# ASSESSING THE EXISTING TRAINING AND TESTING FACILITIES FOR FARM MACHINERY IN MAHARASHTRA

DEEPAK SHAH
K.G.KSHIRSAGAR

AGRO-ECONOMIC RESEARCH CENTRE
GOKHALE INSTITUTE OF POLITICS AND ECONOMICS
(DEEMED TO BE A UNIVERSITY)

PUNE 411 004

NOVEMBER 2001

# ASSESSING THE EXISTING TRAINING AND TESTING FACILITIES FOR FARM MACHINERY IN MAHARASHTRA

DEEPAK SHAH
K.G.KSHIRSAGAR

AGRO-ECONOMIC RESEARCH CENTRE
GOKHALE INSTITUTE OF POLITICS AND ECONOMICS
(DEEMED TO BE A UNIVERSITY)

PUNE 411 004

NOVEMBER 2001

# PREFACE

The adoption of improved seed-irrigation-fertilizer technology and scientific methods of farming have perceptibly increased the use of improved farm machinery and implements (M & Is) over the past few decades. In the light of this fact, the Government of India had established training and testing network in the country. Despite these network of training and testing centres, it was felt that the increase in machinery over time had outstripped the facilities created for the purpose. An urgent need, therefore, was recognized not only to assess the existing training and testing infrastructure available in the country but also to examine its relevance and adequacy in the present context. The present investigation was carried out in the state of Maharashtra at the instance of Parliamentary Committee on Agriculture (PCA) and the Ministry of Agriculture, Government of India.

Findings of this investigation revolved around creation of those facilities such as strengthening of the existing testing centres in the state, provision of sufficient funds for the initiation of various training programmes for the benefit of farmers, etc. The study also found a number of problems faced by the manufacturers of various M & Is. The manufacturers of various farm M & Is included in this study by and large reported to have faced both testing and manufacturing related problems. Further, in the light of the testing requirements of the growing M & Is, the study categorically emphasized upon the need to establish testing centres in the state of Maharashtra, especially at the four agricultural universities located in different regions of Maharashtra.

At the initial stages of this study we had fruitful discussions with Dr. P.A.Turbatmath, Associate Professor, Prototype Manufacturing Workshop, Agricultural Engineering Research Centre (AERC), College of Agriculture, Pune; Shri Ramesh Sangle, Manager (Q.C. & R&D), Maharashtra Agro-Industries Development Corporation Ltd., Pune, and also with the manufacturers of various farm M & Is operating in the state of Maharashtra. We are thankful to all of them and their colleagues for their cooperation in the conduct of the present study.

We are greatly indebted to Prof. V.S. Chitre, Director of this Institute, for his unstinted support, keen interest and providing all the necessary facilities in carrying out the present investigation.

We hereby extend our hearty thanks to Shri S.B. Kate, Shri A.C. Karpe and Mrs Anjali Kale for their assistance in collection, tabulation and processing of data.

We thank them all who have helped us in completing this study. We hope that the researchers, policy makers and all those who are interested in farm mechanization may find this study useful.

Deepak Shah

September, 2001 K. G. Kshirsagar

## CONTENTS



Contd...

**List of Tables**

# CHAPTER I

# INTRODUCTION

## 1.1 Background:

With the progressive adoption of new high-yielding varieties and scientific methods of farming, the demand for farm implements and machinery has increased considerably in more recent decade. The adoption of improved seed-irrigation-fertilizer technology and system of multiple cropping has stimulated the demand for seasonal labour which in turn seems to have precipitated into rise in seasonal wages. This obviously has made the investments in farm implements and machinery by the farmers more attractive. In fact, any use of mechanized power in place of human/ animal power for agricultural operations amounts to farm mechanization. In advanced countries, most of the agricultural operations are performed by varieties of machines. But, in India progress of farm mechanization is confined to some operations by particular machines, viz., (a) tractors which are mainly used for preparatory tillage and transport, (b) power operated pumps used for lifting water for irrigation purposes, (c) power operated sprayers and dusters, and (d) power operated combine harvesters and threshers. However, among the development in Indian agriculture, the introduction of power-driven machines on a sizable scale has not received serious attention in recent times.

In India the farmers have increasingly realised the advantages of farm mechanization such as timeliness, efficiency and quality of operations. As a result, there has been considerable increase in adoption of improved farm implements and machinery over the last three decades. This is evident from the fact that the number of tractors in the country increased from 1.48 lakhs during 1972 to 17.13 lakhs during 1995. Similarly, the number of combine harvesters and irrigation pumps are estimated to have grown from 350 to 11,000 and 3.16 lakhs to 16.80 lakhs, respectively, during the period between 1972 and 1995. The passage of time is not only marked with phenomenal increase in the number of tractors, combine harvesters and irrigation pumps but also in the number of

other machines such as cultivators, planters, threshers, sprayers, dusters, etc. Thus, increasing mechanization, as evidenced by a rising demand for tractors, tillers, threshers, pump sets, etc. is one of the directions in which transformation of Indian agriculture is taking place. The adoption of short-duration high yielding varieties of cereal crops and increasing use of inputs such as seeds, fertilizers, irrigation, pesticides, and those that can be ascribed to new techniques of production, have played a significant role in this achievement. However, it is to be noted that the adoption of any farm tools and equipments by farmers greatly depends on the socio-economic conditions of the local farmers and agro-climatic conditions of the region. This is symptomatic of the fact that a number of improved farm implements designed and developed at various research centres do not reach the farmers due to non-popularization and lack of suitability of these implements to local conditions and, therefore, they lie in the premises of these research organizations. Under such a veritable scenario, it becomes necessary on the part of various research centres not only to test improved implements and machinery in different farm conditions but also to extend various types of training facilities to the farmers with respect to efficient use of these implements and machinery.

### 1.2 Genesis of Training and Testing Centres for Machinery:

Recognizing the importance of farm machines and equipments in crop production and its handling, transportation, processing and preservation, the Government of India had established "Agricultural Machinery Utilization Training Centre" at Budni (Madhya Pradesh) which came into being in 1955. Prior to this, the use of farm machines in the country was quit scant. The objectives of establishing the Budni centre was to train the prospective farmers with respect to proper use, maintenance and up-keep of farm machines. Subsequently, considering the urgent need for the indigenous manufacture of farm machines/ equipments, a testing wing was added to the centre, primarily with a view to ascertain the suitability of agricultural machines/ equipment to varying agro-climatic conditions of the country. Thus, in 1959 this centre was renamed as "Tractor Training and Testing Station". In 1983, the Tractor Training and Testing Station was upgraded and renamed as "Central Farm Machinery Training and Testing Institute (CFMTTI)". In view of the importance of farm machines and training on various aspects

of farm machines and to cope up with the increased demand of trained manpower in the field of agricultural mechanization, three more Institutes were set up at Hissar (Haryana), Anantpur (Andhra Pradesh) and Biswanath Chariali (Assam) in 1963, 1983 and 1990, respectively.

### 1.3 Central Farm Machinery Training and Testing Institute (CFMTTI):

Over the past four decades, CFMTTI has developed necessary expertise and infrastructure and has attained international standard in the field of training and testing of farm machinery. Now, it is recognized as one of the leading testing organization in the world. The information regarding various types of machinery tested at this centre since the year of its establishment is brought out in Appendix I. The objectives of setting up of CFMTTI are delineated as follows:

1 Assessing functional suitability and performance characteristics of agricultural machinery under different agro-climatic conditions so that the published test results would:

   (i) serve as a basis to decide the type of machine best suited for Indian conditions which would be encouraged for import, production and popularization;

   (ii) provide material to engineers and extension workers for guiding farmers and purchasers in proper selection of equipment;

   (iii) help the farmers and prospective purchasers in determining the comparative performance of machines available in the market;

   (iv) serve as a basis for standard specification to be used by the manufacturers and distributors;

   (v) help financial institutions in recommending financial assistance both to the manufacturers and farmers.

2 To carry out tests on machines, which have proved successful in other regions of the world with a view to examine the possibility of their introduction in the country.

3 To maintain check over the quality of agricultural tractors through batch testing programme and also assist the manufacturers in the overall product improvement and facilities in updating the specifications based on the test conducted on latest model.

4 To provide feedback to the manufacturers through user's survey on the nature of field complaints and standards of pre and post-sales service facilities provided by them.

5 To promote export of tractors through testing in accordance with the international standards.

6 To assist Bureau of Indian Standards in formulation of standards and testing of agricultural machines covered under the scope of Certification Marks Scheme.

7 To carry out research and development for further improvement in the product.

The CFMTTI is an important link between the manufacturers and the users of agricultural machines as well as other agencies responsible for the introduction and popularization of the same. In fact, the rapid demand of farm machines and the liberalized policy has induced many manufacturers to undertake production of farm machines.

The training and extension functionaries at this Institute are arranged by Directorate of Extension, Government of India, with the help of Extension Education Institutes, ICAR Institutes, State Agricultural Universities, Farmer's Training Centres and Extension Training Centres. Efforts are now also being made to develop some of the Agricultural Universities and ICAR Institutes as centres of advanced training. However, schedule of the training courses conducted by these Institutes indicate that they are basically limited to specific crops, communication system and management. Some of the courses on improved farm implements and machinery are being arranged in Agricultural Universities in different seasons. Information relating to number of personnel trained at CFMTTI since the year of its establishment is provided in Appendix II.

As regards training, the CFMTTI had made a modest beginning by conducting two types of training courses, viz., long term training courses of 10 months and 6 months duration. These courses were designed to meet the training needs of machinery users, supervisory and middle level functionaries sponsored by the Central and State level Organizations/ Departments who were engaged in mechanized agriculture. With a view to meet the increased demand for training due to growth in farm mechanization, the courses at this Institute have been re-scheduled. At present, the Institute is conducting short duration training courses with the emphasis on the use, repairs, maintenance and management of farm machinery, especially for the benefit of the farmers, technicians,

rural youth and nominees of the Central/ State Government organizations. The details regarding courses conducted by CFMTTI and persons trained under each course from VII Plan onwards are provided in Appendix III. However, a brief description of these courses is also provided as follows:

1 A-Series: "Regular courses on farm machinery utilization and maintenance"

Four courses, each of two-months duration, are offered for machinery owners and departmental candidates on operation and maintenance of machines.

2 B-Series: "Intensive course on special machines and skills"

Three courses with a duration of 1 to 4 weeks on special aspects of mechanization such as land leveling and development, auto electric and farm motors, irrigation pumps and water management, drip and sprinkler irrigation and power tillers are organized.

3 C-Series: "Refresher courses on farm machinery repair and workshop management"

Four courses with a duration of 8 weeks are offered to Government nominees and private mechanics on repairs and overhauling of tractors and agricultural machinery.

4 D-Series: "Education and training course on farm machinery utilization"

Two advanced courses are offered to the undergraduates of Engineering Colleges, Polytechnics and Universities on operation and maintenance of tractors and agricultural machinery.

5 E-Series: "Regular course for rural youth (TRYSEM)"

These courses are of 3 months duration and are conducted on maintenance, adjustment and repairs of commonly used agricultural machines and tractors. Selection of candidates for these courses are made through the agencies of State Governments.

6 F-Series: "Need Based Training Programme"

Six need based courses aimed at familiarizing the trainers with the dangerous acts of machines, their testing procedures, interpretation of test results, farm machinery management, energy conservation, etc. are conducted for sponsors of State/ Central Government Institutions, banks, dealers of farm machinery manufacturers, extension workers, etc. Duration of this course vary depending upon the requirements.

7 G-Series: "Energy Conservation Management Camps"

Ten camps for 2 to 3 days duration on energy conservation and management are organized at district and block levels for the benefit of farmers, trainers, extension workers and others.

In the above sequel, it is to be noted that the trainees are provided free hostel facilities. Trainees from farming community are also eligible for a monthly stipend of Rs. 200/- for two months.

**1.4 Need of the Study:**

In spite of the strengthened network of training and testing of farm implements and machinery in the country, the increase in machinery over time has far outstripped the facilities created for the purpose. Thus, there is a need to assess the existing training and testing infrastructure in the country, and also its relevance and adequacy in the present and future time. The present investigation will, therefore, provide a deep insight into the gaps and help in identifying the causes for such gaps and initiating investment, infrastructure and institutional improvements selected to meet the requirements of the future years.

**1.5 Objectives of the Study:**

This is a common research study undertaken by various Agro-Economic Research Centres/Units of the country. The specific objectives of this common study are as follows:

1. To evaluate the impact of training and testing programme being conducted at the existing four farm machinery training and testing institutes (FMT & TIs) at Budni (M.P.), Hissar (Haryana), Garladinne, District Anantpur (A.P.) and Biswanath Chariali, District Sonitpur (Assam) with a view to assess their adequacy, usefulness, effectiveness and contribution to the development of agriculture, besides extending suggestions with respect to restructuring of the training and testing programmes.
2. To assess the training and testing infrastructure available with the State Governments/ Organizations including industry and trade in various states and UTs.

3. To identify the gaps and additional requirement of training and testing for agricultural mechanization in each of the state and UT by 2020 A.D. in the context of fast changing agricultural scenario in the country.
4. To identify the location of the FMT & TIs in each of the States/ UTs for undertaking these programmes. If the requirement is for more than one FMT & TI in any of the state, the same may also be indicated.

This study is designed for various states in the country. The Agro-Economic Research Centre of Gokhale Institute of Politics and Economics (Deemed to be a University) has been entrusted to conduct this study in Maharashtra. However, in the state of Maharashtra, there are no adequate infrastructure facilities to impart training to the farmers in farm implements and machinery. Some of the centres controlled by the agricultural universities in this state are equipped to perform only testing of minor farm implements and machinery manufactured by other commercial units operating in the state. However, mention may be made here that these centres are also engaged in the development of various implements and machinery (Is & M). Most of the Is & M developed/ manufactured by them are operated with the help of human and bullock labour. The testing of major equipments is done at CFMTTI, Budni. This study is, therefore, confined to the evaluation of these testing centres. Further, an effort is also made in this investigation to evaluate the performance of various manufacturers of farm Is & M in the state.

**********

# CHAPTER II

# METHODOLOGY

The state of Maharashtra has several testing centres for minor farm Is & M. Majority of these centres suffer from lack of infrastructural facilities to undertake training programmes for the farmers in farm Is & M mainly due to shortage of funds. Lack of trained personnel to undertake such training programmes is another problem confronted by these centres. In the absence of such training facilities and thereby beneficiaries of various training programmes, this study is restricted to the evaluation of performance of these testing centres in Maharashtra. However, an attempt is also made in this study to evaluate the performance of various manufacturers of farm Is & M operating in this state. Ironically, there are number of manufacturers of various farm Is & M in Maharashtra. These manufacturers of farm Is & M have several problems not only relating to manufacture of these farm Is & M but also with respect to testing of their manufactured Is & M. It was, therefore, decided to evaluate the performance of these manufacturers of various Is & M, especially when the study could not evaluate the impact of training and testing programmes on the farmers in terms of proper handling and efficient use of improved Is & M.

A list of manufacturers of various farm Is & M operating in the state of Maharashtra was obtained from the office of Maharashtra Industrial Development Corporation (M.I.D.C.) located at Pune. This list not only contained addresses of various manufacturers but also description of various Is & M manufactured by them. In fact as on March 2001, there were 59 manufacturers of various farm Is & M registered with M.I.D.C., Pune. They were found to be located at different districts of Maharashtra. It was decided to study about 20 manufacturers of various farm Is & M. The structured questionnaires designed in this common study for the manufacturers were mailed to 12 major manufacturers of farm Is & M located in different districts. The manufacturers operating in Pune were excluded from the mailed questionnaire as it was decided to contact/ interview these manufacturers personally. As for the manufacturers of farm Is & M operating in other districts, majority of them did not respond to the mailed

questionnaire. This is despite repeated reminders sent to them. It was then decided to personally interview the manufacturers of various farm Is & M operating in Pune district. A few manufacturers from Kolhapur district were also selected for this purpose. Meanwhile when this personal interview of these manufacturers of various farm Is & M was in progress, we received very positive response from one of the leading manufacturers of farm Is & M operating in Kolhapur district of Maharashtra. Apart from this, we also received response from another manufacturer of farm Is & M operating in Aurangabad district of Maharashtra. The responses of all these manufacturers were quite encouraging and they had cited a number of problems faced by them.

Details regarding number of questionnaire mailed and responses received along with information collected through personal interview method are cited in Table 2.1.

**Table 2.1: Information Regarding Selection of Manufacturers of Farm Is & M in The State of Maharashtra**

| Sr. No. | Particulars | Total |
|---|---|---|
| 1. | Number of manufacturers of farm Is & M registered with M.I.D.C., Pune | 59 |
| 2. | Questionnaire mailed | 12 |
| 3. | Responses received | 3 |
| 4. | Data collection from manufacturers through personal interview | 16 |
| 5. | Number of manufacturers selected | 19 |

Information furnished in Table 2.1 clearly show that the study is confined to the evaluation of only 19 manufacturers of various farm Is & M. Majority of these manufacturers are operating in Pune district of Maharashtra. The problems cited by these manufacturers are carefully studied and an attempt is made to highlight the same in this study. However, mention may be made here that lack of responses received (especially mailed responses) from various manufacturers of farm Is & M operating in this state is an indication of lack of awareness of these manufacturers about such studies.

**********

## CHAPTER-III

## PERFORMANCE OF THE TRAINING AND TESTING INFRASTRUCTURE IN MAHARASHTRA

Despite the fact that the state of Maharashtra has three major testing centres for farm implements and machinery (Is & M), none of the centres cater to the requirements of the farmers in terms of providing them training facilities in farm Is & M. Lack of infrastructural facilities, availability of funds and trained personal make these centres underequipped to undertake various training programmes for the farmers with respect to adoption and efficient use of major and minor implements. On closer scrutiny, we have come across three major centres which are either engaged in the development/ production of farm Is & M or involved in the testing of these farm Is & M manufactured by themselves and also by other commercial units located in the state of Maharashtra.

