OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

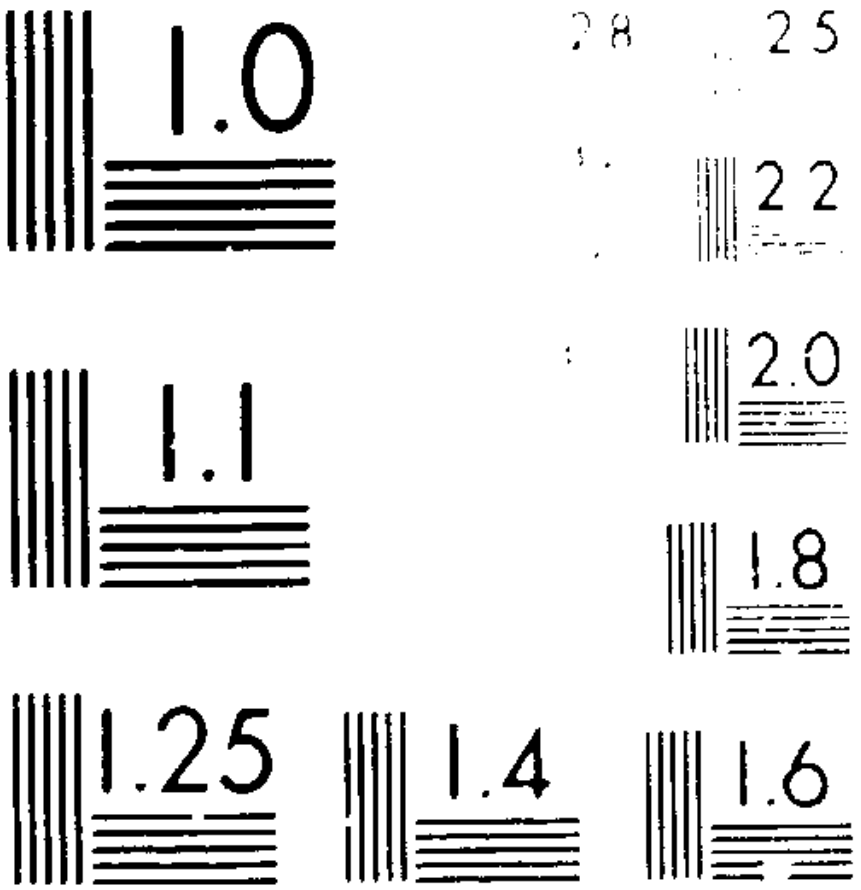
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5

10078

Distr.
LIMITED

ID/WG.330/18
6 October 1980

ENGLISH

United Nations Industrial Development Organization

Meeting on Exchange of Experiences and
Co-operation among Developing Countries in the
Development of Agricultural Machinery Industry

Beijing, China, 20 - 27 October 1980

Agricultural Machinery Manufacturing Programme in Asia*

by

H. G. R. Reddy**

* The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

** Senior Industrial Development Officer, ESCAP/UNIDO Division of Industry, Housing and Technology, Bangkok, Thailand.

80-44368

Contents

I. INTRODUCTION

1. In this paper an attempt has been made to present an overview of the status of mechanization and manufacturing activities at the national level in selected Asian countries and the experience of operation of an inter-country project intended to strengthen their technological capabilities in the indigenous manufacture of agricultural machinery. The participating countries are (i) India, (ii) Indonesia, (iii) Republic of Korea, (iv) Pakistan, (v) Iran, (vi) the Philippines, (vii) Sri Lanka and (viii) Thailand.

