

Introduction

1.1 BACKGROUND

The progress of agricultural mechanization has been closely linked with the overall development in production agriculture. Till 1950, very few farmers possessed prime movers like tractors, engines and motors. Heavy agricultural tractors and machinery were imported by government organizations mainly for land reclamation and development of large government farms. The picture changed quickly during the early sixties with the introduction of high yielding varieties of wheat and other crops which needed irrigation facilities. The progressive farmers soon realized that the traditional water lifts, which were driven by draught animals or operated manually, could not meet the water requirement of the high yielding varieties of different crops. Lift irrigation was, therefore, quickly mechanized through the use of electric motor or diesel engine powered pumps.

The rising production of foodgrains resulting from the extending area under high yielding varieties could not be handled within the normal harvesting and threshing periods. The farmers in North India suffered heavy losses as a result of damage to harvested wheat during the late sixties and early seventies because the threshing of increased wheat production could not be completed before the onset of pre-monsoon rains. Large scale adoption of threshers operated by electric motors, engines and tractors that followed in early seventies onwards was a result of the need to complete threshing operation quickly. Then came the extensive use of tractors for primary tillage and transport and the use of tractor powered or self-propelled harvesting equipment. In the year 1961–62, when the high yielding varieties based agriculture technology started picking up, India produced 880 tractors and imported another 2,997 tractors (Randhawa, 1986), thus adding nearly 4,000 tractors to their small existing population in the country. In the year 2004–05, India produced about 2.5 lakh tractors and the number of tractors in use on Indian farms was estimated to be around 30 lakhs. The number of irrigation pumps both energized and diesel engine powered, stands at 160 lakh. There has been a similar increase in the number of different types of tillage

equipment, seeders and planters, plant protection equipment, threshing and harvesting equipment and tractor-trailers. This increase in numbers indicating the phenomenal growth of agricultural mechanization in agriculture in India has been entirely driven by the needs of the farmer who adopted new production technology. The annual investment on agricultural machinery and prime movers which was less than Rs 1,000 crores in 1950–51 has risen to about Rs 50,000 crores in 2004–05 (Appendix-B). This investment is higher than the total investment on certified seeds, fertilizers and plant protection chemicals.

While the progressive Indian farmers supported by agricultural machinery and tractor manufacturers played the key role in the growth of agricultural mechanization, an equally important contribution to this growth was made by the central and State governments and their various organizations through a large number of programmes to facilitate transformation of Indian agriculture into an efficient production machinery. The Central Tractor Organization, the Tractor Testing Centres, State Agro Industries Corporations, the Agricultural Universities, Krishi Vigyan Kendras, Central Institute of Agricultural Engineering, Bhopal (CIAE); Central Institute of Post Harvest Engineering and Technology, Ludhiana (CIPHET) and the Commodity Research Institutes of Indian Council of Agricultural Research (ICAR) contributed their share to the development and progressive acceptance of agricultural mechanization in India. All India Coordinated Research Projects of ICAR on Farm Implements and Machinery, Power Tillers, Utilisation of Animal Energy, Post-Harvest Technology, and Energy Requirement in Agricultural Sector, along with the large number of agricultural engineering research programmes of the agricultural universities produced a wide range of modern and efficient agricultural equipment and machinery as well as techniques for efficient management of agricultural mechanization. In addition to the above, the central government took many policy decisions to support and facilitate progressive mechanization of agriculture.

While the Indian farmer was striving to modernize his operation through the use of more efficient production equipment, doubts arose about the long-term benefits of mechanization of Indian agriculture. It was feared that the use of tractors and machinery would lead to extensive unemployment in the rural sector. A study entitled “Implications of Tractorization for Farm Employment, Productivity and Income”, conducted by National Council for Applied Economic Research (1980), however, concluded that although mechanization did replace some on-farm labour, this was more than compensated through the mechanization related secondary and tertiary employment opportunities. It was being presumed that the benefits of mechanization are enjoyed only by large farmers, although studies conducted in some States including Punjab as well as the Input Survey Reports, tend to show that all categories of agricultural holdings are sharing these benefits through joint ownership of machines and tractors or through custom operation. It has also been felt that there is a large disparity in the level of agricultural mechanization between different regions of the country and that the benefits of mechanization are going only to few States/regions.

