Chapter I

INTRODUCTION

The agrarian scene in Kuttanad, Kerala as elsewhere in the agrarian economies has been witnessing drastic changes in the organisation and technology of production. There has been a tendency to change from the output maximising Green Revolution strategy towards a sustainable livelihood technology consequent on a new awareness among the farmers against the former.

Though it is fairly assumed that Green Revolution was a major breakthrough in agricultural production, recent decades have seen large number of studies bringing out the costs and consequences of Green Revolution [Mencher, 1974; Rao, 1988; Shiva, 1997; Sidhu, 2002]. The Green Revolution strategy, it is argued, has not only failed to generate sufficient output, but also has destroyed the very foundation of the future production system and hence, self-defeating. There has been a declining trend in area and production and a tendency among farmers to withdraw from active cultivation. This has been happening when the food crisis has not been sufficiently resolved.

As part of the new awareness, the last decade has witnessed new social movements and technological initiatives to tide over the crisis. It has been based mainly on the feedback from the farming community. The movements include both governmental and non-governmental organisations (NGOs). The coming up of initiatives like Integrated Pest Management (IPM), Integrated Nutrient Management (INM) and different types of sustainable agriculture (SA). Correspondingly, there has been a paradigm shift in the organisation and technology of production.
This changing scenario has been a global phenomenon and not confined to Kuttanad, Kerala or India. In order to understand the changing trends and the related socio-economic transformation, we need to explore the process of agricultural technology development.

The role of technology in moulding social and economic conditions is one of the most important and yet, one of the least understood of historical phenomena. The association between technology and socio-economic transformation has not been sufficiently brought to light. It is opined that no serious investigation of the character of technology and technological change in the economies was carried out as part of the study of the process of economic growth and development [Dasgupta, 1977]. Studying the trends in the development of technology, especially agricultural technology is a necessary step in understanding the socio-economic transformation of an agrarian society.

The changes that occur in the agrarian scene are due to a change in the perception of life, environment and development. A revamping of the lost significance of human life has been taking place in the development thinking [Brinkman, 1981]. Man regains the status as the goal of the development process, which he lost on the path of modern economic growth, than as a tool or factor. The philosophy of life, and in particular the place accorded to individuals, would ultimately determine the pace and extent of technological development.

Therefore, an important aspect of the new trend is that along with the target of yield increase, awareness is up with regard to concepts like adaptive research and sustainability. There is a growing conviction that if development to be durable it should be sustainable. The priority has become not just sustainable agriculture, but sustainable livelihoods based
on agriculture, not only for present population but for people in the future as well. There has been a growing concern that food security, which depends on sustainable agriculture, is a pre-requisite for sustainable livelihoods, which in turn constitute an integral element of sustainable development. The closing decades of the 20th century have seen, therefore, initiatives to make the agricultural production system sustainable.

As a prelude to such shifts, there has been a great resurgence of interest in recent times in understanding traditional methods of agriculture. Therefore, it is argued that the changes that occur in the agrarian scene are nothing new but to a large extent on traditional lines based on indigenous wisdom. The said interest has encompassed diverse areas of plant sciences such as agronomic methods, soil testing, weed control, plant nutrient management, pest and disease management to mention a few. This interest comes as part of a re-orientation in agricultural research that has been taking place for the last few decades.

In India, sustainable development is an expanded and updated view of the conventional development strategy and not purely a new thinking. Indian life was deeply rooted in the traditional concept of agriculture, according to which agriculture was interwoven with environmental, cultural, religious and social values. But the food shortages and famines especially in the first half of the 20th century raised serious doubts on the capability of the nation’s agrarian sector to feed the population. The Green Revolution strategy was resorted to in the late 1960s to resolve the crisis. The new strategy resulted in significant progress in agricultural production, especially of food grains. But with in a short span of less than three decades (1968-90) serious doubts did arise on the continued ability of the strategy in feeding the population.
In Kerala, the bio-chemical approach in technology along with additional crop and land reclamation resulted in an output boost in paddy production in Kuttanad. But by the mid-1970s production began to show a declining trend [Kannan and Pushpangadan, 1990]. The high input technology resulted in a decline in the profitability and made farming unremunerative. It also resulted in certain environmental consequences like land degradation and water contamination.