2. The establishment of the UNDP-funded Regional Network for Agricultural Machinery (RNAM) by the Economic and Social Commission for Asia and the Pacific (ESCAP) in September 1976 at Los Banos, Philippines and its successful operation during the last four years has been a distinct land mark in creating an awareness for the agricultural mechanization in Asia. A recent evaluation of its operational activities has provided a valuable opportunity to understand the crucial issues involved in the mechanization of agricultural operations and the imperative need for the indigenous manufacture of tools, equipment and machinery specially designed to meet the local requirements. The four-year operation of the project has brought into focus the weaknesses and gaps in technological capabilities especailly in designing, adaptation and development of agricultural machinery to meet the particular requirements of crops, soil and climatic conditions of the individual countries. Therefore, the programme of work and activities of the second phase of the project will place increasing emphasis on bridging this gap.

II. Regional Network for Agricultural Machinery (RNAM)

3. The RNAM was developed after a series of consultations originating in 1968 at technical levels for conceptualization and a clear definition of its objectives and activities, followed by discussions at intergovernmental levels to create the necessary political will for a group of countries to agree on a co-operative arrangement such as the network to promote collective technological self-reliance. Organizationally, the network concept was accepted with the understanding that the resources and the benefits of the

project would be equitably shared by the participating countries mainly to strengthen their technological capabilities in achieving the goals of selective mechanization and indigenous manufacture of appropriate machinery.

4. Structurally, a Governing Body is established at the highest level to deal with policy matters and issues of a political nature necessitating a dialogue with the Governments to appraise them of the impact of the project and to strengthen their co-operation and participation in the project. It is also an appropriate Forum for the donor countries and agencies to consider bilateral and multilateral financial and technical assistance towards a common cause of rapid agricultural mechanization and thereby improving the income and well-being of millions of farmers in Asian countries. There is a Technical Advisory Committee (TAC), below the Governing Body consisting of Directors of National Institutes or Focal points in the countries participating in the network. The TAC examines all technical matters and operational activities of the work programme of the network.

5. The need for the establishment of Farm Mechanization Committees at the national level has been recognized at an early stage of the commencement of the project. The most important function of such a Committee is the coordination of activities at the national level so that concerted efforts are made for a progressive and dynamic farm mechanization programme and for indigenous manufacture of appropriate agricultural machinery.

6. The subnetwork activities have been deliberately introduced; and on the basis of the recommendation of the TAC, four subnetworks viz.(a) rice transplanter, (b) cereal harvester, (c) weeder and (d) manufacturing technology have been established. The responsibility for coordination of each subnetwork activity has been distributed to four different national institutes. Test codes have been drawn up, prototypes, supplied, which are being field tested and design modifications suggested whever applicable. The manufacturing subnetwork has broader functions and has emphasized standardization and quality control of agricultural machinery. In retrospect this mechanism has proved to be most rewarding, firstly in creating an increasing awareness of the organization of the national activities, in learning from each others experience and in establishing valuable personal contacts. This mechanism could be usefully pursued in the second phase of the project with such modifications as may be required on the basis of the experience gained during the first phase of the project.

7. The training programmes of the project provide for adequate fellowships for familiarization of new developments, pattern and mechanism of organization of similar programmes in other countries etc., exchange of a variety of experiences and training for people at various levels such as policy and decision makers, Directors of R & D Institutes and technical personnel engaged in design development, assembly and manufacture. Perhaps the users of the machinery would also be included. It may however be mentioned that farmers' and manufacturers' days organized in the countries provide opportunities to know each other better and the availability of the farm machinery, their specialized use and the advantages that could be derived by the use of these machinery. Similarly, the manufacturers could learn and appreciate from the users, the problems encountered and the design and engineering modifications that may have to be effected to improve their quality and efficiency.

8. The documents and information services include the issue of technical digests, catalogues, and periodic newsletters, a service which has been appreciated immensely. It has been the most important medium of exchange of information of making known technological developments and innovations to a wide clientele. In fact the documentation and information services have influenced some of the non-member countries in the region viz. the People's Republic of China, Bangladesh, and Malaysia to such an extent that they have expressed keen interest in participating in the activities of RNAM.

