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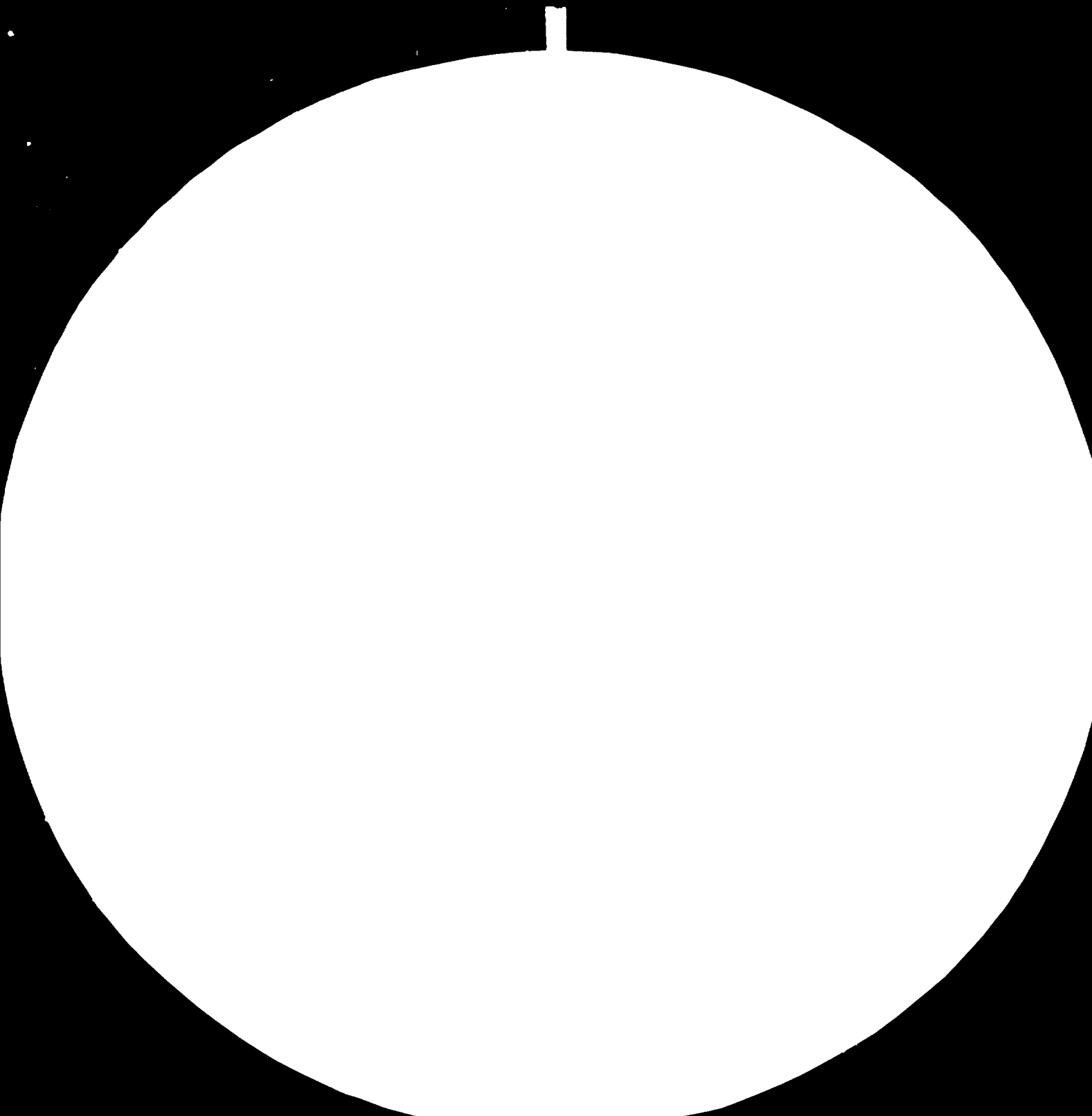

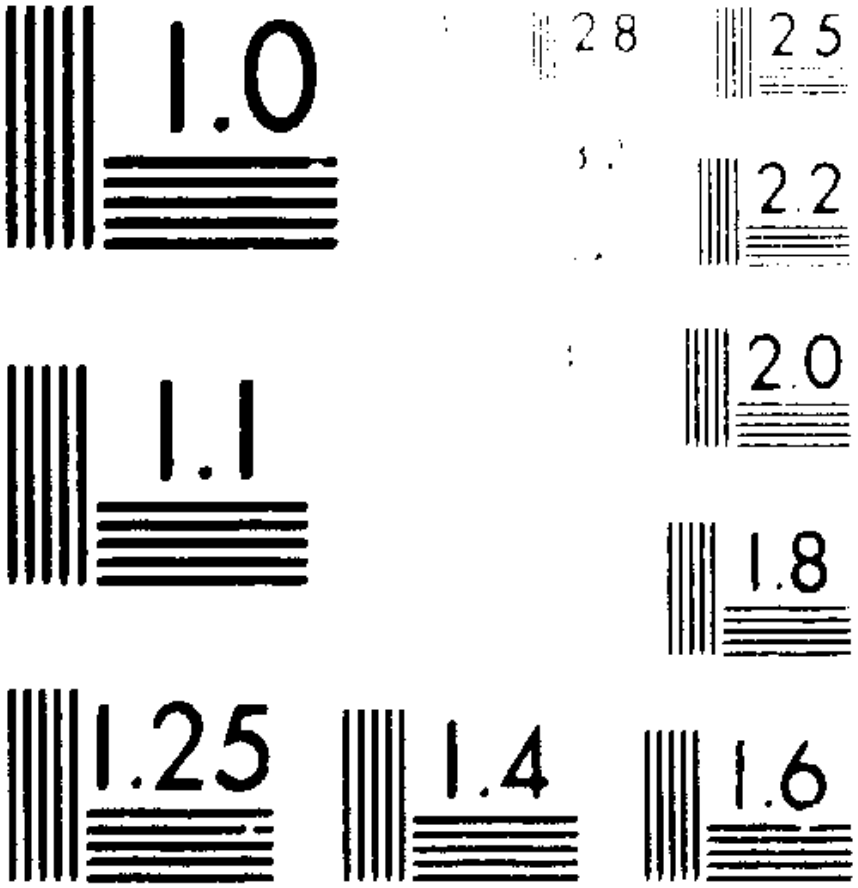
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INDUSTRIAL DEVELOPMENT ORGANIZATION

MISSION REPORT - PAKISTAN

31 March - 17 April 1981

INTEGRATED DEVELOPMENT OF AGRICULTURAL MACHINERY AND IMPLEMENTS SECTOR *

AN ANALYSIS OF

policy, demand, imports, manufacture
applied R and D, repair and maintenance
and training
and
the role of
AGRICULTURAL MACHINERY DIVISION OF PARC

by

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Senior Interregional Adviser

A. Rassadin
Senior Industrial Development Officer
(UNDP/UNIDO Mission members)

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SECTION I

INTRODUCTION

A. THE MISSION

The UNDP/UNIDO team * at the request and concurrence of the Government of Pakistan in general, and that of Pakistan Agricultural Reserach Council (PARC) in particular visited Pakistan from March 31 to April 17, with a view to analyse the agricultural machinery sector and recommend to the Government an integrated programme of action and elaborate a programme of the Agricultural Machinery Division of PARC.

B. IMMEDIATE OBJECTIVE

To review the proposed work programme of the Agricultural Machinery Division of PARC and draft a project document with the specific objective of strengthening the AMD's priority areas of programme for implementation under 1982-86 UNDP Country Programme.

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* The UNDP/UNIDO team consisted of Mr. Swamy Rao A.A., Senior Inter-regional Adviser and Mr. A. Rassadin, Senior Industrial Development Officer, UNIDO, Vienna, Austria. The official counterpart was Dr. A.U. Khan, Director, IRRI-PAK/Agricultural Machinery Division of PARC. The UNDP/UNIDO field support was extended by Mr. Kamal Hussein, UNIDO Senior Industrial Development Field Adviser, UNDP, Islamabad.

C. MISSION'S ITINERARY AND WORK PROGRAMME

(i) The mission visited Islamabad, Nowshera, Peshawar, Daska, Gujranwala, Lahore, Multan, Mianchannu, Rahiemyarkhan and Faisalabad; (pls. see Annex II for the list of persons met). The mission hold discussion with the officials of PARC and the Ministry of Agriculture, discussions were also held with the officials of the Ministry of Industry, the Ministry of Production, the Ministry of Science and Technology and the Ministry of Finance as well as with officials of the Agricultural Development Bank of Pakistan, Pakistan Council of Scientific and Industrial Research and Investment Promotion Bureau.

(ii) The mission also met the officials of IRRI/PAK-AMD/PARC project, Agricultural Mechanization Research Institute, Multan, officials of some directorates of agricultural engineering, provincial Department of Agriculture, and agricultural engineering R and D projects of faculty of agricultural engineering of Peshawar, Sindh and Faisalabad.

(iii) The mission visited and held discussions with more than 25 small and medium manufacturers of agricultural implements, and officials of 5 public sector enterprises involved with local production of agricultural equipment.

(iv) The mission held detailed technical discussions with international experts of UNDP projects executed by UNIDO, ESCAP and FAO.

(v) During the Secong Annual Convention of the Pakistan Society of Agricultural Engineers (PSAE), held at Lahore, the mission members had an opportunity to see some more of the agricultural machinery developed in Pakistan and held discussions with a number of officials, experts and industrialists of Pakistan. The UNIDO mission members, during PSAE Convention presented the following two technical papers:

- promotion of agricultural machinery industry in developing countries and the role of UNIDO;

- some practical issues on import, assembly and manufacture of tractors and power machinery with emphasis on basic facilities in developing countries.

(vi) The mission members have reviewed more than 50 policy and technical documents in the field of agricultural machinery sector in Pakistan from 1970 to 1981 in the areas of policy, institutional research and development, products and applied R and D, imports local manufacture and incentives, agricultural engineering and extension and repair and maintenance (please see annex I for the list - review of literature).

D. SCOPE OF THE REPORT

(i) This report is primarily an analysis of the policy, demand, imports,manufacture in small/medium private and medium/large public sectors, applied R and D by institutions and industry, repair and maintenance and training, within the overall Government policies of agricultural mechanization and industrial development.

(ii) The report highlights the major actions necessary by the Government and to interlink the agriculture and industry. The report also outlines the desirable inter-relationship between AMD-PARC and other areas of related activities under the jurisdiction of other ministries and institution (areas such as mechanization, appropriate technology, agricultural finances, small and medium scale industry, public sector production, investment promotion, etc.).

(iii) The report specifically elaborates the activities of AMD-PARC inter-relationship with the proposed UNDP/UNIDO assistance. Accordingly, a draft project document is prepared and submitted as a separate document.

E. PROPOSED UNDP/UNIDO ASSISTANCE AND MAGNITUDE OF THE PROBLEM

(i) It must be mentioned that agricultural machinery sector in Pakistan is complex and will require an integrated inter-ministerial action. The proposed UNDP/UNIDO assistance is primarily directed towards AMD-PARC, with a view to strengthen its priority programme of actions. In this context, the weak areas (engineering design and development, commercial testing and industrial extension) are proposed areas for UNDP/UNIDO assistance. It is recommended that the existing agricultural engineering institutions and agricultural field projects concentrate on mechanization and field testing aspects of agricultural machinery. As these areas of action require primarily the national technical direction and participation, and as they are a continuous process, it is recommended that the Government of Pakistan develop long-term policies/programmes.

(ii) The proposed UNDP/UNIDO assistance is directed to produce quick and meaningful results with a new approach. It will act as the catalytic nucleus for inter-relationship between applied R and D and manufacture. It will be the focal point for co-ordinated actions by provincial Governments, Department of Agriculture and R and D institutions.

(iii) The proposed project for a duration of 4.5 years envisages and UNDP IPF input of around US $ 2.7 million during 1982-86. It must be mentioned that this represents a fraction of the actual needs. The mission has estimated that the annual gross sales turnover of imported and locally porduced agricultural machinery and implements in Pakistan in 1981/82 is around US $ 320 million. The proposed UNDP IPF input for the total project (4½ years duration) 0.84% of annual sales turnover. The average annual UNDP IPF input is less than 0.2% of the annual sales turnover.

F. ACKNOWLEDGMENTS

The UNIDO mission wishes to thank the Government of Pakistan for their excellent arrangements and counterpart facilities provided and hospitality extended to the mission members. The mission members wish to express their gratitute and sincere thanks to Dr. Amir Muhammad, Chairman, PARC, Mr. Manzur Ahmad, Additional Secretary, Ministry of Agriculture and Dr. A.U. Khan, Director, IRRI-PAK - AMD/PARC for their assistance and co-operation. Special thank are extended to Mr. J.I. Malik, Joint Secretary Ministry of production, and Mr. A. Khalil, Additional Secretary Ministry,of Production for their assistance and hospitality. The mission members are grateful to Mr. M.J. Priestley, Resident Representative, UNDP, Mr. John Phillips, FAO Country Representative and Mr. Kamal M. Hussein, UNIDO Senior Industrial Development Field Adviser for their support, hospitality and excellent co-operation.

SECTION II

SUMMARY OF FINDINGS, CONCLUSIONS AND OVERALL RECOMMENDATIONS

A. NEED FOR AN INTEGRATED NATIONAL PROGRAMME

1. The Government of Pakistan is interested in establishing an integrated programme of action as provision of industrial inputs for agricultural development. The agricultural implements and machinery sector is considered to be one of the most important sectors cotnributing to the development of a healthy and rational agricultural and industrial base. Promotion of this sector will require an inter-ministerial interlink, development of local engineering capabilities, initiation of repair and maintenance programmes, promotion of manufacturing capabilities and development of an extension mechanism.

2. The primary objective of such a programme is to make available to the rural farmer suitable agricultural tools and equipment, intermediate power machinery and appropriate standard power equipment at a reasonably low cost with inbuilt durability and low maintenance requirement. This objective - within the framework of national plans - takes into account the possibilities of local manufacture of appropriate equipment in existing small and medium scale production units utilizing local raw materials, but with upgraded production technology. In addition, it will incorporate an action to establish new manufacturing units - in public and private sectors - especially for manufacture of tractors and engines.

3. It is reported that the estimated annual investment in agricultural mechanization (tractors and equipment plus draught animals and equipment) in Pakistan in 1980 is around US $ 473 million and is expected to increase to US $ 997 million by the year 2000. The gross annual investment in tractors and equipment in Pakistan in 1980 is around US $ 118 million and is expected to reach US $ 647 by the year 2000.

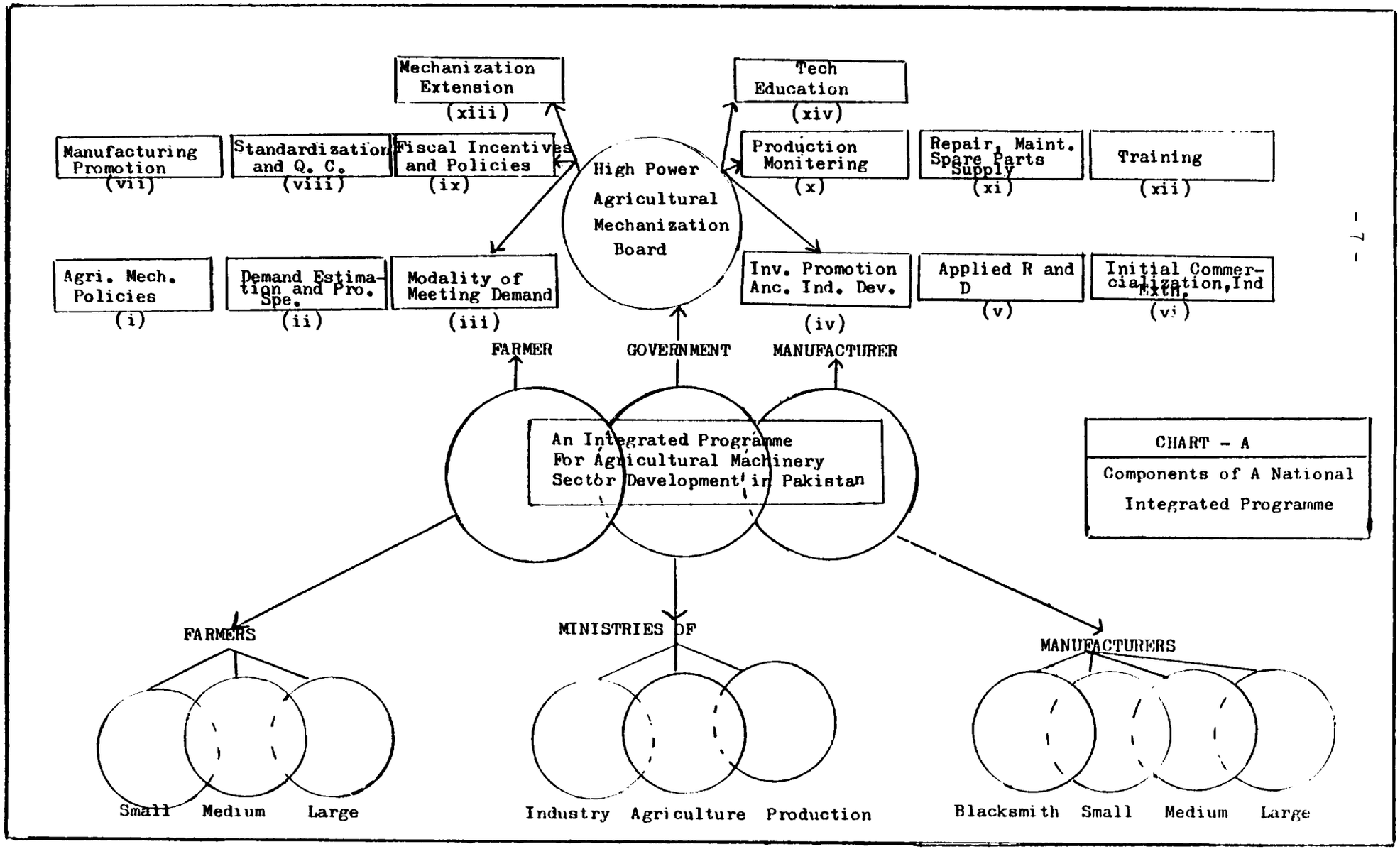


CHART - A

Components of A National Integrated Programme

4. Considering 1981/82 the mission estimates that the total annual sales turnover of imported and locally produced agricultural tools, implements equipment and machinery is around US $ 320 million. (Import of tractors - including local assembly - US $ 150 million, spare parts and component import US $ 20 million, implements import US $ 15 million, local production of agricultural tools and implements in small and medium industries US $ 125 million, rural and artisan hand tools production US $ 10 million).

5. Government of Pakistan has taken a most significant step in 1981 through establishment of a"High Powered Farm Mechanization Board" in order to formulate, develop, implement and monitor an integrated programme in agricultural machinery sector of Pakistan.

