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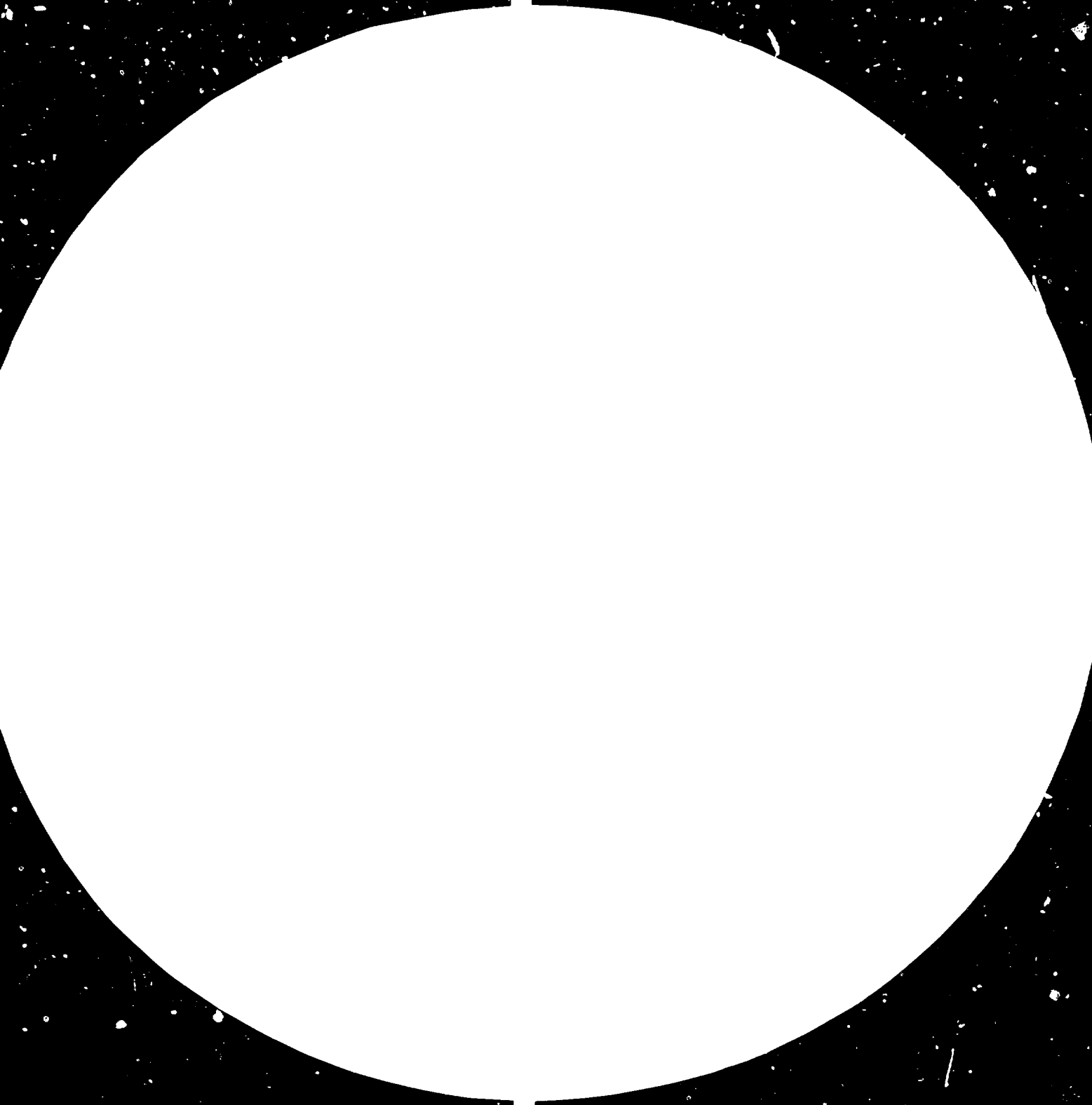
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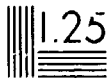
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Meeting on Exchange of Experiences and
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Development of Agricultural Machinery Industry

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COUNTRY SUMMARY - BANGLADESH*

by

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PRESENT STATUS OF AGRICULTURAL MACHINERY AND
IMPLEMENTS IN BANGLADESH.