9. The review of the project activities carried out recently by a two-man mission commissioned by UNDP has reaffirmed the importance and usefulness of the RNAM to the countries of the region. In its view the first phase of three years has served the purpose of organization of the network, creating the necessary awareness for mechanization and manufacture of appropriate machinery, establishing linkages with the national and international institutes and organizations. With the growing realization of the benefits of farm mechanization in the countries, under the stimulus of RNAM, steps are being taken to strengthen the domestic manufacturing capacity of agricultural machinery, tools and equipment specially suited to the requirements of individual countries. RNAM has been rightly referred to as a development institution and in retrospect it could be said that it has made a distinct contribution to the development process of farm mechanization and manufacture of appropriate agricultural machinery in the member countries. One could visualize, given the forethought and far-sightedness of those who guide the destinies of agricultural mechanization programmes in Asia, the

potential in RNAM to be developed as a regional institution of excellence. As is evident by the title of the project, RNAM should, in future, diversify its activities in a variety of fields of agricultural machinery, tools and equipment to meet the requirements of small farmers in Asia. RNAM, in its four-year existence, has demonstrated that it is a development institution without a precedent and a parallel, being the first UNDP intercountry project promoted on the basis of a network concept with particular emphasis on TCDC. In the long-run it is intended to promote collective technological self-reliance.

10. The Regional Network has assisted the UNIDO system of consultations by organizing a preparatory meeting at Manila, Philippines in May 1979 which identified issues of particular importance to the region. These were subsequently discussed at the global consultation meeting at Stresa. The RNAM network Directors were represented at the global consultations on agricultural machinery industry at Stresa in September 1979. Continuous attention is being paid to the implementation of Stresa recommendations in so far as they are relevant to the development needs of the countries of the region and are consistent with the objectives and the programme of work of RNAM. Inter-regional co-operation has also been considered with a view to examining the feasibility of establishing similar networks in Africa, West Asia, and Latin America.

11. It is recognized that, the Beijing meeting which will be held in October 1980 is an outcome of the Stresa recommendations. One would look forward to learning from the experience of the developments in the People's Republic of China. It is also expected that arising again out of the Stresa meeting a regional consultation meeting would be organized in the ESCAP region in the foreseeable future in collaboration with RNAM, as in fact, a regional consultation meeting has already been planned for Africa. The role that RNAM could play in promoting interregional co-operation in the broad context of TCDC cannot be minimized.

12. In the next section of this paper a brief review is presented of the activities generated in the participating countries in terms of the objectives and activities of the RNAM.

III. Activities in Selected Countries in the Region

A. Strategy for Agricultural Machinery Industry

13. Considering the widely differing socio-economic situation of the developing countries in the region, the strategy of agricultural mechanization would differ from country to country and therefore it is necessary to develop strategies suited to the particular needs of individual countries. The situation in different countries is as follows:

(a) The Government of the Philippines is in the process of formulating a national agricultural mechanization policy. The proposed policy would include (i) selective mechanization to take account of crops, soils, employment, social, economic, and other factors; (ii) progressive manufacturing programme; (iii) after-sales services; (iv) joint ownership; (v) local R & D; (vi) credit and financing; (vii) agricultural machinery testing and evaluation; (viii) introduction of new brands of tractors and (ix) training of farmers and operators.

(b) In India the entire requirement of agricultural machinery in the simple, intermediate and powered categories is being met through local manufacture and there are no imports. Agriculture is a state subject; the state development plans are formulated by the respective state governments which are then included in the National Development Plan. Physical and financial targets are fixed, based on the total financial resources available. Agricultural mechanization priorities and needs are components of the Agricultural Development Plan of the National Plan. The National Commission for Agriculture which has been constitutedby the Government of India has also made a detailed assessment of different categories of equipment required in the country.

(c) In the case of Iran it is gathered that the Government's policy is to accelerate the introduction of tractors and implements by the (i) conversion of the present projects engaged in assembly operations into progressively manufacturing operations, (ii) after-sales services, and (iii) credit and financial support to farmers and manufacturers.