One of the major testing centres is located at College of Agriculture, Pune. This centre is under the control of Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri and it was established in 1962. However, the major source of funds for this centre is Indian Council of Agricultural Research (ICAR). In this sequel, the contributions of ICAR and State Government to the total allocation of funds to this centre are noticed to be 75 per cent and 25 per cent, respectively. Another testing centre for farm Is & M is located at Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola. This centre came into being in 1982. Apart from these two centres, the Engineering Division of Maharashtra Industrial Development Corporation (MIDC) located at Pune also performs testing of farm Is & M. The Engineering Division of MIDC is completely commercial in nature. The activities of MIDC encompass not only testing of farm Is & M manufactured by other commercial units but also commercial production of these farm Is & M, besides extending its hand as dealer of such farm Is & M manufactured by various commercial units. An effort was made to evaluate the performance of all the above three testing centres. However, due to lack of cooperation and timely response from MIDC, Pune and PDKV, Akola, the performance of these two centres could not be evaluated. The study is, therefore, restricted to evaluation of the testing centre located at College of Agriculture, Pune.

## 3.1 Agricultural Engineering Research Centre (AERC), College of Agriculture, Pune:

The Indian Council of Agricultural Research (ICAR) had established a training centre for farm Is & M at College of Agriculture, Pune in 1962. This was a part of the ICAR's 'All India Coordinated Research Project on Farm Implements and Machinery'. The major thrust of the project was on research and development of farm implements and machinery and also production/ fabrication of prototypes and their evaluation. However, the prototype manufacturing workshop and prototype feasibility test centre were actually established in December, 1979. During 1991-92, a scheme related to 'Front Line Demonstrations' (FLD) on the cultivator's field for oilseeds was sanctioned to this centre. The successful implementation of FLD for oilseeds was instrumental for the implementation of another scheme of FLD for pulses which was sanctioned in 1994-95. Thus, the activities of Agricultural Engineering Research Centre (AERC), Pune revolve around research and development in farm Is & M, fabrication of prototypes and their feasibility tests, and front line demonstration of improved implements for oilseeds and pulses. The major objectives of establishing this centre are delineated as follows:

### 3.1.1 Objectives of AERC, Pune:

(i) to design, develop and adopt or modify farm tools, implements and machines for small and medium farmers on the basis of research information available from institute and universities relating to dry and irrigated farming in the hilly and plain regions that is suitable for human power, animal power, mechanical and electrical power units with a view to increase production and productivity and reduce drudgery,

(ii) to work out economics of use and cost benefit ratio of crop plant implement system with a view to evaluate the performance of crop plant implement system not only in the laboratory but also on the farmer's fields,

(iii) to establish linkage with small manufacturers of farm tools, implements and machines by involving them in development work and test with a view to promote manufacturers of good quality improved implements ,

(iv) to make selection of suitable prototypes of improved agricultural implements and farm machinery newly developed at various research centres and agricultural universities for various regions and, thus, fabricate the required number of units in the prototype manufacturing workshops (PMW),

(v) to get the prototypes intensively tested at various prototype feasibility test centres (PFTC) that are developed for different agro-climatic zones having varying agro-climatic conditions,

(vi) to promote manufacturers of good quality implements and involve them in field testing,

(vii) to impart training to village artisans with respect to production and fabrication techniques of the selected agricultural implements and machinery, and also their operation, maintenance and repairs,

(viii) to help the trained artisans to set up rural industry with a view to boost rural industrialization,

(ix) to educate farmers with respect to the usefulness of the improved implements and their efficient handling and maintenance through field demonstrations,

(x) to implement 'Transfer of Technology' programme through trained artisans with a view to create potential for rural industrialization and, thus, raising agricultural productivity as well as rural employment opportunities.

Undoubtedly, the Agricultural Engineering Research Centre (AERC) located at Pune has quite ambitious objectives. However, it is unable to conduct any training programme for the farmers in terms of usefulness and efficient use of improved farm implements. The response of this centre in terms of training facilities for farm implements and machinery are brought out in Appendix IV. Although during the early- and the mid nineties a scheme was implemented by this centre to train the farmers in the efficient use of implements, the scheme could not function for long as the funds allocated to the scheme were meagre. A provision of daily allowance of Rs 60 /- per trainee was made under the scheme which included both boarding and lodging expenses for the trainee. This amount was so meagre, especially for an expensive city like Pune, that no farmer came forward to avail the benefit of such training facilities. This had resulted in termination of the scheme. However, it is to be noted that the centre conducts demonstrations of various machinery and implements at farmers' fields under its Front Line Demonstration (FLD) scheme. Demonstrations are conducted for those machinery

and implements such as rotavators, sugarcane planters, power weeders and hand tools used for various agricultural operations.

At present, the centre is completely concentrating on manufacture of minor tools and implements and also testing of such implements manufactured by the centre as well as by other unit/ manufacturers located in Maharashtra. However, testing of major machinery such as planter, thresher, seed drill, etc. is done at Tractor Training Centre, Budni (M.P.) which often consumes enormous time and, thus, lead to delay in marketing of these machines and implements to the farmers.

### 3.1.2 Progress of AERC, Pune:

The progress of the centre encompassing the period from 1983 to 2000 with respect to development of design for various machines and implements, their feasibility testing and manufacture of prototypes is provided in Table 3.1.

It could be observed from Table 3.1 that ever since the early eighties the AERC, Pune, had been concentrating more on the production of manually operated power sources as compared to tractor/ power tiller or bullock operated power sources. As for the manufacture of manually operated prototypes, no trend could be discernible as there was considerable fluctuation in their production during the period between 1983 and 2000. However, an increase was noticed in both tractor/ power tiller operated and bullock operated prototypes, especially during the recent times. The more recent times was also seen to be marked with an increase in development of various designs for tractor/ power tiller operated power sources, apart from increase in their feasibility tests conducted by the Centre.

### 3.1.3 Staffing Pattern of AERC, Pune:

The staffing pattern of AERC, Pune clearly show a considerable gap between number of posts sanctioned and number of posts filled, especially with respect to the support staff (Tables 3.2 and 3.3). It is surprising to note that the position of Principal Investigator for the 'Research and Development' unit of this centre has been lying vacant for the last two years. Needless to mention that the head of the unit is the main driving force for the implementation of any programme and its absence, therefore, may affect the

functioning of the unit. Further, it is to be noted that 50 per cent of the total sanctioned post of support staff also stand vacant. Besides, two positions of Technical Assistants – one each in 'Research and Development' unit and 'Prototype Manufacturing Workshop' – are also lying vacant for the past 2-3 years. Thus, one of the reasons for the non existence of any training programme could, therefore, be linked to the lack of scientific, technical and support staff available at the Centre. The Head of the Prototype Manufacturing Workshop has, therefore, expressed his view in favour of strengthening the existing staff position by filling the vacant posts at the Centre.

### 3.1.4 Upgradation of Testing Facilities at AERC, Pune:

One of the opinions expressed by the head of Prototype Manufacturing Workshop of the Agricultural Engineering Research Centre located at Pune is in favour of upgrading the existing infrastructural facilities available at the Centre. This included purchase of machines like electric dynamometer and soil beans. The approximate cost for this is estimated at Rs 2.00 lakhs for electric dynamometer and Rs 1.00 lakh for soil beans (Table 3.4). In order to upgrade the testing facilities, an urgent need of setting up of "Ergonomic Lab" and "Plant Protection Appliance Lab" is also felt. However, the cost of establishing such labs is not yet estimated and it is left to the funding agencies interested in financing such labs.

### 3.1.5 Activities and Performance of AERC, Pune:

The AERC, Pune was seen to be engaged in multifarious activities that not only included research and development but also manufacture of various proven prototypes and their feasibility tests, besides undertaking front line demonstrations of improved farm implements and machineries. In broader terms, the centre consists of three different units such as Research and Development (R & D), Prototype Manufacturing Workshop (PMW) and Prototype Feasibility Test Centre (PFTC). All these three units are engaged in various research activities relating to modernization of farm implements and machinery. While research and development unit undertakes various kinds of performance evaluation studies, the role of prototype manufacturing workshop is to fabricate various proven prototypes that are tested by prototype feasibility test centre with

**Table 3.1: Progress of Agricultural Engineering Research Centre (AERC), Pune**

| Year | Number of Farm Is & M Designed, Tested and Prototype Manufactured for Different Power Sources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tractor / Power Tiller Operated | | | Bullock Operated | | | Manually Operated | | |
| | a | b | c | A | b | c | a | B | c |
| 1983 | 3 | 15 | 441 | - | 1 | 7 | - | - | 36 |
| 1984 | 2 | - | - | 1 | 1 | 15 | - | - | 570 |
| 1985 | 2 | - | - | 1 | 2 | 6 | - | - | 127 |
| 1986 | 2 | - | 5 | - | 2 | 21 | - | 1 | 780 |
| 1987 | 1 | - | - | 1 | 1 | 27 | 2 | - | 1635 |
| 1988 | 1 | 1 | - | 2 | 1 | 11 | - | 1 | 4 |
| 1989 | - | - | - | - | - | - | - | - | - |
| 1990 | 2 | 1 | 4 | 1 | 2 | 17 | - | 1 | 603 |
| 1995 | 3 | 2 | 5 | - | 2 | 8 | - | - | 240 |
| 1996 | 3 | 2 | - | 2 | 1 | 66 | - | - | 729 |
| 1997 | 2 | 2 | - | 2 | - | 6 | - | - | 803 |
| 1998 | 2 | 3 | 34 | - | - | 30 | - | 1 | 909 |
| 1999 | 3 | 5 | 7 | - | - | 16 | - | - | 509 |
| 2000 | 3 | 3 | 5 | 1 | - | 25 | - | - | 2535 |
| Total Triennium Ending | | | | | | | | | |
| 1985 | 7 | 15 | 441 | 2 | 4 | 28 | - | - | 733 |
| 1990 | 3 | 2 | 4 | 3 | 3 | 28 | - | 2 | 607 |
| 2000 | 8 | 11 | 46 | 1 | - | 71 | - | 1 | 3953 |

Note: a – Design Development ; b – Performance/ Feasibility Testing ; c – Prototypes Manufactured

**Table 3.2 : Staff Position of AERC, Pune As on December, 1999**

| Sr. No. | Name of the Post | No. of Post Sanctioned | No. of Post Filled | No. of Post Vacant | Vacant Since |
|---|---|---|---|---|---|
| | A. Research & Development | | | | |
| 1. | Principal Investigator | 1 | - | 1 | 30.9.99 |
| 2. | Assistant Professor | 1 | 1 | - | - |
| 3. | Draughtsman | 1 | 1 | - | - |
| 4. | Technical Assistant | 1 | - | 1 | 1.12.98 |
| 5. | Mechanical Supervisor | 1 | 1 | - | - |
| 6. | Carpenter | 1 | 1 | - | - |
| 7. | Fitter | 1 | 1 | - | - |
| 8. | Machinist | 1 | 1 | - | - |
| 9. | Welder | 1 | - | 1 | 10.1.85 |
| 10 | Blacksmith | 1 | - | 1 | 1.6.94 |
| 11. | Driver (Jeep) | 1 | 1 | - | - |
| 12. | Steno Typist | 1 | 1 | - | - |
| 13. | Senior Clerk | 1 | 1 | - | - |
| 14. | Watchman | 1 | 1 | - | - |
| 15. | Peon | 1 | 1 | - | - |
| | B. Prototype Manufacturing Workshop | | | | |
| 1. | Associate Professor | 1 | 1 | - | - |
| 2. | Sr. Tech. Assistant | 1 | 1 | - | - |
| 3. | Tech. Assistant | 2 | 1 | 1 | 1.12.98 |
| 4. | Senior Clerk | 1 | 1 | - | - |
| 5. | Turner | 1 | 1 | - | - |
| 6. | Farm Mechanic | 1 | 1 | - | - |
| 7. | Foundryman | 1 | 1 | - | - |
| 8. | Black Smith | 1 | 1 | - | - |
| | C. Prototype Feasibility Test Centre | | | | |
| 1. | Assistant Professor | 1 | 1 | - | - |
| 2. | Sr. Tech. Assistant | 1 | 1 | - | - |
| 3. | Farm Mechanic | 2 | 2 | - | - |
| 4. | Motor Mechanic | 1 | 1 | - | - |
| 5. | Watchman | 1 | - | 1 | 1.7.99 |
| | Total | 30 | 24 | 6 | |

**Table 3.3: Existing Strength and Additional requirement of Staff for AERC, Pune**

| Category of Staff | No. of Post Sanctioned | No. of Posts Filled | Gap | Additional Requirement |
|---|---|---|---|---|
| Scientific | 4 | 3 | 1 | 1 |
| Technical Support | 19 | 15 | 4 | 2 |
| Other Support | 7 | 6 | 1 | 3 |

**Table 3.4: Requirement of Machinery for the Upgradation of Testing Facilities at AERC, Pune**

| Sr. No. | Machines Required | Number | Approx. Cost (Rs. in Lakhs) |
|---|---|---|---|
| 1. | Electric Dynamometer | 1 | 2.00 lakhs |
| 2. | Soil Beans | 1 | 1.00 lakh |
| 3. | Ergonomic Lab | 1 | - |
| 4. | Plant Protection Appliance Lab | 1 | - |

the help of field trials conducted in different regions with varying soil type and agro-climatic conditions. Every year each of the three units undertake different research projects with farmers interests kept in mind, especially in terms of suitability of modern farm implements and machinery developed for various crops grown under different soil types and agro-climatic conditions. In order to popularize modern farm Is & M, the centre also conducts demonstrations of these implements under its 'Front Line Demonstration Scheme' which came into being in April, 1992. The activities of the centre in terms of projects undertaken and completed by its different units encompassing the period from 1995-96 to 2000-01 are brought out in Table 3.5.

During 1995-96, the centre had undertaken eight research projects. Three research projects were assigned to R & D unit, one to PMW and the remaining four to PFTC. The projects undertaken by R & D unit mainly revolved around studies relating to performance evaluation of tractor drawn multicrop planter, power operated groundnut stripper and vertical conveyer reaper for harvesting of paddy and wheat. On the other hand, PMW was found to be engaged in fabrication of various prototypes such as planter, multipurpose hoe, pegtooth weeder, maize sheller, sickle, groundnut decarticator, and sugarcane earthing hoe. As for PFTC, it was seen to be involved in those activities such as feasibility trials of sugarcane interculturing implement, sugarcane cutter planter, motorized thresher for groundnut stripping and front line demonstrations of improved agricultural machineries for major oilseed crops.

As for 1996-97, the centre had undertaken ten research projects. The projects undertaken by R & D unit mainly revolved around performance evaluation studies relating to weeding attachment on sugarcane interculturing implement, weeding attachment to the self propelled vertical conveyor reaper, sugarcane trash disposer, bullock drawn seed drill for pearl millet and tractor drawn multicrop planter. The PMW had continued its activity of fabrication of prototypes as mentioned earlier with the sole exception of fabrication of sugarcane earthing hoe. On the other hand, during this year PFTC was found to be engaged in feasibility trials of Indian Institute of Sugarcane Research (IISR), Lucknow sugarcane cutter planter, self propelled vertical conveyor reaper for harvesting paddy and wheat and sugarcane interculturing implement. Popularization and demonstration of improved agricultural machinery for major oilseed

## Table 3.5: Projects Undertaken by Agricultural Engineering Research Centre During the period from 1995-96 to 2000-2001

| Year | Sr. No. | Name of the Project | Brief Description |
|---|---|---|---|
| **1995-96** | | I. Research and Development | |
| | 1. | Development and Performance Evaluation of Tractor Drawn Multicrop Planter | The centre had developed and fabricated a prototype consisting of components such as main frame, seed box with metering device, furrow openers, fertilizer hopper, and power transmission shaft with ground wheel |
| | 2. | Performance Evaluation of Power Operated Groundnut Stripper | Three labourers can work at a time on this machine for stripping of groundnut pods |
| | 3. | Performance Evaluation of Vertical Conveyer Reaper for Harvesting of Paddy and Wheat | There is saving of cost upto 48 per cent by the use of vertical conveyer reaper over conventional harvesting method |
| | | II. Prototype Manufacturing Workshop | |
| | 4. | To Fabricate the Proven Implements | Fabricated prototypes were supplied to different institutions, organizations and farmers |
| | | III. Prototype Feasibility Test Centre | |
| | 5. | Feasibility Trials of Sugarcane Multipurpose Implements | The trials of tilling and earthing up operations were conducted during this year |
| | 6. | Feasibility Trials of Sugarcane Cutter Planter | This planter does three operations together such as formation of ridges, furrow cutting of sets application of fertilizers and set treatment |
| | 7. | Feasibility Trials of Motorized Phule Sunflower Thresher for Groundnut Stripping | The trials were conducted for the JL-24 variety. The stripping efficiency was found to be 99.5 per cent. |
| | 8. | Front Line Demonstration of Improved Agricultural Machinery for Major Oilseed Crops | The improved implements developed by the centre such as Multicrop Planter, Jyoti Single Row Planter, Pegtooth Weeder , Multipurpose Hoe, Groundnut Digger, Groundnut Decarticator, Vaibhav Sickle, Maize Sheller and Sunflower Thresher were demonstrated |
| **1996-97** | | I. Research and Development | |
| | 1. | Development and Performance Evaluation of Weeding Attachment on Sugarcane Intercultural Implement | It solves the problem of weeding in sugarcane crop. The blade type attachment consisting of shank, shear point and blades is developed. |
| | 2. | Development of Rotary Weeding Attachment to Self Propelled Vertical Conveyer Reaper | A more versatile weeding attachment was developed consisting of main frame, main shaft with hollow pipe, rotary blade disc, height adjustment roller, and power transmission unit. |
| | 3. | Design Development and Performance Evaluation of Sugarcane Trash Chopper | The work done in past on this project was reviewed. Development of design of prototype was carried out for the next year. |
| | 4. | Development and Performance Evaluation of Bullock Drawn Seed Drill for Pearl Millet | The bullock drawn Jyoti multicrop planter developed for different crops was tried for planting pearl millet. |
| | 5. | Development of Tractor Drawn Multicrop Planter | During 1995-96 the centre had developed a prototype of tractor drawn multicrop planter.During this year, it was also tested to evaluate its field performance at different locations and soil types. |