1. Introduction.

Bangladesh is mainly an agricultural country producing rice, jute, sugarcane, tobacco, pulses, oil seeds, vegetables etc. Recently emphasis is given on the production of cotton, wheat and other coarse grains such as barley and joar and 75% of the total cultivable land is occupied for rice production. About 85% of the total population live in rural areas and fully depend on agriculture.

In Bangladesh land is mainly prepared with wooden plough with an iron share attached to it. But this plough can only scratch the surface and the seed-bed and thus preparation of land is not satisfactory. A considerable loss of man-hours and decrease in production occurs due to lack of effective tools.

Presently village blacksmiths manufacture most small farm tools mainly from mildsteel which considerably reduce the life and thus increase cost of cultivation.

Production can be increased by the use of improved implements as it can prepare land well and improved agricultural practices can be adopted. Without these, use of improved seeds, fertilizers, irrigation and plant protection measures would not produce the maximum effect on production. Better cultivation can be achieved by the use of power driven machinery or improved animal or hand operated tools.

In Bangladesh, operations involved in land preparation cannot be highly mechanized with the imported tractors, power tillers and other heavy machinery and implements.

Since Bangladesh has neither sufficient raw materials nor heavy industries to make the sophisticated machinery and implements, at the initial stages, emphasis has been given on design and development of appropriate machinery and implements almost all parts of which are manufacturable by the different organizations and even by the village artisans of the country.

Bullocks are still the main source of power for land preparation and it is not sufficient for preparing the land as the number of them is decreasing steadily.

2. Agricultural machinery and Implements needs and demand:

Agriculture of Bangladesh is mainly dependent on traditional methods of cultivation employing manual labour or bullock power and using traditional implements. There is no comprehensive study available on the actual needs and demand of different categories of agricultural implements and machinery.

2.1. Agricultural implements and equipment generally used by cultivators in Bangladesh:

Category I:

- a) Country plough (Driven by bullock)
- b) Bamboo ladder (-do-)
- c) Yoke
- d) Hammer (Clod breakers)
- e) Spades (Kodal)
- f) Sickle (Kanchi)
- g) Curved knife (Hashua)
- h) Hand operated push weeders
- i) Scythe for harvesting
- j) Hand sprayers

- k) Hand operated seed drill (for jute, paddy, wheat, pulses and oil seeds)
- l) Mold board plough
- m) Rake (Achra)
- n) Pedal thresher

Category II:

- a) Country ploughs and harrows
- b) Hand weeders
- c) Push weeders
- d) Seed treater
- e) Seed cleaner
- f) Sugarcane crusher

Category III:

- a) Low cost power tiller
- b) Shallow tube well
- c) Deep tube well
- d) Low lift pump
- e) Power trasher
- f) Rice drier
- g) Low cost tractor
- h) Paddy threshers
- i) Wheat threshers
- j) Irrigation pumps

Category IV:

- a) Big tractors
- b) Combined harvestors
- c) Electric motors
- d) Automatic engine

Estimate of demand for the above implements cannot be provided as there is no proper study available on this particular area.

2.2. The use of powered machinery has been very limited. There is now more emphasis on powered irrigation than powered land tillage or post harvesting operations. Some heavy tractors have been tried on co-operative farms during pre-liberation period but no wide spread use is envisaged at the moment. Combine harvesters were never tried in Bangladesh because of socio-economic reasons. Following are the estimated requirements for powered machinery in Bangladesh as envisaged in Second Five-Year Plan to cover a total irrigated area of \$ 7.2 million acres of land :

<u>Machinery</u>	<u>Unit</u>	<u>Requirement</u>
Power pumps	Nos.	1,95,000
Hand tube wells	"	5,00,000
Diesel engine	"	69,400
Electric motor	"	26,600
Power tiller	"	Not ascertained

The modern implements that are brought from foreign countries are not suitably working or profitably used due to shortage of spares and dearth of technological know-how of the users. All power tillers and tractors brought from abroad are almost idle due to inefficient handle by illiterate farmers and for want of required spares. But the improved irrigation machinery like deep tube well, shallow tube well and power pumps are given better services.