6. It is also interesting to note that from 1951, Pakistan had a number of policy level committees, working groups, international expert missions and reports in the field of agricultural development in general and in farm mechanization in particular. The following are some of such reports:

- 1951 Report of the"Pakistan Agricultural Enquiry Committee", recommended use of machinery for rapid development of new lands and standardization of farm machines

- 1960 Report of the "High powered Food and Agricultural Commission" recommended increase horsepower per acre and highlighted its relation to crop production

- 1961 "President's Working Party on Agricultural Production" recommended actions to initiate manufacturing plans for agricultural machinery

- 1964 Report by "President's Science Advisory Committee on water logging and salinity in West Pakistan" recommended introduction of tractors

- 1967 Report of Prof. Giles recommended a methodology for determining mechanization pattern and size of tractors

- 1969/70 Report of "ECAFE-AIDC-UNIDO Fact Finding Mission on Agricultural Machinery Industry in Pakistan" recommended integrated action programmes and modalities of implementation

- 1970 Report of the "Farm Mechanization Committee of West Pakistan" set up guidelines on agricultural mechanization

- 1975 Report of the "Agricultural Enquiry Committee" included recommendation on meeting the demand for suitable agricultural machinery, repair and maintenance, and recommended a high priority for manufacturing suitable agricultural machinery, including tractors

- 1975 Report of the "FAO Farm Mechanization Policy Mission" recommended selective mechanization, liberalized import of tractors and accelerated local production

- 1975 Report of World Bank on "The consequences of Farm Tractors in Pakistan" discusses the problems and possibilities of small tractors

- 1978 Report of the "Farm Mechanization Group" submitted to the adviser, agricultural affairs, to CMLA detailed the integrated programmes of action necessary

- 1978 Report of Dr. A.U. Khan on "Farm Machinery requirements and indigeneous production in Pakistan" prepared for high powered Agricultural Committee of Ministry of Industry details the needs and modalities of meeting the demand

- 1980 Report of A.U. Khan on "Public policies and Agricultural Mechanization in Pakistan" details the required action

7. In addition various reports and papers on Pakistan agricultural mechanization by
farmers/industrialists: Mr. Ghulam Mustafa Ghazi (Aug. 1978),
Mr. Mohammad Ghazanfarullah Khan (April 1980);
engineers: Mr. R.C. Gifford (Oct. 1980),
Mr. R.G. Rijk (Oct. 1980)
Mr. T. Devrajani (April 1981);
economists: Mr. Brain Lockwood (April 1981),
Mr. Mohammad Munir (April 1981)
are worthy of mentioning as they represent an interlink to the previously detailed Government policy documents.

8. It is evident that there is a need now for an interlinked programme by the Ministries of Agriculture, Industry and Production. This important interlinked programme appears to be lacking at present in Pakistan. Although the High Powered Farm Mechanization Board may be regarded as the first step in this direction, it is to be categoriacally stated that unless there exists an institutional mechanism to follow up the recommendations, the Board's contribution may not be effective.

9. Although each of the Ministries (Agriculture, Industry and Production) may strengthen their internal departments to implement the Board's recommendations, the proposed Agricultural Machinery Division of PARC is expected to play an important role in establishing an institutional interlink among the three Ministries at the central/federal level and with those of the provincial Governments.

B. COMPONENTS OF AN INTEGRATED NATIONAL PROGRAMME

10. From a national point of view, the overall integrated programme should have the following components:

(i) Agricultural Mechanization Policies:

11. There appears to be no specific detailed documentation on such a national official agricultural mechanization policy. Although the subject is the concern of the Government (an inter-ministerial action), it is recommended that the Ministry of Agriculture initiate steps for elaboration of a medium term (1983-1990) agricultural mechanization policy.

(ii) Demand Estimation - Product Specification:

12. The Ministry of Agriculture may initiate a long term programme by provincial agricultural engineering institutions and selected economic institutions to undertake an analysis project to estimate demand and product specification for the period 1983/84-1989/90.

13. The AMD is to undertake a short term (2-3 months multidisciplinary experts, 3 experts) analysis to estimate prliminary demand and product specifications to facilitate start up a priority programme for 1982-85.

(iii) Modalities of Meeting the Demand:

14. The Ministry of Industry, in co-operation with the Ministry of Agriculture and the Ministry of Production may establish a priority list of products of

- those which require foreign investment/participation, collaboration and technical assistance;
- those which require only foreign technical collaboration, but could be manufactured through domestic resources, technical ability and physical facilities;

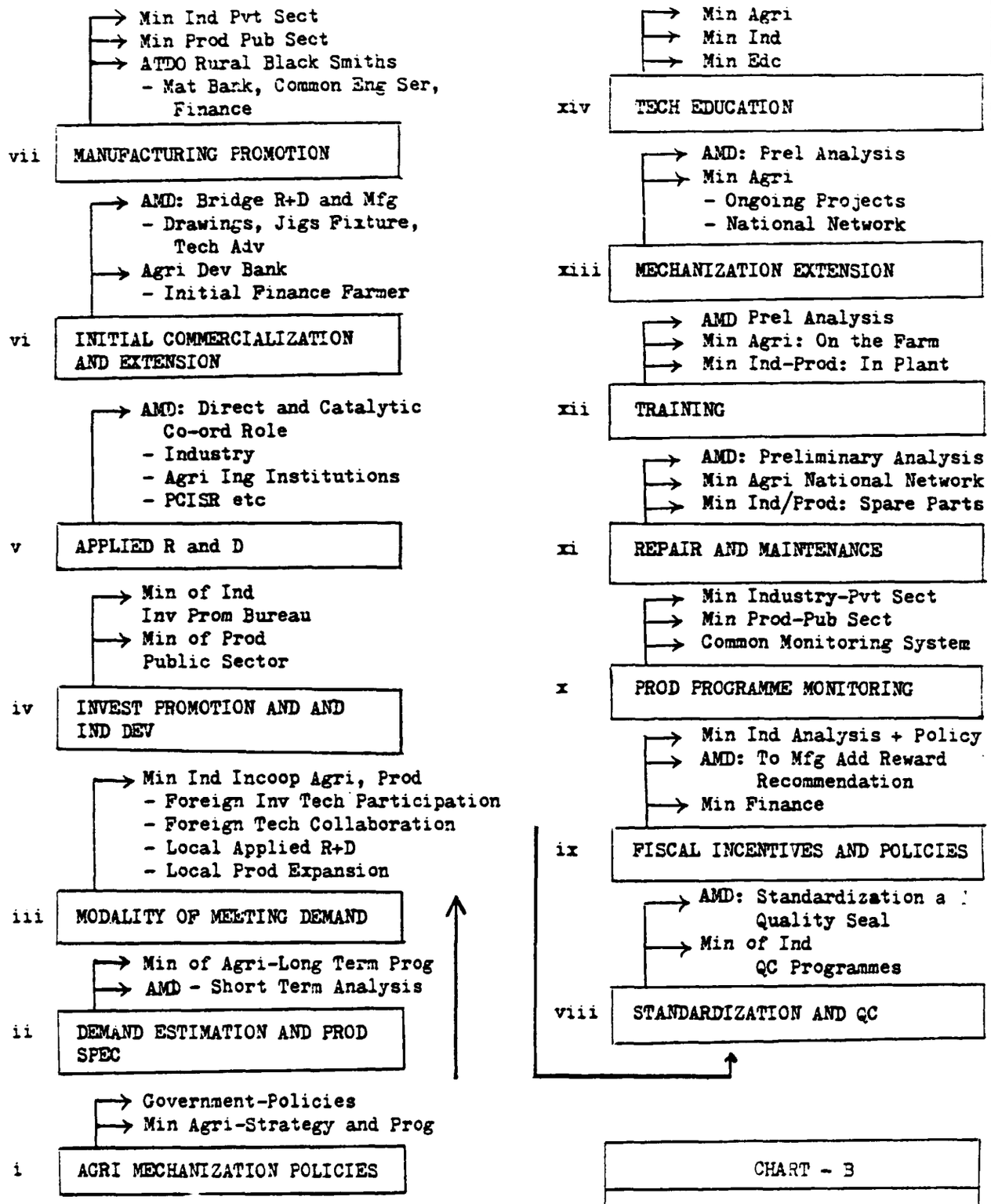


CHART - B

INTER-MINISTERIAL

INTERLINK IN AGRICULTURAL MACHINERY DEVELOPMENT IN PAKISTAN

- those which require foreign prototypes, but could be adapted and manufactured through domestic resources, technical ability and facilities;
- those which require more local applied R and D and prototype manufacture and industrial extension;
- those which are manufactured locally, but require production expansion and/or quality improvement.

(iv) Investment Promotion and Ancillary Industry Development:

15. The Ministry of Industry through the Investment Promotion Bureau (capital goods project: agricultural machinery and automotive industry) has to work out an integrated programme of action. The Ministry of Industry should consider not only the private sector projects but also incorporate co-operation from Ministry of Production on poublic sector projects. At the present such an integrated programme of action does not exist.

(v) Applied Research and Development:
(at institutions and in industry)

(a) Cooperative Programme

16. Although at present applied R and D is taking place - on an ad hoc basis - in many small/medium industries and in provincial agricultural engineering faculties, directorates of agricultural engineering and a few national institutions. It is recommended that AMD of PARC assume a catalytic and co-ordinating role. This may be done through 3 ways:

- AMD assisting other agricultural engineering institutions (preferably under a subcontract arrangement) in active participation by the industry to initiate applied R and D on selected and agreed up on product;

- AMD assisting the industries in their efforts on applied R and D;
- AMD, directly - in co-operation with selected manufacturers - initiating applied R and D.

(b) Initial Prototype Manufacture and Initial Testing:

17. The initial prototype to be fabeicated at respective institution and limited (one season) field testing to be undertaken by institution. The facilities of many agricultural projects in the country to be utilized. AMD to co-ordinate this subcontract activity.

(c) Precommercial Prototype Production and Testing:

18. The following are the recommended programme of action:

- AMD preferably under a subcontract with selected manufacturers, to supervise and co-ordinate precommercial manufacture. Precommercial testing also to be undertaken by the manufacturers on selected farms in co-operation with appropriate institutions and AMD;
- Those farmers who have particpated in this precommercial testing programme by the manufacturer should have an option to buy the equipment at a greatly reduced cost (say 75% reduction);
- AMD should assist the small and medium scale industry to achieve a quality consciusness and upgrading of production technique through advise on material selection, process planning, quality control and design engineering and provision of drawings, jigs and fixture, critical parts (such as selfaligning bearings, oil scals, special hardware, etc) and technical services.

(vi) Initial Commercialization and Industrial Extension:

19. The following are the recommended programme of action:

- AMD has to play an important role in this "bridging" activity. AMD has to assist the small and medium industry in quality production and to achieve cost reduction through appropriate material selection, process planning and production planning;
- AMD, in this context should, with a view to act as a catalyst, initiate a quality imporvement upgrading programme of selected manufacturers in each area. This will act as a pilot demonstration scheme which will be a model for other neighbouring manufacturers;
- Agricultural Development Bank of Pakistan should finance a modest number of such machinery supply to the farmers (this will encourage the small/medium manufacturers to enter into initial batch level production with a guaranteed off take). ADBP in co-operation with AMD should involve the manufacturers to secure the opinions and views of the end-user (farmer to whom ADBP has financed purchase of the machinery and undertake final on-the-field modification (when appropriate which is a usual procedure in such initial commercialization, to be undertaken free of cost to the farmer by manufacture) and incoporate the final modificates in his commercial production.

(vii) Manufacturing Promotion:

20. The following are the recommended programme of action:

- The Ministry of Industry (and the Ministry of Production, when appropriate) should evolve an integrated policy, and assistance to small and medium industries manufacturing agricultural machinery, especially in the area of common engineering services, heat treatment, jigs and fixture provision and technical services.
- ATDC assistance to rural blacksmiths;
- The Ministry of Industry assistance through PITAC and small scale industry branch assist small/medium industries;
- The Ministry of Production through public sector agricultural machinery production units should have an integrated programme

of technical assistance to small/medium industries in acillary component manufacture;

- The Ministry of Industry should establish a Material Bank (structural steel, M.C. Sections, high carbon steel, coke, special standardized parts) to assist small/medium industries.

(viii) Standardization and Quality Certification:

21. The following are the recommended programme of action:

- AMD should initiate a programme of testing of commercially and locally produced agricultural machinery with a view to assist the manufacturers in achieving quality;
- AMD should assist in standardization of critical replacable/ inter-changeable components of the selected machinery;
- AMD should issue "quality certificates" to manufacturers on those products which are manufactured according to AMD's technical directives and specifications;
- The Ministry of Industrie's overall standardization and Q.C. programmes should take over on a national basis.

(ix) Fiscal Incentives and Policies:

22. There is a need to re-orient the present very attractive fiscal incentives to manufacturers and/or initiate additional incentives to reward those manufacturers who will

(a) participate in AMD's agricultural machinery R and D and pre-commercial manufacturing activities

(b) participate in AMD's programme in initial commercialization and industrial extension

(c) produce quality products subject to AMD's certification

(d) initiate viable activities to upgrade production facilities (establish engineering design, industrial engineering, marketing facilities such as tool room, quality control, heat treatment, etc) and

(e) employ qualified engineers and technicians
(f) participate in a proposed national repair and manufacture programme and
(g) participate in a proposed training programme (list not exhaustive);

- The Ministry of Industry in cooperpation with AMD may formulate guideline and recommend the same for consideration of appropriate authorities.

(x) Production Programme Monitoring:

23. There appears to be no institutional mechanism to monitor the production programme in small/medium as well as large scale (public and private sector) except on an annual basis of a two year cycle. The Ministry of Industry as well as the Ministry of Production may explore the possibilities of establishing a more intensive mechanism. However , as both sector activities have common elements, especially in basic facilities, and ancillary industry development, there is a need to initiate a common service monitoring system

(xi) Repair, Maintenance and Spare Parts Supply:

24. The following are the recommended programmes of action:

- The Ministry of Agriculture may explore the possibilities of establishing a "National Network on Repair and Maintenance of Tractor and Agricultural Machinery". A programme to involve provincial agricultural engineering directorates (workshops) in the above activity may be analysed;
- AMD may play an important role in promotion of such a concept and may assist in elaboration of the project;
- The Ministry of Industry and the Ministry of Production are recommended to develop a programme on spare parts manufacture and supply.

(xii) Training:

25. The following are the recommended programmes of action:

- There is a need to initiate an integrated training programme for mechanics/dealers in repair and maintenance and small/medium manufacturers in production technology. There is a need to initiate a national programme. The Ministry of Agriculture and the Ministry of Industry may explore possibilities of initiating such a programme. AMD may play an important role in promoting such a concept;
- The training of operators and farmers should be made mandatotory to the manufacturers. AMD may play an important role in formulating such a guideline for consideration of appropriate authorities.

(xiii) Mechanization Extension:

26. The mechanization extension - introduction of new machinery and techniques, training of farmers, rural education, socio-economic analysis etc - is a continuous process. The most effective method of achieving viable results in this most important area is to incorporate this activity in all agricultural development programmes in general and on going special projects such as Rainfed (Barani) agricultural development project, FAO executed field projects, proposed CIDA and other bilaterial projects etc. In addition the agricultural mechanization projects to the universities and provincial agricultural engineering directorates may be incorporated;
- It is recommended that the Ministry of Agriculture may analyse the same and formulate a rationalized programme of action;
- AMD may undertake a short-term analysis to establish guidelines.

(xiv) Technical Education:

27. There appears to be a lack of sufficient agricultural engineering educational facilities in Pakistan. The faculty of agricultural engineering are in agricultural universities at Faisalabad (Punjab) and Tandojam (Sindh) and in engineering University at Peshawar (NWFP). There is no national agricultural engineering faculty with emphasis on education oriented to engineering design and manufacturing technology on agricultural machinery and implements.

SECTION III

ROLE OF AGRICULTURAL MACHINERY DIVISION OF PARC

A. SCOPE

1. It is very evident that promotion of agricultural machinery sector in Pakistan requires an integrated approach involving the Ministry of Agriculture, the Ministry of Industry and the Ministry of Production.

2. However, as agricultural machinery and implements is one of the most important industrial input for agricultural development and production, it is but natural that the Ministry of Agriculture/PARC should take the leadership in promotion of such an integrated programme of action.

3. In this context, it is to be clearly pointed out that the activities of AMD-PARC are to be within the framework of its own mandate which includes bridging the gap between applied R and D and initial commercialization and industrial extension. However, AMD should play an important role of the institutional mechanism for the High Powered Agricultural Mechanization Board and also initiate selected programmes which will be a base for further elaboration by the Ministries of Agriculture, Industry and Production.

B. AMD's ACTIVITIES

4. It is noted that four components of AMD's activities will be as follows:

- Mechanization Research:
  Develop machinery specifications and design parameters of demand oriented machines.

- Machinery Design and Development:
  Engineering Design and Development of prototype machines and engineering adaptation of imported ones.

- Machinery Testing:
  Testing and evaluation of commercially available machines in the country with the primary objective of improving the quality of locally manufactured machines.

- Industrial Extension:
  Commercialization of agricultural machines developed locally. Assistance to local manufacturers through porvision of machinery designs, drawings, production engineering assistance.

C. AREA OF UNDP ASSISTANCE NEEDED

5. It is the mission members opinion that engineering design and development and industrial extension including commercial testing components of the project should be strengthened through UNDP/ UNIDO assistance. This is based on mission members' visits to the R and D institutions and small and medium manufacturers.