| | | | |
|---|---|---|---|
| | | II. Prototype Manufacturing Workshop | |
| | 6. | To Fabricate Proven Prototypes | The centre had fabricated 792 prototypes as against the target of 493. In order to encourage the manufacturers, 12 drawings of different improved implements were supplied to them. |
| | | III. Prototype Feasibility Test Centre | |
| | 7. | Feasibility Trials of Sugarcane Cutter Planter (IISR Lucknow) | IISR Lucknow had developed sugercane cutter planter ridger type and disc type operated by 35 HP tractor. Field trials of this machine were conducted which showed a few fabrication defects. |
| | 8. | Feasibility Trials of Self Propelled Vertical Conveyer Reaper for Harvesting Paddy and Wheat | The centre had conducted six trials of paddy harvesting. |
| | 9. | Feasibility Trials of Sugarcane Interculturing Implements | Seven trials of fertilizer applications were conducted during this year. |
| | 10. | Popularization and Demonstration of Improved Agricultural Machinery for Major oilseeds and pulses | Seven farmers rallies, 8 lecture cum training programmes and 12 demonstrations were conducted during this year. |
| **1997-98** | | I. Research and Development | |
| | 1. | Development and Performance Evaluation of Weeding Attachment on Sugarcane Interculture Implement | The newly developed weeding attachment was operated under different soil types varying from medium to black soil. |
| | 2. | Development of Rotary Weeding Attachment to Self Propelled Vertical Conveyer Reaper | Two different types of attachments were developed such as rotary attachment and sweep blade attachment |
| | 3. | Design Development and Performance Evaluation of Sugarcane Trash Chopper | The development work of rear mounted tractor operated in situ chopping machine was undertaken. The existing blades were replaced by newly developed chopping blades. |
| | 4. | Development and Performance Evaluation of Bullock Drawn Seed Drill for Pearl Millet | The functional field trials were conducted at the Agricultural Engineering Research Centre, Pune. The visual observations indicated that the metering of the seed was done properly. |
| | | II. Prototype Manufacturing Workshop | |
| | 5. | To Fabricate the Proven Implements | The centre had fabricated 809 prototypes as against the target of 740. The local manufacturers had fabricated 791 different implements that were supplied to the farmers. |
| | | III. Prototype Feasibility Test Centre | |
| | 6. | Feasibility Trials of Tractor Drawn Multicrop Planter | The tractor drawn multicrop planter was tested to evaluate its performance at different locations and soil types. |
| | 7. | Feasibility Trials of Sugarcane Cutter Planter | The machine was tested for its field performance without making any modifications. However, during field trials it had encountered a number of problems. |
| | 8. | Popularization and Demonstration of Improved Agril. Machinery for Major Oilseed and Pulses | Three farmers rallies, 12 lecture cum training programme, 9 demonstrations, 3 exhibitions and 6 radio talks were conducted. |
| **1998-99** | | I. Research and Development | |
| | 1. | Study of Cropping System Agricultural Practices for Identification of Farm Mechanization Gaps and Suitable Farm Machines | The need for mechanization of farms was felt in Pune district especially for the crops like jowar, bajra, safflower, sugarcane, onion, etc. |

| | | | |
|---|---|---|---|
| | 2. | Development and Performance Evaluation of Sugarcane Trash Shredder | Two different models, drum type and tine type, were developed. Each model had four common components such as trash gathering unit, trash compressing unit shredding unit and power transmission unit. |
| | 3. | Design and Development of Tractor operated Onion Harvester | A rear mounting onion harvester was developed which consisted of components such as main frame, harvesting blade and windrowing rake. |
| | 4. | Design Development and Performance Evaluation of Self Propelled Safflower Harvester | This design consists of vertical conveyor reaper which harvests two rows of safflower in one pass. |
| | 5. | Study of Green House Cultivation System in Maharashtra to Identify Mechanization Needs | To identify the mechanization needs of green house, a short survey was conducted. This survey emphasized upon the need to modernize mechanical bed former cum soil and FYM mixture spreader, mulch spreader, mechanical spraying, sulfur fumigation, lateral laying, curtain opening mechanism, and post harvest handling operations. |
| | | II. Prototype Manufacturing Workshop | |
| | 6. | To Fabricate Proven Prototypes | The Centre had fabricated 667 prototypes in the workshop and through local manufacturers as against the target of 70. The fabricated prototypes were supplied to different individuals, institutions and organizations. |
| | | III. Prototype Feasibility Test Centre | |
| | 7. | Feasibility Trials of Sugarcane Cutter Planter (IISR, Lucknow) | The problems confronted in field trials during the previous year were discussed and it was decided to conduct field trials with new prototype. |
| | 8. | Feasibility Trials of Tractor Drawn Multicrop Planter (MPKV Design) | The Centre had conducted field trials to test the feasibility of tractor drawn multicrop planter for wheat, gram, and summer groundnut. |
| | 9. | Feasibility Trials of Manually Operated Paddy Transplanter | The Centre had conducted field trials of paddy transplanter during kharif season at ARS, Igatpuri, ARS, Wadgaon Mawal and ARS, Lonawala and in summer season at village Ghahunje, dist. Pune. |
| | 10. | Feasibility Trials of Power Operated Groundnut Thresher | The field trials could not be conducted due to continuous rain during the harvesting period of groundnut crop. |
| | 11. | Feasibility Trials of Tractor Mounted Rotavator (MAIDC Design) | The trials were conducted on the plot which was fallow during the previous season. The first trial was conducted by operating rotavator only. In the second trial, operation was performed by plough and rotavator. Plough and rotavator were used twice in the third trial. |
| | 12. | Front Line Demonstration of Improved Agricultural Machinery for Major Oilseed Crops and Pulses | During this year nine demonstrations and four farmers rallies were organized. |
| **1999-2000** | | I. Research and Development | |
| | 1. | Study of Cropping System Agricultural Practices for Identification of Farm Mechanization Gaps and Suitable Farm Machines | Objectives of his study revolved around assessment of level of mechanization during different operations of major crops, identification of mechanization gaps and identification of farm tools to be developed and their specifications with respect to prevalent agro-economic conditions. |

| | | | |
|---|---|---|---|
| | 2. | Development and Performance Evaluation of Sugarcane Trash Shredder | Objectives of this project revolved around development of tractor operated sugarcane trash shredder, evaluation of their field performance and study of their cost economics. |
| | 3. | Design and Development of Tractor Operated Onion Harvester | This project had its main thrust on design and development of onion harvester, especially to dig out onion bulbs with the top and also to separate the bulbs from the soil and arrange the bulbs in the form windrows in the field. |
| | 4. | Design Development and Performance Evaluation of Self Propelled Safflower Harvester | The objectives of this project were: to design the self propelled safflower harvester, to develop a prototype according to design for cutting and windrowing, and to test its field performance. |
| | 5. | Study of Green House Cultivation System in Maharashtra to Identify Mechanization Needs | This study emphasized upon the need to modernize mechanical bed former cum soil and FYM mixture spreader, mulch spreader, mechanical spraying, sulfur fumigation, lateral laying, curtain opening mechanism, and post harvest handling operations. |
| | | II. Prototype Manufacturing Workshop | |
| | 6. | To Fabricate Proven Prototypes | The main aim was to fabricate prototypes approved under the technical programme and as per local demands, and to promote manufacturing of farm implements in liaison with small scale manufacturers. |
| | | III. Prototype Feasibility Test Centre | |
| | 7. | Feasibility Trials of Sugarcane Cutter Planter (IISR, Lucknow) | This project had its foci on conducting feasibility trials of sugarcane planter with a view to evaluate its field performance and study the cost economics in comparison with local method, apart from acquainting the farmers with the use of the machine. |
| | 8. | Feasibility Trials of Manually Operated Paddy Transplanter | The major objectives were: to evaluate the field performance, to incorporate suitable modifications based on the field trials, and to study its cost economics. |
| | 9. | Feasibility Trials of Power Operated Groundnut Thresher (TNAU) | The objectives of this project were: to conduct feasibility trials of the groundnut thresher developed by TNAU, and to workout the cost economics of groundnut thresher. |
| | 10 | Feasibility Trials of Tractor Mounted Rotavator (MAIDC Design) | The objects of this project were: to conduct feasibility trials of rotavator for seed bed preparation, and to workout its time savings. |
| | 11. | Front Line Demonstration of Improved Agricultural Machinery for Major Oilseed Crops and Pulses | Objectives of this project revolved around training and demonstration of improved machinery to create awareness amongst farmers about their usefulness and economic utility through front line extension work, multiplication of simple implement for supply to farmers at cost, and organizing farmers' fairs and training of village artisans. |
| **2000-01** | | I. Research and Development | |
| | 1. | Study of Cropping System Agricultural Practices for Identification of Farm Mechanization Gaps and Suitable Farm Machines for different agro-climatic regions of Marathwada | Objectives of this study revolved around identification of mechanization gaps and identification of farm tools to be developed and their specifications with respect to prevalent agro-economic conditions. |

| | | | |
|---|---|---|---|
| | 2. | Design Refinement and Performance Evaluation of Sugarcane Trash Shredder | The objectives of this project were: to develop tractor operated sugarcane trash shredder, to evaluate the field performance, and to study the cost economics. |
| | 3. | Design and Development of Tractor Mounted Onion Harvester | The objectives of this project were: to design and develop onion harvester (tractor operated) to dig out the onion bulbs with the top, to separate the bulbs from the soil, and to arrange the bulbs in the form windrows in the field. |
| | 4. | Design Development and Performance Evaluation of Self Propelled Safflower Harvester | The objectives of this project were: to design the self propelled safflower harvester, to develop a prototype according to design for cutting and windrowing, and to test its field performance. |
| | 5. | Studies on User of Small Tractor Mounted Aeroblast Sprayer in Orchards | Survey of twenty units. |
| | | II. Prototype Manufacturing Workshop | |
| | 6. | To Fabricate Proven Prototypes | Fabrication of five prototypes such as tractor mounted multicrop planter, animal drawn sugarcane multipurpose tool, peg tooth weeder groundnut decorticator, and groundnut digger. |
| | | III. Prototype Feasibility Test Centre | |
| | 7. | Feasibility Trials of Tractor Mounted Sugarcane Cutter Planter (IISR, Lucknow) | This project had its foci on conducting feasibility trials of sugarcane planter with a view to evaluate its field performance and study the cost economies in comparison with local method, apart from acquainting the farmers with the use of the machine. |
| | 8. | Feasibility Trials of Tractor Mounted Multicrop Planter (MPKV Design) | The centre had conducted field trials to test the feasibility of tractor drawn multicrop planter for wheat, gram, and summer groundnut. |
| | 9. | Feasibility Trials of Power Operated Groundnut Thresher | The field trials could not be conducted due to continuous rain during the harvesting period of groundnut crop. |
| | 10. | Feasibility Trials of Tractor Mounted Rotavator (MAIDC Design) | The objects of this project were: to conduct feasibility trials of rotavator for seed bed preparation, and to workout its time savings. |
| | 11. | Feasibility Trials of Tractor Mounted Forage Harvester | PAU Design, 10 hectare |
| | 12. | Feasibility Trials of Power Weeder | TNAU Design, 20 hectare |
| | 13. | Feasibility Trials of Groundnut Stripper | CIAE Design, 20 tonne |
| | 14. | Feasibility Trials of Sunflower Thresher | PAU Design, 20 tonne |
| | 15. | Demonstration of Equipments under FLD Programme | Objectives of this project revolved around training and demonstration of improved machinery to create awareness amongst farmers about their usefulness and economic utility through front line extension work, multiplication of simple implement for supply to farmers at cost, and organizing training of village artisans and farmers' fairs |

and pulse crops was the other activity of this centre during this year. The centre had conducted seven farmers rallies, eight lecture cum training programmes and twelve demonstrations. The demonstrations and lectures about the improved implements and machinery were organized in the Monthly District Workshop of the T & V at different districts in the university jurisdiction.

Some of the projects undertaken during 1995-96 and 1996-97 were seen to continue during 1997-98. These projects were performance evaluation studies relating to weeding attachment on sugarcane interculture implement, sugarcane trash disposer and bullock drawn seed drill for pearl millet, weeding attachment to the self propelled vertical conveyor reaper, and feasibility trials of IISR, Lucknow sugarcane cutter planter. However, some new studies were added during 1997-98. These studies were fabrication of tractor drawn planter and performance evaluation study relating to tractor drawn multicrop planter.

Majority of the projects undertaken during 1998-99 by various units of AERC, Pune were relatively new. During this year, the R & D unit undertook various studies relating to cropping system and agricultural practices for identification of farm mechanization gaps and also mechanization need for the green house cultivation system in Maharashtra, besides undertaking other evaluation studies relating to sugarcane trash shredder, tractor operated onion harvester and self propelled safflower harvester. During the same year, the prototype manufacturing unit was seen to be engaged in fabrication of various prototypes such as tractor mounted multicrop planter, power tiller operated multicrop planter and sugarcane interculturing implements. On the other hand, the activity of PFTC during this year revolved around undertaking feasibility trials for tractor mounted sugarcane cutter planter, tractor drawn multicrop planter, manually operated paddy transplanter , power operated groundnut thresher, tractor mounted rotavator and tractor mounted forage harvester. Demonstration of various equipments were also undertaken by the centre during this year under its FLD programme.

All the research studies undertaken by R & D unit of the centre during 1998-99 were seen to continue during 1999-2000 also. However, during 1999-2000 the PMW was also found to be engaged in fabrication of some new prototype such as groundnut decorticator in addition to the fabrication of various prototypes undertaken during the

previous year. As for the activities of PFTC, during this year studies relating to two feasibility trials were dropped from the list of feasibility trials related studies undertaken during 1998-99. These were feasibility trials of tractor drawn multicrop planter and tractor mounted forage harvester. During 1999-2000, the centre had conducted eighteen field demonstrations of different improved implements at different villages in collaboration with Jankidevi Bajaj Foundation, Pune. These demonstrations were shown on Mumbai Doordarshan. One lecture on improved implements was also delivered by an expert during this year. One of the recommendations of the centre during this year was to involve NGO's and KVK's in popularizing the modern implements manufactured not only by it but also by some other commercial manufacturers operating in the state of Maharashtra.

During 2000-01, the R & D unit of this centre had undertaken various projects that mainly encompassed studies relating to development of design and performance evaluation of self propelled safflower harvester, sugarcane trash shredder, tractor mounted onion harvester, bullock drawn turmeric harvester, small tractor mounted aeroblast sprayer in orchards, and also examination of cropping system and agricultural practices with a view to identify farm mechanization gaps and suitability of farm machines for different agro-climatic regions of western Maharashtra, Konkan and Marathwada. During this year, the PMW was seen to be engaged in fabrication of various prototypes such as tractor mounted multicrop planter, animal drawn sugarcane multipurpose tool, peg tooth weeder, groundnut decorticator and groundnut digger. The PFTC attached to this centre was assigned the task of conducting various feasibility trials for tractor mounted sugarcane cutter planter, power operated groundnut thresher, tractor mounted multicrop planter, tractor mounted rotavator, tractor mounted forage harvester, power weeder, groundnut stripper and sunflower thresher. Front line demonstration of improved agricultural implements for oilseed and pulse crops was another activity of the centre during the year.

Thus, the AERC, Pune has shown excellent results on every front of its research and development activities. However, lack of training facilities available at the centre has put a shadow on the achievements of this centre not only in terms of popularization of various improved implements but also in respect of equipping the farmers in the efficient

use of these implements. Efforts, therefore, should be made by various national and state level organizations/ institutions to provide/ allocate sufficient funds to this centre. This will not only strengthen the activities of the centre but it will also help the centre to initiate various training programmes for the farmers relating to efficient use of various farm implements and machinery. Efforts made towards this direction might also help the centre not only to popularize its own improved machinery but also various implements manufactured by other commercial units operating in the state of Maharashtra.

### 3.1.6 Recommendations of AERC, Pune:

All the major and minor implements and machinery developed by this centre are sent to "Tractor Training Centre" (TTC), Budni (M.P.) for their testing. Sometimes, TTC at Budni consumes 1-2 years to send the reports of such tests. One of the major recommendations of this centre was, therefore, in favour of establishing testing centres for farm implements and machinery in the state of Maharashtra, especially in Pune, Mumbai, and other major cities of the state. However, it is felt that such testing centres should not only have sufficient scientific and technical staff but also adequate testing instruments and funds. Another suggestion was not only in favour of popularization of improved implements manufactured by this centre but also making them available to small and marginal farmers. Efforts made towards this direction are believed to solve the problem of availability of agricultural labour to some extent. Further, in order to popularize improved implements manufactured by this centre, the involvement of various Non Government Organizations (NGOs) and Krishi Vigyan Kendras (KVKs) and private manufacturers is also felt necessary.

**********

# CHAPTER IV

## PROBLEMS AND PROSPECTS OF MANUFACTURERS OF FARM IMPLEMENTS AND MACHINERY IN MAHARASHTRA

This chapter not only evaluates the performance of various manufacturers of farm Is & M but also the constraints perceived by them in the manufacture of these farm Is & M. Added to this, it examines the perceptions of various manufacturers in terms of availability of testing facilities at various testing centres, problems faced by them during testing, and also their suggestions with respect to location of establishment of various testing centres. Suggestions of various manufacturers are also sought with respect to improvement in the efficiency of various farm Is & M testing centres. Thus, the basic idea of this chapter is to highlight the adequacy, efficacy and efficiency of testing facilities from the manufacturers' point of view in the state of Maharashtra.