As per the Green Revolution perception, technology came to be treated as a handmaid of development. Agricultural technology was made subservient to exploitation of resources and maximisation of output. Everything was treated as either input or output. The neo-classical approach to technology, in the form of production function, was the rationale behind the Green Revolution strategy. All resources including labour were reduced to the level of inputs. Production process became more impersonal.

This was in sharp contrast to the traditional concept of technology and development, in which man was the centre of all social and economic activities. Production process was more personal. Close to it comes the Gandhian perception of technology, which is rooted in the concept of *swadeshi*. Local availability of resources shapes the technology and Gandhiji held the view that machine enslaves and only intelligent use of the hand will bring to the worker both freedom and happiness.

The Marxian understanding of technology identified it as the strength and weakness of the economic system. It even leads to the collapse of the capitalist mode of production. The increasing ratio of constant capital (machinery, raw materials etc.) to variable capital (wages) \( c/v \), which Marx called the organic composition of capital, would lead to a fall in the rate of profit since a surplus can only be extracted from labour power.
The Approaches to technology differ in stating whether technology is an endogenous or exogenous variable.

The Systemic approach treats technology as an integral part of the society. It is very much influenced by the all round changes in the society. In this sense, social, cultural, religious, environmental and economic factors influence the path and pattern of technology development, which in turn, affect the whole system. Sustainability has been the core aspect of this approach. Basically sustainability depends on the society’s attitude towards nature and its resources, the way the society combines them and uses them with other resources in production.

Technological progress in agriculture cannot be fully explained in terms of economic and physical input-output factors. A multiplicity of social, cultural and organisational factors interact organically with the input-output factors and thereby, determine in a vital manner the development of technology in an agrarian society.

Economics of technology encompasses the economic analysis of technological change as well as the analysis of economic change focusing on technology. This view does not imply that technology is the concern primarily of economics, nor does it imply that economics of technology is the concern solely of economists. On the contrary, there is a strong reason for interdisciplinary work in this field.

An analysis of technological progress in agriculture necessitates an understanding of the organic interaction of a multiplicity of social, cultural and organizational elements. The observation that there is a lack of sufficient studies on the role and character of technology in the process of economic growth and development motivates this study. This study is a
moderate attempt to fill the lacuna, which, inter alia, appreciates the location specificity of the process of technology development.

It is argued that the stock of technological knowledge available at any given time could be understood only by a systematic examination of the earlier history out of which it emerged. Each innovation constitutes the initiation of a long sequence of path-dependent activities, typically extending over several decades, in which later developments cannot be understood except as part of a historical sequence.

Therefore, an attempt is made to understand the historical process of the development of agricultural technology. In order to understand the process of technology development and its consequences we need to identify the agents/actors and the priorities of technology development which would help in understanding the present crisis, the new tendencies, the challenges and the initiatives in organizing production in agriculture.

With regard to paddy, it is acclaimed as a representative crop of the Asian agrarian scene. Rice occupies a position of overwhelming importance in the global as well as the Asian food system. The Asian mass depends on rice as their primary dietary staple. Without rice they hardly survive. So also the case with Kerala. Rice is so important in the food basket of the land that there is a common term in the local vernacular used interchangeably to mean both food and rice, namely *annam*.

We seek to examine the problem with special reference to Kuttanad, one of the two rice bowls of Kerala and one of the regions where the Green Revolution strategy has been introduced. Prior to its introduction, paddy cultivation in this region attained the traits of capitalist farming like extensive cultivation through *kayal* reclamation, leasing of land,
proletarianisation of labour, their unionisation and their political mobilisation-culminating in the worsening farmer-labour relations, state interventions, and later prohibition of leasing of land. With the introduction of the Green Revolution, after a short span of time, farming has become problematic and environment degrading. It is one of the areas where tenancy has reemerged resulting in a turn in the farmer-labour relations. A new awareness and consequently new initiatives are also observed to make farming an environment-friendly, cost-effective, keeping at the same time a higher level of productivity in this region.

In order to locate the analysis of agricultural technology development in the context of rice cultivation in Kuttanad, Kerala, we identify three major phases in the path of technology development. They are the traditional (which include both the early and the pre-modern productive systems), extending from the very spread of agriculture up to the middle of the 1960s, the Green Revolution (1968-1990) and the post-Green Revolution, beginning with the early 1990s. Demarcating these three phases into water-tight compartments seems to be difficult. Nevertheless, such a classification seems to be necessary and significant for the present study.