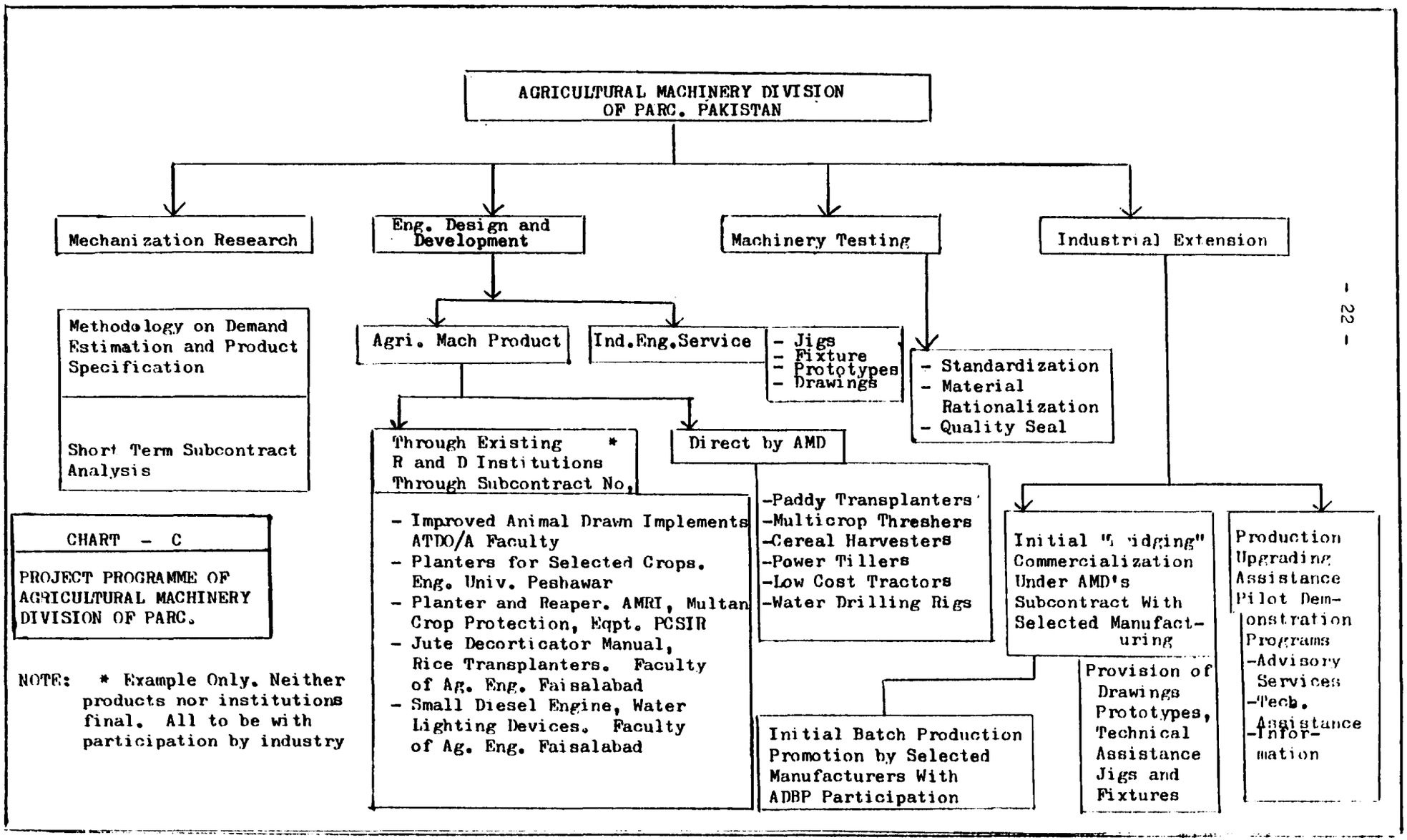
D. RECOMMENDED PROGRAMMES

6. The following programmes are recommended for AMD of PARC for the period 1982-86:

(i) Mechanization Research: Demand estimation and product specification.

AMD of PARC should develop long-term plans in co-operation with provincial Governments. The provincial directorates of Agricultural Engineering and Agricultural Engineering and Economic Institutions must play a continuous role.

7. Thus is a need to develop long-term policies. However, this should not come in the way of start up of AMD's activities. Therefore, a short-term analysis (under an international sub-contract) is to be initiated to estimate the preliminary demand and product specification on selected products within the framework of AMD's proposed activities.


AGRICULTURAL MACHINERY DIVISION OF PARC. PAKISTAN
Mechanization Research
Eng. Design and Development
Machinery Testing
Industrial Extension
Methodology on Demand Estimation and Product Specification
Short Term Subcontract Analysis
Agri. Mach Product
Ind.Eng.Service
- Jigs
- Fixture
- Prototypes
- Drawings
- Standardization
- Material Rationalization
- Quality Seal
Through Existing * R and D Institutions Through Subcontract No,
- Improved Animal Drawn Implements ATDO/A Faculty
- Planters for Selected Crops. Eng. Univ. Peshawar
- Planter and Reaper. AMRI, Multan Crop Protection, Eqpt. PCSIR
- Jute Decorticator Manual, Rice Transplanters. Faculty of Ag. Eng. Faisalabad
- Small Diesel Engine, Water Lighting Devices. Faculty of Ag. Eng. Faisalabad
Direct by AMD
-Paddy Transplanters
-Multicrop Threshers
-Cereal Harvesters
-Power Tillers
-Low Cost Tractors
-Water Drilling Rigs
Initial "Bridging" Commercialization Under AMD's Subcontract With Selected Manufacturing
Production Upgrading Assistance Pilot Demonstration Programs
-Advisory Services
-Tech. Assistance
-Information
Initial Batch Production Promotion by Selected Manufacturers With ADBP Participation
Provision of Drawings Prototypes, Technical Assistance Jigs and Fixtures
CHART - C
PROJECT PROGRAMME OF AGRICULTURAL MACHINERY DIVISION OF PARC.
NOTE: * Example Only. Neither products nor institutions final. All to be with participation by industry

(ii) Engineering Applied Design and Development:

8. R and D activities are to be undertaken with direct participation by the manufacturers with the institutional support from the design and development point of view. The work should include both development of domestic technology and adaptation of imported technology with emphasis on production at small and medium industrial units, with due consideration to standardization and quality control. This will require mobilization of existing institutional and industrial R and D capabilities in the country for specific agreed upon products.

9. The activities are to be in two channels:

(a) by selected provincial agricultural engineering institutions and national institutions on selected products under a subcontract of AMD and direct supervision;
for example: (only preliminary ideas; to be finally decided later)

- improved animal drawn implements and equipment total system suited to the needs of small farmers (for example by appropriate technology, development organization (ATDO), Islamabad);
- planter: cotton, groundnut, beetroot, tractor and animal drawn (for example by faculty of Agricultural Engineering, Engineering University, Peshawar);
- planter: sugar cane groundnut digger tractor PTO mounted reaper (for example by Agricultural Mechanization Research Institute, Multan);
- Crop protection equipment sprayers: cotton, sugar cane (for example by Pakistan Council of Scientific and Industrial Research);
- Jute docorticator, manually operated rice transplanter (for example by Department of Farm Power and Machinery, Faculty of Agricultural Engineering and Technology, Faisalabad);

- small diesel engine;
- low cost pump and water lifting device
  (for example by Department of Basic Engineering, Faculty of Agricultural Engineering and Technology, Faisalabad).

(b) by AMD directly; for example:

- power operated paddy transplanters
- tractor PTO driven multi crop thresher
- cereal harvesting machine
- power tiller 8-10 HP
- low cost small tractor (18 HP)
- low cost water drilling rigs

The Agricultural Machinery Division (AMD) will be directly associating the selected manufacturers in the prototype production and will supervise initial production by selected manufacturers under AMD subcontract.

10. The initial adaptation, engineering design and fist prototype production and "not too long drawn" field testing may be undertaken through institutional support with active participation of selected manufacture.

11. However, pre-commercial production and testing are to be undertaken by selected manufacturers under an AMD's subcontract.

12. The initial batch level production by selected manufacturers are to be with active financial support by Agricultural Development Bank of Pakistan and actual usage by farmers with active participation by AMD.

(iii) Industrial Extension Including Machinery Testing

13. There is a lack of integrated action on transformation of applied R and D into commercialization. This will call for AMD acting as the "bridge" between applied R and D and final commercialization. This will call for provision of improved designs, prototype samples, full set of drawings, material specification and technical support to the interested/programme participating small/medium manufacturers.

14. Unfortunately, this "bridging activity" will not be a viable programme if not accompanied by certain direct support. These include provision of jigs, fixture, and instrumentation for quality control, including some standard critical parts (such as self-aligning bearings, belts, high tensile hardware, high carbon heat treated parts, etc.) as well as selected special raw material.

15. This will also involve AMD formulating a programme on machinery standardization, testing and quality control for existing locally produced items by a number of manufacturers who have mushroomed during the past few years (primarily threshers, cultivators, seeders, ridgers, etc.).

(iv) Other Activities

16. AMD has to play an important role in the development of programme concepts on

- formulation of a methodology on long-term product demand estimation and product specification;
- assistance to small/medium scale agricultural machinery industries through common engineering services and material bank;
- quality certification;
- re-oriented fiscal incentives and policies;
- repair and maintenance;
- training.

17. However, it should be noted that these activities are to be undertaken only to provide the basic information to the concerned Ministries for their consideration for necessary action.

E. NECESSARY FACILITIES AND MANPOWER

18. In order to achieve such an objective, AMD should have high technical manpower, physical facilities (engineering design, office, workshop, tool dies and jigs fabrication, library, industrial extension aids) and some independence of action.

F. INSTITUTIONA FRAMEWORK: TECHNICAL ADVISORY COMMITTEE

19. A policy level Advisory Committee consisting of representatives of PARC, AMD, Ministries of Agriculture, Industry, Production, selected representatives of manufacturers and R and D institutions is to be constituted.

G. PROJECT DOCUMENT FOR UNDP-IPF/UNIDO ASSISTANCE

20. A draft project document on assistance to AMD of PARC for the period July 1982 - Dec. 1986 with an estimated UNDP input of around US $ 2.7 million for a project of 4.5 years duration is submitted as a separate document.

21. It is also felt that there is a need to initiate a start up assistance for a period of 12 months (Sept. 1981 - Sept. 1982) is also submitted as a separate document. It is felt that this phase is very necessary in order to undertake the "ground work" necessary at the grass root level and facilitate start up of 1982-86 project.

SECTION IV

NATIONAL AGRICULTURAL MACHINERY POLICIES

A. National Agricultural Policy

1. The document on "National Agricultural Policy" dated Feb. 1980 issued by the Ministry of Food, Agriculture and Co-operatives highlights overall policies on Farm Mechanization (page 11-12, para 34-40). The Government policies are to encourage selective mechanization which will meet the three fold objectives - increased production, equitable income distribution and increased employment opportunities. The highlights are as follows:

   - Intensification of efforts on local manufacture of standard tractors in public and private sectors;
   - Introduction of small horse power tractors and standardization;
   - Local production of spare parts;
   - Extensive repair and maintenance facilities and training;
   - Local development and manufacturing promotion of appropriate agricultural machinery through Agricultural Machinery Division of the Pakistan Agricultural Research Council and interlinked activities with provincial institutions;
   - Development and manufacture of improved bullock drawn implements, threshers, reaper binders and other equipment;
   - Continued incentives to the local manufacturers (duty refund on raw material, duty exemption on manufacturing machinery, income tax rebates, etc.);
   - Establishment of a mechanism on standardization

B. Agricultural Mechanization

2. Dr. Amir U. Khan in his paper "Public Policies and Agricultural Mechanization" (May 1980) has highlighted the critical situation and has made a number of valuable recommendations. The conclusion on the present status is that "so far, agricultural mechanization in Pakistan has benefitted mostly a small number of larger, more properous farms. If mechanization is to improve the conditions of the majority of the rural population, it would have to serve the needs of the small and medium size farmers. Pakistan has 28% of farms (5% of area) with less than 2 ha, 68% of farms (71% of area) with 2-10 ha and 4% of farms (24% of area) with 20 and above ha. Appropriate mechanization strategies would have to be evalued to satisfactorily cater to the three levels of farming communities", and the paper briefly outlines such an approach.

C. Government Guidelines on Agricultural Machinery Development

3. Vice Admiral M.F. Janjua, the Minister for Food, Agriculture and Co-operatives at his inagural address at the Second Annual Convention of Pakistan Society of Agricultural Engineers (Lahore, 9 April1981) has highlighted the following guidelines on agricultural machinery development in Pakistan.

(i) Mechanization

- There is a need to increase the intensity of cultivation which is still around 110% (i.e. only 10% of cultivated area is used for raising two crops a year) to a higher degree - at least to 150%.
- A large scale programme of farm mechanization is therefore very essential. However, such a mechanization has to be selective ..... small holdings of which 70% are below the subsistance level of 12.5 acres must be reflected in the mechanization strategy.

(ii) Policy and Implementation:

- Implementation of a sutable mechanization programme has to be carried out under a well-thought out plan and the policy issues will have to be carefully thrashed out.

- The Government of Pakistan is seriously considering the constitution of a high-powered farm mechanziation board.

(iii) Design and Development:

- Design and Development of farm machinery through research, experimentation and field trails must claim a high priority in Pakistan's Plan of Action.

- Government of Pakistan has sanctioned a scheme for establishment of farm machinery division in the Pakistan Agricultural Research Council.

(iv) Manufacture:

- Pakistan can not go on importing farm machinery indefinitely.

- Local facilities for the manufacture of farm machinery have to be encouraged. The Government in this connection, has announced a number of incentives - exemption from income tax, rebate on duty on raw materials and fabrication and testing machinery.

D. High Powered Farm Mechanization Board

4. The Government of Pakistan is seriously considering constitution of a High Powered Farm Mechanization Board. The Board may consist of 4 permanent secretaries of the Ministry of Agriculture, secretary of the Ministry of Production, secretary of the Ministry of Industry, Chairman PARC, Chairman PTC, manufacturers representatives and some knowledgable individuals.

5. Some of the tasks that will be entrusted to this Board alone:

* evolution of an integrated farm mechanization policy;
* encouragment of research and development of farm machinery;
* measures for ensuring availability of appropriate equipment through imports or local manufacture;
* quality control and standardization;
* removal of constraints in the wider and more universal adoption of machinery as may be required agricultural production and productivity.

E. Fiscal Incentives for Agricultural Machinery Production 1981

6. The Government of Pakistan's fiscal incentives consists of the rebate/refunds of indirect taxes (custom duty, excise duty and sales tax) and direct tax (income tax, weath tax, etc). The following are the highlights:

- The recognized manufacturers (by respective provincial Governments) will get the entire quantity of raw materials and components for the manufacture of 39 items of agricultural machinery and implements free of custom duty. At the time of import, he will pay only 30% in cash as custom duty (this is to ensure that he does not sell his raw material in the market) and the remaining amount is secured through an insurance guarantee. Even the 30% is refunded if and when the manufacturer consumes these raw materials within one year from his date of import;
- None of the locally produced items of agricultural machinery and implements are to be subjected to excise tax and sales tax;

- The income of companies engaged in the manufacture of agricultural machinery and implements are exempted from income tax;
- If the manufacturer is engaged in the export of agricultural machinery and implements, he is eligible for all the rebates of indirect taxes (which may have been paid on locally purchased raw materials and components) utilised by him in the manufacture and export of this machinery.
- All his company's income from export of machinery and implement is also exempted from income tax. However, like every citizen, the personal income is subject to tax.

F. AGRICULTURAL MACHINERY DIVISION OF PARC

A proposal was submitted by PARC to the Government of Pakistan on the establishment of a National Institute of Agricultural Mechanization (NIAM) at Islamabad. The proposal was approved by the Central Development Working Party (CDWP) in May 1979. This proposal was finally given approval by the Executive Committee of National Economic Council (ECNEC) in August 1979 with the recommendation that NIAM should be organized as a Division of the PARC rather than as an independent institute. Accordingly, the project is named as the Agricultural Machinery Division (AMD) of PARC.

A budget of Rs. 25 million for a period of 5 years with a total staff of 107 was approved by ECNEC for this scheme. The AEC of PARC will be merged in AMD and IIRI-PAK programme will be incorporated.

The four major activities of AMD will be:

(i) Mechanization Research: policy studies related to agricultural mechanization at the farm level. Development of specifications, design and paramters of demand oriented agricultural implements and machinery.

(ii) Machinery design and development: engineering design and local development, engineering adaptation of imported machines.

(iii) Machinery testing: testing and evaluation of various commercially available farm machines in the country with the primary objective of improving the quality of locally manufactured machines.

(iv) Industrial extension: commercialization of locally developed and imported/adapted machinery. Technical service to local manufacturers through provision of machinery design, engineering drawings, feasibility studies, production engineering assistance,etc.

G. Agricultural Development Bank of Pakistan (ADBP)

The Agricultural Technology and Technical Assistance Division (ATTAD) of ADBP is involved in promotion of appropriate level of agricultural mechanization in Pakistan. The Pakistan Agricultural Service Company (PASCO) also promotes appropriate mechanization through provision of inputs.

The 1979 World Bank loan of US $ 30 million and IFAD loanof US $ 30 million was primarily used for agricultural development and provision of inputs. However, it has been felt that these loans (67%) have only assisted the large farmers inpurchase of tractors and installation of tube wells. Therefore, ADBP has now initiated a priority programme to assist small farmers. However, there are constraints in import/local manufacture of low/medium horsepower machinery and equipment (less than 40 HP tractors and less than 20 HP engines). 5 units of 25 HP TAISHAN Chinese tractors have been imported ($ 3000/unit). Attempts are underway to secure Government permission to import more units. 1,000 units of Janmar 7-12 HP high speed (2,500 rpm) diesel engines will arrive in April/May 1981.

ADBP has 18 regions. Each region has 20 mobile credit offices (to be increased to 30 by end 1981). Each mobile unit (22 days travel/month) cover 25 villages and thus 5,000 villages are covered in each region.

ADBP through ATTAD wishes to promote commercialization of locally manufactured improved agricultural machinery and equipment through specific loans to the selected farmers and supervision of its utilization in the initial stages.

SECTION 7

ESTIMATED DEMAND FOR AGRICULTURAL MACHINERY

(i) PRESENT STATUS

1. There appears to be no systematic analysis for estimation of long term demand for agricultural machinery in Pakistan. However, it must be recognized that it is a continuos process and is a function of agricultural mechanization policies. The Government's recent guidelines and policy programmes have given an indication on the possible trends. Therefore, the priority local manufacturing programme promotion should be based on an intermediate term consideration, based on existing and immediate future requirements.

A. ANIMAL DRAWN IMPLEMENTS

2. There is no need to initiate a long drawn research, development and field testing activity in this sector in Pakistan. There is a need to import improved animal drawn plows, seed drills, tool bar, planter, groundnut digger, thresher, etc., from neighbouring developing countries and initiate a local pilot demonstration production on a small scale at rural industrial level. The field extension and extension should be a part of such a pilot demonstration scheme. In this context there is a need to undertake an analysis of the needs and develop a programme for local development and production.

B. TRACTOR DRAWN IMPLEMENTS

3. The farm mechanization group, in their report of January 1978, has identified the following tractor drawn implements which have a local potential for application and manufacture.

4. Sub soiler, chiesel plow, seed cum fertilizer drill, paddy transplanter, planters for cotton, potato and sugar cane, reaper, reaper pick up, reaper binder, harvesters for potato, cotton and sugar cane and improved wheat/paddy threshers are some of the products that may have a local demand and manufacturing potential.

5. The annual demand by 1982 is estimated during 1978 by international experts for agricultural implements and equipment as follows:

6. Tractors 42,000 units; cultivator 38,000; mould board plow 4,000; disc plow 4,700; disc harrow 3,700; levelling blade 16,000; rotovator 1,400; grain drill 2,750; fertilizer drill 400; power sprayer 700; trailer wagon 22,200; cane crusher 900; tractor powered wheat thresher 8,000; and electric engine/motor powered wheat thresher 3,200 units.

7. There is a need to undertake indepth analysis of the needs, and elaborate product specification, demand and local manufacturing potential.

C. POWER TILLERS

8. No detailed "mechanization analysis" and evaluation of applicability and potential for power tillers has been undertaken in Pakistan. There are a few reports giving some ad-hoc opinion.

9. The 1973 estimates by Dr. Javed Hamid of the Pakistan Planning Commission is that around 30,000 - 40,000 power tillers (10 HP) may be regarded as average annual demand for the 14 year period from 1971 to 1985, and the total potential demand is around 400,000 - 500,000 units in Pakistan.