In this study, we have selected 19 manufacturers of various farm Is & M. They are: (1) Popular Steel Works and Agricultural Implements Pvt. Ltd., Kolhapur, (2) Farm Machinery Research and Development Centre, Pachora, (3) Shriram Agro Industries, Narayangaon, Pune, (4) Rahul Traders and Agro Industries, Pune, (5) Bhujbal Agro Manufacturers, Narayangaon, Pune, (6) Smita Industries, Pune, (7) Ambika Agro Industries, Pune, (8) Diwane Industries, Pune, (9) Tejas Polymers and Engineers, Pune, (10) Surya Engineers, Pune, (11) D.M. Agro Industries, Kolhapur, (12) Agro Engineering Work, Chinchwad, Pune, (13) Ashok Traders, Pune, (14) R.B. Hemade and Company, Pune, (15) Aham Steel Founders, Kolhapur, (16) Shree Swami Samarth Engineers, Pune, (17) Neelson Precision Engineering, Pune, (18) Venkatesh Traders, Pune, and (19) Sunmoon Sleeves Pvt. Ltd., Aurangabad. Thus, majority of the selected manufacturers of various farm Is & M belong to Pune district of Maharashtra. The performance of these manufacturers is evaluated separately in the subsequent sections. However, the major foci of attention in this respect are on the awareness of the manufacturers about the facilities being provided by various testing centres and the perceptions of these manufacturers with respect to the adequacy of infrastructure available with the testing centres.

### 4.1 Popular Steel Works and Agricultural Implements Pvt. Ltd. (PSW):

Popular Steel Works and Agricultural Implements Pvt. Ltd. (PSW) is reckoned as one of the leading and major agricultural implements manufacturing firm not only in Maharashtra but also in India. It was established in 1955. It has been successfully manufacturing and marketing the reversible mould board (M.B.) plough for the last 43 years. The first MB plough in the country was manufactured by this firm in 1958. At present, it is engaged in the manufacture of 75 different types of tractor drawn agricultural implements. In fact, the list of manufactured implements of PSW is very vast. However, the major implements manufactured by this firm encompass single furrow/ bottom reversible MB plough, two furrow/ three furrow and four furrow reversible MB plough, various types and sizes of tillers and cultivators, two/three furrow ridgers, various types of levelers, five furrow MB plough, mounted as well as pull-type disc harrows, and blade/ tine types of rotary implements which are available in various sizes for RPM 540 and RPM 1000 PTO shaft speeds (Table 4.1). It also manufactures manual as well as automatic seed cum fertilizer drills, apart from manufacturing various implements for sugarcane crop growers such as semi automatic sugarcane planters, off-Barring and Healing-up implements. The semi automatic sugarcane planter performs various functions simultaneously such as opening of a pair of furrows, dropping of sugarcane sets into the furrow openings and dropping of fertilizers. Recently it had exported 10 units of sugarcane planters to Nigeria through an independent exim agent.

It is to be noted that PSW has its own marketing and sales network which covers a large part of India. There are as many as fifty sales outlets spread over Maharashtra, Karnataka, Gujarat, Madhya Pradesh and Andhra Pradesh. This obviously ensures proper distribution of PSW implements and also easy availability of its spare parts throughout the country. Further, in order to promote after sales service to its customers, it has opened a number of authorized service centres. The implements manufactured by PSW are not only suitable for different agro-climatic conditions but they are also compatible with all makes of tractors available in India (from 18 H.P. to 75 H.P. tractors). In the states like Maharashtra and Karnataka the mobile service vans of this firm pay regular and periodic visits in order to bridge the gaps in service facilities catered to its customers by its authorized service centres.

**Table 4.1: Performance of Popular Steel Works and Agricultural Implements Pvt. Ltd., Kolhapur**

| Sr. No. | Name of the Machinery/ Implements Manufactured and Tested | Year and Number of FIM | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| 1. | Off-Barring and Healing-Up Implements | 300 | 400 | 600 | 900 | 1200 | 1700 | 1900 |
| 2. | Two Furrow Surry Ridger | 500 | 800 | 900 | 1200 | 1400 | 1900 | 2000 |
| 3. | Kakari Cultivators | 400 | 600 | 900 | 1000 | 1200 | 1700 | 1600 |
| 4. | Plough and Hoe | 500 | 900 | 1800 | 1900 | 2000 | 1900 | 2000 |
| 5. | Lawn Movers | 1200 | 1700 | 2000 | 3000 | 4000 | 3000 | 5000 |
| 6. | Ridger for Bed Planter | 250 | 350 | 700 | 900 | 1200 | 1600 | 1600 |
| 7. | Trail Disc Harrow | - | - | 300 | 700 | 900 | 1100 | 1700 |
| 8. | Two Furrow Plough | - | 900 | 600 | 1700 | 1900 | 1800 | 2000 |
| 9. | Reversible M. B. Plough | 400 | 500 | 700 | 900 | 1000 | 1700 | 2000 |
| 10. | Disc Harrow | - | 500 | 900 | 1790 | 1900 | 2000 | 2500 |
| 11. | Seed cum Fertilizer Drill | - | 950 | 950 | 1800 | 1600 | 1700 | 2500 |
| 12. | Seven and Nine tines Tiller | - | 1000 | 1800 | 1800 | 2000 | 2500 | 3000 |
| 13. | Popular Rotor | - | - | 400 | 700 | 900 | 1000 | 1700 |
| 14. | Tiller with Kulav Bleed | - | - | 200 | 600 | 400 | 900 | 1000 |
| 15. | Automatic Sugarcane Planter | - | - | - | 400 | 700 | 900 | 1200 |
| 16. | Five Plough L.P. | - | - | - | 300 | 750 | 900 | 1000 |
| 17. | Tractor Blade | - | - | - | 200 | 300 | 600 | 700 |
| 18. | Leveler | - | - | 900 | 1100 | 1200 | 1700 | 2500 |

PSW has indicated a number of problems confronted by it as regards manufacture of its implements and their testing done at various testing centres, especially with respect to its reversible MB plough. As for its reversible MB plough, PSW finds the method as well as standards recommended by the Government Testing Agencies to be inaccurate with lack of their practical applicability. The testing agencies are alleged to have no exact or reliable testing data, especially for MB plough. This manufacturer, therefore, holds the view that selection of reversible MB plough by testing centres should be done in consultancy with the pioneer manufacturers of these plough such as PSW. It is also being held by this firm that their reversible MB plough should be declared as "Standard" and the MB plough manufactured by other firms should be compared with their MB plough. Interestingly, this manufacturer finds the infrastructure of testing centre quite adequate. However, the parameters followed by various testing centres for comparing tests are alleged to be questionable. It is also held by PSW that the Bureau of Indian Standards (BIS) specifications with respect to tractor drawn agricultural implements in general and that for reversible MB plough in particular are either out dated or have been incorporated without considering the practical aspects of soil tillage and its dynamics. There is, therefore, a need to modify BIS specifications with respect to tractor drawn agricultural implements.

It is also argued by PSW that in the absence of exact or proper testing data available with BIS, the implements having wider acceptability among the end users (farmers) should be considered as standard model and implements manufactured on similar lines by other manufacturers should be compared with these implements. Such methods are alleged to have been practiced in many countries. For instance, it has been pointed out that in many advanced countries testing of farm machinery is only voluntary. In such countries, standard or baseline/ reference machine/ implement is selected on the basis of its popularity and acceptability and such machines are used for comparison with other machines manufactured on similar lines. Further, in response to a question on location of various testing centres, PSW has categorically emphasized upon establishment of such centres in agriculturally progressive regions like Pune (Maharashtra) and Belgaon (Karnataka).

### 4.2 Farm Machinery Research and Development Centre (FMRDC), Pachora:

The Maharashtra Agro-Industries Development Corporation Limited had established FMRDC at Pachora in 1982. Ever since its establishment, the FMRDC has been engaged in manufacture of 'Krushivator' [Table 4.2(a)]. The testing of Krushivator is also done at the testing lab of this centre. It was only during 1990 that one unit of Krushivator was sent to CFMTTI for testing. Apart from testing of Krushivator, it also performs the testing of other implements and machinery which mainly encompass power operated, bullock drawn and manually operated machines and implements. However, infrastructure available with this testing centre is alleged to be inadequate (Table 4.3). This centre is, therefore, in favour of receiving funds for its proper infrastructural development, especially for creating its own Material Testing Laboratories, and also for the purchase of Load/ Draft Digital Measuring Instrument, Material Hardness Testing Machine, specific tools and gauges. Compulsory testing of various farm machines/ implements is another suggestion of this centre. Further, the location of testing centre is suggested at chinchwad which has been approved by the M.I.D.C., Mumbai as the production centre. In order to improve the efficiency of farm machinery/ implements testing centre, the suggestion of the FMRDC revolve around those facilities such as provision of computer for data storage, analysis and report writing, etc., use of modern electronic instruments instead of using dynamometer for measuring draft/ load.

### 4.3 Shriram Agro Industries, Narayangaon, Pune:

This firm mainly manufactures cultivator, harvester, leveling blade, harrow, plough (iron), lawn mover, etc. It was established in 1985. Over the last 15 years, it has shown steady and sharp increase in the production of its cultivators, combine harvesters and leveling blade [Table 4.2(a)]. However, the production of harrow, plough, lawn movers, etc. have fluctuated considerably over time. This is mainly because of fluctuations in demand for such machines/ implements. One of the suggestions of this firm is to improve the methods adopted by various testing centres with respect to testing of various machines/ implements. It deserves mention here that with the technological advancement, the manufacture of improved implements has grown considerably. Modernization of testing centres is, therefore, equally important, specially to cater to the

requirements of newly developed machines and implements. As regards suggestion with respect to location of testing centre, this firm has aired its view in favour of establishing such testing centres at those major commercial cities of this state such as Pune, Mumbai, Kolhapur, Aurangabad, and Nagpur (Table 4.3).

**4.4 Rahul Traders and Agro Industries, Pune:**

This firm came into being in 1989. Various machinery manufactured by this firm include rotavator, combine harvester, leveling blade and harrow/ iron plough. This firm has shown considerable growth in the manufacture of various machinery over the past one decade [Table 4.2 (a)]. This is mainly due to increase in demand for the machinery manufactured by this firm. The knowledge about testing facilities for farm Is & M was gathered by this firm through its business partner. This firm is not only satisfied with the available infrastructure of testing centres but also feels that testing of farm Is & M should be made mandatory (Table 4.3). In this context, one of the suggestions extended by this firm is in favour of establishing more number of such testing centres in the country, especially to meet the growing testing requirements of improved farm Is & M in the face of increase in level of mechanization of farms. Suggestion of this firm is, therefore, in favour of establishing testing centres in every state of the country. In this sequel, involvement of state governments towards establishment of such testing centres is suggested. It is also being held that the centre should direct various State Governments to establish such testing centres. Further, availability of skilled labour in the manufacture of various farm Is & M is cited as one of the major problems faced by this firm since the year of its establishment.

**4.5 Bhujbal Agro Manufacturers, Narayangaon, Pune:**

This firm has been engaged in the manufacture of various implements and machinery such as cultivators, combine harvesters, razor, harrow, plough, hoe, seed drill, lawn mover, etc. ever since its establishment in 1978. The number of implements manufactured by this firm has grown considerably over the past decade or so [Table 4.2 (a)]. This holds especially true in case of cultivators, razor and lawn movers which have shown more than ten folds increase in their production during the period between 1990

and 2000. This firm not only aired its view against the adequacy of infrastructure with the testing centres but also showed its resentment for the persons engaged in testing of farm Is & M and the procedure followed by them in such testing (Table 4.3). Inadequate infrastructure and lack of trained persons to perform testing of farm Is & M are, therefore, cited as some of the major drawbacks of testing centres. This firm also showed its displeasure for the norms fixed by the Government in terms of manufacture of various farm Is & M. Further, one of the interesting suggestions extended by this firm was in favour of conducting various training programme by the manufacturers of various farm Is & M rather than other recognized government agencies. Various manufacturers are, therefore, suggested to come forward and extend their hands in such training programmes. This will truly help the farmers in the efficient handling and operation of the implements manufactured by the particular firm. This firm has reserved its view as for the establishment of various testing centres at various locations of this state.

**4.6 Smita Industries, Pune:**

Smita Industries is in the manufacturing business of various implements for the last 20 years. It has been manufacturing not only labour drawn implements such as sickles, groundnut decarticator, khurpe, etc. but also mango harvesters, lady finger plucker, groundnut digger, chikku (sapota) harvester, tooth peg weedier, single raw planter, multipurpose hoe, spade and other minor implements. The implements manufactured by this firm has wider acceptability among the farmers. This is also evident from the fact that the number of implements manufactured by this firm has been more than doubled during the period between 1990 and 2000, especially the manufacture of sickle, khurpe, groundnut decarticator, lady finger plucker and spade [Table 4.2 (a)]. This firm has not only aired its view in favour of adequacy of infrastructure with the testing centre but also favoured testing of various farm Is & M (Table 4.3). As for testing, while the hardening testing of metal of various implements is being carried out by "United Metal Industries", "Accurate Laboratory Service" performs the material testing of implements manufactured by this firm. Both these testing centres are located at Bhosari, Pune. However, some of the major implements manufactured by this firm are sent to Budni (M.P.) for their testing. This firm feels that government testing centres such as

located at Budni (M.P.) consume more time in terms of sending the testing reports as compared to private testing centres involved in such business.

### 4.7 Ambika Agro Industries, Pune:

This firm has been manufacturing trailer, leveler and cultivator for the last 5-6 years. There has been reasonable growth in the number of implements manufactured by this firm ever since its establishment [Table 4.2 (a)]. Like Smita Industries, this firm has aired its view in favour of adequacy of infrastructure with the testing centres. It also feels that the testing of farm Is & M should be made mandatory. As for location of various testing centres, this firm feels that such testing centres should have been located either at Pune or Mumbai (Table 4.3). This firm also wants various testing centres to follow simple and speedy methods of testing. Thus, in order to meet this objective various testing centres are suggested to have testing inspectors with permission given to them to perform testing at the production point rather than at laboratories of testing centres.

### 4.8 Diwane Industries:

This manufacturing firm was established in 1990 and since then it has been manufacturing various manually driven spraying implements/ equipments such as pump sprayer, hand compressing sprayer, rocking/ foot sprayers, etc. Information relating to number of spraying implements manufactured by this firm during the period between 1990 and 2000 are provided in Table 4.2 (a) which clearly show considerable fluctuation in the number of implements manufactured by this firm during this period. This is mainly due to fluctuation in market demand for such implements during the given period of time. This firm manufactures spraying implements as per the norms prescribed by BIS. Unlike other manufacturers included in this study, this firm has its own testing facilities approved by the Government of India, and it is quite satisfied with the available infrastructure for such testing. However, one of the views expressed by this firm is to establish as many testing centres as possible with a view to meet the growing testing requirements of various farm Is & M. This included establishment of testing centres at Pune, Mumbai, Sangli, Satara, Kolhapur and Aurangabad (Table 4.3).

## Table 4.2(a): Performance of Various Manufacturers of Farm Is & M in Maharashtra

| Sr. No. | Name of the Firm and year of Establishment | Farm Is & M Manufactured and Tested | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| 1. | FMRDC 1982 | a. Krushivator | 451 | 326 | 401 | 277 | 315 | 348 | 271 |
| | | b. Power Operated* | - | - | - | - | 1 | 1 | 1 |
| | | c. Bullock Drawn* | - | - | - | 6 | 5 | 9 | - |
| | | d. Labour Drawn* | - | - | - | 2 | 5 | 2 | - |
| 2. | Shriram Agro Industries 1985 | a. Cultivators | 60 | 140 | 200 | 400 | 600 | 400 | 900 |
| | | b. Harvesters | 90 | 120 | 160 | 200 | 400 | 600 | 700 |
| | | c. Leveling Blade | 60 | 90 | 180 | 300 | 400 | 300 | 900 |
| | | d. Harrow,Hoe Seed Drill | - | 170 | 170 | 200 | 170 | 300 | 400 |
| | | e. Lawn Mover | - | 190 | 190 | 300 | 190 | 300 | 700 |
| 3. | Rahul Agro Industries 1989 | a. Rotavator | 30 | 120 | 60 | 130 | 200 | 300 | 700 |
| | | b. Harvester | 40 | 60 | 30 | 70 | 80 | 120 | 300 |
| | | c. Leveling Blade | 20 | 40 | 70 | 80 | 60 | 90 | 200 |
| | | d. Harrow Plough, Hoe | - | 40 | 120 | 300 | 210 | 300 | 200 |
| 4. | Bhujbal Agro Manufacturers 1978 | a. Cultivators | 40 | 70 | 160 | 90 | 170 | 200 | 400 |
| | | b. Harvester | 20 | 60 | 70 | 90 | 120 | 160 | 140 |
| | | c. Razor | 70 | 160 | 200 | 400 | 200 | 600 | 900 |
| | | d. Harrow,Hoe, Plough Seed Drill | - | 90 | 60 | 70 | 40 | 120 | 300 |
| | | e. Lawn Mover | - | 60 | 90 | 200 | 400 | 200 | 700 |
| 5. | Smita Industries 1981 | a. Vaibhav Sickle | 7142 | 8000 | 8700 | 9000 | 10000 | 11000 | 14700 |
| | | b. Mango Harvester | 1000 | 1100 | 700 | 900 | 1400 | 1600 | 1700 |
| | | c. Khurpe | 900 | 700 | 1400 | 1500 | 1600 | 1700 | 1900 |
| | | d. Groundnut Decarticator | 120 | 200 | 320 | 400 | 1000 | 900 | 900 |
| | | e. Groundnut digger | - | - | - | 100 | 100 | 200 | 300 |
| | | f. Plain Sickle | 700 | 700 | 900 | 900 | 700 | 600 | 300 |
| | | g. Lady finger Plucker | 200 | 250 | 300 | 700 | 700 | 900 | 1100 |
| | | h. Weeder | - | - | - | 900 | 700 | - | 1400 |
| | | i. Spade, etc. | 1100 | 1210 | 1310 | 1475 | 1400 | 1900 | 2025 |
| 6. | Ambika Agro Industries 1985 | a. Trailer | - | 30 | 45 | 70 | 80 | 110 | 130 |
| | | b. Leveler | - | - | 30 | 40 | 45 | 50 | 70 |
| | | c. Cultivator | - | - | 15 | 30 | 40 | 60 | 45 |
| 7. | Diwane Industries 1990 | a.Hand/ Foot/ Rocking Sprayer | - | 8307 | 15674 | 15339 | 4668 | 7987 | 3776 |
| | | b. Pump Sprayer | - | 12000 | 20000 | 21000 | 9000 | 10000 | 5000 |
| 8. | Tejas Polymers & Engineers 1989 | a.Trailor 2 tons - 10 tons | - | - | 20 | 40 | 60 | 76 | 110 |
| | | b.Cultivator | - | - | 30 | 40 | 30 | 60 | 160 |
| | | c. Disc Harrow | - | 40 | 70 | 90 | 110 | 140 | 200 |
| 9. | Surya Engineers 1988 | a. Trailer | 25 | 60 | 85 | 90 | 90 | 110 | 180 |
| | | b. Cultivator | 40 | 30 | 60 | 70 | 30 | 70 | 110 |
| | | c. Seed Drill | - | - | - | 20 | 40 | 30 | 20 |