2.3. Present usage of Agricultural Implements and Machinery:

Under the present strategy of Agricultural production in Second Five-Year Plan, a gradual adoption of appropriate technology is envisaged. At the present

time, a gradual demand is already created for various agricultural implements in the country. Improved indigenous and new implements like ploughs, weeders, seed drills, bamboo tube wells, threshers, sprayers etc. will be introduced in the near future in large scale and intensive cultivated area.

The traditional implements are generally labour intensive and inefficient. Country plough consists of a wooden shape with tongue for holding an iron tooth, a handle for holding down and a pole for attachment of bullocks. These ploughs are generally non-standardised and made by rural workshops and, therefore, not efficient. However, the introduction of improved light standard plough requires following considerations:

- a) The availability of plough
- b) The price of the plough
- c) The effectiveness of the plough in all seasons
- d) Nature of soil to be ploughed
- e) The draft of the plough and power available from a pair of bullocks.

Some improved models of plough have been tried, but the experiment were not very successful. More work is required in this line keeping in view the reduced health standard of Bangladeshi livestock.

Other hand implements currently used in Bangladesh are also generally non-standardised and their efficiencies vary with the standard of local production.

Some intermediate machinery are now experimentally tried in Bangladesh. These are:

- a) Foot pedaled threshers
- b) Weeders
- c) Seed winnowers
- d) Hand operated pumps
- e) Furnaces for drying paddy using rice husks etc.

The results of these machines are still being assessed in laboratory and on pilot project basis.

Main thrust of agricultural mechanisation in Bangladesh is presently directed at irrigation sector. The number of different water pumps used in 1978-79 is as follows:-

a) Low lift pump	36,730 Nos.
b) Shallow tube wells	12,613 Nos.
c) Deep tube wells	7,470 Nos.
d) Hand tube wells	60,000 Nos.

Total area under irrigation programme was 2.875 million acres which includes 0.9 million acres under traditional irrigation. Compared to this, planned total area for irrigation in 1984-85 is 7.2 million acres. LLPs and HTWs are sold to the farmers and STWs and DTWs are fielded by Bangladesh Agricultural Development Corporation, Bangladesh Krishi Bank, IRDP, UNICEF and Ministry of Agriculture on rental basis. HTWs are more popular to farmers for the following reasons:-

- a) Low cost
- b) Easy availability of spare parts and easy maintenance
- c) Small farm holding (generally less than 3 acres per farmer)
- d) Labour oriented and hence generates employment.

Under the conditions of seemingly unending labour supply and low general/technical education level of Bangladesh,

tractors were not very popular. Pre-independence period used only about 150 numbers of four wheel tractors for primary cultivation has not substantially improved in post-independence period. Two wheeled tractors of 7 to 9 HP capacity were imported and fielded by BKE. These small tillers seem to be of interest to large land owners and co-operatives.

Import of these tillers has been stopped in view of local production of hand tillers of IRRI design. This particular tiller of 4-5 HP. range using mold-board plough and spiked harrow can be a suitable substitute for traditional bullock drawn ploughing for increased agricultural productivity.

3. Manufacture and Import:

Bangladesh is dependent on import of most of the raw material for industrial production. For industries to produce farm machinery, generally the following items are imported:-

- a) PIG Iron
- b) Coke
- c) Steel scraps
- d) Carbon and alloy steels
- e) Oil and lubricants
- f) Tools for manufacturing
- g) Foundry chemicals
- h) Spares and components of machine tools
- i) Component and spare parts of diesel engine
- j) All types of bearings, etc.

3.1. Small tools and implements:

The requirement of traditional tools and implements used by the farmers are mostly met by the local manufacturers.