14. There are conscious efforts to promote the development of agricultural equipment in the other developing countries in the region. However, these have been on an ad hoc basis. No integrated and coordinated programmes consistent with agricultural development plans are under preparation in all the countries. It has been shown that selective and rational mechanization does not displace labour. On the contrary, additional employment opportunities are created both in the agricultural and non-agricultural

sectors. This is a point which has been underscored by / the UNDP Review Mission with particular reference to the findings of the studies in the Punjab, India. The survey carried out by the National Council of Applied Economic Research (NCAER) New Delhi also makes the point that mechanization is a significant instrument for growth enabling farmers to practice more, utilize their inputs better, employ more labour and effect timely sowing operations.

B. Creation of National Farm Mechanization Committees

15. The need for each country to establish a National Farm Mechanization Committee consisting of the representatives of the Ministries of Agriculture, Industry, Research and Economic Affairs, the Agricultural Extension Services and the Agricultural Machinery Industry is indispensable. The main function of such a committee would be coordination of the activities generally dispersed in different departments and ministries in the National Governments.

(a) In the Philippines a National Agricultural Mechanization Committee on the basis of the RNAM guidelines has been established. The Committee was to be composed of the (i) Minister of Agriculture (Chairman), (ii) Institute of Agricultural Engineering and Technology (INSAET), University of the Philippines at Los Banos (Member Secretary), (iii) Ministry of Industry, (iv) Agricultural Machinery Manufacturers and Distributors Association (AMMDA), (v) National Economic Development Authority (NEDA), (vi) Development Bank of the Philippines (DBP), (vii) Philippine Inventors' Commission (PIC), (viii) Philippine Council for Agricultural and Resources Research (PCARR) and (ix) International Rice Research Institute (IRRI). Due representation was also to be given to Farmers' Association. It is now learnt that the committee is functional.

(b) In India the Board for Agricultural Machinery and Implements is being re-constituted to include the terms of reference suggested in the guidelines of RNAM. It is said that the new committee will become functional by about January 1981.

(c) In the Republic of Korea there is a Committee on Farm Mechanization in the Ministry of Agriculture whose re-organization is said to be under consideration. It is concerned with mechanization policies and its Chairman is the Deputy Minister of Agriculture.

(d) Pakistan has already consituted a National Farm Mechanization Committee on the basis of guidelines proposed by RNAM. Its orientation is said to be towards policy consideration including issues such as machinery

and spare parts importation, research, local manufacturing and standardization procedures.

(e) In Indonesia an Agricultural Machinery Testing Committee was established in 1976, to deal with policy matters, control and distribution of agricultural machinery, coordination of testing activities and standardization. It is proposed to change the title of this body into National Farm Mechanization Committee.

(f) In Sri Lanka the Farm Mechanization Committee is said to be too large. It is supposed to function both as a technical and advisory body for policy decisions.

(g) In Thailand the National Farm Mechanization Committee was set up in 1979, which is involved with mechanization policy issues, implementation guidelines and standardization requirements. Representatives of government, farmers, manufacturers function in a sub-committee, the recommendations of which are considered by the National Committee.

16. It is gratifying to know that the Guidelines drawn up by RNAM for the Establishment of National Farm Mechanization Committees are being followed in a number of countries.

17. In consideration of the foregoing, the following points require consideration:

(a) The status and authority of the members of the committee should be such that it has an effective choice in formulating and executing policy; and

(b) Guidelines for establishment of such committees already drawn up by RNAM could be made available to interested countries in other regions of the world through UNIDO (Document No. IHT/RNAM/TAC-SC/5 28 July 1978).

C. Design and Development Centres

18. The innovations in agricultural machinery emerge from the farmers, research sector, industry, but eventually design concepts must be transplanted to commercial realization. Therefore, the design and development of agricultural machinery using teams of agronomists, agricultural engineers and industrialists assumes importance. By and large, design and development would have to be carried out locally in view of the differing agronomic, climatic and socio-economic conditions of individual countries, for which designs have to be developed/adapted.