Note: FMRDC = Farm Machinery Research and Development Centre; * - only testing of machinery

**Table 4.2(b): Performance of Various Manufacturers of Farm Is & M in Maharashtra**

| Sr. No. | Name of the Firm and year of Establishment | Farm Is & M Manufactured and Tested | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
| 1. | D.M. Agro Industries 1981 | a. Blade Disc Harrow | 690 | 900 | 1200 | 1400 | 1600 | 1900 | 2350 |
| | | b. Cultivator | - | 200 | 400 | 600 | 900 | 1100 | 1400 |
| | | c. Plough, Hoe | - | - | 900 | 900 | 780 | 1100 | 1200 |
| 2. | Agro Engineering Work 1971 | a. Rotavator | | | | | | | |
| | | - Manufactured | - | 301 | 401 | 277 | 315 | 348 | 271 |
| | | - Tested | - | 300 | 400 | 270 | 310 | 340 | 270 |
| 3. | Asok Traders 1985 | a. Tractor Trailer | 70 | 60 | 30 | 70 | 40 | 60 | 60 |
| | | b. Combine Harvester | - | 70 | 120 | 90 | 140 | 200 | 410 |
| | | c. Harrow, Plough | - | - | - | 700 | 900 | 800 | 700 |
| | | d. Lawn Mover | - | 120 | 160 | 180 | 200 | 300 | 700 |
| 4. | K.B. Hamade & Company 1990 | a. Trailer | 120 | 140 | 160 | 170 | 160 | 190 | 210 |
| | | b. Cultivator | - | - | - | 140 | 130 | 170 | 140 |
| 5. | Sham Steel Founders 1996 | a. Tractor Trailer | - | - | 61 | 60 | 70 | 60 | 75 |
| | | b. Tiller | - | - | 120 | 180 | 190 | 300 | 700 |
| | | c. Four Wheel Trailer | - | - | 70 | 80 | 60 | 120 | 200 |
| | | d. Harrow,Lawn Mover | - | - | 900 | 1000 | 1200 | 1400 | 1600 |
| 6. | Shree Swami Engineers 1997 | a. Trailer | - | - | - | 25 | 25 | 25 | - |
| | | b. Cultivator | - | - | - | 20 | 40 | 20 | - |
| | | c. Leveling Blade | - | - | - | 20 | 30 | 15 | - |
| | | d. Seed Drill | - | - | - | 4 | 5 | 5 | - |
| | | e. Animal Drawn Implements | - | - | - | 60 | 120 | 120 | 120 |
| 7. | Neelson Precision Engineers 1998 | a. Sugarcane Interculture Implement | - | - | - | - | 16 | 20 | 40 |
| | | b. Maize Sheller | - | - | - | - | 200 | 300 | 700 |
| | | c. Groundnut Decarticator | - | - | - | | 400 | 700 | 900 |
| | | d. Sickle | - | - | - | - | - | - | 400 |
| 8. | Venkatesh Traders 1998 | a. Tractor Trailer | - | - | - | - | - | 65 | 80 |
| | | b. Cultivator | - | - | - | - | - | 40 | 60 |
| | | c. Leveling Blade | - | - | - | - | - | 15 | 40 |
| | | d. Plough, Hoe | - | - | - | - | 60 | 120 | 140 |
| | | e. Lawn Mover | - | - | - | - | 30 | 40 | 60 |

**Table 4.3: Responses of Manufacturers of Farm Implements and machinery Regarding Testing Facilities**

| Sr. No. | Name of the Firm | Availability of Testing Facilities | | Whether Testing done for Is & M | | Adequacy of Infrastructure of Testing Centre | | Should there be Compulsory Testing | | Suggested Location of Testing Centre |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Yes | No | Yes | No | Yes | No | |
| 1. | Popular Steel Works | √ | X | √ | X | √ | X | X | √ | Pune (Mah.) Belgaon (Kar.) |
| 2. | FMRDC | √ | X | √ | X | √ | X | √ | X | Chanchwad |
| 3. | Shriram Agro Industries | √ | X | √ | X | √ | X | √ | X | Pune, Nagpur Mumbai, Kolhapur, Aurangabad |
| 4. | Rahul Agro Industries | √ | X | √ | X | √ | X | √ | X | One Centre in Every State |
| 5. | Bhujbal Agro Manufacturers | √ | X | √ | X | √ | X | √ | X | No Comment |
| 6. | Smita Industries | √ | X | √ | X | √ | X | √ | X | One in Every State |
| 7. | Ambika Agro Industries | X | √ | X | √ | √ | X | √ | X | Pune, Mumbai |
| 8. | Diwane Industries | √ | X | √ | X | √ | X | √ | X | Mumbai,Pune, Sangli,Satara, Kolhapur, Aurangabad |
| 9. | Tejas Polymers & Engineers | √ | X | X | √ | √ | X | √ | X | No Comment |
| 10. | Surya Engineers | √ | X | √ | X | √ | X | √ | X | In All District Level HQ |
| 11. | D.M. Agro Industries | √ | X | √ | X | √ | X | X | √ | No Comment |
| 12. | Agro Engineering Work | √ | X | √ | X | √ | X | √ | X | No Comment |
| 13. | Ashok Traders | √ | X | √ | X | √ | X | √ | X | No Comment |
| 14. | K.B. Hamade & Company | √ | X | √ | X | √ | X | √ | X | In All District HQ |
| 15. | Sham Steel Founders | √ | X | X | √ | X | √ | X | √ | No Comment |
| 16. | Shree Swami Engineers | X | √ | X | √ | X | √ | X | √ | Pune, Kolhapur, Aurangabad, Mumbai |
| 17. | Neelson Precision Engineers | X | √ | X | √ | X | √ | √ | X | Pune, Nasik, Kolhapur, Nagpur, Aurangabad |
| 18. | Venkatesh Traders | √ | X | X | √ | √ | X | √ | X | Pune, Mumbai, Kohlapur, Aurangabad |
| 19. | Sunmoon Sleeves | √ | X | √ | X | √ | X | √ | X | Pune |

**4.9 Tejas Polymers and Engineers, Pune:**

This firm came into being in 1989 and since then it has been manufacturing trailer having capacity in the range of 2 to 10 tons, cultivators, chaff cutters, disc harrows, etc. The proprietor of this firm is an agricultural engineer. Interestingly, this firm never got testing done for its manufactured equipments/ implements. However, this firm appears to be quite satisfied with the available infrastructure with various testing centres. Not only this, the firm also holds the view that testing of farm Is & M should be made mandatory (Table 4.3). This firm has extended various suggestions to improve the efficiency of various testing centres. One of the suggestions of this firm is for the testing centres to have not only latest testing equipments but also well qualified staff with mechanical and agricultural engineering background.

**4.10 Surya Engineers, Pune:**

This firm has been manufacturing trailers, cultivators and seed drills for the last 10-12 years. In due course of time it has shown considerable growth in the production of these implements [Table 4.2 (a)]. This firm had gathered the knowledge of testing facilities from its business partner. Like other manufacturers of farm Is & M, this firm is also satisfied with the available infrastructure of testing centres and holds the view that such testing should be made mandatory. However, establishment of such testing centres at district level and taluka level headquarters is also suggested by this firm (Table 4.3). As for the manufacture of various implements, this firm follows the norms prescribed by the Bureau of Indian Standards. Nevertheless, at times it also makes modifications in the design of implements with a view to meet the requirements of the farmers. This firm does not support testing of minor implements and also training of farmers with respect to use of such implements.

**4.11 D.M. Agro Industries, Kolhapur:**

D.M. Agro Industries is one of the leading manufacturers of disc harrow, blade/ tine harrow, cultivators, iron plough, hoe, etc. The establishment of this firm dates back to 1981. All the agricultural implements of this firm are manufactured as per the design approved by the BIS and testing centres. Information relating to number of various

implements manufactured by this firm encompassing the period between 1990 and 2000 is brought out in Table 4.2 (b) which clearly show many folds rise in the production of various implements during the given period of time, especially the production of its disc harrow, blade harrow and cultivators. Interestingly, although this firm is satisfied with the available infrastructure of testing centres, it does not support testing of various farm Is & M to be made mandatory (Table 4.3). This firm has reserved its view as for the establishment of testing centres at various locations of the state.

**4.12 Agro Engineering Works, Chinchwad:**

This firm is engaged in the manufacture of only one agricultural implement, i.e., Krushivator (rotavator). It was established in 1971. Information relating to number of rotavators manufactured by this firm along with their testing during the period between 1990 and 2000 is provided in Table 4.2 (b). Evidently, there has been considerable fluctuation in the number of rotavators manufactured by this firm during the period between 1990 and 2000. The possible reason for this could be fluctuation in market demand for rotavators during the given period of time. This firm is found to be quite satisfied with the available infrastructure of testing centres. Added to this, it also supports testing of farm Is & M (Table 4.3). This could be the reason as to why this firm has not aired its view in favour of establishing the testing centre in the state.

**4.13 Ashok Traders, Pune:**

This firm was established in 1985 and since then it has been manufacturing tractor trailers, combine harvesters, harrows, iron ploughs, hoes, lawn movers, etc. This firm had gathered information relating to testing facilities of various farm Is & M from other firms engaged in the similar kind of business. Over the past one decade, it has shown considerable increase in the manufacture of its combine harvesters and harrow/ lawn movers (Table 4.2 (b). Like other manufacturers, this firm also follows the norms prescribed by the Government, especially in terms of the design of machine/ implements. This firm is not only satisfied with the available infrastructure of testing centres but also supports testing of various farm Is & M (Table 4.3). However, this firm has also shown its displeasure for the testing of implements against complaints filed by the users/

farmers. Since manufacturers are generally from different states like Tamil Nadu, Karnataka, Gujarat, Punjab, etc., it becomes difficult for them to solve such testing related problems within the stipulated time prescribed by the testing centres. This firm also feels that it is only the well established manufacturers who are loyal to their brand name and, therefore, strictly adhere to the quality control aspects of their equipments/ implements. Contrary to this , small manufacturers of various agricultural implements are least conscious about the quality of their implements.

**4.14 K.B. Hemade and Company, Pune:**

K.B. Hemade and company has been in the trading and manufacturing business of trailers and cultivators for the last one decade. Since the year of its establishment in (1990) it has shown reasonable growth in the manufacture and distribution of its trailers [Table 4.2 (b)]. Information relating to testing facilities for farm Is & M was gathered by this firm from other manufacturers of such Is & M. One of the vies expressed by this firm is to have testing centres at various district headquarters of different states (Table 4.3). However, it also supports the testing of farm Is & M to be made mandatory. In order to improve the efficiency of testing centres, this firm has not aired any clear cut view and has preferred to reserve its comments for such improvements.

**4.15 Sham Steel Founders, Kolhapur:**

Ever since its establishment in 1996 this firm has been manufacturing various tractor driven implements and machinery such as tractor trailer, tiller, four wheel trailers, plough, hoe, lawn mover, etc. [Table 4.2(b)] Although this firm is quite aware of the testing facilities provided by various testing centres, it never got testing done for its manufactured implements and machinery. Further, this firm is neither satisfied with the infrastructure of testing centres nor supports testing of various implements and machinery (Table 4.3). It has also reserved its view as for the establishment of testing centres at various locations of the state. However, this firm has cited a few problems faced by it in the manufacture of various implements and machinery. Important among these problems are lack of availability of skilled labour, electricity related problems such as frequent cuts and fluctuation in electricity, and lack of availability of raw material. Interestingly, the

implements manufactured by this firm are as per the design approved by the testing centres. However, at times it also makes modifications in the approved designs, especially to meet the requirements of the local farmers.

**4.16 Shree Swami Samarth Engineers, Pune:**

This firm was established in 1997. The major implements manufactured by this firm include trailor, cultivator, leveling blade, seed drill, and animal driven implements. This firm has neither got testing done for the implements manufactured by it nor is aware of such testing facilities being provided by the government for farm Is & M. Despite this, the firm holds the view that such testing centres should be established at various locations of the state such as Pune, Kolhapur, Aurangabad, Mumbai, etc (Table 4.3). The firm receives orders from local farmers and manufactures the implements as per their requirement. However, this firm has shown displeasure for the irregular power supply which often hampers manufacture of its implements.

**4.17 Neelson Precision Engineering, Pune:**

This has been manufacturing various agricultural implements for the last three years. Majority of the implements manufactured by this firm are minor in nature and they include sugarcane interculturing implements, sickle, maize sheller, ladyfinger plucker, multipurpose hoe and groundnut decaticator. Information regarding number of various implements manufactured by this firm during the period between 1998 and 2000 is given in Table 4.2 (b). Since this firm is engaged in the manufacture of minor implements, it does not get these implements tested by various testing centres. However, this firm still feels that there is an urgent need of establishing more testing centres at various locations, especially in major commercial cities of this state like Pune, Kolhapur, Nasik, Nagpur and Aurangabad (Table 4.3). This is mainly due to inadequate infrastructure facilities available with the existing testing centres and their distant locations. Nonetheless, there are various suggestions extended by this firm as for improvement in the efficiency of testing centres. The testing centres are suggested to follow quick and simplified testing procedures for various implements and machinery. Provision of technical guidance to the manufacturers is another suggestion in this respect. Besides, this firm feels that the

testing fees should be in line with the cost of farm implements. Steps initiated in these direction are likely/ expected to improve the efficiency of various testing centres operating in different states of the country.

**4.18 Venkatesh Traders, Pune:**

Venkatesh traders was established in 1998. The major implements manufactured by this firm encompass trailer, cultivator, leveling blade, plough, hoe, harrow, lawn mover, etc. The implements manufactured by this firm are not seem to be tested. However, this firm is quite aware of the testing facilities being provided by various testing centres. This firm also supports testing of various implements and machinery. In this regard, it holds the view that more number of testing centres should be established in the state of Maharashtra, especially in cities like Pune, Mumbai, Kolhapur and Aurangabad (Table 4.3). Further, lack of availability of skilled labour is cited as one of the major manufacturing related problems faced by this firm.

**4.19 Sunmoon Sleeves Pvt. Ltd., Pune:**

This firm came into being in 1995 and since then it has been manufacturing only one tractor driven implement, i.e., power tiller. This firm came to know about the testing facilities being provided by various testing centres from the Ministry of Agriculture, Government of India. The farm implements manufactured by this firm are sent to Budni (M.P.) for testing. Although this firm is satisfied with the infrastructure of testing centre and supports such testing, it also recommends establishment of a testing centre in Pune district of Maharashtra (Table 4.3). As for improving the efficiency of testing centres, a couple of suggestions have been extended by this firm. Testing centres are suggested to have a maximum time limit to complete testing of various farm Is & M with emphasis being given on practical aspects rather than theoretical aspects of testing.

Thus, majority of the manufacturers of various farm Is & M included in this study were noticed to be not only aware of the facilities being provided by various testing centres but also supported the testing of major and minor farm Is & M, besides showing their satisfaction with respect to the adequacy of infrastructure available with the testing centres. However, they also felt the necessity of establishing more testing centres at

various locations of the state. The possible reason for this could be correlated with the increase in mechanization of farms which has not only invariably increased the manufacture of various improved farm Is & M but also the testing requirements of these Is & M. The existing testing centres are also suggested to follow quick and simplified methods of testing with some maximum time limit prescribed to complete such testing. Besides, they are suggested to have not only latest testing equipments but also well qualified staff with mechanical and agricultural engineering background. These efforts are likely to improve the efficiency of various testing centres.

It is clear that all the manufacturers of farm implements and machinery have made conscious efforts not only to increase the production of their products but also to improve its quality by establishing their own testing/quality control facilities or by arranging its testing through other testing centres in the state/country. Thus, the private sector has rapidly responded to rising demand by designing/producing simple innovative farm implements and machinery. They are also instrumental in stimulating and increasing the adoption of improved farm Is & M in Maharashtra.

However, some of the manufacturers or farm Is & M included in this study seems to be facing the constraint of testing of their complex and relatively high technical farm Is & M prototypes for which they themselves do not have adequate testing facilities. In such a situation their demand for public sector investments in developing infrastructure for evaluation and testing of farm Is & M designed/produced by various private manufacturers as well as setting the standards may need to be considered. The setting up of testing and training facilities in public sector may give boost to private sector investment in farm Is & M and may help in setting up of such small scale industries in rural areas. Moreover, it may have beneficial impact in terms of enhancing quality, timeliness and efficiency of various agricultural operations.