However, no product lines as such exist on commercial basis. For traditional items no assistance is envisaged. Govt. has plan for research, improvements and adoption of simple tools and implements. Some foreign help is available through different United Nations Organizations at Bangladesh Rice Research Institute, Bangladesh Agricultural Research Institute, Bangladesh Agricultural Research Council and other agricultural institutes.

3.2. Intermediate Equipment:

Research and development work is going on in the field of threshers, weeders, winnower, driers, etc. to suit the local socio-economic condition. Design and engineering capabilities exist locally to certain extent. The institutes mentioned in 3.1. are involved in this area for the development of local capabilities. In addition to the above-mentioned institutes, other organizations involved are Bangladesh Machine Tools Factory, Comilla Co-operative Karkhana Limited, Renwick and Jogueswar Engineering Co. Ltd., National Foundry and Engineering Works, Khulna, Bengal Implements and Steel Products, Essentia Products Ltd., Mirpur Agricultural Workshop and Training School and other private entrepreneurs.

No foreign licencing and investment are envisaged in this particular field.

3.3. Powered Machinery and Specialised Equipment:

In the Second Five-Year Plan Bangladesh has put emphasis on obtaining self-sufficiency in the production of powered farm machinery of appropriate type. Total target envisaged in the production of agricultural machinery is as follows:-

Machinery	Unit	Public Sector Production		Private Sector Production		Total
		Bench make	Target	Bench make	Target	
		1979-80	1984-85	1979-80	1984-85	
Power Pumps	Nos.	9,000	18,100	5,100	30,000	48,100
Hand Tube well	"	-	300,000	60,000	200,000	500,000
Diesel Engine	"	6,500	25,000	-	10,000	35,000
Electric Motor	"	-	25,000	1,000	5,000	30,000
Power Tiller	"	-	5,000	-	-	5,000

For power pumps manufacture main organizations involved are BMTF and KSB Private Ltd. These concerns are self-sufficient in design and manufacture of different capacities of pumps from $\frac{1}{2}$ cusec to 2 cusec for irrigation purpose. Some other enterprises of Bangladesh Steel and Engineering Corporation to which BMTF Factory belong and some private organizations also produce power pumps. Except for bearings, the rest of the pump components are locally manufactured from imported raw material.

Diesel engines are at present assembled in Bangladesh Diesel Plant and Bangladesh Machine Tools Factory in collaboration with foreign firms. EDP has plan to produce about 70% of the component by value locally within this financial year. BMTF has a plan for progressive manufacture of upto 68% local components in three years time. One private factory has also been established for the assembly of diesel engine with a plan for progressive local manufacture with foreign collaboration.

Electrical Motors are being produced by G.E.C. (Bangladesh) Ltd., and General Electric Manufacturing Plant Ltd. with foreign assistance.

Power tiller of IRRI design are being produced in BMTF. About 60 numbers of power tillers have been produced in the first phase. With the introduction of certain basic facilities such as forging, press work etc. and improvement of method and process for production, BMTF is endeavouring to meet the national target.

Main problems in the manufacture of power tillers and pumps lie in the non-availability of raw materials and commercial items in time. These items are generally imported and is tied up with foreign financial assistance and availability of foreign currency. International assistance specifically related to financing for import of raw material for agricultural production will be helpful.

3.4. Basic facilities and Ancilliary Industries:

A large number of small foundries exist in the country but these are not capable of production of farm machinery parts in large numbers. Basic facilities for foundry, forging, heat-treatment, surface treatment and machining has been recently created in BMTF for the production of machine tools agricultural and textile machinery. The planned capacity is as follows:-

a) Foundry	7,200 tons	(2 shift basis)
b) Forging	1,500 tons	(1 shift basis)
c) Machinery	567,000 m/c.hours	(2 shift basis)
d) Assembly	80,000 man hrs.	(2 shift basis)

Some small ancillary and supporting industries exist in private sectors for the manufacture of small commercial and engineering items such as fastners, rubber products, etc.