(a) In India adequate infrastructure for design and development has been established. There is the Central Institute of Agricultural Engineering (CIAE) at Bhopal. There are also state-level research centres whose main function is to evaluate and adapt available improved implements. There are 27 central agricultural commodity institutes, and 6 of them have divisions of agricultural engineering. There are 2 tractor testing and training centres. Eleven of the 24 agricultural universities have agricultural engineering colleges which also design, develop and adapt implements and carry out demonstration activities. The ICRISAT at Hyderabad is engaged in the development of new implements for arid zones. Design and Development is also being carried out by the Industry.

(b) In the Philippines there is no formal centre for design and development. The Institute of Agricultural Engineering and Technology, the University of the Philippines at Los Banos carries out some design and development. The Bureau of Plant Industry and a few other state universities in Luzon and Mindanao are also carrying out some design and development of farm machinery.

(c) Malaysian Agricultural Research and Development Institute (MARDI) is the main institution that carries out some design and development work.

(d) In Thailand, the Division of Agricultural Engineering in the Department of Agriculture at Bangkhen, Bangkok is engaged in some design and development activities.

(e) In Indonesia there are limited facilities for design and development.

(f) In the Republic of Korea, the Institute of Agricultural Engineering and Utilization is engaged in design and development work in co-operation with selected manufacturers.

(g) In Pakistan, the Institute of Agricultural Engineering at Faisalabad and the Institute of Mechanization Research in Multan are engaged in some design and development of farm implements.

(h) In Sri Lanka some work is undertaken by the research centre of the Department of Agriculture located at Peradeniya.

(i) In Iran the Institute of Agricultural Engineering at Karaj carries out some design and development activity.

19. In most of the countries the importance of design and development role has not been fully appreciated and with few exceptions, much of the

work carried out has little relevance to designs which would be commercialized. Generally, the work carried out in academic institutions is research oriented and is not often leading to commercial utilization of machines. It is to be emphasized that a high priority has to be given to Design and Development. A serious constraint, however, is the inadequacy of design engineering capability in most developing countries.

20. In consideration of this constraint, it is recommended:

(a) that UNIDO might prepare 'guidelines' and assist in the establishment of design and development centres in interested countries. The Centre must have adequate facilities for manufacture of prototypes for extensive field evaluation so that the designs could be brought to the stage of commercial acceptance after field proving.

(b) Assistance should be provided for establishing suitable mechanisms for the commercialization of the designs developed within the countries at various levels.

(c) In the context of design and development activity, considerable emphasis should be placed on standardization of the components of agricultural machinery.

(d) Links should be encouraged between international research institutes and interested member countries of ESCAP.

D. Financing and Investment

21. The position in different countries is as follows:

(a) In India, credit facilities are provided by commercial banks and land development banks. These are easily available to farmers for purchase of agricultural implements and machinery at low rates of interest. At the national level, the Reserve Bank, the Agricultural Development Bank and Refinance Corporation are responsible for coordinating the entire credit programmes. For encouraging domestic manufacture, import duties are levied upto 45%.

(b) In Thailand, the commercial banks, the Bank of Agriculture and Agricultural Cooperatives have been provided with loans at low interest rates to farmers and farmers' cooperatives for purchasing agricultural machinery. The credit and finance for manufactures is considered to be not adequate.

(c) In Iran, agricultural machinery are being distributed under hire-purchase system and 10% of the cost is said to collected as down payment and the balance is repayable at 6% interest. No import duties are levied. A Rural Agricultural Bank and Industrial Development Bank provides

enough funds and credit to manufacturers. The present situation needs to be verified.