**********

# CHAPTER V

## PRESENT STATUS AND FUTURE GROWTH OF FARM IMPLEMENTS AND MACHINERY IN MAHARASHTRA

Over the past few decades India has experienced perceptible growth in the mechanized sources of farm operations. This is mainly because of increasing adoption of short duration high yielding varieties of crops and thereby increasing use of inputs such as fertilizers, pesticides, fungicides, machinery, irrigation, etc. The growth and improvement in farm technology coupled with compulsions of current agricultural situation and requirements might further increase the demand for power for more intensive practices, especially to meet the ever increasing need for the rapid completion of farm operations. There is no denying the fact that India's immediate requirement is to increase productivity of land through augmentation of irrigation, improved seed, fertilizers, multiple cropping, improved implements, and use of pesticides. In this sequel, many states in the country have shown considerable increase in their crop productivity levels due to adoption of mechanization in farming. The state of Maharashtra is not an exception to this phenomenon. In this state, there has been considerable increase not only in power drawn machinery and eqipments but also in bullock and manually operated improved implements. The major focus of this chapter is, therefore, not only to examine the extent of mechanization in the state of Maharashtra but also to evaluate the expected number of various implements and machinery in future. An evaluation into the pattern of changes in the level of farm implements and machinery and their expected levels in the future will be helpful in terms of formulating policies for the creation of infrastructure for training and testing facilities for farm Is & M in the state of Maharashtra.

### 5.1 Farm Mechanization in Maharashtra:

The mechanization of farming has taken place at much faster pace in the state of Maharashtra as compared to the country as a whole. This could be evident from the fact that while the country showed nearly two folds rise in her tractor population during the period between 1981/82 and 1991/92, this increase in tractor population for the state of Maharashtra was more than two folds during the same period (Table 5.1). As a result of

this, the share of Maharashtra in the country's total tractor population had increased from 4.14 per cent during 1981/82 to 4.49 per cent by 1991/92. Similarly, the growth in the population of electric pumpsets was much faster in the state of Maharashtra as compared to India during the same period. Consequently, the share of Maharashtra in country's total electric pumpset population had increased from 12.53 per cent during 1981/82 to as high as 17.01 per cent by 1991/92.

As a matter of fact, the growth of mechanization of irrigation has contributed significantly to the increase in the availability of farm power in agriculture. A rapid increase in the number of electric pumpsets and oil engines was seen during the last three decades (Table 5.2). The number of electric pumpsets and oil engines, which stood at only 0.19 lakhs during 1966, increased to 11.89 lakhs by 1992. The bulk of the increase was contributed by electric pumpsets. A major increase in electric pumpsets was noticed during the period between 1972 and 1977, and also between 1987 and 1992. On the other hand, after registering an increase between 1966 and 1977, oil engines showed a decline in their number in the subsequent periods. However, the decline in oil engines after the 1977 period was more than compensated by considerable increase in electric pumpsets during this period. Consequently, the overall growth in mechanized sources of irrigation did not get affected. Similarly, the tractor population in the state also rose dramatically, especially after 1972.

A steady growth in pumpsets, oil engines and tractors has resulted in a significant increase in the availability of total farm power in Maharashtra (Table 5.2). The estimated gross availability of farm power from animal and mechanized sources was about 2.5 million horse power (HP) units in the mid sixties and this had increased to 5.6 million HP in the early seventies. By the early nineties, it is estimated to have increased to 9.9 million HP units.

The composition of farm power has also undergone a marked change. While the share of power from mechanized sources in total farm power availability showed a rising trend in the last three decades, a declining trend was seen to be caught with draught animal power, though in absolute terms the draught animal power remained almost constant over the last three decades. The contribution of animal power to total farm power availability declined to 28 per cent by 1992 which was about 96 per cent in 1966.

**Table 5.1: A Comparative Statement of Tractors, Diesel Engines and Electric Pumpsets for India and Maharashtra**

| Machinery | India | Maharashtra | Share of Maharashtra in India (Per cent) |
|---|---|---|---|
| Tractor | | | |
| - 1981-82 | 518799 | 21453 | 4.14 |
| - 1991-92 | 1030107 | 46300 | 4.49 |
| - Change (%) | 98.56 | 115.82 | - |
| Diesel Pumpsets | | | |
| - 1981-82 | 3295697 | 139196 | 4.22 |
| - 1991-92 | 4577505 | 99500 | 2.17 |
| - Change (%) | 38.89 | - 28.52 | - |
| Electric Pumpsets | | | |
| - 1981-82 | 3581485 | 448631 | 12.53 |
| - 1991-92 | 6403770 | 1089000 | 17.01 |
| - Change (%) | 78.80 | 142.74 | - |

Source: CMIE, Agriculture, 1999.

**Table 5.2: Availability of Mechanical and Draught Animal Power (HP) in Maharashtra**

| Year | Number ($10^3$) | | | Mechanical Power ($10^6$ HP) | | | | Draught Animal Power | Total Farm Power |
|---|---|---|---|---|---|---|---|---|---|
| | Electric Pumpsets | Oil Engines | Tractors | Electric Pumpsets | Oil Engines | Tractors | Total | | |
| 1966 | 3.80 | 14.70 | 0.30 | 1.90 (0.77) | 7.35 (2.98) | 0.75 (0.30) | 10.00 (4.06) | 236.40 (95.94) | 246.40 |
| 1972 | 4.70 | 17.40 | 6.70 | 2.35 (0.83) | 8.70 (3.07) | 16.75 (5.90) | 27.80 (9.80) | 256.00 (90.20) | 283.80 |
| 1977 | 378.00 | 167.80 | 12.50 | 189.00 (33.43) | 83.90 (14.84) | 31.25 (5.53) | 304.15 (53.81) | 261.11 (46.19) | 565.26 |
| 1982 | 448.60 | 139.20 | 21.50 | 224.30 (36.61) | 69.60 (11.36) | 53.75 (8.77) | 347.65 (56.74) | 265.00 (43.26) | 612.65 |
| 1987 | 448.60 | 139.20 | 21.50 | 224.30 (36.32) | 69.60 (11.27) | 53.75 (8.70) | 347.65 (56.29) | 270.00 (43.71) | 617.65 |
| 1992 | 1089.00 | 99.50 | 46.30 | 544.50 (54.93) | 49.75 (5.02) | 115.75 (11.68) | 710.00 (71.63) | 281.20 (28.37) | 991.20 |

Note: 1) It is assumed that one animal is equivalent to 0.40 HP, oil engines/pumpsets 5 HP and tractors to 25 HP

2) Figures in parentheses indicate percentages to the total farm power

A cursory look at Table 5.2 further revealed that the share of irrigation equipments in total farm power availability increased from 4 per cent to 60 per cent and that of tractors from less than 1 per cent to nearly 12 per cent between 1966 and 1972. About 85-90 per cent of the mechanized power in Maharashtra's agriculture was estimated to be derived from oil engines and electric pumpsets and the latter has been increasing at a faster rate in resent years.

**5.2 Present Status and Future Growth in Farm Is & M in Maharashtra:**

There are numerous agricultural operations where traditional as well as mechanized sources of power can be used. One of the crucial aspect of farm mechanization is the growth of tractorization. In the state of Maharashtra, tractorization has taken place at a faster rate from the early as well as the late seventies onwards. This is evident from very high growth in tractor population during the period between 1977 and 1992 (Table 5.3). In the mid-sixties there were only 300 tractors in the state used for agricultural operations. However, by 1992, the strength of tractors had increased to 46,300. The number of tractors used for agricultural operations in this state are projected to increase further to 2,22,771 by 2010 and to 5,33,216 by 2020 (Table 5.4). Similarly, electric pumpsets in the state have also grown considerably, especially after the late seventies. Contrary to this, there has been decline in the number of dieselized pumps in the state. Nonetheless, the decline in the number of dieselized pumps during the period between 1977 and 1992 has been more than compensated by an increase in the number of electrified pumps in the state during the same period. The number of electrified pumps in the state are projected to grow to 38,77,496 by the year 2010 and to 78,51,513 by 2020 from the existing level of 10,89,000 in 1992 (Table 5.4). On the other hand, the number of dieselized pumps are projected to decline to 53,185 by the year 2010 and to 37,555 by 2020 from the existing level of 99,500 in 1992.

In the above context, it deserves mention here that before the advent of oil engine operated pumpsets, the main appliance for lifting water from wells and ponds was moth, rahat or Persian wheel operated by bullock and human labour. Now that electric pumps and oil engines are available, it has become possible to augment irrigation on such a scale that could not have simply thought of with bullock and human power. However, in order

to conserve available supplies of water, there is a need for further water saving mechanization of irrigation, including introduction of drip and sprinkler systems of irrigation in scanty rainfed areas.

As regards ploughing, harrowing and other preliminary tillage operations, it deserves mention here that traditionally wooden ploughs drawn by animals were used for ploughing operations. However, with the passage of time iron/ steel ploughs in general and mould board ploughs in particular have become most important implement used for ploughing operations. This could also be evident from the fact that while steel ploughs had registered a very marginal increase in their number during the period between 1977 and 1992, the growth in mould board ploughs was quite substantial during this period. The number of mould board ploughs in this state have grown from 17,600 in 1977 to as high as 73,200 by 1992 (Table 5.3). The number of mould board ploughs are expected to be around 4 lakhs by the year 2010 and about 10 lakhs by 2020 (Table 5.4). However, it is to be noted that wooden ploughs are still one of the major implements used for ploughing operations in the state of Maharashtra. Further, of late power tillers, harvesters, etc. have become the chief machinery used for tillage operation. There has been considerable growth in the use of these machinery. However, growth in harvester is estimated to be faster than growth in tillers during the period between 1977 and 1992. Based on the growth between 1977 and 1992, the number of tillers in the state are estimated to be around 18,000 by the year 2010 and about 46,000 by 2020. Similarly, because of very high growth during the given period, the number of combine harvesters are estimated to grow from 1,400 in 1992 to around 33,000 by the year 2010, and further to nearly 2 lakhs by 2020 (Table 5.4).

The other implements and machinery which showed positive and very high growth in their numerical strength were sprayers and dusters, threshers, cultivators, disc harrow (particularly power drawn), and levelers. It is to be noted that in 1977 there were only 1,17,100 sprayers and dusters in this state. However, by 1992, their strength had increased to 5,89,500. The sprayers and dusters are expected to rise further in the near future. It is estimated that by the year 2010, the number of sprayers and dusters in this state will be 41,02,170, which might further increase to 1,20,52,740 by 2020 (Table 5.4).

**Table 5.3: Existing Levels of Farm Implements and machinery in Maharashtra**

| Sr. No. | Farm M &Is | Number of Farm Is & M during the year | | | | | | AGR (77-92) |
|---|---|---|---|---|---|---|---|---|
| | | 1966 | 1972 | 1977 | 1982 | 1987 | 1992 | |
| 1. | Tractors | 300 | 6700 | 12500 | 21500 | 21500 | 46300 | 9.12 |
| 2. | Diesel Pumpsets | 14700 | 17400 | 167800 | 139200 | 139200 | 99500 | -3.42 |
| 3. | Electric Pumpsets | 3800 | 4700 | 378000 | 448600 | 448600 | 108900 | 7.31 |
| 4. | Tillers | - | - | 800 | 700 | 700 | 3300 | 9.91 |
| 5. | Animal Cart | 146100 | 152100 | 1494600 | 1493700 | 1493700 | 1103900 | -2.00 |
| 6. | Seed / Fert. Drill @ | 2600 | 98300 | 1287100 | 1601200 | 1601200 | 858700 | -2.71 |
| 7. | Sprayers & Dusters | 24400 | 45800 | 117100 | 194200 | 194200 | 589500 | 11.38 |
| 8. | Sugarcane Crusher | 17700 | 8800 | 9500 | 9800 | 9800 | 9200 | -0.21 |
| | - Bullock Drawn | 10300 | 2900 | 2000 | 2600 | 2600 | 2500 | 1.50 |
| | - Power Drawn | 7400 | 5900 | 7500 | 7200 | 7200 | 6700 | -0.75 |
| 9. | Thresher | 4300 | 3900 | 5000 | 12000 | 12000 | 80400 | 20.34 |
| 10. | Trailer | - | 1700 | 7100 | 13000 | 13000 | 13000 | 4.11 |
| 11. | Cultivator | - | 2300 | 28100 | 28100 | 28100 | 110000 | 9.52 |
| 12. | Wooden Plough | 176500 | 178000 | 1918700 | 1927000 | 1927000 | 1927000 | 0.03 |
| 13. | Steel Plough | 46500 | 52700 | 575200 | 660000 | 660000 | 660000 | 0.92 |
| 14. | Mould Board Plough | - | 14200 | 17600 | 23900 | 23900 | 73200 | 9.97 |
| 15. | Disc Harrow | - | 1700 | 11700 | 13500 | 13500 | 99100 | 15.31 |
| | - Animal Drawn | - | NA | 7900 | 7900 | 7900 | 41100 | 8.74 |
| | - Power Drawn | - | 1700 | 3800 | 5600 | 5600 | 58000 | 19.92 |
| 16. | Chaff Cutter | 19700 | 17600 | 17900 | 19200 | 19200 | 48500 | 6.87 |
| | - Hand Operated | 19700 | 16700 | 16700 | 16700 | 16700 | 42600 | 6.44 |
| | - Power Operated | - | 900 | 1200 | 2500 | 2500 | 5900 | 11.20 |
| 17. | Combine Harvester | - | 100 | 100 | 300 | 300 | 1400 | 19.24 |
| 18. | Levelers | - | 5500 | 49800 | 119200 | 119200 | 491200 | 16.48 |
| 19. | Persian Wheel | 300 | 900 | 2200 | 1300 | 1300 | 1500 | -2.52 |
| 20. | Ghanis | 3800 | 2000 | 2000 | 1600 | 1600 | 1600 | -1.48 |
| 21. | Wet Land Paddler | - | 13700 | 125400 | 91300 | 91300 | 8400 | -16.49 |
| 22. | Maize Sheller | - | - | 100 | 200 | 200 | 200 | 4.73 |

**Note: @ - including manual, animal and power operated**

## Table 5.4: Future Projections of Farm Implements and machinery in Maharashtra

| Sr. No. | Farm Is & M | Projections | | |
|---|---|---|---|---|
| | | 2000 | 2010 | 2020 |
| 1. | Tractors | 93071 | 222771 | 533216 |
| 2. | Diesel Pumpsets | 75322 | 53185 | 37555 |
| 3. | Electric Pumpsets | 1914915 | 3877496 | 7851513 |
| 4. | Tillers | 7028 | 18079 | 46511 |
| 5. | Animal Cart | 930757 | 767360 | 626989 |
| 6. | Seed / Fert. Drill | 689266 | 523684 | 397879 |
| 7. | Sprayers & Dusters | 1396180 | 4102170 | 12052740 |
| 8. | Sugarcane Crusher | 9047 | 8858 | 8674 |
| | - Bullock Drawn | 2816 | 3268 | 3793 |
| | - Power Drawn | 6308 | 5851 | 5427 |
| 9. | Thresher | 353619 | 2252351 | 14346179 |
| 10. | Trailer | 17942 | 26842 | 40154 |
| 11. | Cultivator | 227688 | 565294 | 1403488 |
| 12. | Wooden Plough | 1931630 | 1937432 | 1943253 |
| 13. | Steel Plough | 710169 | 778277 | 852917 |
| 14. | Mould Board Plough | 156569 | 404993 | 1047585 |
| 15. | Disc Harrow | 309749 | 1287298 | 5349940 |
| | - Animal Drawn | 80345 | 185716 | 429282 |
| | - Power Drawn | 248062 | 1525728 | 9384116 |
| 16. | Chaff Cutter | 82526 | 160378 | 311677 |
| | - Hand Operated | 70186 | 131008 | 244538 |
| | - Power Operated | 13794 | 39878 | 115288 |
| 17. | Combine Harvester | 5721 | 33245 | 193172 |
| 18. | Levelers | 1664444 | 7652139 | 35180053 |
| 19. | Persian Wheel | 1223 | 947 | 734 |
| 20. | Ghanis | 1420 | 1223 | 1054 |
| 21. | Wet Land Paddler | 1987 | 324 | 54 |
| 22. | Maize Sheller | 289 | 460 | 729 |

Note: 1) Projections are based on applying annual growth rate estimates for the period 1977-1992 on 1992 figures.

2) The projected figures have been examined, discussed and supported by the experts of Agricultural Engineering Research Centre (AERC), College of Agriculture, Pune.

Among various implements and machinery, the growth in thresher was estimated to be very high. As could be noticed from Table 5.3, the number of threshers in the state had grown from 5,000 in 1977 to as high as 80,000 by the year 1992. Because of very high rate of growth between 1977 and 1992, the strength of threshers in the state is expected to be 22,52,351 by the year 2010 and 1,43,46,179 by 2020. The increase in disc harrow was also found to be perceptible during the given period of time. However, the growth in power drawn disc harrow was noticed to be much faster than growth in animal drawn disc harrow. Based on the rate of growth between 1977 and 1992, the number of disc harrow in the state are estimated to grow from the existing level of 99,100 in 1992 to 12,87,298 by the year 2010, and further to 53,49,940 by 2020 (Table 5.4).

In fact, both disc harrow and levelers have shown around 15 per cent annual growth in their number during the period between 1977 and 1992. Based on this rate of growth, the number of levelers in the state are projected to grow from the existing level of 4,91,200 in 1992 to 76,52,139 by the year 2010, and further to 3,51,80,053 by 2020. Further, it is estimated that based on the annual growth rate of 10 per cent between 1977 and 1992, the projected number of cultivators in the state will be 5,65,294 by the year 2010 and 14,03,488 by 2020. The number of cultivators in the state were 1,10,000 in 1992 (Table 5.3). Similarly, based on the growth rate of 7 per cent a year between 1977 and 1992, the number of chaff cutters in the state are projected to grow from the existing level of 48,500 in 1992 to 1,60,378 by the year 2010, and further to 3,11,677 by 2020 (Table 5.4). However, since growth in power operated chaff cutters is faster than hand operated chaff cutters, the bulk of the projected increase will be contributed by power operated chaff cutters.

There are also spectrum of other implements and machinery which have shown either very slow growth or a decline in their number during the period between 1977 and 1992. The declining trend in the numerical strength was noticed in the case of seed cum fertilizer drill, sugarcane crusher, animal cart, Persian wheel, ghanis and wet land paddler. On the other hand, slow growth in numerical strength during the given period was noticed for trailers, maize shellers, bullock drawn sugarcane crusher, wooden and steel plough. Obviously, the expected number of these implements and machinery will remain either stagnant or decline further in the near future.