Basic difficulties in the establishment of basic ancilliary industries are:

- a) Lack of standardization
- b) Lack of market research and statistics on products types
- c) Lack of technical know-how for large-scale production
- d) Lack of suitable finance.

It is recommended that the above points should be properly investigated and solved.

4. Design and Development, Adoption, Testing and Evaluation:

There is an appropriate technology cell in Bangladesh Agricultural Research Council under Ministry of Agriculture. It caters for the research work leading to design, development and adoption of agricultural machinery.

BMTF has a design and method department engaged in design and development of power pumps for the irrigation sector. It has shortage of experienced man-power for design and development of other farm machinery.

BRRRI and BARI have their own engineering division for the research work in the development of small farm implements and machinery adoptable to local conditions. These organizations also test and evaluate farm machinery both imported and locally produced. Central Extension Resources Development Institute recently formed also tests and evaluates farm machinery under the umbrella of a National Committee for standardization of farm machinery and a national committee exists for standardization of engines.

Educational institutes such as Agricultural University, Agricultural College and Agricultural Institute are also engaged in the development of appropriate agricultural technology.

5. Engineering and Manufacturing Technology:

There is at present no national institution in the style of Science and Technology Institute to provide advisory or technical service for the manufacturing industries. There is an Industrial advisory centre which generally evaluates and advises on industrial schemes submitted to it for subsequent approval by National Economic Council. Another institution called Bangladesh Industrial Technical Assistance Centre provides counsel on technical problems faced by industries and makes all types of spare parts for them. Moreover, financial aid, technological assistance and sufficient spare parts for machinery to be provided to available industrial units who are producing agricultural implements.

Government should consider formation of a science and technology centre with guidance and help of international agencies under the Ministry of Science and Technology. This should employ both expatriate and local expertise for centralised research and development work in the field of science and technology. This should have an agricultural mechanisation division working in collaboration with other agricultural research and development centres of the country for the development of appropriate farm machinery and implements and their standardization.

6. Repair, maintenance and spare parts supply:

Facilities exist in small workshops spread all over the country for repair and maintenance of small agricultural tools and implements BADC which supplies bulk of the power pumps to farmers have a central workshop and a network of workshops in different parts of the country for the repair and maintenance of power pumps. It has a plan for establishing workshops upto thana level for efficient servicing

of diesel engine or electric motor driven pumps. Some private workshops are also capable of servicing and supplying spare parts for pumps. However, there is a dearth of proper maintenance personnel in this field.

The availability of spare parts of engines which are generally imported poses a great problem. Many of the powered machinery lie in unserviceable condition because of the lack of timely procurement of spare parts for prime-movers. Government of Bangladesh is now emphasizing that each of the prime-mover supplier should have servicing and wherever feasible spare parts manufacturing workshops in Bangladesh.

7. Policy, Strategy and Co-ordination:

Policy of Bangladesh for agricultural mechanisation is centralised on two themes:

- a) To provide maximum irrigational facility.
- b) To develop and adopt simple and appropriate technology in pre-post harvesting operation.

There is a policy decision for the establishment of a technological development centre to provide equipment for local adaptation and identifying of appropriate technology for small and cottage industry sub-sector.

Following plan has been adopted for agricultural machinery sector to attain self-sufficiency in agricultural tools and equipment, pumps, spares etc. at thana level.

- a) Production lines for power tillers, tractors, dradges, automatic sprayers, threshers etc. to be established in different enterprises of BSEC and private sectors.
- b) 400 small foundry and workshops for manufacturing and servicing agricultural and irrigational equipment are to be established. Out of these 200 numbers will be under BSEC and 200 under private sector.

For successful implementation of the plan, the following policy measures will be taken.

- a) No import of machinery, machine components and spares allowed without clearance from the National Import Substitutes Co-ordination Committee.
- b) A high powered standing technical committee under NISCC should identify machinery, machine components and spares needed by development projects and absolute import requirement.
- c) Existing duties and tariff structures to be rationalized to favour domestic manufacture. Appropriate tariff barrier is to be imposed against intrusion of foreign supplies at the cost of domestic manufacture.

