CHAPTER 1
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INTRODUCTION

Agriculture plays a major role in the Indian economy as it contributes to overall economic growth. It supplies food, fodder and raw-material and generates income through exports. This key sector is a chief source of livelihood for the rural population and provides a large market for non-agricultural commodities and service sector. Further, through backward and forward linkages considerable urban population also is benefited from agriculture.

While the industrial and service sectors provide employment for urban population, more than 70 per cent of the rural population still depend on agriculture. The government has launched various agricultural programmes for increasing the production, reducing the unemployment, narrow-down the poverty and regional disparity, strengthening the weaker sections of the farming society and effectively utilising the inputs in agriculture. However, due to various reasons the aimed objectives were achieved at limited scale.
It is true that a major break-through in agriculture has been achieved during green revolution phase. Introduction of high yielding varieties (HYV) coupled with modern techniques and technologies, increased the production and productivity during the green revolution period. However, the post-green revolution scenario is somewhat grim.

The intended objectives in agriculture, such as, reducing the disparities between the rich and the poor farmers, effective utilisation of farm inputs and bridging the gap between the regional disparities could not be accomplished. There are divergent views on the benefits derived from the green revolution. Some empirical studies concluded that the green revolution widened the disparities between the rural rich and the poor and resulted in the misutilisation of the crucial inputs such as land and irrigation. On the other hand, quite a few studies contended that the green revolution coupled with land reform measures has made a major break-through in agriculture. Whatever be the argument, it is essential to rationally utilise the valuable farm inputs for sustainable agricultural development not only to increase the production but also to increase the productivity.

The available empirical studies noted that due to the dynamics of agricultural development, transformation in terms of technology and management
have taken place within agriculture. As a result of this the magnitude of use of different inputs underwent a change. Use of modern inputs like fertilizer and pesticides increased manifold and it has led to increase in production. For some inputs like farm power, both modern and traditional sources are extensively used even after green revolution.

In fact, though various agricultural developmental programmes have been launched during First and Second Five Year Plan periods, emphasis on farm power has been given only during Third Plan period. During the Third Plan period it was realised that the quantum of available farm power stock, particularly machine power was not sufficient to meet the area brought under cultivation and proposed a number of measures for improvement.

Regarding the farm power, traditional sources like labour and animal are replaced/displaced by the modern sources like agricultural machineries. In most of the available literature it is argued that the use of modern inputs resulted in the increase of output. But it is difficult to assess the contribution of these inputs at a disaggregated level.

Agricultural activities depend upon adequate and timely availability of various factors of production like land, labour and capital. Of these, labour plays an important role in the farm economy. In the
traditional agricultural system, hand tools were used for land preparation and other operations; gradually, farmers began using animals along with conventional farm implements. Inventions and innovations in science and technology have now made it possible for the adoption of machine power to various agricultural operations. Moreover, increase in income from farm business has influenced the farmers to substitute capital intensive farm machineries for labour intensive techniques.

At present farmers use human labour, animals and machineries to carry out various farm operations. These modes of power used for carrying out farm operations such as ploughing, sowing, irrigating, harvesting, threshing and the like are designated as farm power.5

Generally, there are two sources of farm power viz., (i) biological and (ii) mechanical. The biological sources (muscle power) of farm power can be classified into human and animal. And the mechanical source of farm power can be divided into mobile - tractors and tillers - and stationary - pumpsets and threshers.

In developed countries agricultural operations are highly mechanised due to scarcity of human labour. As a result of the big strides taken in the industrial sector, large-scale production of agricultural
machineries has taken place in these countries. This has obviously led to the replacement of traditional implements and human and animal sources of power. But most of the third-world countries are industrially backward with surplus labour in rural areas.

In these countries, the application of new technology in agriculture is poor mainly due to low level of awareness and lack of resources. This leads to poor yield forcing them to lead a subsistence life. As majority of them are living in conditions of a subsistence economy, large investments on improved agricultural machineries are not possible. Hence as a corollary, the dependence on biological source of power with traditional implements is very high in most of the developing countries.