10. There is a need to undertake an indepth analysis of the country's requirement and elaborate product specification, demand and manufacturing potential.

D. SMALL TRACTORS (15-30 HP)

11. There are no indepth analysis on the need for small tractor, the estimated demand, production specification and local manufacturing potential. It is very desirable that such an analysis is undertaken.

E. STANDARD TRACTORS (45 - 60 HP)

12. Although the present licenced manufacturing capacity is around 20,000 units/year (Plus another proposed unit with a capacity of around 4,000 units/year) there appears to be no indepth analysis of the requirements, imports and local manufacture. There is also a "repeatative technology import" for local manufacture of same range HP and similar type of tractors.

F. MEDIUM AND HIGH SPEED DIESEL ENGINES

13. It is the general feeling in Pakistan that the lack of light weight medium-high speed (5-6 kg/HP 2,000 - 3,600 rpm) diesel engines of less than 25 HP has been a serious bottleneck in the mechanization of small farm agriculture in Pakistan. There is a need for such engines for a variety of agricultural application: irrigation pumps, threshers, chaff cutters, cane crushers, crop processing machines, construction equipment, power tillers and small tractors. The three ranges of diesel engines required may be:

3 - 8 HP
10 - 15 HP
15 - 25 HP

14. Therefore, there is a need for an analysis of demand and specifications and an indepth techno-economic feasibility and investment study on local production of appropriate diesel engines in the country.

G. AUTOMOTIVE ENGINES

15. There appears to be no standardization and rationalization of the automotive engines. This will include high speed lower horse power engines which may be used on power tiller and for stantionary purposes, but also medium and high horse power automotive engines for tractor, trucks, as well as for earthmoving machinery and construction power machinery. Rationalization is necessary to promote local manufacture and for standardization of spare parts supply.

(ii) A METHODOLOGY FOR DEMAND ESTIMATION

16. From the above detailed information, it is evident that there is no detailed (scientific and technical) analysis of the demand for various agricultural machinery and implements in Pakistan. In addition, there is no detailed product specifications. Although it is a continuous process and a long-term process, the Ministry of Agriculture may initiate a long-term programme through privincial agricultural engineering faculties of the Universities. Such a programme may involve

- establishment of "optimum time" (standard "T" in days) available for primary tillage, sowing, secondardy tillage and harvest of major crops. This will call for controlled field experiments involving number of days of late sowing or harvest and its effect on crop production. Another simple method is to secure this general information from the farmers of the region;

- Based on the "optimum time" (T) establishing an inter-relationship between the optimum time and size of holdings and determining "available number of days" for given size holding (example:2,5,10,50 ha)
- Determination of average soil draft (kg/spcm) during primary tillage;
- Determination of "width of cut" and coverage per day for plowing, transplanting and harvesting and determination of size of power unit required for given average size of holdings for operation to be completed in "optimum number of available days";
- Determination of the size of the power unit (animal, power tiller 8-10 HP, small tractor 18 and 25 HP and standard tractors 35, 50 and 75 HP, transplanter - manual, power tiller/ self-propelled, reaper-power tiller, tractor PTO and self-propelled, etc.);
- Determination of the overall "national ultimate potential" for each type equipment based on size of holding and major crop pattern;
- Analysis of historical data, imports, co-operative and custom farming, etc.; and possible future trends including agricultural development, finances, etc. and estimating (in other words, an intelligent guess work always!) of the demand for next 4-5 years (say 1983/84 - 1989/90) together with product specification.

17. It should be noted that the above methodology may be made as complicated, exhaustive, accademic and long-term as possible. On the other hand, it could be simplified and by cutting corners could be made a project of 3-4 years duration, with active project implementation by provincial institutions.

18. However, considering the immediate priority needs, it is recommended that an integrated general analysis to estimate preliminary demand and product specification is undertaken, under a multidisciplinary team of experts with a view to outline an immediate/intermediate agricultural machinery programme start up.

(iii) RECOMMENDED PROGRAMME OF ACTION

19. Two programmes are recommended as follows:

(a) A long-term (3-4 years) programme by national provincial agricultural engineering institutions in co-operation with selected national/provincial economic institutes - to determine demand and product specification for the period (1983/84-1989/90).

(b) A short-term (2-3 months) multidisciplinary experts analysis to estimate preliminary demand and product specifications to facilitate start-up of a priority programme for 1982-85.

SECTION VI

IMPORT OF AGRICULTURAL MACHINERY FOR INTRODUCTION

(by industry and financial institutions)

(Note: The following is the summary of the imports of some machinery with the primary view of introducing the same in Pakistan. The equipment may be sold to the farmers or given for on-the-farm trails. The analysis of overall manufacturing possibilities may be taken up at a later date by some of the local firms).

A. POWER TILLERS

1. During 1976 Pakistan Tractor Corporation had a contract to import 2000 chinese power tillers and during 1977 around 1000 power tillers were imported. The present feeling is that "poer tillers are not suitable for this country". However, this is based on not detailed techno-economic evaluation. The Government approved list (makes and HP) of power tillers for import includes quite a few makes of similar power tillers. Rationalization of this list to two or three makes is necessary.

B. SMALL TRACTORS (20-35 HP)

2. The Farm Mechanization Group in their report of January 14. 1978 recommended import and testing of small tractors. During mid 1970s 5 different makes of 20-35 HP conventional tractors were imported and have been under test with the porvincial Agricultural Engineering Department at Fizalabad for about 3 years. No test results have so far been made available to the public.

3. In May 1980 the Government of Pakistan decided to allow import of less than 20 HP tractors and ban import of tractors of the range 20-40 HP. The tractors of less than 20 HP were for small farms and restriction on 20-40 HP was based on the idea that there is little difference in price between these ranges and medium range (40-65 HP) tractors currently imported.

4. However, in the wake of land holding ceilings, the following are the recent development regarding small tractors during 198081.

- Agricultural Development Bank of Pakistan (ADBP) is trying to introduce small tractors;
- The Government of Pakistan has permitted ADBP to import 5 tractors of 25 HP from China which are currently being tried on private individual farms;
- Recently the Government of Pakistan has indicated their acceptance to ADBP's idea on import of 100 small HP tractors from Japan (less than 20 HP);
- Recently the Government of Pakistan has indicated their interest on the import of 50 units of 25 HP tractors from USSR;
- It is reported that certain dealers recently imported 3 units of Kubota, Hinomoto, Iseki and Yanmar tractors of 30-35 HP and being tested at provincial directorate of agricultural engineering. Test on Yanmar is still going on; other 3 have been passed. These tractors are yet to be standardized. Afterward commercial imports are possible.
- ADBP, subject to the Government's approval, has plans to import 100 tractors of 22-25 HP which will be sold to the farmers; and is in the process of registration of interested farmers.

5. Agricultural Development Bank of Pakistan (ADBP) has imported in 1980 five units of 25 HP Taishan Chinese Tractors and are used by farmers.

6. Dadins Agro Engineers Ltd. of Gujranwala have imported a few Chinese 25 HP tractors.

7. Recently a scheme to import a limited number (15 units?) of "Self-Help" tractors (8-12 HP) under a U.S. voluntary aid programme of small scale mechanization in Pakistan has been approved and it is reported that the units have just arrived in Pakistan.

C. STANDARD TRACTORS

8. Pakistan has more than 30 years of field experience in utilization of standard tractors. During 1964/65 - 1976/77 a total 78,091 tractors were imported.

9. The farm mechanization in their report of January 1978 has estimated the annual demand of 20,000 units in 1978 increasing to 42,000 units by 1982, thus reaching a total tractor park of 162,000 units.

10. The Government approved a list of tractors for import includes tractors of 45-60 HP size. Thus the list has in effect successfully banned import of all tractors below 45 HP.

11. The Government approved a list include 5 makes. The 1978-80 import indicate around 65% in the range of 40-50 HP and around 35% in the range of 50 HP and above.

12. The approved standard list (Group A) of tractors for import is as follows:

M.F.	240,265
Fiat	480,640
Ford	3,600; 4,600
Bylarus	MTZ-50
I.H.	444

The Group B list which allows import when Group A is not available is as follows:

IMT
David Brown
Zeotr
Deutz
Ursus
(all between 45-60 HP)

D. TRACTOR DRAWN IMPLEMENTS

13. The 1964-65 tractor import licence scheme is supposed to devote 16,3% for import of tractor implements, 16,3% for import of spares and 66,3% for import of tractors. Although around 25% of tractor value is earmarked for import of implements, the current tractor imports are not following this scheme and there is a lack of matching full range of equipment and implements.

14. Pakistan Tractor Corporation (PTC) during 1976/77-80/81 has imported a limited quantities of different range of tractor drawn implements. Only cultivators are made in Pakistan and cannot be imported. However, the Government list on approved implements for import does not include many important implements that are needed in the country. Since such implements have not been introduced previously, local demand or production has not yet developed.

E. PADDY TRANSPLANTERS

15. The imported Korean self-propelled transplanter, the Japanese power tiller tranplanter and Indian manually operated transplanter were found to be not suitable. A Chinese bicycle type transplanter is being imported for local testing. IRRI-Pak Programme has developed a manually operated transplanter.

F. POTATO DIGGERS

16. Fizal Engineering Company (Islamabad) has imported (April/May 1981) 13 units from U.K.

G. PEANUT DIGGERS

17. Fizal Engineering Co. has imported (April/May 1981) 10 units from USA.

H. MULTICROP THRESHERS

18. Dadins Agro Engineers Ltd. of Gujranwala have imported a few Chinese RF-450 model threshers for rice and wheat; 6 threshers have been put in the field.

I. REAPER-BINDER

19. During 1976/77-1979/80 Pakistan Tractor Corporation (PTC) has imported a few walking reaper binders.

20. M/S ISGA Ltd. also imported 9 units of self-propelled cutter cum binders in 1978 from Italy.

21. Fizal Engineering Company has imported (April/May 1980) 7 units from Italy.

J. HARVESTERS

22. The Pakistan Tractor Corporation during 1977/79 imported 50 units of JF Tractor mounted combines.

K. DIESEL ENGINES

23. Pakistan has more than 30 years of experience in application and manufacture of diesel engines for agriculture. However, almost initial 20 years of experience is limited to slow speed (600 rpm, 6-10 HP) heavy, old lister type diesel engines. Only from the past 10 years improved diesel engines of low-medium sped (1500-1800 rpm, are being produced by 2 companies. These are still heavy (arcund 15 kg/HP) and suited to stationary use in general.

24. Since imports of diesel engines of less than 20 HP size, irrespective of types has been banned for a number of years, local demand for medium and high speed (2000-3600 rpm) low weight diesel engines are not yet developed and manufacturers have not made nay efforts to locally produce wuch engines in the country.

L. HIGH SPEED ENGINES

25. Agricultural Development Bank of Pakistan (ADBP) in April 1981 has imported 1000 units of Yanmar 7-12 HP high speed (2500 rpm) diesel engines.

SECTION VII

PRESENT MANUFACTURING STATUS

1. There are around 400 agricultural machinery manufacturers in Pakistan of which around 100 may be regarded as medium scale and the rest as small scale. Due to the Government encouragment and financial incentives,the number of manufacturing units have have trippled during the past 3 years. However, the product range is limited, quality poor, production technology inadequate and engineering design and development non existent. The following are the details:

A. HAND TOOLS AND MANUALLY OPERATED EQUIPMENT

2. Hand tools such as shovels, sickles, rakes, pickax, etc., are primarily manufactured in village level blacksmiths. There is also a limited import of these items. However, no analysis has been undertaken on the needs, and on the quality of these locally produced items. There is not a single small/medium scale engineering firm making quality hand tools in Pakistan, with propoer steel, manufacturing techniques, heat treatment and durability.

3. There are a few small scale manufacturers who are making hand operated chaff cutters, hand maize shellers and sprayers, together with other agricultural machinery, such as threshers, trailers and tractor drawn implements.

4. It is reported that many hand tools are manufactured by urban blacksmiths and implements are made by rural artisans. The NWFP villages Takhtbai and Sarderi are known for blacksmiths making special animal plows out of scrap iron on a rural artisan basis.

B. ANIMAL DRAWN IMPLEMENTS

5. It is very interesting to note that Pakistan, inspite of a large number of bullocks used in agriculture, has no significant production of improved animal drawn implements. Only wooden "Desi" plows, wood peg cultivator and wood leveller are used. There are a few small manufacturers (around 20-30 units) who are making improved plows on a limited volume basis. However, such manufacturers have given more importance to thresher and tractor blade fabrication.

6. There are a few manufacturing bullock operated sugar cane crushers and cutters.

C. TRACTOR DRAWN IMPLEMENTS

7. Pakistan has a number of small and medium level manufacturers who primarily make rigid and spring tyne cultivators. Around 17,000 - 20,000 units/year are produced. Even these cultivators are not of quality and standard, as there is a wide variety of material selection and heat treatment of critical parts. The second most widly used equipment is a trailer. Trailer and trailer hitches are manufactured by many units. There is a limited local production of dric harrow, chiesel plow, ridger tractor blade, and mould board plow. In general chiesel plows, ridger, mould board plow and dric plows are seldom used on the farms. There are some making simple seed drill. Seed cum fertilizer drills and planters are not manufactured even on at modest volume.

Manufacturing:

8. The only manufacturing firm (out of many firms visited) which is Manufacturing quality tractor drawn implements (dric plow, harrow, chisel plow, M.B. plow, seed drill, cotton planter, leveller, etc.), is GMTC at Rehemeyerkhan (Punjab). GMTC has good manufacturing facilities, (machine tools, tool room, heat treatment, die, jigs and fixture production) and organizational aspects (stores, quality control, inventory control, etc)., as well as good designs. The only major constraint with GMTC is its lack of market development and

marketing capabilities at present. (Another problem may be lack of institutionalized management system on factory operations).

9. Recently some attempts have been made by some manufacturers to produce selected other tractor drawn implements. The following are a few examples:

(i) Cotton planter:

10. GMTC Company at Rehemeyerkhan (Punjab) is making quality semi-automatic tractor drawn cotton planter (1-2 row).

11. Climax Engineering Company at Gujranwala - based on given local design by Punjab Government - are producing 500 units of cotton planter for Punjab Government (Rs 3,000 per unit). There appears possibilities for simplification of the design and lower cost of production.

(ii) Tractor Drawn Ground Nut Diggers:

12. Around 4-5 companies (small manufacturers) are making simple blade type tractor drawn groundnut digger (around Rs 1,600 per unit). It is reported that around 250 implements are made per year. They are with a blade or blade-roller combination.

D. STANDARD TRACTORS

13. The Government during 1980-81 has approved 4 local manufacturing licences (2 in public sector and 2 in private sector) as follows: Massey Ferguson, Fiat, IMF and Bylarus (yet to be finally approved). Only Millat Tractors in public sector are assembling MF Tractors (6,000 units/yr) with a claimed local content of around 20%.

E. CROP PROTECTION EQUIPMENT

14. Three companies in Pakistan are manufacturing crop protection equipment. JECO at Karachi manufacture power (3-4 HP) sprayer (imported engine and nozzle), and hand operated sprayer and trolley mounted sprayer. The Carvan at Karachi manufacture hand operated knapsack sprayer. Another firm in Lahore manufacture power and hand sprayer. However, the production volume is limited and engines, nozzle andother critical parts are imported.

F. STANDARD WHEAT THRESHERS

15. In 1976, Pakistan produced around 5,100 threshers, out of which Punjab alone produced around 4,000 threshers. In 1980 the Pakistan production is around 10,000 threshers manufactured by around 15 medium units and 80 small units in the country. These are primarily copies of one design, reproduced without drawings or rigid material specifications.

G. POWER SUGAR CANE CRUSHERS/

16. Standard power operated (PTO, Engine, Electric Motor) sugar cane crushers are manufactured locally by many small/medium companies. However, no applied R and D has been undertaken to increase their efficiency. Only recently PCSIR Peshawar undertook such a work and has developed an improved design.

H. POWER MAIZE SHELLER

17. 3-4 firms are making power operated maize shellers with hopper in a modest volume.

I. Diesel Engines

(i) Slow Speed Stationary Engines

18. There are many small amnufacturers making low speed engines (8-15 HP, 350 RPM weight 1600 kg/16HP engine). The directory of such manufacturers and other details are not available.

(ii) Medium Speed Engines

19. There are a few manufacturers. The total production in Pakistan is around 1500 units. For example Ittafaq Brothers make 7.5 HP diesel engine 1500 - 2000 RPM and 1979-80 production was around 500 units.

20. PECO manufacturers MH-1 model (9 HP 1800 RPM). It also manufactures 15-20 HP (1500 - 200 RPM engines). However, the manufacturing capacity is highly underutilized (35% capacity utilization). The total capacity is around 3600 units/year and 1981 production will be around 600 units only. (Note: The above information may have to be rechecked properly, to secure a correct perspective).

21. "Matchless" 9 HP and 12 HP (1800 - 2000) RPM diesel engines are also produced by one company on a modest basis.

22. ITTAFAQ also produces 7.5 HP diesel engines. All above diesel engines are not light weight high speed engines. They weigh around 120 - 150 kg per unit and are not real automotive type and compact in design.

SECTION VIII

MANUFACTURING INDUSTRY IN PAKISTAN: PROFILES, DISTRIBUTION PATTERN AND SALES TURN OVER

(i) Profiles:

1. The three tractor units in Pakistan for all practical are to be considered as assembly operations and present status and constraints are detailed in a separate section.

2. Considering the agricultural implements and machinery manufacturing sector in Pakistan, it may be divided into 3 categories: blacksmith shops, small scale units and medium scale units (large scale units do not exist in Pakistan). The following are the highlights of such amnufacturing units in Pakistan:

(a) Blacksmith shops:

3. These are one person owned with 2-3 family workers. Around 60% will have electricity and 40% operate without electricity. The only production equipment are anwil, forge, hand tools, hammer and drill;some may have welding equipment. The raw material is scrap iron. The production is around 3-4 impelments per week (Rs 100/unit). The monthly turn over is around Rs 2,500 - 4,000. The total number of such blacksmith shops and other details are not known.

(b) Small Scale Manufacturers:

4. Those are family owned units with 10-15 workers. The production equipment are old lathes, drills, electric and gas welding, forge, grinding machine. There are no shaping, milling machines, no heat treatment, no design, quality control and process planning facilities. The raw material used are primarily mild steel and medium carbon steel of unknown specification castings and high carbon steel parts of unknown specification and heat treatment) are bought from other manufacturers.

5. The field analysis has indicated annual sales turn over of around Rs 2 million by each of these small scale units in Pakistan. The estimated total number of such units in Pakistan is around 325 and the total annual sales turn over is around Rs 650 million. The following are the production details of such a small scale unit (2 examples).