It is well established that agricultural mechanization is driven by the needs and demands of the farmer and that it is an essential input for modernizing production agriculture. Its benefits should extend to all categories of farmers and to all regions of the country. If this is not happening, then we should know the reasons and find solutions to overcome the difficulties and obstructions. Lack of power and equipment should not deprive any region of the opportunity to modernize its production agriculture.

Taking into consideration these often expressed reservations as also the importance to modernize agriculture through technological innovations in all regions, the Department of Agriculture and Cooperation (DOAC), Ministry of Agriculture, Government of India, decided to sponsor a comprehensive study with the following objectives:

1.2 OBJECTIVES

The broader objectives of the study were as follows:

1. To study the soil types, land topography.
2. To study the socio-economic conditions (financial status) of the farmers and farm labourers and assess their capabilities for acquiring and adopting the needed agricultural equipment/machinery.
3. To study the present status, ultimate potential, the gaps, highlighting critical ones; for equipment

used in various agricultural operations starting right from tillage to the post-harvest operations.

4. To study the types and utility of various agricultural equipment, both conventional and improved ones, presently in use and those needed in future, for different crops/cropping systems in the Zones.
5. To study the impact of farm mechanization on employment of labour.
6. To study the cropping pattern, both agricultural and horticultural, in the Zones, yields in relation to the national average, and their growth potential.
7. To study and assess the use of farm power per hectare, ultimate requirement, ways and means to fulfil the gaps for various farm operations.
8. To study the infrastructural facilities for the manufacture, marketing, after sale service/repairs availability etc. of agricultural equipment.
9. To study and assess the adequacy and the requirement of infrastructure at the central and State levels, for planning, promotion, execution and extension of the various plan programmes on agricultural mechanization.
10. To identify new/improved farm equipment that may be needed by the farmers during next 20 years, i.e. by the year 2020, for carrying out different farm operations.
11. To formulate strategies and programmes that may be required for mechanization of agriculture during the period 2001–2005, 2005–2010, 2010–2015, 2015–20.

The study was assigned to Indian Agricultural Statistics Research Institute (ICAR), New Delhi. It was initiated during July 2000.

1.3 SUMMARY OF ACHIEVEMENTS OF THE OBJECTIVES

For formulation of appropriate long-term mechanization strategy, it was necessary to know the status of farm mechanization in the country. Accordingly, a document entitled “**Status of Farm Mechanization in India**”, comprising 10 status papers on topics related to different objectives of the study was prepared by experts identified for the purpose. The document which was submitted to the DOAC, Ministry of Agriculture, GOI, has been approved and published.

The Objective-wise achievements of the study are summarized below:

1.3.1 Soil types and land topography

Information on soil types and land topography was

compiled and presented in the status paper entitled “**Agro-ecological zones, their soil resource and cropping systems**” by Dr KS Gajbhiye. Soil types and land topography have also been described in strategy papers for different agro-climatic zones in Chapter IV.

1.3.2 Socio-economic conditions of the farmers and farm labourers

Information on this aspect was compiled and presented in the Status Paper entitled “**Scope, progress and constraints of Farm Mechanization in India**”, by Dr Joginder Singh.

Survey results have also shown that, in general, the holding sizes were small and did not justify individual ownership of costly machines. However, such farmers were also taking the advantage of improved agricultural machinery on custom hiring basis. This showed that the size of holding and investing capacity of individual farmer was not a limiting factor in the progress of mechanization. Although the majority of the farmers were not very literate but with proper training and demonstration, they were able to operate different types of machinery needed for different agricultural operations.

1.3.3 Present status, ultimate potential and gaps for equipment used in various agricultural operations

Information relating to present status for equipment used in various agricultural operations was compiled and presented in different status papers and the information on future requirements and gaps have been given in different strategy papers in Chapter IV. Information on agricultural machinery being used by the farmers and those needed for future use have been given in Appendix-A.

