inputs. There is need to identify the profitability of the existing cropping system, develop or modify the suitable integrated farming systems and ensure its sustainability. The integrated farming system, which combines various agricultural practices such as agriculture, animal husbandry and aquaculture in a farmstead giving maximum production per unit area and per unit of time utilizing latest scientific and technological innovations, practiced in the coastal agro-eco system of Kerala is a suitable alternative and a step in the right direction.

Production of livestock, fishery and poultry together with rice, in combination, has been recognized as a revolutionary concept to increase production in several countries. Rearing of fish in paddy fields is known to improve the soil conditions leading to increase in the rice yield. Rice-fish rotation is also considered to be effective in suppressing weeds, pests and diseases. With the popularization of aquaculture as an integrated activity with rice, several polders, presently remaining uncultivated for the past several years could be brought to farming with enhanced profitability.

In the background of aquaculture emerging as one of the most promising industries in the world, the Research and Development support
Economic Analysis of Rice based Cropping System in Coastal Agro-Eco System of Kerala

in India has rendered aquaculture as a bankable rural industry recording an average growth rate of 11.4 per cent. Aquaculture, however, needs to take lessons from our experiences in agriculture and its recent crash on the east coast of India. These lessons indicate that application of wrong technology or over exploitation of natural resources have only short-term gains. Hence, environment friendly integrated fish farming, suitable to the overall agricultural system is a sound alternative to capital intensive hi-tech aquaculture. Again, it is essential to develop a threshold grow-out strategy for aquaculture integration, making rotational farming of rice mandatory, whereby the waste generated by aquaculture is assimilated in rice farming and vice-versa. A wealth of documented evidence has been accumulated in favor of integrated farming approach or bio-diverse farming. Such studies demonstrate that integrated farming can compete with industrial agriculture as well as industrial fisheries in terms of producing ability and that bio-diverse farming offers the important additional advantages of sustainability and risk reduction.

The practice of utilization of paddy fields for prawn filtration is an age-old practice in the Pokkali paddy fields of Kerala, the coastal tract extending over three districts; Alappuzha, Ernakulam and Thrissur. These are brackish water fields adjoining Vembanad Lake. The practice is popularly known as Chemmeen Kettu\(^1\). Here, in one and the same field, rice and prawn are reared in a cyclical manner, the detritus supplement of straw after the rice crop forming bulk of the food material for prawns. In these fields, rice is cultivated during the low saline phase extending from June to October. Prawns are reared during the summer months starting in November and ending in April, when salinity builds up and when the field

\(^1\) Traditional method of prawn filtration practiced in the Pokkali fields during the high saline phase.
is unsuitable for rice. In this system, the prawn seeds naturally entering from the coastal seas are trapped and cultivated as a mutually beneficial and ecologically efficient enterprise-farming model. The biomass residues of the paddy crop form the feed base for the prawns and the residues of the prawn culture acts as a fertilizer for paddy and hence the symbiotic system can be referred to as "Zero Input" organic farming system. The extension services of Marine Products Development Authority (MPEDA) and research activities of Fisheries Station Puduveypu during 1980’s paved the way for the popularization of an improved extensive method of prawn farming with selective stocking and supplementary feeding. This has made a paradigm shift in Pokkali sector with more people concentrating on rice-prawn rotational farming against the traditional practice of paddy-prawn filtration. In general it has been agreed that this modified paddy field prawn culture systems are well productive. Its capacity to generate protein rich prawns and in addition to usual paddy is rather commendable. Pokkali farming received Geographical Indication of Govt. of India recently.

The studies conducted in the late 1980’s by Kerala Agricultural University at the Regional Agricultural Research Station (RARS) Kumarakom have set the pace for a change in integrated farming in Kuttanad, the major coastal ecosystem and rice bowl of the state. These studies indicated that in addition to rice production averaging three tons per hectare, fish production ranging up to One tonne per hectare could be obtained through sequential farming of rice and fish. As compared to the practice of simultaneous farming that requires several modifications in the paddy fields to protect the fish from the inherent risks of pesticide applications, utilization of paddy fields for rotational farming was found more advantageous. This was so because rotation permitted adoption of better management practices for both rice and fish. In these investigations,
wherein fish production of Indian major carps, *Cyprinus*, *Etroplus*, and *Macrobrachium rosenbergi* were polycultured, a better yield was attained without incurring huge investment expenditure on feeding or manuring. From these observations it could be argued that rotational farming of rice and fish or rice and prawn is a viable proposition for the entire coastal ecosystem of the state.

