CHAPTER I

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Pandit Jawaharlal Nehru, our first Prime Minister said, "We certainly attach importance to industry, in the present context we attach for greater importance to agriculture and food and matters pertaining to agriculture. If our agricultural foundation is not strong then the industry we seek to build will not have a strong basis either".

Agriculture represents the oldest culture of Man and the beginning of higher civilization. It is the supplier of food, fuel, fibre, dairy products and other raw materials which serve as a basis for several industries. Crop production and livestock raising are the realm of agriculture which turned man from being a parasite in nature into its controller to a certain extent. But agriculture is marked by certain peculiarities. It is an outdoor profession and its operation seasonable and, hence, nature governs most of the agricultural activities. Latitude, altitude, temperature, configuration and biological activities limit agricultural activities. Time-Lag is much pronounced in agriculture. In developing countries, it
is the main source of occupation of the vast majority of population and a dominant contributor to national income.

With the beginning of agricultural civilization, began the accumulation of food and some beginning of surplus wealth and a heavier growth of population. Agriculture and economics began to be viewed as two intimately intertwined aspect of complex phenomenon that regulates the life of the farmer. Later its relation to economics has become so intimate that it provides the basic foundation stone for international economic co-operation in fighting hunger and want.

With the introduction of modern technology, inputs high yielding varieties of crops, fertilizers, pesticides, Labour saving machines, improved cultural practices with additional irrigation facilities, the traditional equilibrium in agriculture is saving way to a system of agriculture characterised by dynamic equilibrium. The relationship between resources and products are changing. The allocation of resources and marginal productivity analysis has gained the importance.

Agriculture cannot remain isolated from the march of time. National agriculture policy is directed toward self-sufficiency and a favourable balance of trade in agriculture. National
agriculture strengthens international commercial co-operation and pave the way for peace. Technical progress in the field of agriculture is not only national but also international, because knowledge is shared between nations. Agricultural prosperity grows up at the national and international levels. As such, technical progress in agriculture is truly international. The introduction of high yielding Mexican varieties is an example of the pursuit of such policies by various nations which has changed the face of agriculture.

The international trend in the field of agriculture focusses our attention on the working of the food and Agricultural organization (F.A.O.), which was setup in October 1945. It is entrusted with the task of reconstruction, rehabilitation and revitalization of agriculture. It aims at ensuring the welfare of farmers, fishermen and foresters. As a specialised branch of United Nations Organization, its technical division cover Agriculture, Fisheries, Nutrition, Forestry, Rural Welfare, Distribution, Production and Statistics, while its advisory services include soil conservation, Irrigation, Engineering, Insect infestation, Artificial Insemination, Farm Machinery, Fertilizers and Manures. Its headquarter is located in Rome and
its regional offices are stationed at Rome, Cairo and Bangkok. It periodically reviews the world situation in regard to food, Forestry, Agriculture, Livestock and rural Welfare. It receives reports and frames policies concerning both the surplus and the shortage economics, renders advice and takes action accordingly. Its statistical year book and other compilation provide information on Food and agriculture. Its contribution has been significant in improving agriculture and bringing farmers of the World into closer contact. In developing countries agriculture is rediscovering its honoured place in the economic activities of the farmers.

Probably no other subject has attracted as much attention since India became independent as Agriculture and its development. At present, the Indian agriculture stands at the cross roads, uncertain of how to strengthen agricultural economy in the face of rapidly growing population. Important decisions lie ahead on what way to turn to make the best use of agricultural resources and how much agriculture will be able to meet the ever growing demand for food, fodder, fibre, fuel and other raw materials. Of course, remarkable results have been attained on farm production side by the introduction of modern technology and the application of scientific management beyond anything previously attained. But the darness of
our agricultural economy might appear if the development potential of agricultural sector is not raised to the extent needed for meeting the demand of raising population of the country.

However the bright picture of our agricultural economy is there if strain and constrain in agriculture are removed by rational use of scare agricultural resources through the application of the principle of agricultural economics, proper planning and the choice of indicators for selecting between alternatives.

Agricultural economics and statistics relatively are young disciplines inspite of the fact that for thousands of years administrators and public leaders have been interested in the behaviour and economic activities of agriculturists. Their studies of the political, psychological foundations of rural India and diversity in historical heritage and the character of economic institutions do not lend themselves to statistical and scientific treatment. It is only in recent times that these problems of agriculture are being statistically investigated. Agricultural statistics in research has become of crucial
importance to the decision making both at the farm management level and national level in view of the emphasis now being laid on the rapid development of agricultural sector to sustain and develop the general economy of the country. In agricultural economics branch, research depends heavily on physical input output data provided by agronomist and other agencies. In understanding the human factor in agriculture, research studies in agricultural economics overlap with many other subjects which study farmer's wants and their satisfaction. Farmer's culture influences his personal and material dealings with others. The usefulness of multi-disciplinary research is gaining attraction of scientists to a large extent. The planners now recognise the gravity of food production, food consumption and population growth problems. They are now coming to realise that the progress in problem oriented research in agriculture is necessary for guidance in the optimum use of scarce resources. Thus the situation represents a particular challenge to agricultural scientists and other social scientists engaged in rural development to analyse the farmer behaviour as a relationship between objectives and limited resources which have alternative uses.