(d) In the Philippines, credits for manufacturers and distributors are provided by development banks and commercial banks. Credits to farmers are provided by the Development Bank of the Philippines (DBP), Central Bank of the Philippines (CB) through the rural banks and savings and loan associations and the Land Bank of the Philippines (LBP). The Farm Systems Development Corporation (FSDC) and the Agricultural Credit Administration also provide credits to special farmer groups. Slow availment of credit funds could be due to (i) high cost of machinery and implements, (b) inadequate credit outlets of lending institutions and (c) the depressed condition of the country's sugar industry for example.

(e) In Indonesia, adequate credits are available for small-scale manufacturers and also to farmers. Import duties on components of agricultural machinery are low. Incentives are given for assembly and manufacturing operations.

22. Having regard to the situation obtaining in a large number of countries the following points should receive consideration:

(a) In theory the users of agricultural machinery and tools or farmers have access to credit from the banks. However, the National Governments should examine the problems of lack of utilization of available credit and eliminate procedural difficultures, especailly to small farmers.

(b) Local manufacture is important to the country for its long-term growth. Special steps should therefore be taken by Governments to encourage local manufacture such as:

(i) Eliminating discrimination in local taxes and duties against local manufacturers,

(ii) Providing incentives to local manufacturers,

(iii) Eliminating unnecessary competition from imported machinery, and

(iv) The programme on small-farm implements is often handicapped for lack of funds for demonstration, manufacture of prototypes, hiring, hire-purchase, etc. and therefore adequate funds should be provided for the promotion of these activities.

E. Manufacturing Activities

23. The problems encountered in the installation of metal working equipment including facilities for forming, heat treatment, machining and welding and therefore the manufacturing capacity for agricultural machinery varies greatly from country to country in the region. The following is a brief account of the individual country situation.

(a) In the Philippines, there are more than 60 units manufacturing and assembling tractors and other types of farm machinery. Metal Industries Research and Development Centre (MIRDC) provides training in the basic metal working operations. The Government incentives of tax exemption are aimed at encouraging installation of basic equipment especially in rural areas.

(b) In India, there are 11 tractors manufacturers and one of them is in the public sector. The total production in 1979 was estimated to be 60,000. Three manufacturers licensed are in production of power tillers and the production in 1979 was estimated to be 2,000 per year. There are a large number of large and small-scale diesel engines and agricultural implements manufacturers in the country.

(c) In Iran, the Government is said to be committed to the policy of decentralization of agricultural machinery and small-scale industrial operations to the rural areas. There are 2 tractor plants producing 20,000 tractors per year. It has attained 38% indigenous content. There are 2 power tiller manufacturing units producing Mitsubishi and Kubota type, numbering 8,000 units annually. There are 30 other manufacturers producing various other agricultural machinery and equipment.

(d) In Thailand, there are a number of manufacturers producing simple power tillers, 4-wheel tractors, water-pumps, disc-ploughs, corn-shellers, threshers and rice-mills.

(e) In Malaysia, there are only a few firms actively involved in the assembly or manufacture of small-farm machinery. The potential for manufacture is considered to be good.

(f) In Indonesia, the agricultural machinery industry had not expanded sufficiently owing to the limiting factors such as insufficiency of production technology, shortage of designs and inadequate technical manpower.

24. The points that emerge from the position explained in the previous paragraphs are:

(a) Assistance would be required in the establishment of rural workshops for the manufacture of simple equipment and for the repair,

maintenance and service facilities of agricultural machinery, tools, equipment, etc. which are in use in individual countries.

(b) Considerable technical assistance is required in order to improve the quality of the designs, metallurgical aspects and efficient manufacturing technology of the agricultural tools, implements and machinery to the second category of countries.

(c) In most developing countries in the region there is a metal industry development centre of Industrial Service and Training Institute (ISTI). Such institutes should be utilized for development of manufacturing technology of agricultural tools and machinery.

F. Training Programmes

25. Some of the countries have established training programmes at various levels which however require considerable improvement.

(a) In India, training in farm machinery is being provided at the two tractor testing and training stations at Budhni and Hissar. The manufacturers have their own product training centres. Industrial technical institutes of the Labour Ministry provide training in various production operations such as welding, milling, grinding, etc. There are 11 agricultural engineering colleges producing agricultural engineering graduates.