A study\(^6\) covering 90 developing countries showed that in 1980 the human and animal power alone accounted for 95 per cent of the total power used in agriculture in those countries. Another study\(^7\) points out that in most of the countries of the world, at least 80 per cent of the farmers use hand-tools only, while 15 per cent use draught animal power and the remaining 5 per cent rely on machine-powered equipment for their agricultural operations.

However, it does not mean that there are no agricultural machineries in these countries. Farmers of large size group have access to capital intensive farm
machineries. Due to introduction of new technology, the productivity in agriculture improved significantly. But as compared with the developed countries, the extent of diffusion of farm machineries in developing countries is very low.

In India, the traditional implements with draught animals were used for farm activities before the British rule. During the British regime, the Government imported some iron ploughs from Britain to India and introduced them to farmers. Gradually farmers picked up the use of the less time consuming iron plough. Later on tractors were introduced for farming. In those days tractors were imported from European countries and America. After independence, by 1958 licensing became strict with regard to the import of tractors. Thereafter, foreign currency became scarce. The East European countries accepted Indian currency and hence, conquered the business of selling tractors to India. Tractors imported from these countries were cheaper than most of the Western European types offered.

In 1961 the first tractor plant was established at Faridabad and licenses were given to the industrialists to produce tractors in India. Around 1968 imports of tractors were restricted to balance the foreign trade and to promote home production. However, the tractors were imported till 1976-77. Efforts were also made to produce pumpsets for irrigation. The
Government policy stresses not only to produce more agricultural machineries but also to produce suitable and appropriate machineries.

Even though there is a growth in the different sources of farm power, the available farm power is not sufficient for the cultivation purposes. According to the Report (1976) of the National Commission on Agriculture (NCA) during 1971 the availability of farm power - both biological and mechanical - worked out to 0.35 hp per hectare of cultivable land in India. The Commission has suggested that the available farm power per hectare be increased to 0.50 hp to achieve an increase in crop production. Of the various sources of farm power available in India it has been estimated that the draught animal power alone contributes 41 per cent, whereas human labour contributes 21 per cent and machineries 38 per cent.9

Various agricultural development programmes in India, like Intensive Agricultural Area Programme, Intensive Agricultural District Programme, HYV Programme and Dry Farm Technology have introduced a new technological epoch. The successful adoption of these programmes has resulted not only in the increase in output and employment but also caused a change in the patterns of input use including the use of farm power in agriculture.
The Livestock Census Reports show that there is a steady increase in modern labour saving or capital intensive devices like tractors, threshers and pumpsets. On the other hand, India has abundant rural population - who are wholly dependent on agriculture either as cultivators or as agricultural labourers. Although mechanisation is taking place in India, the extent of diffusion of various agro-mechanical devices is very much less as compared to some developed countries. This may be due to some institutional factors such as highly skewed land distribution, heavy initial investment required for buying machineries and inadequate credit facilities.

Distribution of different sources of farm power across various states are uneven. In some regions capital intensive equipment is dominant, whereas in some other regions the diffusion of labour intensive farm power is large. Moreover, the aggregate distribution of various farm power sources also differs in relative terms i.e., per unit of cultivated area. The distribution of draught animals (in aggregate terms) is more in Uttar Pradesh followed by Madhya Pradesh in 1972. But if one looks at the distribution of draught animals per unit of cultivated area Assam comes first followed by Jammu and Kashmir. Tractors and pumpsets are highly concentrated in Tamil Nadu followed by Punjab and Haryana. Thus the patterns of uneven distribution of farm power may be due to the agro-climatic conditions on
the one hand and complex nature of other socio-economic elements on the other.

In spite of the fact that the draught animal power contributes more to the farming, the growth of farm machineries is more than the growth of animal population. However, the growth rate of various sources of farm power differs from one source to another. The Livestock Census Reports reveal that between 1951 and 1982 the draught animal population increased by 22.58 per cent with the annual growth of 1.13 per cent in India. Oil engines increased over 31 years at an annual growth rate of 119.39 per cent; tractors at an annual growth rate of 90.66 per cent. And a spectacular growth has been observed for electric pumpsets. It has increased over the 31 years at an annual growth rate of 409 per cent.