Table I. Pakistan: product and turn over of a small unit

example no. 1

item	units/yr	weight	price/unit	annual turn over (million Rs)
cultivator 9 tine	500	180 kg	Rs 3,200	1.6
MB plow	50	260	4,000	0.2
Tractor blade	200	100	1,000	0.2
ridger	100	185	3,000	0.3
trolly hitch	1,000	28	300	0.3
Total	1,850			2.6

example no. 2

item	units/yr	weight	prices/unit	annual turn over (million Rs)
tractor trailer	100	4 T capacity	Rs 10,500 (without tyres)	1.05
cultivator 9 tyne	150	180 kg	3,000	0.45
trolly hitch	2,400	28	300	0.72
tractor blade	100	100	1,650	0.16
Total	550			2.38

(c) Medium Scale Manufacturers:

6. These are also family owned units with 30 - 70 workers. The production equipment are a number of lathes, shaper, milling machine, welding, elementary heat treatment. There is no engineering design, quality control, inventory control and process planning facilities. Jigs and fixtures are not used. The castings are either bought outside or made with their own sister firm.

   The total number of such medium scale manufacturers is estimated to be around 100 in Pakistan.

7. The field analysis has shown that average sales turn over by each unit is around Rs 5 million. Thus the total turn over of such medium units (including agricultural implements operations of a few large engineering units) is around Rs 500 million. The following are the production details of such a medium scale unit (3 examples).

Table 2: Pakistan: Production and Turn over of a medium unit

example no. 1

item	annual production units	unit sale price/Rs	annual turn over Rs million
wheat thresher	100	18,000	1.8
sugar cane power crusher	100	6,000	0.6
sugar cane animal crusher	900	2,500	2.2
power chaff cutter (without engine)	500	1,250	0.6
manual chaff cutter	9,500	500	4.7
Total			9.9

example no. 2

item	annual production units	unit sale price/Rs	annual turn over Rs million
threshers	300	20,000	6.0
cotton planter	500	3,000	1.5
Total			7.5

example no. 3

item	annual production	unit price Rs	annual turn over Rs million
thresher	400	20,000	8.0
trailers	180	10,000	1.8
cultivator	140	3,000	0.42
tractor blade	80	1,000	0.08
other implements such as plow, seed drill, etc.	200	1,500	3.00
Total			13.30

(d) Large Manufacturers:

8. There is only one large manufacturer of agricultural machinery and implements in Pakistan. The tractor firms are still in elementary stage. A few engineering firms who make agricultural machinery (such as threshers, engines, pumps, spravers) make other engineering products. These agricultural machinery sections of the firm may employ 120-200 persons. However, the firms have no design engineering, producess planning, industrial engineering and quality control facilities in general. The agricultural engineering operations of those firms may be regarded as "medium scale".

9. The only large manufacturer is Ittafaq Ltd. in Lahore, who manufactures 3,000 threshers per year (Rs 20,000/unit) and 500 engines of 7.5 HP 1,500 - 2,000 rpm (Rs 6,000 per unit) with a total annual sales turn over of around Rs 63-65 million.

(ii) Regional Distribution of small and medium units in Pakistan

10. There is no up to date national directory. However, through verbal information of some knowledgable persons in Pakistan, the following details the estimated distribution pattern in 4 provinces of Pakistan:

Table 3: Estimated Distribution pattern of small and medium scale agricultural machinery manufacturers in Pakistan

Province	City/Town	Total Units	No. of units medium level	Small scale units
Punjab				
	Faisalabad	40	10	30
	Mianchannu	40	6	34
	Multan	40	15	25
	Lahore	30	10	20
	Sargodha	30	8	22
	Daska	30	10	20
	Gujaranwala	24	4	20
	Manawala	12	2	10
	Gojra	12	2	10
	Bahawalpur	10	2	8
	Okara	10	2	8
	Sahiwal	7	2	5
	Sheikhapura	7	2	5
	Jaranwala	6	1	5
	Mandi Chuharkana	5	1	4
	Sailkok	4	1	3
	Gujarat	4	1	3
	Wazirabad	4	1	3
	Sub total	315	80	235

Sindh	Karachi	28	8	20
	Hyderabad	14	4	10
	Larkhana	13	3	10
	other towns	10	0	10
	sub total	65	15	50
NWFP	Peshawar	12	4	8
	Mardan	7	1	6
	Nowshara	6	1	5
	Gujergaru	5	-	5
	Sarderi	5	-	5
	other town		-	5
	sub total	40	6	34
Baluchis-tan	Hubchowki	3	-	3
	other towns	5	-	5
	sub total	8	-	8

(iii) Estimated Annual Sales Turnover

11. Based on estimated distribution pattern of number of small and medium units in Pakistan and average turn over, it is estimated that the total annual sales turnover is around Rs 1,000 million in agricultural implements and machinery production units in Pakistan, as detailed below:

Table 4: Estimated Annual Sales Turnover by Small and Medium Agricultural Machinery Industry in Pakistan

Province	Total no of units	No of units medium units	No of units small scale units	Estimated * total annual sales turn over Rs million
Punjab	315	80	235	870
Sindh	65	15	50	175
NWFP	40	6	34	98
Baluchistan	8	-	8	16
Total Pakistan	428	101	327	1,159

* Assuming an annual turnover of Rs 2.0 million by a small scale industry and Rs 5.0 million by a medium scale industry

12. Thus, taking into account the rural blacksmiths, above detailed (estimated) small and medium units and 1-2 relatively large units of agricultural implements and machinery production in Pakistan the estimated annual domestic production sales turn over may be in the order of around Rs 1,250 million (equivalent to around US $ 125 million).

SECTION IX

MUSHROOMING OF AGRICULTURAL MACHINERY MANUFACTURERS

(i) Mushrooming:

1. The demand for specific products (threshers, cultivators, tractor blade, trolly hitch seed drills, and trailers) and the very encouraging incentives provided by the Government, a large number of small/medium agricultural machinery manufacturing firms have been started up in private sector from the past 3 years.

2. For example at Mianchannu (Punjab), during 1978, there were only 2 manufacturing firms. In 1981, there are around 40 manufacturers of which 6-8 are medium scale (average annual turnover around Rs 4.0 - 5.0 million) and the rest are small scale (average turnover Rs 2.0 million). The total annual turnover of agricultural machinery manufacture at Mianchannu is Rs 60 - 65 million and the industry employs around 800 - 900 workers.

3. In Faisalabad alone there are around 40 agricultural machinery manufacturers of which 4-6 may be regarded as medium and the rest small scale. Around 35 are manufacturing standard threshers primarily through copying from other local manufacturers.

4. In Multan area alone there are around 40 agricultural machinery manufacturers of which 15 are medium and the rest are small units. Wheat threshers, sugar cane crushers, chaff cutter and trailers are important products.

(ii) Problems:

5. It is interesting to note that there are no real technology gap between small and medium scale agricultural machinery industry in Pakistan. The only difference is the number of units produced and the number of labour force. However, in all units, there is a lack of quality, production technology, engineering know-how and management.

6. The overall problems of small andmedium scale agricultural machinery industry in Pakistan may be summerized as follows:

- Lack of sufficient marketing and export outlets organization;
- Lack of suitable designs. In many cases those supplied by foreign collaborators need modification for local use;
- Uncertainties in supply of spare parts, which often lead to machine breakdowns and plant stoppages;
- Higher production costs caused by interior productivity and production techniques;
- Lack of correct raw materials at reasonable price;
- Lack of technical personnel at the middle management level;
- Lack of production engineering and design engineering facilities;
- Lack of training facilities, particularly at the operator level;
- Substitution of high-quality parts with lower-quality ones to save money. This is false economy and reduces customer satisfaction.

(iii) Possible solutions:

7. In order to improve this sector, the following points need special conideration:

- Bulk purchase of raw materials and subsequent distribution at reasonable prices (material bank);
- Financial assistance through credit for purchase of raw materials and new machinery;

.../..

- Introduction of product mix operations;
- Supply of improved designs;
- Intensification of training facilities;
- Introduction of industrial engineering techniques, process planning and quality control and cost control;
- Introduction of standardization, design and development engineering;
- Direct assistance in improving production technology.

8. There is no overall solution to these problems. Individual agricultural machinery manufacturing units must analyse all of the major problems that hinder their production. However, the Government aided common technical service, engineering facilities and training programmes are very necessary. On the other hand, it is necessary that the Government direct its incentive policies to reward those units which will initiate engineering and quality control activities and production upgrading.

SECTION X

TRACTOR MANUFACTURE PROJECT
DETAILS AND CONSTRAINTS

1. The following licences have been granted by Government of Pakistan during 1979-81.

(i)	Millat Tractor, Lahore: (public sector)	Massey Ferguson model MF 135, Mf-165	6,000 units/yr
(ii)	P.T.C. Karachi (public sector)	Fiat Italy model 480, 640	10,000 units/yr
(iii)	Associated Agencies Lahore (PVT Sector)	IMT Yugoslavia 47 and 55	4,000 tractor/yr

It is also reported that following company will be also lincenced.

Facto Pakistan, Lahore (put sector)	USSR Bylarus MTZ-50	3,000 units/yr

A. PAKISTAN TRACTOR CORPORATION (public sector)
(Karachi, Fiat Tractors, models 480, 640)

2. The licenced capacity is 17,000 tractors/year. The investment is Rs 225 million. The plant initial staff around 200 in 1981/82 and to reach 511 by 1987/88 with shop floor staff of 150. The in-house manufacture will consist of assembly, provision tooling required by venders, and 2 machine lines for machining of transmission case and centerhousing. The investment includes pattern cost for major castings. Inhouse manufacture does not include machining of rear axle or any other components. The local content by end of 6 years to each 85%. The total staff of 511 to include 150 shop floor persons, 40 in local purchase and import section, 45 in quality control, 30 in industrial engineering, and 30 in vender cell (engineering development plus R and D).

B. MILLAT TRACTORS (public sector MF)

3. Massey Ferguson started its operation in Pakistan in 1967. Millat tractor are assembling MF tractors from the past three years under an old 1968-69 MF-Pakistan agreement. The agreement for phased local manufacture is not very clear. Some quarters of MF - as reported - appears to be of the opinion that there is no up to date firm licencing agreement as per usual international standards.

4. At the present models MF 135 and MF 165 are assembled (6,000 tractors per year on single shift basis, 35 tractors/day). It is reported, that around 250 parts constituting around 25% is locally made by end of 1980. The planned January 81 - June 81 deletion is 7.52% (cummulative 30.46%) and planned July 1981 - June 1982 deletion is 10.3%, (cummulative 40.78%). The deletion percentage is calculated on ex works price U.K. By 1986 around 75-80% is expected to be locally made. At present, the total staff is 470 persons including 189 in assembly. The investment at Millat Tractor plant in Lahore is Rs 14 million.

5. The local manufacture is to be based on in-house machining of some engine components, (engine block , head) and all other components bought from venders or imported and local assembly.

6. Millat Tractor has a product local development department (1 year old) with 14 persons (7 engineers, 5 inspectors and 2 draftsmen) at Lahore and 7 persons (3 engineers and 4 other staff) at Karachi.

C. ASSOCIATED AGENCIES, LAHORE (PVT sector)

7. IMT Tractor, Jugoslavia; 47 and 55 HP licenced in early 1981. The total investment is Rs 135 million. Licenced capacity 3,000 tractors/yr. The proposed staff 200. The proposed programme will involve 20% deletion by 1982 and 80% deletion by 1986. The programme will involve 30 local venders and Rs 100 million in ancillary industries.

D. SOME CONSTRAINTS IN TRACTOR MANUFACTURE (automotive sector)

8. The two public sector tractor manufacturing ventures are with Pakistan Automobile Corporation (PAC). PAC also wishes to promote local manufacture in automotive sector under public sector. The presently licenced one tractor manufacture in private sector and anticipated second tractor licence in private sector should also be considered from a national point of view, in planning of the total tractor/automotive/ancillary industry sector.

9. The following is the summary of magnitude of the C.E.M. sector of Pakistan Automobile Corporation (and its subsidy Pakistan Tractor Corporation) and private sectors.

Product	Company	proposed annual production by 1986 (demand figures)
Tractor	Millat Tractor	6,000
	P.T.C	10,000
	Assoc. Agencies	4,000
Truck	National Motor Bed Ford	10,000
Bus	National Motor Fiat/Bed Ford	3,000
Jeep	-	4,000
Cars	900 cc	20,000
	1,300 cc	20,000
Light commercial vehicles	-	10,000
Total		67,000

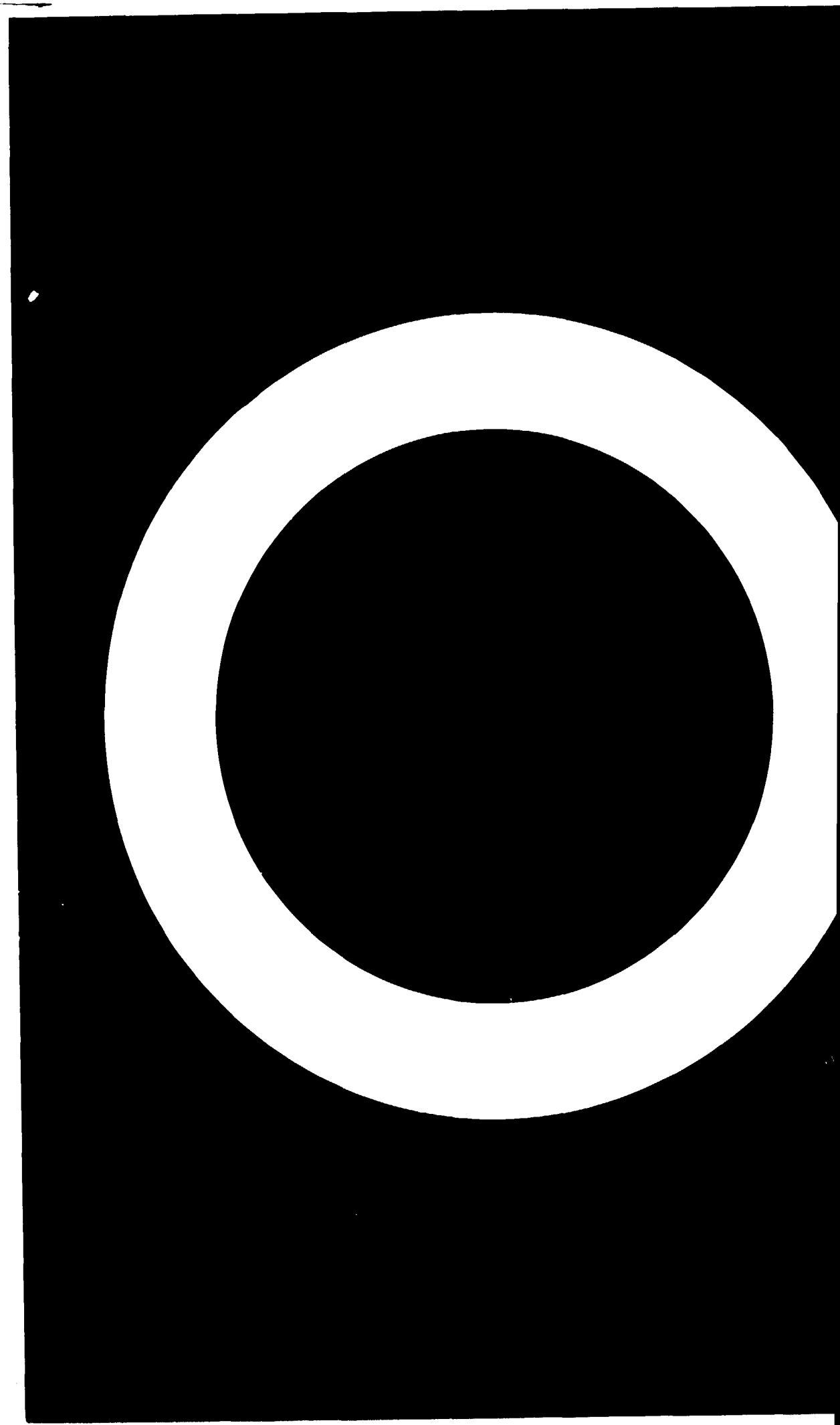
10. In addition to this 67,000 O.E.M. products, the ancillary industry promotion should take into account the requirements for other engines manufacture and the total spare parts requirements for the existing park and future additions.

11. The whole local manufacturing proposal aims at attaining 85% local content in 5-6 years (by 1986/86). However, the investment for each of the major manufacturing plant is around Rs 150 million with eventual staff of around 400 - 500 persons in each plant by 1986-87.

12. The project proposal also aims at very limited in-house production and outside local vender development and ancillary industry promotion. This includes castings, forgings, gears, machined components, sheet metal components and other usual components (electrical, rubber, plastic, etc.). In addition, properitary item are to be manufactured under separate licence. This is a huge task.

13. It is not very clear if an indepth analysis of local existing potentials and existing facilities have been analysed to serve as ancillary industries. There is also a need for investment analysis for component manufacture, facilities for training of technical manpower and development of organizational and management capabilities.

14. Without going into details - it is very apparent - that unless some very integrated and authoritative steps (with powers on protection of local industry, tariff regulations, monitoring and co-ordination) are taken now on a priority basis, it may not be possible to reach 1985/86 targets.



SECTION XI

A. PRODUCT LIST FOR MANUFACTURING PROMOTION

1. The following list consists of products, which are identified as those having a potential for local development and manufacture in Pakistan:

(i) Quality hand tools:
- sickle matchet, shovel, pick ax, etc.;

(ii) Hand operated machines:
- chaff cutter, groundnut decorticator, maize sheller, rice transplanter, knapsack sprayer, duster;

(iii) Animal drawn implements:
- mould board plow
- chiesel plow
- seed drills
- seed drill/fertilizer distributor
- planter: cotton, groundnut, beetroot, tobacco
- groundnut digger
- reaper
- sugar cane crusher, etc.

(iv) Tractor drawn implements:
- sub coilers
- chiesel plows
- mould board plows
- disc harrows
- rotary tillers
- seed/fertilizer distributor
- planter: cotton, groundnut, bettroot, tobacco, sugar cane
- rice transplanter
- groundnut digger
- reaper (tractor mounted)
- reaper/binder (tractor mounted)
- boom sprayer
- combine harvester

(v) Power Tiller with implements:
- 6-10 HP simple power tiller
- transplanter
- reaper

(vi) Small ridging tractor (15-25 HP):
- simple low HP tractor with attachments (18 HP and 25 HP)

(vii) Standard tractor:
3 HP range (35 HP, 50 HP and 75 HP)

(viii) Crop protection equipment (power operated):
- micro engine knapsack sprayer
- trolly mounted engine sprayer

(ix) Medium speed diesel engines (4-15 HP):
- 3 HP range (4-6, 8-10, 12-15 HP)

(x) High speed diesel engines (8-25 HP):
- 3 HP range (8-10, 15-18, 20-25)

B. PRIORITY LIST FOR LOCAL R AND D

2. Although many products could be undertaken for local R and D, with due consideration to the existing and immediate future R and D technological capabilities, physical facilities and infrastructure, as well as the immediate needs, it is recommended that the following list of product is considered for applied R and D.

3. Such R and D must be undertaken with manufacturers as the nucleus with institutional support from design/development point of view. The field testing should be undertaken by the manufacturers with institutional support and direct participation by selected farmers. In this context, it is to be emphasized that the role of the R and D institution should be to play a catalytic role, taking leadership role with manufacturer as the active partner in the adaptation and first prototype fabrication and initial testing (not to be long drawn). The manufacturers activive participation is to be incorporated in all aspects.