It is interesting to note a reference made by Sir Brain, more than hundred years ago (in 1882) to the Glasgow Chamber of Commerce on Trade with India would indicate the potential of Indian agriculture.
He writes, "India is the great and valuable country on the East. With all degrees and variations of climate, capable of growing all kinds of crops with great rivers, a large extent of rich alluvial soil, equal in quality to any in America and requiring no fertilizers, a numerous and industrious population able and willing to live at a very small cost and now within a distance in time not more than America was 30 years ago, India requires only the judicious application of capital to railways and irrigation to enable it to develop its great natural riches and became a great exporting country from which we could draw the cereals we require at a cheap, or a cheaper, cost than from any other part of the globe. India is a country of immense natural resources. It has soils capable of growing every kind of crop in profusion. What is required is judicious irrigation in some districts, and a very considerable increase of railways accommodation to transport the produce."
India being a developing country with its huge population and limited agricultural production, it will be helpful for agriculture planners to apply sophisticated techniques like Linear Programming to maximize or optimize the agricultural production. Systematic agricultural planning on a large scale and detailed basis has become possible by means of data generally available through use of modern computers and linear programming models that are manageable.

1. A linear programming problem has three quantitative components (a) an objective (b) process for attaining the objective and (c) or other restraints. A problem which these three components can always be expressed as a linear programming problem. The objective of a linear programming study may be expressed in physical, monetary or other terms, depending upon the problem being analysed. A Linear Programming problem does not exist unless resources are restricted or limited.

2. In the last two decades, linear programming technique has been used extensively in U.S.A. Developing countries are using this technique for agricultural planning. In agriculture, the resources like Land, Labour, capital, fertilizer irrigation etc. are scarce. Linear programming is one of such technique
which comes to rescue the farmer in order to get the maximum farm income with the existing resources. It is an efficient way of determining how to use limited resources to obtain a particular objective such as maximizing net benefit or minimizing production costs, maximizing labour employment, when resources have alternative use.

This type of study is of more use to the planners who are engaged in the development of urban and rural sectors. Agriculture is of utmost important sector which deals with welfare of the people in the country and which contributes significantly to the National economy. Keeping this in view an attempt has been made in the present thesis, to study the existing cropping pattern of the Akola district, which has most typical character representing the Deccan plateau region. Statistical methods such as Linear Programming Problem has been utilised to obtain the optimum solutions of the problem in regards to the objective functions of profit maximisation and employment maximisation taking in to considerations the limited resources of water, land and minimum requirements of food and non-food crops that are grown in the Akola district.
The pivotal role of agriculture in the Indian Economy and the importance of foodgrains both from production and consumption points of view needs no over emphasis. India turned from being a significant importer of food grains during the first two decades after independence. This so called self-sufficiency has by no means meant that the majority of the population enjoys an adequate diet. In fact large number of people have been categorised as under and mal-nourished.

Confining the attention to food grains, the target of production under the seventh Five Year Plan is 178 to 183 million tonnes subsequently reduced to 175 million tonnes at the time of the mid-term appraisal to be achieved by 1989-90. According to the Annual Report of the Ministry of Agriculture for 1987-88, the first three years of the plan are drought years. The food grain production in 1987-88, the third year of the plan was expected to be 7 to 10 per cent lower than the already low production of 1986-87 of 144 million tonnes. For the sixth Five Year Plan, which ended in 1984-85, the foodgrains production target was 154 million tonnes, but the actual production was only 145.5 million tonnes. More-over the per capita availability of foodgrains was 166 kilograms in 1985 as compared to 175Kg. in 1984 and 174 Kg. in 1986. (J.S. Sarma: 1989). The income-elasticity approach for estimating
the demand was introduced for the first time in the Second Five Year Plan and a level of 18.3 ounces of consumption of foodgrains per day per adult was proposed for 1961, the last year of the plan. The projected demand for foodgrains in 2000 is estimated to be 163 million tonnes for a projected population of 976 million. The estimated allowances for seed, feed, other uses and waste add up to about 38 million tonnes making a total demand of 201 million tonnes.

John W. Mellor (1980) had drawn attention to the changing needs for effective agricultural policy. He advocated the analysis of returns to controlled water supplies, interaction of water with technology and the role of ground water as an instigator of multiple cropping, greater intensity per crop and increased stability as compared to other sources of supplies. The relationship between agricultural growth and infrastructure, particularly roads, electricity and market facilities needs to be studies in the different agroclimatic regions. The areas where indepth studies are required to include the linkage between agricultural growth, employment and income, improvements in efficiency of agricultural output technological and economic aspects of dry farming, use of agricultural implements, and trends in Land and Labour productivity.
In Dr. Rajendra Prasad Memorial Lecture N.G.P. Rao discussed on perspective in Agricultural research and development in India: Some issues for analysis and database, he said about technological change. The accuracy of predictability has considerably increased due to a better understanding of the kinds of systems and their interactions and the use of newer statistical tools and techniques. These include extrapolative and intuitive (Deltphi) techniques, morphological designs and diffusion times the time required to translate a technological findings to ultimate production. The country will be getting into the frontier areas of technology like biotechnology in Agriculture. This is no doubt vital for the growth of agricultural science. Electonics and computers will have impact on agriculture of irrigation, planting, fertilisation, pesticide application and a large number of operations can be accomplished by coupling to sensors. Better information systems will influence agricultural business. Constraints on Land, Water and energy use would require an ability to shift agricultural production systems to more reliance on science and technology and greater human skills. The approach to analyse the technological change will itself be a challenge. In shaping future agricultural research, the Statisticians have to play a vital and innovative role.
P.K. Bose has rightly quoted in his speech on "Indian Agriculture retrospect and prospect" that in order to achieve the twin objectives of self sufficiency of food and commercial crops and increasing the employment and income of the farming community, a suitable agricultural plan should be drawn up. It is a fact that during the last thirty years in each plan document sufficient financial allocations were provided and plans were formulated for the development of agriculture but unfortunately we are still far away from achieving the two main objectives. There may be various reasons for this failure but I feel at no time sufficient emphasis was given on the statistical requirements for agricultural planning.