Even though all sources of farm power increased over a period of time in India as a whole, Tamil Nadu presents a different picture. Between 1956-1982 the draught animal (excluding female draught animals for 1982 as the data are not available) population decreased by 21 per cent with an annual decline of 0.79 per cent. However, the number of oil engines, tractors and electric motor pumpsets increased at an annual growth rates of 22.69 per cent, 73.49 per cent and 147.86 per cent respectively during the same period. The human labour (including cultivators and
agricultural labourers) population increased by an annual growth rate of 1.24 per cent during 1961-81.

According to the all India Livestock Census Report of 1972, out of the total farm power stock 6.51 per cent of the draught animals and 11.43 per cent of the oil engines have been concentrated in Tamil Nadu; also 4.18 per cent and 31.42 per cent of the tractors and electric engines respectively have been concentrated in Tamil Nadu during the same period. It may also be interesting to observe that Tamil Nadu is the leading state in India in electrified pumpsets and accounted for over a fifth of all such pumpsets in the country in the late 1970s.\textsuperscript{12}

Scope of the Study

This study has attempted to analyse the problems concerning economics of farm power both at macro and micro levels. The macro analysis gives an aggregate picture of the growth of farm power, availability and distribution.

On the other hand micro level/disaggregate analysis of the issues concerning farm power helps to trace the growth of farm power across regions, availability and distribution of farm power by different size classes of farms. In addition to this, the analysis of cropwise, seasonwise and operationwise farm power use
explains the differences in the magnitude of farm power. Differences in input use across varying magnitude of farm power use have also been analysed across farms.

The study also attempts to find out the gross expenditure and net returns in the sample area and variations across selected farms. This enables to capture relationship between varying levels of farm power use and production. Further, this study attempts to highlight the gap between the supply of and demand for farm power use.

Limitations of the Study

Although plot-wise information for each household was readily available, due to time constraint the analysis was not carried out accordingly. Moreover, plot-wise analysis might not have indicated any pattern for policy implications as various inputs use and the decision-making for cropping pattern and others are to be decided at farm household level.

Secondly, despite careful selection of sample households which equally represented each size of holding and different agro-climatic conditions, it was not possible to generalise the results for a larger state like Tamil Nadu as a whole. Because, each crop, farm operation, input use pattern, cropping system, irrigation pattern and related issues in agriculture are
largely influenced by various extraneous factors like fluctuations in rainfall, weather, occurrence of pests and diseases, government policy and risk involved. Therefore, based on the findings of this study it may not be possible to arrive at concrete conclusions and suggest policy recommendations.

Outline of the Thesis

The present study has been divided into eight chapters. The first chapter deals with the introduction, scope of the study and limitations of the study. Second chapter deals with objectives, data base and methodology. The third chapter contains a review of literature on farm power use. Also the research issues identified for the present study have been highlighted in this chapter.

The fourth chapter outlines the growth of farm power stock and the factors responsible for the variations in the growth of farm power. An analysis of the availability of different types of farm power stock with the sample farm households has been presented in the fifth chapter. The sixth chapter takes a look at the utilisation of farm power on the selected farms. The penultimate chapter deals with the intensity of farm power use and use of other inputs. Also the cost structure, output and net return across different
Intensity levels of farm power use have been dealt with. Further, the impact of farm mechanisation on the agricultural output and employment is analysed in this chapter. Concluding observations of each chapter have been presented in the last chapter. In addition, policy implications of farm power use also has been indicated in the concluding chapter.


Government of India (GOI), Part X Inputs, Chapter 50, Farm power, Ibid., 1976.


Theodor Bergmann, Mechanisation of Indian Farming, Bombay, Popular Prakashan, 1978.

10 A Valdyanathan, "The Role of Bovines in Indian Agriculture: A Study of Size, Composition and Productivity". (Mimeo), Centre for Development Studies, Trivandrum, 1982.

11 The Livestock Census Report, 1983 is the latest one available for all India.