1.3.4 Conventional and improved agricultural equipment/machinery in use, and those needed for future in different zones, for different crops/cropping systems

Information on the types and utility of various agricultural equipment/machinery, both conventional and improved ones, being used by the farmers for different crops/cropping systems was compiled and presented in the two Status Papers entitled, “**Present Status and Future Requirements of Farm Equipment for Crop Production**” by Dr MM Pandey and “**Farm Power Sources, their Availability and Future Requirements to Sustain Agricultural Production**” by Dr NSL Srivastava. These have also been discussed in the strategy papers for different agro-climatic zones in Chapter IV.

1.3.5 Impact of farm mechanization on employment of labour

Information on this aspect was compiled and presented in the Status Paper entitled “**Impact of Agricultural Mechanization on Production, Productivity, Cropping Intensity, Income Generation and Employment of Labour**” by Dr SR Verma.

1.3.6 Cropping pattern in different zones, yields in relation to the national average and their growth potential

Information on the cropping pattern, both agricultural and horticultural crops, along with yields, gaps and future thrusts was compiled and presented in the Status Paper entitled “**Cropping pattern—agricultural and horticultural in different zones, their average yields in comparison to national average/critical gaps/ reasons identified and yield potential**” by Dr P Das. These have also been discussed in details in the Strategy Papers for different agro-climatic zones in Chapter IV.

1.3.7 Farm power availability per hectare and future requirement

Farm Power availability per hectare for different region in the year 2001, was computed on the basis of the population of agricultural workers, draught animals, tractor, power tiller, engines and electric motors, combines, power sprayers and other self propelled machinery and presented in the status paper entitled “**Farm Power Sources, their Availability and Future Requirements to Sustain Agricultural Production**” by Dr NSL Srivastava. Future requirements of farm power availability per hectare to sustain in the desired agricultural growth rate have been given in strategy papers for different agro-climatic zones in Chapter IV.

1.3.8 Infrastructural facilities available for manufacture, marketing, after sale service/repairs of agricultural equipment and machinery

Information on the infrastructural facilities available for the manufacture, marketing, after sale service/repairs of agricultural equipment was compiled and presented in the Status Paper entitled “**Agricultural Machinery Industry in India- Manufacturing, Marketing and Mechanization Promotion**”, by Dr Gyanendra Singh.

Under the study, at district level, the farm machinery manufacturers sample covered was limited. The information has been processed. However, in the meantime a more comprehensive report on the status of farm machinery manufacturing in India entitled

“Directory of Agricultural Machinery & Manufacturers-NATP Mission Mode project on Proto-type Manufacturing of Agricultural Implements” compiled & edited by Dr KC Bhardwaj, Dr S. Ganesan; Dr MM Pandey & Dr G Singh, has been prepared and published by Central Institute of Agricultural Engineering, Bhopal during December 2004. It contains detailed information about 1900 farm machinery manufacturing units in different States. It will be logical to utilize the more detailed report for planning purposes.

1.3.9 Adequacy of existing infrastructure for planning, promotion, execution and extension of agricultural mechanization programmes and need for future strengthening

Detailed recommendations in this respect have been given in the strategy papers for different agro-climatic zones in Chapter IV.

1.3.10 Identification of new/improved farm equipment that may be needed by the farmers during next 20 years

Information on new/improved equipment to be introduced and promoted in future was compiled and

presented in the Status Paper entitled “**Future Requirements of Agricultural Machines for Mechanizing Agriculture**”, by Dr Anwar Alam. Information on this aspect has been given in the strategy papers for different agro-climatic zones in Chapter IV and also in Appendix-A.

1.3.11 Strategies and programmes that may be required for mechanization of agriculture during next 20 years

Detailed strategies, programmes and strengthening of infrastructural facilities for different agro-climatic zones have been given in Chapter IV.

The report brings out the gaps and needs in terms of mechanization and strategies have been suggested. The rate of implementation of the programme of mechanization based on the recommendations contained in the report has to be decided by the programme implementing agencies which will determine the provisions to be made for the numbers and quantities of different types of equipment for different 5-year periods. The rate of implementation will depend on the progress made in different States to develop the required infrastructure supported with adequate manpower and finances. Only then the quantities of equipment for different periods may be determined.

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