(b) In Iran, agricultural machinery practical post-graduate and technician courses are provided at the Institute of Agricultural Engineering. Practical training is provided at the Institute in Karaj.

(c) In Thailand, in order to increase the efficiency of farming, a training centre has been established at Prathumthani by the Government of Thailand in collaboration with the West German Government. Different types of courses are being organized for different purposes. The emphasis is on practical work and field demonstration. Several hundreds of farmers, agricultural students, operators and technicians are being trained. Training courses on metal working operations and plant management are provided for manufacturing. However, there should be a comprehensive training programme for agricultural machinery manufacturers.

(d) In Malaysia, the Department of Agriculture provides training in the operation, maintenance and repair of agricultural machinery at 10 farm mechanization training centres, and one of them is devoted to train agricultural assistants and technicians.

(e) In the Philippines, national and local training programmes are offered by some of the government agencies and machinery distributors. Five

hundred new farmers' training centres with necessary facilities are to be established, in which agricultural mechanization could be included in the training programmes.

(f) In Indonesia, there are institutes conducting training for manufacturers in the field of metal working. Some of these institutes are Vocational Training Centre, Metal Industries Development Centre and Polytechnics. For the farmers, training is provided by the Ministry of Agriculture, especially in the field of Agronomy and the techniques of using equipment and implements.

26. In consideration of the foregoing situation it is recommended that:

(a) the UN system should prepare a high priority modern written/audio/visual training programme kits for upgrading skills of (i) farmers for operating and maintenance of agricultural equipment, (ii) mechanics for repair and servicing of agricultural machinery, (iii) fitters, welders, machinists, etc.

(b) The metal industry development centres or equivalent organizations should provide necessary technical assistance and training facilities in the basic metal working operations. Such centres could also train industrial extension workers. International assistance is needed to strengthen the technological and service capability of such centres.

(c) Management is considered to be an important area which needs particular attention. Another crucial deficiency in manufacturing is the design-development skills within the developing countries. The design-development capability at the regional level should be developed within the activities of the Regional Network for Agricultural Machinery (RNAM) which should be suitably strengthened for this purpose.

IV. Conclusions

27. The main thrust of RNAM activities are oriented towards assisting the small farmer and development of appropriate technology. A principal objective of RNAM is to enhance the technological capability of the national institutes to produce innovative technical knowledge and information. More specifically the strengthening of the technical capability is to strengthen their design and manufacturing capabilities for the local production of appropriate agricultural machinery and tools. The point has been repeatedly made that despite the availability of a pool of technological knowledge in the developed countries, the requirements of agricultural equipment and tools is specific to each location and has to be adapted to local conditions. No time should be lost in the indigenous development of technology to meet the particular requirements of individual countries. It is with this background that the strengthening of the technological capacity is sought to be achieved through the establishment of subnetwork activities and a variety of supporting programme elements in the RNAM.

28. The ultimate objective of the inter-country project is to bridge the gap on the one hand between design and development and on the other, the commercial manufacture of machinery and their acceptance and use by the farmers.

29. There is a growing consciousness of the need for agricultural mechanization and a progressively increasing programme of manufacture of appropriate agricultural tools and machinery in the developing countries of the ESCAP region. The national efforts to strengthen their mechanization and manufacturing programmes could be accelerated through co-operative institutional support such as the Regional Network for Agricultural Machinery. The role of more developed among the developing countries in promoting co-operation cannot be understated. Therefore, the Beijing meeting has a particular significance in making available the experience of the People's Republic of China to the participants from other developing countries in the meeting.

30. The reference made to RNAM as a development institution by the recent UNDP Review Mission is ample testimony of the unique importance of the Regional Project. It is a portent to a far more dynamic role which RNAM is destined to play in spearheading the agricultural machinery manufacturing programme in Asia at the behest of the participating governments.