4. The manufacturer's role in initial commercial testing prototype manufacture is to be workout on a subcontract basis between the manufacturer and the institution. The commercial field testing by the manufacturer is to be within the framework of such a subcontract. A financial allocation to the manufacturer for such commercial fabrication and testing is to be provided by the Government through institution under the subcontract.

5. As a next step, initial batch production by the manufacture is to be supported by Agricultural Development Bank and farmers acceptance is to be evaluated by the Bank on a commercial (may be subsidized in the initial stage) basis. The institutional support in production technology and quality control is essential.

6. As a result of the above, the possible assistance to the manufacturer to undertake production will have to be considered under Government's incentive and promotion policies.

7. Under such a scheme, detailed above, the following items may be considered for a priority R and D and batchlevel production promotion programme are as follows:

8. Projects that may be undertaken by provincial agricultural engineering directorats, agricultural engineering institutions and other R and D institutions under ADM subcontract are listed below:
(products and corresponding institutions require further analysis).

- improved animal drawn implements and equipment total system suited to the needs of small farmers (for example by appropriate technology, development organization (ATDO), Islamabad)

- planter: cotton, groundnut, beetroot, tractor and animal drawn (for example by faculty of Agricultural Engineering, Engineering University, Peshawar)

- planter: sugar cane groundnut digger tractor PTO mounted reaper (for example by Agricultural Mechanization Research Institute, Multan)

- Crop protection equipment sprayers: cotton, sugar cane (for example by Pakistan Council of Scientific and Industrial Research)

- Jute decorticator, manually operated rice transplanter (for example by Department of Farm Power and Machinery, Faculty of Agricultural Engineering and Technology, Faisalabad)

- small diesel engine
- low cost pump and water lifting device (for example by Department of Basic Engineering, Faculty of Agricultural Engineering and Technology, Faisalabad)

9. The following projects may be undertaken directly by Agricultural Machinery Division

- power operated paddy transplanters
- tractor PTO driven multi crop thresher
- cereal harvesting machine
- power tiller 8-10 HP
- low cost small tractor (18 HP)
- low cost water drilling rigs

The Agricultural Machinery Division (AMD) will be directly associating the selected manufacturers in the prototype production and will supervise initial production bey selected manufacturers under AMD subcontract.

C. AREAS THAT REQUIRE ANALYSIS

10. The following areas may be analysed by appropriate local institutions under a subcontract by AMD.

- Agricultural Mechanization: System of agricultural machinery requirement with reference to holding size, crop and optimum time available for operations (for example by AMRI in co-operation with appropriate Economic Research Institute)

- Repair and Maintenance systems and an interlinked programme in the country (for example by Agricultural Engineering Directorate of NWFP or Punjab in co-operation with an appropriate economic institute)

- Training programme for mechanics and small scale industry (for example by an appropriate industrial institution).

SECTION XII

Research and Development in Institutions and in Industry

1. A number of agricultural Engineering Institutions and some manufacturers are engaged in applied R and D in the field of agricultural machinery and implements in Pakistan.
(Note: Please also see Annex I - "Institutions involved with Agricultural Machinery Sector in Pakistan"). However, it is very appearant that there exists no significant interlink or cooperation between agricultural engineering institutions and manufacturers. The following are some of the highlights of such R and D work.

A. Improved animal drawn implements

2. It appears that the Agricultural Machinery Research Unit of Punjab Agricultural Engineering Directorate, Dept. of Agriculture, Punjab, Faisalabad, is the only major unit in the country engaged in R and D work on improved bullock drawn implements.
(Note: There are 7 million farming bullocks in Pakistan).

3. The Agricultural Engineering Directorate of Department of Agriculture, N.W.F.P., Peshawar, has done some mechanization promotion work on locally made and imported implements and machines (animal and tractor drawn) in Tardaab, D.I-Khan, Malakard and Haripur areas.

B. Tractor Drawn Implements

4. The Agricultural Engineering Faculty of Sindh Agricultural University - under US PL-480 aid - has a project on agricultural machinery application and farm mechanization management. The type of tillage implements, degree of mechanization, harvesting techniques on wheat, cotton and sugar cane are analyzed.

5. The Faculty of Agricultural Engineering and Technology under PARC grant (Rs 100,000 3 years) completed tillage implements application and adaptation (.M B plow, DISC plow, sub soiler, chisel plow for primary tillage and type cultivator, disc harrow and sweep cultivator for secondary tillage) on wheat crop. The conclusion is the best combination in disc harrow followed by a narrow type cultivator or sweep cultivator

C. Multiple Seed Drill

6. A 11 type multiple seed drill for sowing of wheat, sorghum, pulse, rapeseed was designed and developed in mid 1979 at Karkhana Allat-e-zadi Bhawalpur preliminary tests have indicated its suitability even in stubbled and rocky unlevelled Barani lands.

7. Some manufacturers are also developing tractor drawn seed drill as well as seed/fertilizer drills.

D. Manual Indian rice transplanter

8. AMRI Multan under RNAM project secured Indian Annapurna 10 row rice transplanter in 1979. The machine was tested and declared to be not suitable.

9. IRRI-PAK has developed an improved manually operated rice transplanter

E. Power Rice Transplanters

(i) Korean Rice Transplanter (self propelled)

10. In 1976 the Government imported 200 units of self propelled rice transplanter (Rs. 17,000 per unit) from Korea (PDR). 1978 a few units were given to the Faculty of Agricultural Engineering and Technology at Faisalabad. The Faculty in 1979 tested the same in 5 districts. AMRI also tested the same. The machine was declared to be uneconomical and not suitable. The detailed technical details are not available. It is

interesting to note that one farmer (col. Akhtar) successfully planted 25 - 30 Acres in 1979 by using this machine and was satisfied. However, the whole Korean transplanter project is abandoned in the country now.

(ii) Japanese Rice Transplanter (Power Tiller attachment)

11. AMRI Multan under RNAM Project secured Japanese Mametora Ja-2 power tiller with rice transplanting attachment in 19179. The machine was tested and declared to be not suitable.

(iii)Chinese Rice Transplanter

12. AMRI Multan under RNAM project will be securing a self propelled trycle type Chinese Rice Transplanter in 1981 for testing.

F. Power Weeder

13. The Department of Basic Engineering of the Faculty of Agricultural Engineering and Technologh, University of Agriculture, Faisalabad, has developed a 5 HP gasoline/Diesel Engine Wheat Weeder and row crop intercultivator.

G. Potato Planter

14. Naushara Engineering Company has undertaken preliminary work on development of a simple tractor drawn potato planter.

H. Sugar Cane Planter

15. AMRI Multan under RNAM Project will be securing a tractor drawn Indian sugar cane planter in 1981 for testing.

I. Sugarbeet Planter

16. Nowshera Engineering Co. of Nowshear (NWFP) has developed a animal/ tractor drawn sugar beet planter.

17. The Agricultural Engineering Department of Engineering University of Peshawar has made a hand operated/billock drawn sugarbeet planter (July 80) for sowing on ridges. 3 prototypes have been made.

J. Tobacco Planter

18. The PCSIR Peshawar, under a grant from Tobacco Board has designed and developed a tractor drawn tobacco planter. The Tobacco Board has tested 2 prototypes. PCSIR will make 10 samples next year (price around Rs. 9,000/unit).

K. Power Sprayer

(i) Power Sprayer

19. The Department of Basic Engine ; of the Faculty of Agricultural Engineering and Technology, U ;ity of Agriculture, Faisalabad, has developed a power sprave ;ium pressure 50-100 lb per sq. inch) for cotton.

(ii) Tractor operated Power Sprayer

20. The Agricultural Engineering Workshop at Multan, Punjab,, Department of Agrictulture, in early 1979, has developed a tractor PTO driven mist sprayer for crops like cotton, sugarcane and orchards. Mist of blower range: upto 100 feet with an adjustable angle of 120° from verticle. The machine is under test and evaluation.

(iii) High cycle Tractor mounted Sprayer

21. GMTC has developed (a few years back - in 1960's - for its own then extensive mechanized farm) a sprayer with a locally adapted high clearance design for a standard tractor if proper incentive and support are provided, GMTC may have potential to develop the same on a national basis.

(iv) Truck Type Turbine Pesticide Sprayer

22. GMTC has developed (a few years back - in 1960's - for its own then extensive mechanized farm) a sprayer (90 feet blast). If proper incentives and support are provided, GMTC may have potential to develop the same on a national basis.

L. High Clearance Fertilizer Applicator for Cotton

23. GMTC has developed (a few years back - in 1960's - for its own then extensive mechanized farm a fertilizer applicator. If proper incentives and support are provided GMTC may have potential to develop the same on a national basis.

M. Potato Digger

24. PECO has secured a Swedish prototype potago digger for study on possible local development.

N. Groundnut Digger

25. The Agricultural Machinery Research Unit of Agricultural Engineering Directorate, Pun Jab, Faisalabad, has developed a tractor drawn blade groundnut digger.

O. Sugarbeet Harvesting

26. The Agricultural Engineering Departure of Engineering University of Peshawar has plans to develop a bullock drawn and tractor drawn sugar beet harvesting machine. The estimated sales price should be around Rs. 8-10,000/unit for a tractor drawn unit.

P.(i)Reaper Animal drawn

27. Navshara Engineering Co. has just started preliminary analysis on a bullock drawn side mounted 3 feet cut reaper.

(ii) Reapers - self propelled

28. The Faculty of Agricultural Engineering and Technology, the University of Agriculture Faisalabad, during 1979-80, developed a self propelled (7HP side mounted, petrol engine) 4 feet cut reaper. The first manufacturer is not interested. The second manufacturer feels it is expensive for initial production of 2-3 units only. The project is at standstill.

(iii)Power Tiller - Reaper

29. The Agricultural Machinery Research unit of Agricultural Engineering Directorate, Dept. of Agriculture, Punjab, at Faisalabad, has developed a power tiller front mounted reaper.

(iv) Reaper - Tractor mounted

30. A 7 feet tractor mounter harvester has been designed and developed in mid 1979 at Karkhana Allat-e-Sari Bahawalpur. Further improvement in the design and development of the machinw was carried out at agricultural mechanization Research institute, Multan.

31. Navshara Engineering Company has just started preliminary work on tractor front mounted reaper propelled by ground wheel with 7 feet cut.

32. Ittefaq Brothers Ltd. of Lahore are trying to develop a tractor front mounted or self propelled (Italian type) cutter binder 4 feet cut.

33. Climax Engineering Co. of Gujranwala is trying to develop a harvester based on BCS Italian design.

34. Gatti Foundry of Faisalabad developed one unit of tractor mounted Augistine type 7 feet cut reaper with binder. The very first prototype was sold. The farmer returned the same to Gatti foundry on it could not work in high thick standing wheat (money was refunded to the farmers. This project requires further support.

35. AMRI has developed a tractor mounted reaper which appears to have good potential.

(v) Harvester (Cutter Binder)

36. PECO has secured from Millat Tractors an imported cutter binder for study on possible local development.

(vi) Tractor Drawn Combine Harvester

37. Hassan Engineering Company at Lahore has developed a prototype of a tractor drawn combine harvester (Rs. 86,000) based on an old Allis Chalmer design. Many components are made locally. This machine will require extensive durability, realiability and performance evaluation field trails together with controlled laboratory tests.

(vii) Rice Harvesting (Power tiller) - Japanese

38. AMRI Multan under RNAM project secured Japanese mametora-TA2 powertiller with harvesting attachment in 1979. The machine was tested and declared to be not suitable.

Q. Thresher

(i) Multicrop Axial Flow Thresher

39. IRRI-PAK has developed a PTO operated axial flow multicrop thresher and commercial prototypes are being built by 10 - 15 manufacturers. One has added a self-feeder.

(ii) Double bar-El Wheat Tresher

40. Gatti Foundry of Faisalabad - it is reported - that new wheat tresher with double drum directly fed by P.T.O. (2,000 kg/hour) has been developed. It is reported that 20 units were made and sold (Rs. 40,000/unit), but many of them have been recalled by Gatti Groundry due to defects. This project requires further analysis and necessary support.

(iii) Standard Wheat threshers

41. Standard threshers are being manufactured by all thresher manufacturers in Pakistan. This requires further engineering work on raw material specification, critical component standardization and quality control

R. Power Maize Sheller

42. The Agricultural Machinery Research Unit of Agricultural Engineering Directorate, Department of Agriculture, Punjab, Faisalabad, has developed a Engine Power Driven Maize Sheller with hopper.

S. Jute Decorticator

43. The Faculty of Agricultural Engineering and Technology of the University of Agriculture, Faisalabad, during 1979/80, developed a prototype. One was given to cresent Jute mills of Faisalabad. The Kharkana Allat Zari Bhawalpur (a Government workshop) made 6 units through copy and it had problems in the field. The manual output is 5 kg of dryfibre/man day and the faculty machine output is 40 - 50 kg of dry fibre/man day. So the jute farmers want that

jute mills should buy this machine of the faculty design and give it to them. The project is at standstill.

T. Indegeneous Small Low Cost Tractor

44. IRRI-PAK brought in a small Thai tractor and some modifications have been done. This 15 HP tractor has V-belt transmission and standard automotive components. Climax Engineering Company of Gujranwala is interested in possible local development and local productions. As a first step, Engine, transmission and differential are to be imported. (Cost of such a tractor may be around RS 22 - 25,000 including Engine worth RS 8 - 10,000).

45. 2 - 3 local farms are exploring the possibilities of local development and manufacture of imported Chinese Small Tractor.

U. Medium/high speed Diesel Engine

46. PECO, based on an imported Dongfeng Chinese diesel Engine (12 HP 2000 rpm) has fabricated a prototype in March 1981. PECO claims that it has spent Rs 100,000 and 6 months duration involving 1200 man hours (excluding material cost).

47. It should however be noted that it is only one prototype with significant imported (original) components. In addition no rigid tests have been carried out and a manufacturing technology with emphasis on quality and durability has not been worked out. The interest of a private trading company in PECO's eventual local manufacture of this engine and the trading companies plan to assemble 12 HP Dengfeng tractor (with all imported components) require careful analysis to determine realiability of such a proposal.

48. Similarly Abdul Majid and sons of Lahore have developed a prototype copying Chinese Engine (9 HP - 1500 RPH and 12 HP 2000 rpm). The weight is 135 kg (around 15 kg/hp). The imported parts are Nozzle, Fuel Pump, Piston rings, Bearings etc. Again the question of realiability and durability, quality and manufacturing potential have to be assessed.

SECTION: XIII

FROM APPLIED RAND D TO INITIAL COMMERCIALIZATION

1. The experience of "IRRI-PAK agricultured machinery programme" in multipurpose theresher development, that of Faculty of Agricultural Engineering and Technology of Fisalabad in Self Propelled reaper development and taht of Agricultural Mechanization Research Institute Multan in Rice Transpalter are Harvester project three interesting cases which highlights the problems of transformation of applied R and D into commercialization and promotion of industrial liason by R and D institutions.

A. IRRI-PAK: THRESHER PROGRAMME: MULTICREP THRESHER

2. The IRRI-PAK project started in Pakistan in April 1979, IRRI-PAK started its programme in Pakistan in October 1976 and a IRRI rice thresher was brought in. In late 1976-76 prototypes for wheat was made (through Habib Industries Karachi) and tested in June-July 1977. The thresher was redesigned in August 1978 and tested in June 1979 for wheat and rice. By June 1980, the final multicrop PTO Driven thresher was ready. During 1977-80 programme, around 6 local manufacturs were involved.

3. By late 1980 around 10 manufacturs have made around 40 IRRI-PAK threshar of various models. In 1981/82 around 15 manufacturs will be making first batch production of IRRI-PAK multi crop thresher.

(I) Case of a manufactur (Fizal Engineering)

4. The fizal engineering company (primarily involved in automative repair, maintance, workshop service and spare parts trade) decided to enter agricultural machinery manufacturing field in mid 1978. In april 1979 contact with IRRI-PAK programme was established and drawings of IRRI-PAK small thresher was secured in May 1979 (no prototype from IRRI-PAK was brought and copied). In June 1979, fabrication based on drawings started and completed in June 1980. In 1980, 10 threshers were made, 8 sold internally and 2 were exported.

5. In Sept. 1980, the company engineer saw a IRRI-PAK new multicrop PTO thresher. Drawings could not be obtained due to IRRI-PAK's limited

resources. A sample was obtained and in Dec. 1980 fabrication started and completed within a month. The prototype was tested in January 1981 and sold for commercial testing in Feb. 1981. During Feb. - March 1981 5 units were fabricated and sold. The present plans are to produce 5 - 6 threshers a month, with existing facilities. By early 1982, a new agricultural machinery production facilities will be established and IRRI-PAK PTO/Engine Multicrip large threshers will be produced in greater numbers. (present sale price Rs 26,500 which includes an engine worth Rs 10,500).

(II) Case of Selected other manufacturers: Moughal, Javid, Ghazinab climax with Roomi.

6. Similarly the Moughal Industries at Daska (small unit 15 workers) who produces around 60-70 standard threshers a year has fabricated 2 units of IRRI-PAK multicrop thresher. In 1982, 30 units are planned. Fabrication is based on Rs 10,000 advance (40%) on the thresher (Rs 23,000 PTO Drive, capacity around 1000-1200 Kg/hour) by the farmer.

7. The Javid Engineering Co at Gujranwala have developed IRRI-PAK thresher with self feeder.

8. The Ghazi Industries at Miahchanhu which manufacture around 400 standard threshers per year is in the process of fabricating IRRI-PAK threshers.

9. In 1982, climax engineering Co at Gujralvala will start modest production of IRRI-PAK thresher. Climax produces 200 standard threshers in 1980, and will produce 300 standard threshers in 1981.

   Similarly the Roomi Industries of Mianchanmu will start IRRI-PAK thresher fabrication.

10. The above an only but a few examples. IRRI-PAK thresher project in not reached on significant commercial production, but is in the right direction and 1982/83 will be critical years where there is every possibility that it may make a commercial impact. However, there is a need for IRRI-PAK/AMD programme to strengthem its capabilitites to assist the manufacturers through provision of critical components for initial production, full drawings and material specification and industrial/production engineering services.

B. FAET UA-FISALABAD-SELF PROPELLED REAPER PROJECT

Reaper project (faculty of Agricultural Engineering and Technology. The University of Agriculture, Faisalabad).

11. In May 1977 the faculty project on development of a reaper-self propelled 4 feet cut, sidemounted 7HP BBS petrol Engine. (PSF finances $ 25,000 (1 year) was approved for implementation under existing staff and facilities. In May 1978 first prototype was completed. A Lahore Company (Malbro International, Pakistani trading Company) financed by TAFF Brothers of Australia was interested in this project. In June 1978 the Faculty gave the prototype to Malbro. The Faculty in 1977 had estimated the costo to be Rs. 8,000 including engine. The Malbro's 1978 estimated price was around Rs 13,000 to Rs 15,000 with significant imported components and engine. Malbro was not interested in local development and manufacture. (It is interesting to note that Malbro gave the university a appreciation grant of Rs 15,000 for Faculty's efforts).