The committees mentioned above consist of personnel from related Ministries to co-ordinate activities and policies of different Ministries.

Special concession are provided to private entrepreneurs for establishing agro-based and agro-support industries. Institutional and infra-structure facilities are extended to expand private investment. To attract foreign capital investment, certain facilities are provided such as repatriation of capital, remittance of post-tax dividends, approved royalties and technical fees, family remittances, exemption of tax on foreign loan etc.

8. Inter-Regional Co-operation:

Agricultural mechanisation in Bangladesh is in very rudimentary stage. Appropriate mechanisation technology has not yet been identified and, therefore, development of expertise in this field is not worth mentioning. This automatically put Bangladesh at the receiving end of any assistance programme without much really significant to offer to other countries in the form of assistance. One

particular area where Bangladesh can participate is the sharing of her limited experience in the field of agricultural mechanization development particularly in power pump irrigation and exporting man-power.

The specific areas where other developing countries can help are as follows:-

- a) Sharing of design and manufacturing know-how of simplified agricultural implements and machinery developed specially in countries of South-East Asia and Pacific who shares similar socio-economic, climatic and soil condition as in Bangladesh. This kind of assistance would save much needed time and fund.
- b) Assistance in establishing manufacturing lines in existing engineering enterprises of Bangladesh for those agricultural machinery which are already in production in the country offering assistance with adaptation of design if necessary.
- c) A 'network approach' for training of young scientists, engineers and other human available resources may be built by using the existing agricultural research and development institutes and programme that have complementary training facilities for the whole region. Appropriate technology is growing very fast in countries of this region and it is desirable that research gain be consolidated and further improvement sought on joint footing, holding of regional seminars and fair on agricultural machinery, equipment and tools can help in exchange of information and transfer of technology.

9. Role of UNIDO:

UNDP activities in Bangladesh have increased considerably in recent years specially in agricultural sector. Expert findings on different projects and actual participation of UNIDO experts in development projects are being found very helpful.

Priority areas where UNIDO may contribute towards agricultural mechanization are as follows:-

- a) Survey of present state of agricultural mechanization in Bangladesh and determination of inputs and support arrangements required for appropriate mechanisation.
- b) Research and development of appropriate forms of farm mechanisation. This will include the following:-
 - i) Review of traditional agricultural tools implements and machinery.
 - ii) Field studies under various conditions such as soil, implement with reference to power requirement and employment situation.
 - iii) Optimising tools implements and machinery.
 - iv) Cataloguing of optimal designs.
 - v) Recommendation on development of industries for manufacture.
- c) Technological help and initial financial support of projects for the manufacture of appropriate tools, implements and machinery and their service network.

UNIDO is already providing shop-floor level experts to BMTF for development of basic technology and for training of personnel in certain selected fields where know-how is not sufficient. This will help in development of basic engineering facilities in Bangladesh.

10. Specific proposals and recommendations:

In the light of present infant stage of agricultural mechanization in Bangladesh, the following specific proposals and recommendations are made:

- a) Immediate institution of techno-socio-economic survey with expertised help on the use of traditional and modern agricultural tools and implements in Bangladesh with special reference to land tenure system, technical know-how and inputs position and employment situation.

- b) Development of appropriate technology through establishment of a properly equipped National Science and Technology Institute drawing experts from home and abroad. This should have an agricultural machinery division for research, development and standardization of agricultural tools, implements and machinery.
- c) Institution of technical and financial supports to BMTF in establishing an integrated programme for agricultural production and establishing potential for the planning, design and methods for such production.
- d) Since Bangladesh is the most thickly populated areas in the World and there is acute shortage of land acreage under different cultivation in relation to population/farmers of Bangladesh, high yielding variety of seeds of rice, jute, paddy, sugarcane, tobacco etc. to be imported from abroad. Financial aid is to be provided by Foreign agencies particularly in this area.

Mechanised cultivation, irrigation and pre-post harvesting automation is to be emphasized.

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