It is to be noted that despite Maharashtra being considered as one of the leading states in the country in sugarcane cultivation, the number of sugarcane crushers have declined in this state. This decline is mainly due to considerable decline in power drawn sugarcane crushers since bullock drawn sugarcane crushers have shown an increasing trend in their numerical strength during the period between 1977 and 1992. The bullock drawn sugarcane crushers are estimated to grow from the existing level of 2,500 in 1992 to 3,268 by the year 2010, and further to 3,793 by 2020 (Tables 5.3 and 5.4).

Thus, the agricultural sector of Maharashtra has undergone considerable transformation over the past three decades. While traditional methods of farming are losing their grounds, newer methods of farming with modern equipments and machinery such as power operated disc harrow, chaff cutter, combine harvester, trailer, and also other improved implements and machinery such as mould board plough, seed cum fertilizer drill, sprayers and dusters, tillers, cultivators, levelers, etc., in particular, have received considerable significance in the newer techniques of production. The number of these improved implements and machinery have already gone up considerably in the state of Maharashtra. Due to faster rate of adoption of farm mechanization, these implements and machinery are likely to increase further in the near future. This obviously places an onerous task on various government organizations/ agencies to ensure/ create proper testing facilities for these growing implements and machinery. the present testing infrastructure available in the state of Maharashtra for various farm implements and machinery is not only inadequate but it is also noticed to be beset with many deficiencies. There is, therefore, a need to establish various testing centres in the state, especially to cater to the existing and future testing requirements of various farm implements and machinery. There is also a need to put a renewed and greater emphasis on the training aspect of farm machinery. At present, there is no well structured training facilities available to the farmers of this state in farm implements and machinery. This makes it necessary to start a large number of short duration courses not only for the farmers but also for the extension workers. This will certainly help the farming community to reap the benefits of farm mechanization in this state.

**********

# CHAPTER VI

# SUMMARY AND POLICY SUGGESTIONS

## 6.1 Introduction:

The adoption of short-duration high yielding varieties of cereal crops and increasing use of inputs such as fertilizer, irrigation, pesticides, and those that can be ascribed to new techniques of farm production, have not only considerably increased the capital requirement but also stimulated the demand for improved machinery and implements. As a result of this, there has been perceptible increase in the use of improved farm implements and machinery (Is & M) over the past few decades. However, the spread of mechanization has varied from state to state and also within the state. This is mainly due to non-popularization of various farm Is & M and also lack of suitability of these implements to different soil type and agro-climatic conditions. It becomes, therefore, necessary on the part of various research and training centres not only to develop and promote improved Is & M but also to extend various types of training facilities to farmers with respect to efficient use of these Is & M.

The importance of farm Is & M in crop production and its use in handling, preservation, processing and transportation was even recognized during the mid-fifties when the Government of India had established "Agricultural Machinery Utilization Training Centre (AMUTC)" at Budni (Madhya Pradesh). Prior to this, the use of mechanized sources of farm power in the country was quit scanty. The objective of establishing AMUTC was to train the prospective farmers with respect to proper use and maintenance of farm machines. Subsequently, considering the urgent need for the indigenous manufacture of farm Is & M, a testing wing was added to the AMUTC. The basic idea behind creation of this testing wing was to ascertain the suitability of agricultural machines/ equipments to varying agro-climatic conditions of the country. Thus, in 1959 the AMUTC was renamed as 'Tractor Training and Testing Station (TTTS)'. In 1983, the TTTS was further upgraded and, thus, renamed again as 'Central Farm Machinery Training and Testing Institute (CFMTTI)'. In view of the importance of

farm machines and training on various aspects of farm machines and to cope up with the increased demand of trained manpower in the field of agricultural mechanization, three more Institutes were set up at Hissar (Haryana), Anantpur (Andhra Pradesh) and Biswanath Chariali (Assam) in 1963, 1983 and 1990, respectively. Despite these efforts and strengthened network of training and testing centres, it was, however, felt that the increase in machinery over time had outstripped the facilities created for the purpose. An urgent need, therefore, was recognized not only to assess the existing training and testing infrastructure available in the country but also to examine its relevance and adequacy in the present context. The present investigation, carried out in the state of Maharashtra, is an attempt in this direction and it specifically focuses on the gaps in the existing training and testing facilities for farm Is & M. The study not only identifies the cause of such gaps but also helps in framing policies for institutional improvements and initiation of investments for infrastructure creation, especially in terms training and testing facilities for farm Is & M.

**6.2 Objectives of the study:**

The study has been carried out with the following specific objectives:

1. To evaluate the impact of training and testing programme being conducted at the existing four farm machinery training and testing institutes at Budni (M.P.), Hissar (Haryana), Garladinne, District Anantpur (A.P.) and Biswanath Chariali, District Sonitpur (Assam) with a view to assess their adequacy, usefulness, effectiveness and contribution to the development of agriculture, besides extending suggestions with respect to restructuring of the training and testing programmes.
2. To assess the training and testing infrastructure available with the State Governments/ Organizations including industry and trade in various states and UTs.
3. To identify the gaps and additional requirement of training and testing for agricultural mechanization in each of the state and UT by 2020 A.D. in the context of fast changing agricultural scenario in the country.

4. To identify the location of the FMT & TIs in each of the States/ UTs for undertaking these programmes. If the requirement is for more than one FMT & TI in any of the state, the same may also be indicated.

The study is designed for various states in the country. The Agro Economic Research Centre of Gokhale Institute of Pollitics and Economics has been entrusted to conduct this study in Maharashtra. However, in Maharashtra, there are no adequate infrastructure facilities available to impart training to farmers in farm Is & M. Some of the centres controlled by the agricultural universities in this state are equipped to perform only testing of farm Is & M manufactured by themselves and other manufacturing units operating in the state. However, testing of Is & M such as planter thresher, seed drill, etc. manufactured by them is done at CFMTTI at Budni. This study is, therefore, confined to the evaluation of these testing centres. The study also evaluates the performance of various manufacturers of farm Is & M.

**6.3 Methodology:**

Although the state of Maharashtra has three major testing centres for farm Is & M, none of the centres cater to the requirement of the farmers in term of providing them training in farm Is & M. In the absence of such training programmes and thereby beneficiaries of various training programmes, the study is restricted to the evaluation of performance of these testing centres in the state. However, it is to be noted that there are numerous manufacturers of farm Is & M in this state. These manufacturers have manufacturing and testing related problems. It was, therefore, thought prudent to evaluate the performance of these manufacturers also. The performance of these manufacturers is evaluated with respect to various parameters encompassing the period from 1990 to 2000.

A list of manufacturers of various farm Is & M operating in Maharashtra was obtained from the office of the Maharashtra Industrial Development Corporation (M.I.D.C.) located at Pune. It was decided to select about $1/3^{rd}$ manufacturers of various farm Is & M out of a list of 59 manufacturers registered with M.I.D.C., Pune. The structured questionnaires designed for the manufacturers were mailed to 12 manufacturers of farm Is & M located in different districts. The manufacturers belonging to Pune district were contacted personally. However, majority of the manufacturers

belonging to other districts did not respond to the mailed questionnaire. The responses from the manufacturers operating in Pune district were quite encouraging and, therefore, majority of the selected manufacturers belonged to Pune district of Maharashtra. In all, the study covered 19 manufacturers of various farm Is & M with 16 belonging to Pune district and the remaining 3 (mailed responses) belonging to other districts of Maharashtra.

### 6.4 Major Findings:

The state of Maharashtra has three major testing centres for Is & M. These centres are not only involved in the testing of various Is & M manufactured by other commercial firms located in the state but also manufacture of various implements, especially manually driven. One of the major testing centres, located at College of Agriculture, Pune, is under the jurisdiction of the Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri. This centre came into being in 1962. Another testing centre for farm Is & M, established in 1982, is located at Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola. Apart from these two centres, the Engineering Division of Maharashtra Industrial Development Corporation (MIDC) located at Pune also performs testing of farm Is & M. However, this centre is completely commercial in nature. Its activities involves not only testing of farm Is & M manufactured by commercial units but also commercial manufacture of these farm Is & M, besides extending its hand as dealer of such Is & M manufactured by various commercial units. An effort was made to evaluate the performance of all the above three testing centres. However, due to lack of cooperation and timely response from MIDC, Pune and PDKV, Akola, the performance of these two centres could not be evaluated. Therefore, the study is restricted to evaluation of the testing centre (Agricultural Engineering Research Centre) located at College of Agriculture, Pune.

#### 6.4.1 Agricultural Engineering Research Centre (AERC), Pune:

Agricultural Engineering Research Centre (AERC) was established at College of Agriculture, Pune, in 1962 as a part of ICAR's "All India Coordinated Research Project on Farm Implements and Machinery". While ICAR is the major funding agency with 75 per cent share in total allocation of funds, the state government contributes the remaining

25 per cent funds to this centre. The centre has multifarious activities that mainly encompass research and development, manufacture of prototypes, testing of farm implements and machinery and front line demonstration of improved farm implements and machinery for oilseeds and pulses. Despite these activities carried out by the centre, it is unable to conduct any training programme for the farmers in respect of maintenance and efficient use of improved farm Is & M. Lack of infrastructural facilities, non-availability of funds and trained personnel have rendered this centre under equipped to carry out any training programme for the farmers. Although during the early – and the mid nineties a scheme was implemented by this centre to train the farmers in the efficient handling and use of implements, the scheme could not last for long as the funds allocated to the scheme were meagre. A provision of daily allowance of Rs. 60 /- per trainee made under the scheme turned out to be so meagre that no farmer came forward to avail the benefit of this training. This had obviously resuted in termination of the scheme. Thus, at present, the emphasis of this centre is not only on manufacture of various prototypes but also on conducting their feasibility tests/ trials. However, testing of major implements such as planter, thresher, seed drill, etc. manufactured by it is done at Tractor Training Centre, Budni (M.P.).

### 6.4.2 Functions of AERC, Pune:

The AERC located at Pune consists of three separate units such as Research and Development (R & D), Prototype Manufacturing Workshop (PMW) and Prototype Feasibility Test Centre (PFTC). The major focus of these units is on modernization of farm Is & M. While R & D unit undertakes various performance evaluation studies relating to farm Is & M, the role of PMW is to fabricate various proven prototypes that are finally tested by PFTC with the help of field trials conducted in different regions with varying soil types and agro-climatic conditions. Every year each of the three units are assigned research projects keeping in mind the interest of the farmers in Maharashtra.

### 6.4.3 Staffing Pattern of AERC, Pune:

The study showed gap between the number of positions sanctioned and number of positions filled-in at this centre, especially with respect to the scientific and support staff.

About 50 per cent of the total sanctioned posts of support staff were found to be vacant. Besides, two positions of technical assistants and a position of principal investigator for the 'R & D' unit of this centre was also found to be vacant for the last two years. Needless to mention that the head of the unit is the main driving force for the implementation of any programme.

### 6.4.4 Steps Toward Upgradation of Testing Facilities at AERC, Pune:

The selected centre was found to be in need of funds, especially to upgrade its testing facilities. Funds were particularly required for the purchase of machines like electric dynamometer and soil beans. The approximate cost for this was estimated at Rs. 2.00 lakhs for electric dynamometer and Rs. 1.00 lakh for soil beans. Added to this, an urgent need of setting up of 'Ergonomic Lab' and 'Plant Protection Appliance Lab' was also felt.

### 6.4.5 Activities and Performance of AERC, Pune:

In this investigation, an effort was made to examine the activities of all the three units attached to the centre encompassing the period from 1995-96 to 2000-01. During the given period of time, the projects entrusted to R & D unit mainly revolved around studies relating to performance evaluation of tractor drawn multicrop planter, power operated groundnut stripper, weeding attachment to the self propelled vertical conveyer, reaper for harvesting paddy and wheat, weeding attachment on sugarcane interculturing implement, sugarcane trash disposer, bullock drawn seed drill for pearl millet, sugarcane trash shredder, tractor operated onion harvester, self propelled safflower harvester, bullock drawn turmeric harvester, small tractor mounted aeroblast sprayer in orchards, cropping system and agricultural practices for identification of farm mechanization gaps, mechanization need for the green house cultivation system in Maharashtra, etc. On the other hand, during the same period, PMW was found to be engaged in fabrication of various prototypes such as tractor mounted multicrop planter, power tiller operated multicrop planter, sugarcane interculturing implements, multipurpose hoe, pegtooth weeder, maize sheller, sickle, groundnut decarticator, sugarcane earthing hoe, groundnut digger, animal drawn sugarcane multipurpose tool, etc. The major function of PFTC

during the above mentioned period was to conduct field trials/ tests for various proven implements fabricated by PMW. Popularization and demonstration of improved agricultural machinery for major oilseed and pulse crops was the other activity of this centre during the given period of time.

The AERC located at Pune had not only shown excellent results on every front of its research and development but the activities undertaken by it were also quite ambitious. Nevertheless, lack of training facilities available at the centre appears to have put a shadow on the achievements of this centre not only in terms of popularization of various improved implements but also in respect of equipping the farmers in the efficient handling / use of these implements. Efforts, therefore, should be made by various funding agencies to provide/ allocate sufficient funds to this centre. This will certainly strengthen the activities undertaken by this centre.

### 6.4.6 Performance of Manufacturers of Farm Is & M in Maharashtra:

Among various manufacturers included in this study for evaluation, Popular Steel Works (PSW) was noticed to be one of the leading and major agricultural implements manufacturing firm in the state of Maharashtra. Ever since its establishment in 1955, this firm was engaged in the manufacture of number of agricultural implements such as reversible mould board (MB) plough, tillers, cultivators, ridgers, levelers, disc harrows, and blade/ tine types of rotary implements. It was also found to manufacture manual as well as automatic seed cum fertilizer drills, semi automatic sugarcane planters, and off-Baring and Healing-up implements.

It is to be noted that PSW has its own marketing and sales network which covers a large part of India. This obviously ensures proper distribution of implements manufactured by the firm and also easy availability of its spare parts. However, PSW has indicated a number of problems faced by it as regards manufacture of its implements and their testing, especially with respect to its reversible MB plough. The firm was of the view that the methods used as well as standards recommended by the Government Testing Agencies for reversible MB plough were inaccurate with lack of their practical applicability. Moreover, the firm has questioned the parameters followed by them for comparing tests. In order to solve the problem, one of the suggestions of PSW is to

compare the reversible MB plough manufactured by various firms with those that are considered as standard model such as reversible MB plough manufactured by PSW.

Farm Machinery Research and Development Centre (FMRDC) is another important testing centre located at Pune. It was established in 1982 and since then it has been manufacturing 'krushivator (rotavator)', apart from conducting testing of farm Is & M manufactured by other commercial firms operating in Maharashtra. However, the infrastructure available with this centre is reported to be inadequate. And, therefore, this centre was in favour of receiving funds for its infrastructural development, especially for creating its own Material Testing Laboratories, and also for the purchase of Load/ Draft Digital Measuring Instruments, Material Hardness Testing Machines, specific tools and gauges, etc. With a view to improve the efficiency of its testing centre, the suggestions of FMRDC revolved around those facilities such as provision of computer for data storage and processing, use of modern electronic instruments instead of using dynamometer for measuring draft/ load, etc.

Another important manufacturer of farm Is & M was found to be Smita Industries located at Pune. Over the last 20 years this firm has been manufacturing sickles, groundnut decarticators, khurpes, mango harvesters, lady finger pluckers, groundnut diggers, chikku (sapota) harvesters, tooth peg weediers, single raw planters, multipurpose hoes, spades and other minor implements. The implements manufactured by this firm have wider acceptability among the farmers. This firm has not only aired its view in favour of adequacy of infrastructure with the testing centres but also favoured testing of various farm Is & M. The testing of hardening of metal and the material of various implements manufactured by this firm is being carried out by private firms in Pune. However, the major implements manufactured by this firm are sent to Budni (M.P.) for testing. Such testing are reported to consume enormous time.

The other manufacturers of farm Is & M included in this study have, by and large, expressed similar views as for the adequacy of testing facilities available with the testing centres. Majority of the selected firms had gathered knowledge about testing facilities for farm Is & M either from their business partners or from other firms engaged in the similar kind of business. Most of these manufacturers were seen to be not only satisfied with the available infrastructure of testing centres but they also favored testing of farm Is & M. In

general, various manufacturers of farm Is & M included in this study were seen to follow the norms prescribed by the Government/ Bureau of Indian Standards (BIS), especially in terms of design of farm machines and implements. However, some of the manufacturers were also found to make certain modifications in the designs approved by BIS with a view to meet the requirements of local farmers. Interestingly, testing of minor implements was not supported by majority of the manufacturers of such implements. However, views expressed by the manufacturers of major implements was positive in this respect and they strongly supported the testing of major farm implements to be conducted by various testing centres.

Some of the manufacturers of both minor and major implements also had some manufacturing related problems. Important among these problems were lack of availability of skilled labour, electricity related problems such as frequent cuts and fluctuations, and lack of availability of raw material. Further, this study also showed a basic difference between the functioning of small and large manufacturers of farm Is & M. While small manufacturers turned out to be least bothered about the quality aspects of their implements, the well established manufacturers were noticed to be not only conscious about their brand name but also strictly adhere to the quality aspects of their manufactured implements.

### 6.4.7 Farm Mechanization in Maharashtra:

Technological changes in agriculture associated with green revolution have contributed significantly to the mechanization of farm in Maharashtra. In this state, there has been remarkable increase in power drawn machinery and equipments as well as in bullock and manually operated improved implements. The growth of mechanization of irrigation has contributed significantly to the availability of farm power in agriculture. Although number of oil engines in the state have declined over time, this decline in oil engines has not affected the overall growth in mechanized sources of irrigation since the number of electric pumpsets have grown dramatically in this state. The bulk of the increase in total farm power in this state is, therefore, contributed by electric pumpsets. Interestingly, the advent of time also saw a marked change in the composition of farm power in this state. In fact, the increase in share of mechanized sources in total farm

power availability is seen in the face of sharp and steady decline in the share of draught animal power. Further, it is to be noted that about 85-90 per cent of the mechanized power in Maharashtra's agriculture is estimated to be derived from oil engines and electric pumpsets and the latter has been increasing at a faster rate in recent years. This has obviously resulted in a rapid increase in the consumption of electric power per hectare of cultivated land.