Our basic premise is that in the process of agricultural technology development, over the various phases, the agents/actors and the priorities of technology development are different. The nature of the technology developed and its consequences depend on the agents behind and the priorities in the process.

In the traditional phase, cultivators and the society with a strong sense of religion, culture and environment seems to have shaped the
technology and set the priority of optimal use of resources just for their sustenance. Technology was subservient to culture and environment. Instead, in the Green Revolution phase, scientists and thus research stations functioned as the agents with the priority of maximisation of production and productivity. Technology became subservient not to culture or environment but to the goals like exploitation of resources and maximisation of production and profit. In the post Green Revolution stage technology development is becoming a mutually respecting endeavour of scientists and farmers with the priority of production maximisation and environment protection. Each stage has its own pattern of technology diffusion too. We argue that the process of technology development and the socio-economic transformation, are intertwined.

Kuttanad has gone through the first two phases and it has specific stories to share. In the post-Green Revolution phase it has been facing new challenges and to overcome them, various technological initiatives have been taking place in the early years of the closing decade of the 20th century. These initiatives comprise different degrees and/or types of organic and sustainable farming such as Integrated Farming System (‘one-rice and one-fish’) individual initiatives of organic farming and the GALASA project (Group Approach for Locally Adapted and Sustainable Agriculture).

Studies with specific reference to Kuttanad on organic farming [Devi, 2001] and integrated farming system [Narayanan, 2003] are available. No such study on GALASA has ever been made so far. GALASA is claimed to be a farming system based on group approach, locally adapted technology using locally available resources, respecting sustainability. A moderate attempt is made in the present study to examine
GALASA as a post-Green Revolution technology initiative. It is to be examined to what extent GALASA differs from the traditional and the Green Revolution strategy with regard to input use, agricultural practices, productivity and environmental concern. Accordingly the following specific objectives are set for the study.

Objectives of the Study

The study takes to:

1. identify and explain the agents and the priorities in the development of agricultural technology over the phases.
2. trace the changes in agricultural technology and explore the resultant socio-economic changes.
3. understand the post Green Revolution initiatives, mainly GALASA (Group Approach for Locally Adapted and Sustainable Agriculture).
4. make a comparison of the input structure in the traditional, Green Revolution and the GALASA.

Methodology of the Study

Being a historical cum empirical study both primary and secondary data are used. A number of senior and progressive farmers and farm workers from Kuttanad, scientists and agricultural officers were interviewed during the cropping seasons of 2001-02 and 2002-03. A primary study was conducted during the farming season of 2002-03, covering all the farmers in the GALASA project. Publications of central, state and local self governments, national and regional research stations have been made use of.
Outline of the Study

The study is organised in eight chapters. Chapter II makes a general review of the relation between technology and development and the various theoretical approaches to technology namely the Classical, Neo-classical, Marxian, Gandhian and the Systemic. The common determinants of agricultural technology are also discussed in this chapter.

In chapter III a historical sketch of the early phase of the traditional agriculture traces the evolution of agriculture per se in the course of history, the development of agricultural tools, of plough in particular in the various farming systems.

Chapter IV discusses the Green Revolution experience in India and Kerala.

Chapter V reviews the socio-economic conditions obtaining in the pre-modern phase of the traditional agriculture in Travancore and the history and physical features of Kuttanad, the study area. It also examines the process of Kayal reclamation and the agricultural practices and relations that existed in Kuttanad in the traditional and the Green Revolution phases.

An evaluation of the Green Revolution experience in Kuttanad, its claims and consequences are discussed in Chapter VI. Its effects are examined in terms of employment, environment and input structure.

Before proceeding to the examination of GALASA in detail, as implemented in Kuttanad, in Chapter VII, a brief review of the studies on sustainability problem and the sustainable initiatives in Kuttanad is made. A comparison of the input structure in the three phases is also attempted.
The paradigm shifts that occurred in the process of agricultural technology development are discussed in Chapter VIII. We try to identify the agents/actors and the priorities behind the process in each phase. We argue that the effects of technology varied with the agents and the priorities of technology development. Four varying patterns of technology development are also presented.

The last Chapter summarises the discussion and presents the findings of the study.