12. In Sept. 1979 the Faculty gave this prototype to Ittafaq Brothers of Lahore, who estimates the 1981 price to be around Rs 15,000 - Rs 20,000. Ittafaq has received 3 provisonal orders. Ittafaq will only be interested in initial batch production if there are orders for 10 units. Thus the self propelled Reaper project is at standstill.

13. It appears that Ittafaq Company has abandoned this project and the self propelled reaper design concept. In mid 1980, Ittafaq has started development of its own tractor mounted reaper. The firm is securing some assistance from the Faculty

14. From this expence it can be seen that it is very important that R and D institutions should involve manufacturers right from the concept stage. In addition, the R and D institutions should develop its own engineering capabilities with reference to engineering design, material selection and production technology in order to be capable of communicating with manufacturers.

C. AMRI-RNAM TRANSPLANTER-HARVESTER PROJECT

15. The AMRI secured Indian hand operated 10 row Annapurna Rice transplanter Japanese Mametora AT-2 power tiller with rice transplanting and harvesting attachements in 1979 under RNAM project. It is reported that these machines were tested in 1979/80 and found to be not suitable.

NOTE: In addition the Korean (PDR) self propelled transplanters secured by the Government of Pakistan was also tested and declared to be not suitable. Now during 1981-82, AMRI, under RNAM project will be sucuring Chinesse rice transplanter (self propelled) and Indian tractor drawn sugar cane planter for local testing. These machines have not been seem by AMRI and its potential suitability has not been throght of even on a provisonal basis.

16. It appears that one of the major problem faced by AMRI is its lack of interrelationship with local manufacturers in product specification elaboration and testing. In addition there is also a lack of engineering capabilities in design and adaptation. Thus the imported prototypes are remaining with the institute and local manufacturers are not benifited by the expence due to the lack of their active participation.

D. RNAM-UNDP EVALUATION MISSION FINDINGS

(Regional network on agricultural machinery (RNAM)
Project consists of 8 countries - Iran, Indonesia, India, Korea Rep. Pakistan, Philippines, Srilanka, Thailand).

17. The UNDP RNAM Review mission (14 July-12 Aug. 1980) which visited the participating institutions of 8 member countries has identified the bottlenecks faced by these Institutions and has recommended specific actions. The following are the highlights of the recommendations.

- "there is a need to design engineering efforts to meet the requiments of the agricultural machinery sector"
- "there is a need to ensure that adequate number of experienced designers and draftsmen are available to the participating institutions not only to modify machines for the testing programme,

but to produce full set of engineering drawings for manufacturers and to undertake the design of other machines needed in the country"

- "there is a need for adequate number of experienced industrial engineers to establish and streng them linkages with the manufacturing industry of the country. Research design and development engineers rearly have knowledge or experience of working with manufacturers and the linkage between the manufacturers and the institutions working on the RNAM programme are wak or non-existent in most of the participating countries"
- The present need is for designers, development engineers and industrial engineers rather than for more researches"

18. Regarding Pakistan the UNDP Evaluation Mission has emphasised the need for establishing a broader contact with the local manufacturing community and development of local engineering capabilities.

SECTION XIV

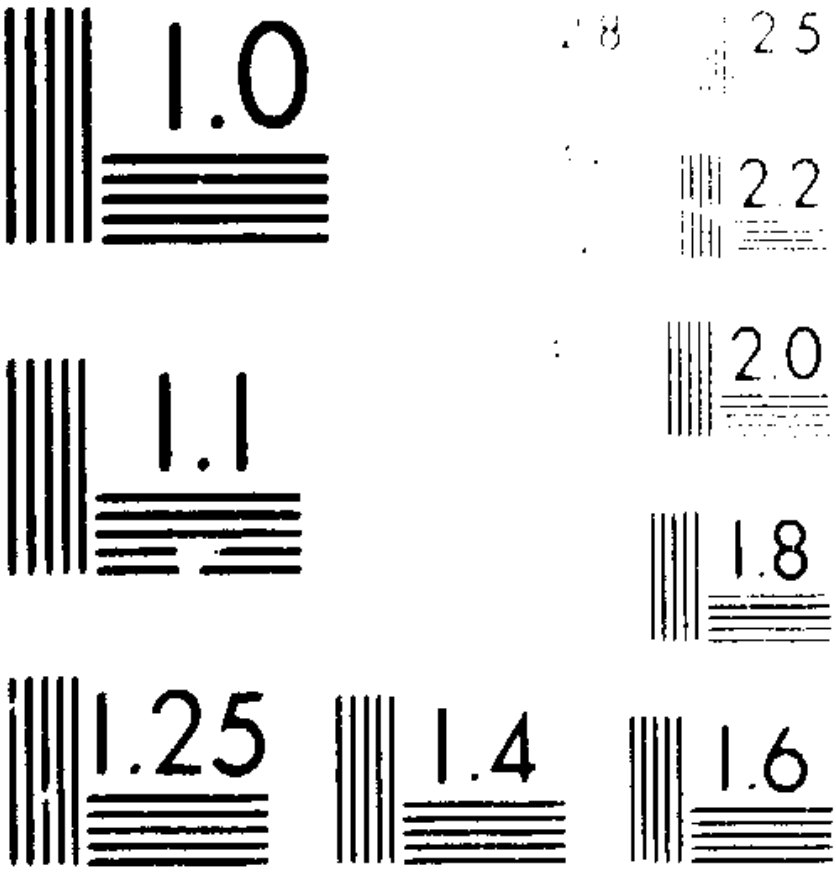
REPAIR, MAINTENANCE AND SPARE PARTS SUPPLY

A. THE NEED

1. There is no organized repair and maintenance programme and physical facilities network in the country. Due to the liberalized import situation and import of different makes, a large number of dealers and agents have mushroomed during the past 3-4 years. It is reported that these dealers are not providing the basic and necessary service. There is a lack of physical facilities and monitoring on dealer's commission from the importing agency. On the other hand altough repair and maintenance facilities exist at Government sector at provincial level, it is reported that farmers do not use these facilities due to procedural difficulties.

2. The 1978 study in Faisalabad district by Punjab Economic Research Institute Lahore (which involved 88 tractor and machinery-owning farmers, 47 private mechanic workshops, 11 small manufacturers of agricultural machinery, 2 tractor dealers, 3 co-operative farm service centers, 2 general automotive workshops and 16 spare parts dealers) has highlighted the major problems and integrated action programme has been recommended.

3. The critical aspects requiring immediate attention are
   (i) strengthening of repair and maintenance workshops
   (ii) quality control in agricultural equipment and implements manufactured locally
   (iii) spare parts production and supply and
   (iv) training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B. RECOMMENDED PROGRAMMES

4. Therefore, there is a need to develop and implement an action programme to promote repair and maintenance system involving the above four critical aspects.

5. There is a need to undertake a full analysis of the spare parts requirement through "Repalcement Turnover Factor" (RTF) analysis for the existing park, OEM and imported agricultural machinery and implements (including tractors) and establish a programme for local manufacture and a policy for continued imports.

6. A "National Network on Repair and Maintenance of Tractors and Agricultural Machinery" in Pakistan is recommended to be established. AMD may play an important role in the pormotion of such a network. This should include both private and public sectors and an overall policy and work programme should be established.

7. There is also a need for strengthening of existing workshops of the Agricultural Engineering Directorates of provincial Governments with reference to a more involved repair and maintenance activity. A common programme network on workshop and organizational aspects of repair and maintenance should be evolved by all provincial directorates. AMD can also play an important role in the promotion of such a concept.

C. REORIENTATION OF GOVERNMENT'S TAX REBATE INCENTIVES

8. In this context, it is highly desirable that the Government's financial incentives (tax rebate etc.) are directed - either within the existing framework or as an additional incentive - to those manufacturers who will participate in such a national repair and maintenance programme and contribute effectively.

9. The tractor manufacturers and importers of tractors should be incorporated into such a national programme of action and activities. This will require evolving national guidelines and work programme. Similarly, the small and medium manufacturers of agricultural machinery should be also encouraged to participate in sub-area repair and maintenance programmes.

SECTION XV

TRAINING

A. EXISTING FACILITIES

1. For proper upkeep of tractors and agricultural machinery, the existing train of facilities are to be expanded and new units are to be established. The existing facilities for training of operators, mechanics and dealers are as follows:

2. Training school for operators:
   (i) Pak-German institute of co-operative agriculture at Chak, 5-faiz Multan;
   (ii) Agricultural Engineering Organization at Faisalabad, Multan, Leiah (Muzaftargarh), Bhawalpur, and Talagang (Campbellpur) and
   (iii) Agricultural engineering organization, Sindh at Tandojam.

3. Training school for mechanics: only Pak-German institute of co-operative agriculture at Chak has facilities and a programme.

4. Training school for dealers and servicemen: Millet Tractor Ltd. at Shahdara Lahore has facilities and programme for M-F and Fiat Tractors

B. NEED

5. It is very clear that the overall facilities for training of repair and maintenance mechanics, and end users need strengthening. A national programme on such training involving public and private sector should be formulated.

6. The constraints faced by small and medium level manufacturers of agricultural machinery in Pakistan - especially in design engineering, material selection, production technology, industrial engineering, quality control and marketing - are primarily due to lack of knowledge. Therefore, a proper short term training programme to the small and medium manufacturers of Pakistan. In addition, there is a need to select a few manufacturers (1-2) in some industrial towns and initiate a programme of upgrading their manufacturing activities so that they can serve as a model to others in the same area. This will require the willingness of the manufacturers and they, allocating the resources necessary for such improvements. The Government's assistance may be in terms of provision of experts and commong engineering facilities. AEQ should play an important role in promotion and implementation of such a programme.

C. REORIENTATION OF GOVERNMENT'S TAX REBATE INCENTIVES

7. It is also highly desirable that the Government's financial incentives (tax rebate, etc.) are directed towards (either within the existing framework, or as an additional incentive) those manufacturers who actively participate in such an upgrading programme and improve the quality of products and production technology.

8. In this context, it is also necessary to mention that none of these small and medium manufacturers (who definitely at the present have a ready market for their low quality products, but enjoying Government tax incentives and making a good profit) have not even employed a single agricultural engineer, a production engineer and let alone a design engineer. It is highly recommended that the Government's financial incentives (tax rebate) are directed towards those who will employ qualified technicians and engineers as appropriate.

ANNEX I

INSTITUTIONS INVOLVED WITH AGRICULTURAL MACHINERY SECTOR

The following are the highlights of the Institution and activities:

A. PARC AGRICULTURAL ENGINEERING CELL (AEC)

The Pakistan Agricultural Research council (PARC) established the Agricultural engineering cell (AEC) in mid 1976. AEC in collaboration with the Regional Industrial extension Project of International Rice Research Institute (IRRI), set-up IRRI-PAK Agricultural Machinery Programme. During 1976-79 IRRI-PAK had its own temporary facilities. During 1980 PAK-IRRI moved into a modest building and physiend facilitites built by the Government (Rs. 500,000) at the National Agricultural Research Center Islamabad. A small complementary staff has been provided by PARC, thus establishing the Agricultural Engineering Cell (AEC). For all practical purposes AEC - IRRI - PAK Programme is one entity, fully integrated and working together on common problems. However due to lack of counterpart senior engineers on the PARC staff the IRRI project leader is providing the overall leadership. At present the PARC engineering cell has around 37 sanctioned post and around 27 technical and non technical staff are on board. The AEC-IRRI-PAK Project will become the nucleus for AMD of PARC.

B. IRRI-PAK AGRICULTURAL MACHINERY PROGRAMME

IRRI-PAK programme started in mid 1976 and now the PARC-AEC and IRRI-PAK programmes acts as one unit. The enphasis is on practical adaptation and industrial extension of successful IRRI machines.

Out of the 11 implements and machines tried out in Pakistan, the following may be regarded as a preliminary rummary of results (a) IRRI power tiller, diaphram pump, push type paddy weeder - not very encouraging (b) Rice hull cooking stove, batch drier, grain cleaner, bullock drawn seeder- Limited possibilities (c) standard axial flow thresher, mini axial flow thresher, PTO thresher, small 4 wheel tractor and improved power tiller- Possitive and encouraging results.

Priority has been allocated to threshing problems. The PTO axial flow universal (wheat and paddy) with a large capacity (around 1300 Kg/hour)

has been developed and industrial extension work has started witharound 10 - 15 manufacturers. The preliminary commercial testing will be undertaken this year and limited batch production by the manufacturers will be undertaken during 1982. An extensive industrial liason will be undertaken with the manufacturers.

The Sept 1976- June 1981 5 years budget was $220,000 per year plus $50,000 grant from Ford Foundations

C. AMRI ACTIVITIES (MULTAN)

Agricultural Machinization Research Institute (AMRI) Multan, was established in 1976 and is under the juristriction of Provincial Government of Punjab (Department of Agriculture). It moved into its new building in 1980. It has 6.5 acres of land and administrative block, workshop and 15 residential houses. The 1976/77-1980/81 investment is Rs 12.5 million of which that on buildings is Rs 4.7 million. The annual budget is Rs 1.5 million. The total approved staff is 130 of which around 30-35 are technical (engineers, specialists and mechanics).At present there are only around 8-10 technical personnel

The four objectives of Agricultural Mechanization Research Institute (AMRI) are as follows:

- Improvement of design of locally produced items
- adaptation of imported items
- Research on economics of mechanization
- Test and trails for the purpose of standarization

The three divisions of AMRI are

* Design and Development
* Fabrication and workshop
* Testing and field research

The supporting sections are

- Agronomy
- Economic analysis
- Statistics
- Industrial extension and publicity

The AMRI's own design and development work programme details are as fol-

lows: during 1981-84.

(I) Tractor front mounted reaper: Prototype completed and to be tested in June 81

(II) High clearance sprayer Prototype ready and to be tested in June 81

(III) Cotton planter on ridge: An ongoing project. Prototype ready

(IV) Rice transplanter: developing is going on from the past few years.

(V) Bio gas plant-one prototype developed.

Other development projects under consideration are (I) Potato digger (II) Self propelled combine harvester (III) sugar cane planter (IV) Trickle irrigation and tubewell drilling (V) implements for dayland farming and (VI) jute decorticator

In addition AMRI is also entrusted with the job of pre standarization testing of agricultural machinery - Primarily the tractor. More than 10 models/makes have been tested.

NOTE: There appear to be a great need for AMRI to be selective in its R and D work and concentrate on transformation of applied R and D into eventual local manufacturing of 1 - 2 selected products. In addition AMRI has potential to specialize in laboratory and field testing.

D. RNAM-AMRI ACTIVITIES:

Agricultural mechanization research institute (AMRI) Multan is the official Pakistan Institution participating in Regional Network on Agricultural Machinery (RNAM) project.

Under RNAM Project, AMRI undertook the following work from march 79 with the results as summerized below:

(1979-80 programme)

(a) Rice trasplanter

- Field testing of hand operater 10 row Annapurna Rice transplanter supplied from India. Found not suitable.
- Field testing of Mametora TA-2 power tiller with Rice transplanter supplied from Japan. Found not to be suitable.
- NOTE: Self propelled Korean (PDR) Rice Transplanter supplied under bilateral aid was also found to be not suitable.

(b) Cereal Harvester (Reaper)

- Field testing of Mametora AT-2 power tiller with harvesting attatchment supplied from Japan and was found to be not suitable.

Under RNAM 1980-81 Programme AMRI will be securing a cereal harvester (Reaper with prower tiller) from China (PR) and a sugarcane planter from India for field testing.

Under 1979-80 RNAM work programme, AMRI had a RNAM expert in manufacturing technology from Oct.79 for 18 months (including touring of participating countries). AMRI also hosted first workshop on manufacturing technology (20-23 January 1980). Unfortunately the participants from member countries were R D Institutional representatives and not small/medium scale manufacturers. Positive or significant results appears not to have been achieved as a result of this programme on manufacturing technology.

E. FACULTY OF AGRICULTURAL ENGINEERING AND TECHNOLOGY. UNIVERSITY OF AGRICULTURE, FISALABAD, PUNJAB.

The University was established in 1963. The faculty of Agricultural Engineering and Technology has B.Sc. courses and intake of undergraduates are 125 per year and expected numbers of students to be graduated in 1981 is 30. R and D activities of the faculty was established in 1972. It is has a laboratory for material testing. The Department of Farm machinery and power and Department of Basic Engineering of the faculty are involved with R and D work on agriculturalmachinery. The R and D. finances allocated by the University are very modest. Each department is granted Rs 4500 per year only for material purchase. When R and D in financed by other outside finances (for example PARC) and existing faculty staff are utilized on a part time basis, the concerned staff will get 1 months salary bonus per year. Such projects has to be approved by university directreate of Research and Punjab agricultural Research coordination board.

The R and D work undertaken of the Department of Farm machinery and power are as follows:

- Tillage implements: application and adaptations. (PARC finance Rs 100,000 3 years duration with one Dept staff and one research officer who could not be hired.Only Rs 50,000 spent and project completed)

- Reaper project (PAF finances Rs 25,000 1 year. project is at standstill with a prototype and a hesitant manufacturer.
- Jute deccorticator(1 year Project). A prototype developed and would be a success if Jute wills buy the machine and give it to farmers.
- Korean (PDR) Transplanter: bought in 1976 (Rs 17,000/unit) was given to the faculty in 1978 for testing. The planter was tested and found to be not suitable.

The Department of Basic Engineering has developed.

- Sweep cultivator
- Weeder (5 Hp Engine) for wheat
- Sprayer (Medium presure 50 -100 lb/sq inch) for cotton

F. AGRICULTURAL ENGINEERING DEPARTMENT OF ENGINEERING UNIVERSITY OF PESHAWAR NWFP.

This is the only agricultural engineering faculty with in an engineering university in Pakistan and was established in 1965.

The applied R and D work undertaken are:

- hand operated sugar beet planter for sowing on ridger.
- bullcok drawn ridger.

G. SINDH AGRICULTURAL UNIVERSITY

The Sindh Agricultural university at Tandojam, the only agricultural engineering faculty is primmirly involved in teaching and no applied R and D and prototype fabrication in Agricultural implements and machinery is udertaken.

H. PROVICIAL AGRICULTURAL ENGINEERING DIRECTORATES

The present main activities of provincial agricultural engineering directorate-under provincial departmert of agriculture- are tractor (mainly buildozer crawler) hiring, land develpment and tube well installation. Nowork in agricultural machinery and implements and applied R and D in this field are being carried out in general. The Directorates of Agricultural Engineering have Divisional Centres workshops and Distric workshops for heavy equipment and

tube well unpair and maintance and fleet operation. The following are highlights

(i) SINDH: The Agricultural Engineering Directorate has 2 Divisional workshop Hyderabad and Sukkur) and one small workshop in each of its 11 Districts.

(ii) PUNJAB: Agricultural Engineering Directorate of Department of Agriculture, Punjab at Faisalabad has good workshop facilities and is primmily involved in hiring of Bulldozers and installation of tube wells.