### 1.5 Problem Statement

In Kerala, farming in the coastal rice ecosystem is coming down at an alarming rate. Paddy cultivation in Kuttanad, the rice bowl of Kerala, witnessed a steady decline over the years. In other low-lying coastal rice ecosystems like the Pokkali tracts and the Kole lands also, this dwindling trend is visible. Since paddy cultivation became less remunerative in the coastal tract, farmers have either kept the paddy fields fallow or converted it for non-agricultural uses. So the need of the hour is to identify suitable farming systems and techniques which are economically viable and which will arrest the present trend of illegal conversion of paddy tract to other purposes. It is high time to analyse the rice based farming practices and find out the issues in their popularization. The complementary nature of the crops raised in the rice based integrated systems should be systematically analyzed through an exploratory research.

### 1.6 Need and Significance of the Study

The present study is intended to fill the research gap in systematic identification of the trends in the agricultural sector of the coastal agro-eco system of Kerala especially with regard to the rice based farming practices in the low lying paddy fields of the coastal tract. The result of the proposed research would help to study the economic viability and employment potential of the rice based cropping system of coastal Kerala. The yield gap analysis would help to understand the potentiality of the varieties cultivated
by the farming community and identify the constraints in bridging the gap. The study would also throw light on the technical efficacy of the farms under the study and find out ways and means for optimal use of resources for better productivity. The findings of the study, it is hoped, would help planners and policy makers to identify and popularize the farming system best suited for the coastal agro-eco system.

### 1.7 Objectives

The main objective of the present study is to delineate the economics of rice based cropping systems practiced in recent times in the coastal agro-eco system of Kerala. The specific objectives of the research work are the following.

1. To examine the endowments of coastal agro-eco system of Kerala and appraise the institutional support in existence for its sustenance.
2. To study in detail the recent trends in crop production in Coastal Kerala through the Compound Annual Growth Rate analysis.
3. To examine the rice based cropping systems in coastal agro-ecosystem of the state through an exploratory research in Pokkali and Kuttanad ecosystems with respect to profitability, sustainability and employment prospects.
4. To analyze the resource use efficiency and identify the yield gap in the present cropping systems and
5. To identify the constraints including risk in the sustainability of optimal rice-based cropping system and suggest measures to overcome / minimize the constraints.

### 1.8 Methodology and Database

The study is exploratory in nature. Both primary and secondary data are used. In order to collect the primary data on cropping pattern, the economics of cultivation, private social cost-benefit structure, resource use
efficiency and constraints in farming, a pre-tested research schedule is used. Secondary data is collected from the following official sources.

1. Directorate of Economics and Statistics, Govt. of Kerala
2. Directorate of Agriculture, Govt. of Kerala
3. Kerala State Planning Board
4. ADAK Alappuzha
5. BFFDA Ernakulam
6. Krishi Bhavans in various districts

The data is tabulated and analysed using various statistical tools.

Details of the methodology used are discussed in Chapter 4 of the thesis.

1.9 Limitations of the Study

The present study is intended to analyze the rice based farming systems practiced in the coastal ecosystems of Kerala through a micro analysis of two typical systems which has many features in common. Since many of the issue discussed are related to farming system research, other problems like gender sensitization are not addressed in the study. Though the study is multi-disciplinary in nature, the analysis and interpretation are absolutely confined to the social science spectra. However, the study had taken utmost care to correlate primary and secondary information on various issues observed in the low lying tracts of coastal Kerala, which in turn could help to expose the incredible truth about the conservation and management of coastal agro-eco systems from eternal damnation.

1.10 Scheme of the Study

The study is divided into seven chapters. First chapter includes the introduction, background and context of the study area, need and relevance, objectives, methodology and limitation of the study. The first chapter serves as a structural foundation of the subsequent chapters. The second chapter reviews the literature on the subject and highlights the theoretical
framework for farming system analysis. It also portrays the evolution of rice based integrated farming systems. The third chapter gives a detailed description of coastal agro-ecosystem and its endowments. It also throws light on the institutional framework operating for coastal agricultural promotion, conservation and support. Chapter four provides the methodology; the concepts and materials used for investigation in the study. Chapter five examines agricultural scenario of the coastal economy through a detailed trend analysis and address the changing cropping scenario in Coastal Kerala. Chapter six discusses the results of the prospects and problems of rice based cropping systems in the coastal tract carried out through field investigation. Summary, findings and policy implication of the study are presented in chapter seven of the thesis.
REFERENCES


CHAPTER - 2
REVIEW OF LITERATURE

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