### 6.4.8 Existing Level and Future Growth of Farm Is & M in Maharashtra:

With the passage of time, the state of Maharashtra has shown considerable growth not only in mechanized but also in traditional farm implements and machinery. The number of tractors in the state have grown from mere 300 during the mid-sixties to as high as 46,300 by the early nineties. Similarly, electric pumpsets in the state have also grown considerably, especially after the late seventies period. However, this increase in electric pumpsets has been achieved in the face of decline in number of diesel pumps in the state. The number of tractors and electric pumpsets are expected to rise further by the year 2010 and 2020. It is to be noted that majority of the implements and machinery used in agricultural operations have shown perceptible growth in their numerical strength only after the period of late seventies. Apart from tractors and electric pumpsets, the other implements and machinery that have shown remarkable growth in their number, especially during the period between 1977 and 1992, are sprayers and dusters, threshers, cultivators, tillers, disc harrows (particularly power drawn), mould board plough and levelers. By and large, these implements and machinery have shown 10-20 per cent annual growth in their numerical strength during the above period. Therefore, the strength of these implements and machinery is expected to be very high by the year 2010 and 2020. However, there are also spectrum of other implements and machinery which have shown either very slow growth or a decline in their number during the period between 1977 and 1992. The declining trend in numerical strength is particularly noticed in the case of seed-cum-fertilizer drill, sugarcane crusher, animal cart, persian wheel, ghanis and wet land peddler. On the other hand, slow growth in numerical strength during the given period is noticed for trailer, maize sheller, bullock drawn sugarcane crusher,

wooden and steel plough. Obviously, the expected number of these implements and machinery will remain either stagnant or decline further in the near future.

### 6.5 Policy Implications and Recommendations:

1. Although the existing testing centre evaluated in this study has shown excellent results on every front of its research and development activities, the absence/ non-availability of training programme for the benefit of farmers, especially in terms of efficient use, maintenance and up keep of various farm Is & M, has put a shadow on the achievements that is envisaged by this centre in more recent times. This could be considered as the major shortcoming of this centre. However, the possible reason for this could be attributed to lack of availability of funds, especially for its infrastructural development, lack of staff - both scientific and technical, and lack of popularization of its improved implements despite its front line demonstration scheme. Thus, in order to improve the efficiency of this centre, serious and concerted efforts are required to be initiated by the state and central level organizations to provide sufficient funds. This will not only strengthen the existing infrastructure of this centre but it will also help it to initiate various training programmes for the benefit of farmers. Efforts initiated towards this direction might also help this centre to popularize the improved machinery not only manufactured by it but also by other firms operating in the state of Maharashtra.
2. Notably, the major implements and machinery such as planters, threshers, seed drill, etc. developed by AERC, Pune are sent to the testing centre located at Budni (M.P.) for their testing. Quite often the testing centre at Budni consumes enormous time (often 1-2 years depending upon the machines) to complete the testing and send the report of such testing. One of the major recommendations of AERC, Pune is , therefore, to have testing centres located in the state of Maharashtra, especially in Mumbai, Pune and other commercial cities of the state. However, such testing centres are suggested to have sufficient scientific and technical staff, besides adequate testing equipments and resources.

3. Undoubtedly, the AERC, Pune has manufactured/ fabricated a number of improved implements and machinery. However, popularization of these implements and machinery has become the major problem of this centre. One of the suggestions is, therefore, to have helping hand from various organizations such as Non Government Organizations (NGOs) and Krishi Vigyan Kendras (KVKs) not only in terms of popularization of its improved implements and machinery but also to make them available to small and marginal farmers.
4. One of the major problems encountered by a leading manufacturer (Popular Steel Works) of reversible MB plough was relating to the testing of these implements, especially in the absence of reliable or exact testing data with the testing centres. It may, therefore, be worthwhile to look into the suggestions of the Popular Steel Works to select a standard or baseline/ reference machine/ implement on the basis of its popularity and acceptability and use such machines for making comparison with other machines manufactured on similar lines as reportedly being done in many advanced countries.
5. It is suggested that the manufacturers of various farm Is & M may also conduct training programmes for farmers, especially for the farm Is & M produced by them along with other government agencies. Such training programmes are likely to help the farmers in the efficient handling and operation of the implements manufactured by the particular firm.
6. Interestingly, as for the testing of farm Is & M, two differing views were expressed by the manufacturers included in this study. While one section of manufacturers strongly supported testing of farm Is & M, the other one not only criticized such testing but also showed their dissatisfaction for the available infrastructure with the testing centres. Lack of instruments and lack of trained persons to perform testing of farm Is & M, and excessive time taken to complete testing were the major reasons for their dissatisfaction. The testing centres are, therefore, suggested to complete the testing within some maximum time limit prescribed for such a testing. An effort made towards this direction might improve the efficiency of the existing testing centres of the country.

7. Another suggestion is for the testing centres to have inspectors with permission given to them to perform testing at the production point rather than at laboratories of testing centres, provided that the necessary infrastructure is available.
8. One section of the manufacturers had also cited some manufacturing related problems faced by them. The major problems in this respect were lack of availability of trained/ skilled labour, frequent cuts and fluctuation in power supply, and lack of availability of raw material.
9. Notably, with the passage of time the state of Maharashtra has shown perceptible growth not only in irrigation equipment and machinery but also in power drawn as well as bullock and manually operated improved implements and machinery. Because of perceptible growth in electric pumps, now it is possible to augment irrigation on such a large scale that could not have been thought of with bullock and human power. Nonetheless, there is still further scope of mechanization of irrigation in the state, especially in terms of introduction of drip and sprinkler systems of irrigation. An introduction of the same will certainly help in conserving available water resources, especially in rainfed areas of Maharashtra.
10. The study has shown remarkable increase in number of various improved implements and machinery in Maharashtra. The number of these implements and machinery is likely to grow further in the near future. This obviously places an onerous task on government organizations/ agencies to ensure adequate infrastructure of testing facilities for these growing implements and machinery. The present testing infrastructure available in the state is grossly inadequate to handle even the testing requirements of the existing farm implements and machinery. This further emphasizes upon the need to establish more testing centres in the state, especially to cater to the present as well as future testing requirements of various farm implements and machinery. There is also a need to put a renewed and greater emphasis on training aspects of farm machinery. An introduction of such training programme will certainly help the farming community to reap the benefit of farm mechanization in the state.

It deserves mention here that with the technological advancement, the manufacture of improved farm implements and machinery has grown considerably. Modernization of the existing testing centres is, therefore, equally important, especially to cater to the requirement of newly developed machines and implements. Nonetheless, it is to be also noted that the increase in farm mechanization has also increased the testing requirements of growing improved farm Is & M. There is, therefore, a need to establish more testing centres in the country. However, as for the state of Maharashtra, the suggestions of majority of the manufacturers of farm Is & M included in this study revolved around establishing such testing centres in those commercial cities of this state such as Mumbai, Pune, Sangli, Satara, Kolhapur, Nagpur, and Aurangabad.

The manufacturer of various farm implements and machinery included in this study have extended their suggestions in favour of establishing testing centres at various cities in Maharashtra as mentioned above. However, as per our estimate, there is a need to establish minimum four testing as well as training centres in the state of Maharashtra, especially with a view to meet the rising demand of farm mechanisation. Among these four centres, two centres have already been established under the control of Mahatma Phule Agricultural University, Rahuri and Dr. Panjabrao Agricultural University, Akola. However, these centres need to be provided the required infrastructure to enable them to work efficiently as full fledged testing and training centres. Additional two training centres may be established at Marathwada Agricultural University, Parbhani and Konkan Agricultural University, Dapoli. Upgradation of facilities and or establishment of training and testing centres under the aegis of existing four agricultural universities of Maharashtra is also advantageous because these centre shall be able to cater not only the testing requirements of machinery but also the training needs of the farmers from their distinct agroclimatic regions. Moreover, the basic resources such as land and requisite expertise are already available with these universities. Establishment/ Upgradation of training and testing centres under the control of respective agricultural universities will not only help the rapidly expanding farm mechanisation in the state but might also benefit both farmer as well as the manufacturers of farm implements and machinery in Maharashtra.

## Appendix I

## Machines Tested At CFMTTI Budni (M.P.) Till 30th Nov. 1998

| Category of Machines Tested | 61-62 to 65-66 | 66-67 to 70-71 | 71-72 to 75-76 | 76-77 to 80-81 | 81-82 to 85-86 | 86-87 to 91-92 | 92-93 | 93-94 | 94-95 | 95-96 | 96-97 | 97-98 | 98-99 | Total | CATEGORY WISE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wheeled Tractors | 05 | 15 | 32 | 44 | 58 | 95 | 20 | 15 | 16 | 16 | 15 | 16 | 11 | 358 | 358 |
| Crawler Tractors | - | 05 | 04 | 02 | - | - | - | - | - | - | - | - | - | 11 | 11 |
| Power Tillers | 09 | 10 | 05 | 06 | 03 | 07 | - | - | 01 | 01 | - | 04 | 02 | 48 | 48 |
| User's Survey | - | - | - | 03 | 06 | 18 | 02 | 05 | 04 | 04 | 06 | 01 | 01 | 50 | 50 |
| Diesel Engines | - | 01 | 04 | 28 | 34 | 24 | - | - | - | - | - | - | 01 | 92 | 92 |
| Agri. Implements | 04 | 04 | 17 | 05 | 02 | 10 | - | - | 02 | 05 | 01 | 02 | - | 52 | 52 |
| Land Levelling Equip. | - | 06 | 03 | 03 | - | - | - | - | - | - | - | - | - | 12 | 12 |
| Sowing Equipment | - | 01 | 06 | 05 | - | - | - | - | - | - | - | - | - | 12 | 12 |
| Irrigation Pumps | - | - | - | 05 | 09 | 13 | - | - | - | - | - | - | - | 27 | 27 |
| Plant Protection Equip. | - | - | - | 01 | 01 | - | - | - | - | - | - | - | - | 02 | 2 |
| Harvesting and Threshing Equipment | - | 09 | 18 | 06 | 04 | 08 | 02 | 01 | - | - | 02 | 01 | - | 51 | 51 |
| Grain Cleaners | - | 01 | - | - | - | - | - | - | - | - | - | - | - | 01 | 1 |
| Agricultural Discs | 01 | 08 | 19 | - | - | - | - | - | - | - | - | - | - | 28 | 28 |
| Components | - | 02 | 03 | 03 | 05 | 04 | 01 | 02 | 02 | 01 | 01 | 02 | - | 26 | 26 |
| Vehicles | - | - | - | - | - | - | - | 01 | - | - | - | - | - | 01 | 1 |
| TOTAL | 19 | 62 | 111 | 111 | 122 | 179 | 25 | 24 | 25 | 27 | 25 | 26 | 15 | 771 | |

## Appendix II

### Statewise Personnel Trained By The CFMTTI Since Inception

| NAME OF STATE | No. of Trainees Trained |
|---|---|
| Andaman & Nicobar | 02 |
| Mizoram | 07 |
| Goa | 08 |
| Lakshwadeep | 12 |
| Meghalaya | 13 |
| Arunachal Pradesh | 23 |
| Jammu & Kashmir | 37 |
| Manipur & Tripura | 43 |
| Delhi | 53 |
| Himachal Pradesh | 61 |
| Assam | 134 |
| Nagaland | 135 |
| Haryana | 185 |
| Karnataka | 194 |
| Orissa | 214 |
| Tamil Nadu | 333 |
| West Bengal | 411 |
| Kerala | 412 |
| Andhra Pradesh | 432 |
| Gujrat | 454 |
| Punjab | 496 |
| Bihar | 567 |
| Rajasthan | 895 |
| Uttar Pradesh | 2237 |
| Maharashtra | 3459 |
| Madhya Predesh | 11940 |

Foreign National 59

Defence 1555

| | 93-94 | 94-95 | 95-96 | 96-97 | 97-98 | Total |
|---|---|---|---|---|---|---|
| SC | 134 | 162 | 95 | 66 | 91 | 548 |
| ST | 53 | 55 | 62 | 39 | 51 | 260 |

Note : Defence personnel trained from 1956-57 to 1993-94 = 1555
(Defence personnel trained from 1994-95 onwards has been included in the statewise break-up)

## Appendix III

### Personnel Trained By CFMTTI Since Inception Including Coursewise Distribution From VII Plan Onwards

| NAME OF COURSE | Duration | YEAR | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 92-93 | 93-94 | 94-95 | 95-96 | 96-97 | 97-98 | 98-99 |
| 'A' Series : Farm Machinery utilisation & maintenance | Two months | 373 | 351 | 359 | 322 | 310 | 412 | 126 |
| 'B' Series : Intensive course on special machines & skills. | One months | 95 | 85 | 84 | 70 | 65 | 45 | 31 |
| 'C' Series : Refresher course on Farm Machinery, repair & workshop management | Two months | 171 | 167 | 174 | 116 | 154 | 214 | 102 |
| 'D' Series : Educational training course on Farm Machinery Utilisation | One months | 165 | 105 | 129 | 116 | 128 | 108 | 170 |
| 'E' Series : Regular course for rural youth (TRYSEM) | Three months | 91 | 109 | 116 | 88 | 79 | 68 | 42 |
| 'F' Series : Need based training Programme | One to Four weeks | 127 | 166 | 230 | 198 | 270 | 258 | 272 |
| 'G' Series : Energy Conservation and management camps | 5 camps 2-3 days | 567 | 548 | 5 camp | 175 | 81 | 51 | 55 |
| Special Course (foreign Nationals) | 10 to 18 weeks | 05 | 01 | - | 02 | - | - | - |
| Graduate & Technician Apprentices | 12 to 24 weeks | 08 | 06 | 09 | - | - | - | - |
| Total Trainees Trained (till 30th November, 1998=24,371 | | 1602 | 1538 | 1101 | 1087 | 1087 | 1156 | 798 |

| | | |
|---|---|---|
| 1. Personnel trained since inception till 1991-92 | : | 16,002 |
| 2. Personnel trained during VIII Plan (1992-97) | : | 6,415 |
| 3. Personnel trained during 1997-98 | : | 1,156 |
| 4. Personnel trained during 1998-99 till 30th Nov.98 | : | 798 |
| Total | : | 24,371 |

## Appendix IV

### Information Relating Training Facilities at Agricultural Engineering Research Centre (AERC), Pune

1. Do you also organize any training programs to facilitate the persons with different farm Machines.

   No.

2. If yes, then

| Components | Year 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|
| i) Type of training | - | - | - | - | - | - | - |
| ii) Duration | - | - | - | - | - | - | - |
| iii) No. of participants | - | - | - | - | - | - | - |

3. What is the training infrastructure available with the centre and what is required ?

| Components | Available | Required |
|---|---|---|
| Machines | Not Applicable | |
| Professional staff | | |
| Helping staff | | |
| Any other (mention) | | |

4. a) Do you have any mobile training units : No
   b) If yes, then what is the approx. number of persons training last year? NA

5. How do you motivate the persons to attend the various training programme : N.A.

6. What are the different facilities provided by the centre during training programme : NA

7. Do you assess the farmers performance who have not training at your centre : NA

8. Do you think that the present number of farm machinery training institutes in the state sufficient : NA

   If no, whether their number should be increased or the present institute should be Strengthened. : NA

**ANNEXURE I : COMMENTS ON DRAFT REPORT BY DESIGNATED AERC UNIT LUDHIANA, PUNJAB**

TITLE OF THE STUDY REPORT : ASSESSING THE EXISTING TRAINING AND TESTING FACILITIES FOR FARM MACHINERY IN MAHARASHTRA

AUTHORS : DEEPAK SHAH and K.G.KSHIRSAGAR

ORGANIZATION : AGRO-ECONOMIC RESEARCH CENTRE, GOKHALE INSTITUTE OF POLITICS AND ECONOMICS, PUNE

1. COMMENTS ON THE METHODOLOGY FOR THE STUDY:

   As per the synopsis circulated for the study. No Comments

2. COMMENTS ON THE ADEQUACY AND QUALITY OF COVERAGE OF EACH OBJECTIVES OF THE STUDY:

   The set objectives appear to have been achieved. However, the following clarifications are needed:

   (i) As no farmer is willing to come to Pune (page 12), is it not pertinent that there must be some efforts for conducting small training programmes near the farmers' fields ( that is rural areas).

   (ii) The level of tractors, levelers, electric motors and sprayers and dusters, threshers, cultivators for 2010 and 2020 (page 47-48) seem to be quite high. It should be backed up by the expert views and not merely by the previous growth trends.

3. MISCELLANEOUS COMMENTS:

   Apart from the above mentioned suggestions, some minor omissions have been indicated in the draft report itself which will definitely help in improving the quality of the report.

4. OVERALL VIEW ON THE ACCEPTABILITY OF THE REPORT:

   Finally I may say that this is a well written report and may be accepted after the revision in the light of the above suggestions.

## ANNEXURE II : ACTION TAKEN BY AUTHORS ON THE COMMENTS OF THE DESIGNATED CENTRE FOR THE STUDY ENTITLED "ASSESSING THE EXISTING TRAINING AND TESTING FACILITIES FOR FARM MACHINERY IN MAHARASHTRA"

The authors are thankful to the reviewer for the keen interest taken and the suggestions made by him. The comments have been taken care of at length and replies to these comments are given as follows:

2. (i) Agricultural Engineering Research Centre (AERC) located at Pune also conducts demonstrations of various machinery and implements at farmers' field under its Front Line Demonstration (FLD) scheme. This information has now been incorporated in the report (page 12).

   (ii) The growth rates and projected figures for various machinery and implements for 2010 and 2020 have been examined, discussed and supported by the experts of Agricultural Engineering Research Centre (AERC) located at College of Agriculture, Pune.

3. The minor omissions indicated in the draft report have been removed.

November 30, 2001

Deepak Shah
K.G.Kshirsagar