The Directorate has also a research unit for agricultoral machinery at Faisalabad (12-15 staff. 1 research engineer, 1 assistance agricultoral engineer, 10 - 12 mechanics and 1 draftsman) There are plans to more the same to AMRI Multan and Merge with AMRI.

The research unit has developed a power tiller mounted Reaper, a tractor drawn ground nut digger, and engine driver maize sheller with hipper and improved animal drawn implements.

(iii) N.W.F.P.

DIRECTORATE OF AGRICULTURAL ENGINEERING
DEPARTMENT OF AGRICULTURE. NWFP. PESHAWAR

The Directorate is Primarily involved in hiring of bulldozer (20 units) and installation of tubewells (1981-150 tube wells depth 400 feet). It has 2 divisional workshops and 4 district workshop. The Peshawar workshop has 100 persons.

No R and D in agricultural machinery has been undertaken. Some mechanization promotion work has been undertaken on tillage implements

However the directorate has putup a proposal (1982-86 Rs 10.0 million) on establishment of 4 Training development testing and research Institues in agricultural machinery. The project is not yet approved. The proposal consists of establising 4 such institutes at D.I. Khan, Malakand, Tardnab, and Haripur areas. Each Institute will have an agricultural engineer, a workshop and 1 research engineer.

At the present the starts of the above project proposal is not very clear and may be considered after IDA credit is approved for overall agricultural development.

I. PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (PCSIR) PESHAWAR

PCSIR has branches in Karachi, Lahore and Peshawar. The Peshawar PCSIR has following R and D Projects in agricultural machinery field.

- Development of a Tobacco planter (under a grant and contract from Tobacco Board.
- Improved bullock/power operated cane crusher (decrease waste from 15% to 5%)

J. APPROPRIATE TECHNOLOGY DEVELOPMENT ORGANIZATION (ATDO)

ATDO's activity aid role are (a) technology clearing house (b) catalyzing applied R and D towards commercialization (c) small scale finances for pilot activities in R and D and production and (d) extension activity.

The 1980/81 finances of ATDO was around Rs 4 million which include Rs 2 million for technology assistance. The corresponding figures for 1981/82 aid be Rs. 8 millions Rs. 3 millions and Rs. 5 million.

ATDO has no activities in agricultural machinery and implements field. Preliminary contact has been established with IRRI-PAK project. In July 1981, ATDO will be establishing a full section on agricultural technology. The area of activities will include (a) agricultural machinery and implements (b) post harvest losses (c) recycling of agricultural wastes (d) Agro processing technology (e) agro industries, etc.

K. BARANI AGRICULTURAL DEVELOPMENT PROJECT

The Barani agricultural development project of department of agriculture, NWFP is involved in overall agricultural development in rainfed areas. Similar project exists in Punjab. These two projects may be utilized in testing of new agricultural equipment and machinery.

L. CANADIAN INTERNATIONAL DEVELOPMENT AGENCY (CIDA)

The proposed CIDA assistance to PARC for development of Barani (rainted) agriculture in Pakistan is around $2.6 millions. A sum of $ 500,000 (excluding the service of one agricultural engineer for a duration of 2 years preferadly starting from early 1982) in earmarked for agricultural machinery testing and development programme.

It is proposed that field testing and adaptation programme on agricultural machinery by agricultural machinery Division of PARC is carried out through this CIDA activity.

M. UNDP-FAO AGRICULTURAL PROJECTS EXECUTED BY FAO

(I) TF/PAK/80/001: Prevention of Food losses. (PFL). Dokri, Sindh (at Federal project of PARC). The project started in early 1981 and will continue for 2 seasons (till early 1983).

(II) DP/PAK/73/026: Central cotton research institute in Multan. The present phase of the project will end in 1982 and a new phase will start.

(III) DP/PAK/73/023: Live stock development centre, Bahadnagar punjab. This project will continue during the 3rd. programme cycle. This project deals with mechanization of fodder crops.

(IV) DP/PAK/73/025: Development of decirious fruits (such as apples) This project will also continue. This project may be used to field test small tractors, power tillers, sprayers, small engines, etc.

(V) Live stock feeding project: This new project is expected to be included in the 3rd country programme cycle.

This project will deal with fodder preparation and development of new technology in recycling agricultural wastes including straw etc.

N. UNDP-UNIDO PROJECTS IN THE FIELD

(I) DP/PAK/78/003: CAPITOL GOODS DEVELOPMENT

The project consistes of a project manages (18 months on board) and 5 consultants (4 month each yet to report) in the areas of:

- Agricultural machinery
- Textile machinery
- Transport equipment
- construction machinery
- machine tools

The present phase is expected to develop into an intentinked programme of action.

(II) DP/PAK/79/014: SMALL SCALE INDUSTRY SURVEY.

This completed project has analysed five areas. One of the major area is light engineering industry promotion, involving pumps, engines, implements, etc. So any following programmes in this area will assist agricultural machinery sector of Pakistan.

ANNEX II

PAKISTAN - REVIEW OF LITERATURE

(31 March - 17 April 1981)

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14. Inaugural Address by Vice Admiral M.F. Januja, Minister for Food, Agriculture and Cooperatives. Government of Pakistan. 2nd annual convention of Pakistan. Society of Agricultural Engineers. Lahore April 1981.

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19. Progress Report - IRRI - PAK
Agricultural Machinery Programme 1981.

20. Summary of National Institute of Agricultural Mechanization Project of Pakistan (NIAM).

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III. PRODUCTS AND APPLIED R + D

22. Low cost tractor for dry land cultivation in Pakistan. Mr. K.H. Uquili and Dr. A.V. Khan. IRRI-PAK Agricultural Machinery Programme.

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24. Development of a Power Tiller front mounted harvester.
- Mr. Muhammad Yasin. Dept. of Agriculture. Pun Jab
PSAE April 81.

25. Development of Harvesting Machinery in Pakistan. Mr. Nalvaz Strarit. PSAE April 1981.

26. Development of manually driven sugar - beet planter for small holdings in Pakistan - Mr. Arshad Aziz, Mr. Mohammad Tariq and Mr. Ratiq Ahmad, NWFP Univ. of Engineering and Technology. PSAE April 1981.

27. Wheat Threshing in the Barani (Rain Fed.) area of the Punjab. - Mr. P.M. Moshabbir and Dr. A.V. Khan. AMD-PARC. PSAE April 1981.

28. Mechanization of Sunflower in Pakistan Mr. Javed Akhtar. PSAE April 1981.

29. Problems and Prospects of Agricultural Machinery in Pakistan: Mr. K.A. Hussain and Mr. A.D. Chavdhey. Univ. of Agriculture. Fisalabad Dec. 80.

30. Improved Design and cane crushing equipment for higher juice extraction in the villages. Mr. Strafqat Ijaz. PSAE April 81.

31. All news letters and documents of IRRI-PAK Agricultural Machinery Programme.

32. All news letters and relevant documents of AMRI. Multan.

33. Effective Tillage for wheat production: Dr. H.M. Hepworth PSAE April 81.

34. Technical and Economic Suitability of Tillage implements under Irrigated conditions.
- Dr. Ghulam S. Sheikh. PSAE April 81.

35. Development of comparative programme of a cultivator with sweep shovels for adoption in Pakistan - Mr. J.K. Sial. PSAE April 81.

36. Catalogue of improved agricultural implements in Pakistan. Technical Report AMRI 2/79.

IV. IMPORTS LOCAL MANUFACTURE AND INCENTIVES

37. ESCAP-AIDC-UNIDO Report on Fact Finding Mission on agricultural machinery in Pakistan. 1968-69.

38. Strategy and Targets of import, local assembly and manufacture of agricultural machinery in Pakistan.
Mr. R. Mushtaq Ahmed. AMRI Oct. 1979.

39. Thresher manufacturing industry in Pakistan. IRRI-PAK.
Agricultural Machinery Programme 1977.

40. Tractor manufacturing in Pakistan. Mr. Iqbal Z. Ahmad.
PSAE April 1981.

41. Role of small tractor in agricultural development in Pakistan.
Mr. Rab Nawaz Malik. PSAE May 1980.

42. Machine Technology in Pakistan - Farm power, Machinery and Mechanization. Mr. Bherval T. Devrajani. PSAE April 81.

43. Fiscal incentives for production of agricultural machinery.
Mr. Masud. A. Dahir. ADBP. PSAE April 1981.

44. Role of credit in Diffusion of agricultural technology in Pakistan. Mr. Muzabfar H. Malik. ADBP PSAE April 1981.

45. Import of Japanese Tractor: Circular by Mr. M.H. Malik, Director. Agricultural Technology and Technical Assistance. Agricultural Development Bank of Pakistan. March 1981.

46. Quarterly Report on Pakistan January - March 1981
by Mr. M.K. Hussein, SIDFA, UNIDO. March 1981.

47. Directory of the industrial units capable of undertaking contracts. subcontracting exchange. DIMD. 1979/80.

48. Directory of industrial establishment in Punjab DIMD. January 1980.

V. AGRICULTURAL ENGINEERING AND EXTENSION

49. Agricultural Engineering in Pakistan. A Review: Mr. Jehangir Khan Sial. PSAE May 1980.

50. Mass media support to agricultural extension in Pakistan. Mr. Muzafar Hussain. Director of agricultural information Pun Jab. (RNAM) Aug. 80.

VI. REPAIR AND MAINTENANCE

51. An assessment of capacity of workshops and farmers to repair and maintain farm machinery in District Faisalabad. Nov. 1980. Punjab Econimic Research Institute Lahore. Mr. Khawaja Attaf Hussain and Mr. B. Lockwood.

ANNEX III

LIST OF PERSONS MET

(31 March-17 April 1981)

I. PAKISTAN AGRICULTURAL RESEARCH COUNCIL (PARC) ISLAMABAD

1. Dr. Amir Muhammed, Chairman Pakistan Agricultural Research Council (PARC) and secretary, Ministry of Agriculture

2. Mr. H.M. Rizvi, Deputy Director (T and TL)

3. Mr. Majeed Akhtar, Member - Finance

4. Mr. Ikramit Haq, Director, Planning and Tech. Service

5. Dr. Haleemul Hassain, Member - Animal Science

6. Dr. Amir U. Khan, Director IRRI-PAK Programme on Agricultural Machinery, Islamabad
National counterpart to UNIDO Mission, and Director Agricultural Machinery Division, PARC

7. Dr. Zia-Ur-Rahman, ADM.PARC

II. MINISTRY OF AGRICULTURE (ISLAMABAD)

8. Mr. Manzur Ahmad, Additional Secretary, also president Pakistan Society of Agricultural Engineers (PSAE)

III. MINISTRY OF INDUSTRY (ISLAMABAD)

9. Mr. J.I. Malik, Joint Secretary

IV. MINISTRY OF PRODUCTION

10. Mr. A. Khalil, Add. Secretary,

11. Mr. T.Z. Farooqui, Joint Secretary

V. APPROPRIATE TECHNOLOGY DEVELOPMENT ORGANIZATION MINISTRY OF SCIENCE AND TECHNOLOGY

12. Mr. Asib Ali Sheikh, Vice Chairman (ATDO)

VI. MINISTRY OF FINANCE

13. Mr. A.M.E. Kango

VII. PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (PCSIR)

14. Dr. Ziaz Ali Shah, Director
PCSIR Labs Peshawar

15. Mr. Fazal Hussain,
PCSIR Labs, Peshawar

VIII. DEPARTMENT OF AGRICULTURE (PROVINCES)

16. Mr. Kamar Gul, Engineer
Barani Agricultural Project (BAP), Dept. of Agriculture NWFP, Peshawar

17. Mr. Abder Rehman, Agronomist
BAP, Peshawar

18. Mr. Arch Richards,
Sugarbeet consultant, BAP
Peshawar

19. Mr. Jah Sher Mohammed, Director
Agri. Eng. Directorate of Agri. Eng. (DAG), NWFP, Peshawar

Mr. Mohammad Arif Khan,
Agricultural Engineer, DAG,
Peshawar

IX. AGRICULTURAL ENGINEERING INSTITUTIONS

20. Mr. Arshad Aziz, Head
Agricultural Eng. Dept.,
Engineering University of Peshawar

21. Mr. B. Devrajani, Principal
Investigation Officer,
Sindh Agricultural University
(Agricultural Eng. Faculty)
Tondojam, Sindh

22. Dr. Lockwood and Dr. Lockman
Agricultural Development Council
Agricultural University of Punjab, Faisalabad

23. Mr. Khawaja Altaf Hussain
Agricultural University of Punjab, Faisalabad

24. Dr. G.S. Sheik, Dean
Faculty of Agricultural Engineering and Technology
University of Agriculture, Faisalabad

25. Mr. A.D. Chaudhry, Chairman
Dept. of Farm Machinery and Power, University of Agriculture, Faisalabad

26. Dr. Jahinger, Chairman,
Department of Basic Engineering
University of Agriculture,
Faisalabad

27. Mr. Abdel Majeed Jameel,
Agriculturel Engineer (Design
Agricultural Mechanization Research
Institute - AMRI), Multan

28. Mr. Ashfaq Hussein Rana
Assistant Agricultural Engineer
AMRI, Multan

X. AGRICULTURAL EQUIPMENT MANUFACTURERS

29. Mr. Niaz Ahmad, Chairman,
Fizal Engineering Company,
Islamabad, (threshers - IRRI)
also auto repair.

30. Mr. Naeem Rana, Director
Fizal Engineering Company

31. Mr. Syed Phool Badshah
Managing Director, Nowshera
(Peshawar) (cultivator,
thresher, IIRI-thresher)
also rolling mill, castings, etc.

32. Mr. Pir Jamat Ali Shas
Director, NEC

33. Mr. Owais Ahmed Ghani,
Works Manager, NEC

34. Mr. Daud Ahmad, owner,
Hashtnagar Industries,
Hashtnagar, Peshawar
(cultivator, IRRI thresher,
trolley, tractor balde)

35. Mr. Mirza, Mughal Industries,
Daska, (old and IRRI threshers
small unit

36. Mr. Iqbal, Green land engineers -
Daska, small unit
(cultivator, MB plow, ridger,
blade)

37. Mr. Iftikhar A. Aziz, Senior
Executive, Climax Engineering
Co. Ltd., Gujranwala
(thresher and planter) large
multi engineering complex

38. Mr. Mushtaq Ahmad Sandhu,
Dadins Agro Engineers,
Gujranwala, (threshers and
agricultural implements)
also experts)

39. Mr. Iqbal, Green Land Engineers
Daska, (Agricultural implements)
small

40. Mr. Javaid and Mr. Arsad,
Javaid Eng. Co.,
Gujranwala (threshers) small

41. Mr. Mohammad Raffi, Kingland
engineers, Daska (trailers
and implements) small

42. Mr. Gulam Mustafa Ghazi,
Ghazi Industries, Manchannu,
(threshers and implements)
medium scale

43. Mr. Fazal Haq, Roomi Industries
Manchannu, (threshers and
Implements) medium

44. Sardar Ghazanfarullah Khan,
GMTC, Rehemeyerkhan (Punjab)

45. Mr. Mohammad Sharif Mirza,
Design and Development Engineer
ITTEFAQ Brothers Ltd., Lahore
(threshers and enignes) large scale

46. Mr. Mohammad Shahbaz Sharif
ITTEFAQ Brothers Ltd., Lahore

47. Mr. Gulam Qadir, Punjab Eng. Co.
Multan (threshers, sugarcane crusher,
and chaft cutters) medium

48. Mr. Mohammad Afzal, and
Mr. Mohammad Ibrehim
New Crown Industries, Multan
(threshers, sugarcane crusher
maiza sheller and chaft cutter)
medium scale

49. Mr. Naseer A. Qureshi, Director,
Matchless Company
(small diesel engines, medium
speed)

50. Mr. Bilal Ahmed Qureshi,
Managing Director, Rellek Ltd.
(Hongkong/Karachi)
(interested in Chinese tractor
import and engine fabrication
by PECO)

XI. AGRICULTURAL DEVELOPMENT BANK OF PAKISTAN

51. Mr. Muzaffar H. Mali, Director
Agricultural Technology and
Technical Assistance, ADBP,
Islamabad

52. Mr. Muhammed Afzal Hussain,
Director

XII. GOVERNMENT INDUSTRIAL COPORATIONS

53. Mr. Jalaluddin, Chairman, Pakistan Automobile Corporation, Karachi

54. Mr. Aijaz Ahmad Hashmi, General Manager, Pakistan Automobile Corporation, Karachi

55. Mr. Sohail P. Ahmad, General Manager (Tractor project - Fiat) Pakistan Tractor Corporation Ltd. Karachi

56. Mr. Saiduddin, Managing Director, Pakistan Engineering Co. Ltd. Lahore

57. Mr. Ehsan Ullah Khan, Managing Director, Millat Tractors (MF) Lahore

58. Mr. Shafique, Development Manager, Millat Tractors

59. Mr. Sohail Bashir Rana, Senior Manager (Technical) Millat Tractors Ltd. , Lahore

60. Mr. Saidduin, Managing Director, Pakistan Engineering Co. Ltd.(PECO) Lahore (Diesel Engines)

61. Mr. Siddiqui, General Manager, (Marketing) PECO

62. Mr. Toor, General Manager (Engineering), PECO

63. Mr. S.H. Mahmud, Design Manager, State Engineering Corporation
Heavy Mechanical Complex Ltd. Taxila
(Met at PSAE Meeting, Lahore)

XIII. INTERNATIONAL COMPANIES

64. Mr. D.W. Parry, Marketing Manager - West Africa
Massey Ferguson A.G. , Switzerland (at Lahore)

XIV. OTHER INDUSTRIALISTS

65. Mr. M. Hussain Dawood

66. Mr. Naeem M. Rana

XV. UNDP/ESCAP/RNAM PROJECT

67. Mr. David F. Howson, Cereal Harvester Expert
RNAM-CIAE Bhopal, India and AMERI Multan, Pakistan

XVI. UNDP/UNIDO PROJECTS

68. Mr. Cronje H.J. Baeck, Chief Technical Adviser - Project Manager
Programming of Development of Capital Good Industries (DP/PAK/76/003)
Investment Promotion Bureau, Ministry of Industries, Karachi

69. Mr. Iqbal Ahmad, Deputy Director (ENG.) National Director
DP/PAK/76/003 Karachi

70. Mr. Husein Nuhbegovic, Adviser on Steel Industry, Metal Advisory Services
State Engineering Corporation, Lahore

XVI. UNDP/FAO PROJECT

71. Mr. Pedelina, Expert, Food Harvest Losses Project
Rice Research Institute, Dogri

XVII. FAO

72. Mr. John Phillips, FAO Country Representative

XVIII. UNDP

73. Mr. M.J. Priestley, Resident Representative

74. Mr. Philip S. Reynolds, Assistant Resident Representative

XIX. UNIDO/UNDP

75. Dr. K.M. Hussein, Senior Industrial Development Field Adviser

76. Mr. Tom van der Lans, JPO, Assistant to the SIDFA.