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THE ROLE OF UNIDO IN PROMOTING THE AGRICULTURAL MACHINERY AND IMPLEMENTS INDUSTRY

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CONTENTS

EXPLANATORY NOTES

Reference to dollars ($) indicates United States dollars.

The term "billion" signifies a thousand million.

Dates divided by a hyphen (e.g 1966-1969) indicate the full period involved, including the beginning and end years.

The following abbreviations are used in this volume:

ECAFE	Economic Comission for Asia and the Far East
FAO	Food and Agriculture Organization of the United Nations
IDCAS	Industrial Development Centre for Arab States
SIS	Special Industrial Services
UNDP	United Nations Development Programme
UNESOB	United Nations Economic and Social Office in Beirut

PREFACE

This volume has been written for the information of countries interested in receiving technical assistance for the agricultural machinery and implements industry. Its main purpose is to provide a practical summary of the contents and forms in which assistance for this industry can be obtained through UNIDO, the types of programmes that have been established and the procedure that must be followed to obtain assistance. This background information is contained in part one. Part two contains very concrete information and gives specimens of project data sheets to be used when technical assistance is requested.

The information presented here has been prepared in accordance with guidelines established by the Industrial Development Board, which requested that "the operational activities of the United Nations Industrial Development Organization should be widely publicized and brought specifically to the attention of Governments of developing countries in order to assist them in formulating their requests under the operational programme of the Organization in the immediate future". It should be of special interest to:

(a) Government officials - Ministers of agriculture, industry, commerce and trade, finance and national planning;

(b) Commercial organizations - Chambers of commerce and industry, engineering manufacturers associations, agricultural machinery and implements manufacturers or dealers, users associations, agroindustrial corporations;

(c) Professional societies - National engineering institutes, national agricultural engineering societies;

(d) Technical institutions - National institutes of agricultural research, mechanization, agricultural machinery manufacture; design, development and testing institutes; national agricultural engineering research centres;

(e) Agricultural engineering, educational institutions - Agricultural colleges, agricultural engineering colleges or universities;

(f) Financial institutes - Industrial development banks, regional development banks;

(g) National and international organizations - National and international organizations and foundations concerned with the development of agriculture and industry;

(h) Manufacturers and related enterprises - National and international manufacturers of agricultural machinery and implements from hand tools to engines, pumps, tractors, and power machinery; commercial organizations distributors and wholesalers;

(j) Organizations disseminating information - Technical journals concerned with mechanization of agriculture and agricultural machinery and implements; organizers of agricultural machinery and implements exhibitions; documentation and information centres for the engineering industry (including agricultural machinery);

(k) Individuals and technical personnel - All who are engaged in the mechanization of agriculture or in agricultural machinery and implements industry.

PART ONE

TECHNICAL ASSISTANCE PROVIDED BY UNIDO

I. UNIDO AND ITS FUNCTIONS

Aims, organization and activities

The United Nations Industrial Development Organization (UNIDO) was established by the United Nations General Assembly in 1966 as an autonomous body within the United Nations to promote and accelerate the industrialization of the developing countries. It was given the central role in co-ordinating all the activities undertaken by the United Nations family in this field. UNIDO came into existence on 1 January 1967 and has its headquarters in Vienna.

The principal policy-making body of UNIDO is the Industrial Development Board whose 45 members are elected by the General Assembly from Member States of the United Nations and its agencies for a term of three years. The Board meets once a year to formulate guidelines and policies for UNIDO and to approve its programme of activities.

UNIDO undertakes three basic types of activities: operational, supporting and promotional.

Operational activities

Operational activities involve direct assistance to developing countries in the following fields:

(a) Establishing, operating and managing industrial enterprises, to promote domestic investment and increase external financing for specific industrial projects;

(b) Building effective national organizations to administer industrial services;

(c) Preparing industrial development programmes and specific projects;

(d) Training staff;

(e) Solving problems related to the exploitation and use of natural resources, industrial raw materials and by-products;

(f) Disseminating information on new technologies and assisting the developing countries to apply such information effectively;

(g) Promoting national, regional and international action to achieve more rapid industrialization.

Supporting activities

Supporting activities include action-oriented research, exchange of information and training designed to contribute to the effectiveness of field operations through seminars, workshops, in-plant training programmes and expert group meetings. Also falling into this category are the compilation, analysis, publication and dissemination of data on various aspects of industrialization such as industrial technology, investment, financing, production, management and planning.

Promotional activities

Through its promotional activities, UNIDO seeks to mobilize resources far greater than its own by encouraging direct contact between the financial and business communities in the industrialized world and their counterparts in the developing countries. Thus, UNIDO seeks to provide an opportunity for businessmen in the developed and developing countries to initiate a relationship that they may then pursue alone, to their mutual benefit.

Financing UNIDO's activities

Expenses for UNIDO's administrative and supporting activities are borne by the regular budget of the United Nations. For its operational activities, UNIDO draws mainly on the resources provided by the United Nations Development Programme (UNDP) and on a part of the regular programme of technical assistance included in the budget of the United Nations as well as on voluntary contributions from member Governments.

Forms of technical assistance available

Special Industrial Services (SIS)

Designed to supplement other United Nations activities in the manufacturing sector, the Special Industrial Services Programme (SIS) sends teams or individual experts for brief periods and at relatively short notice to assist countries in the solution of urgent, unanticipated industrial problems. Such emergency service is possible because of the accelerated and simplified procedures followed. Experts will, for example, advise at the factory level on the solution of technical problems arising in connexion with the operation of plants and machinery, flow of materials and quality control.

Assistance can also be provided during the post-feasibility stages of industrial projects - investment analysis, investment promotion, tender analysis, contract negotiation - until appropriate financing is obtained. Other assistance includes advice on specific questions related to the preparation and implementation of industrial projects, confidential consultations with government officials or top management on matters relating either to specific projects or industrial development programmes, and advice on industrial project promotion.

In addition, the rapid preliminary assessments of feasibility and requirements that can be undertaken by SIS may lead to more adequate formulation of requests for longer-term assistance. Missions can be carried out, as appropriate, by UNIDO staff members or individual consultants, or, for complex projects, through consulting firms.

Upon the request of a Government, the services of interregional advisers on agricultural machinery and implements and senior staff members can be made available for short-term programming missions for on-the-spot study, review and analysis of a country's needs, with a view to defining further assistance in specific fields of industrial development and establishing the priority needs of the countries consistent with the targets of national development plants. (Note: the duration of technical assistance in this category is normally a maximum of four weeks if the assignment is undertaken by the interregional adviser or staff members, and a maximum of six man/months if the assignment is undertaken by individual experts.)

Examples of areas of UNIDO technical assistance are given in chapter III; specimen project data sheets for technical assistance requests are given in chapter IV.

Country programming

UNIDO is a Participating and Executing Agency of UNDP. All UNDP-financed technical assistance projects in the developing countries (large-scale and small-scale projects) are formulated within the framework of the "country programming" and indicative planning figures (IPF) proposed by UNDP for each developing country. The "country

programme document", which is prepared for each country by the respective resident representative in co-operation with the Government concerned and other United Nations agencies, makes it possible to plan the development of projects for a duration of three to five years. Such a country programme document details the projects for technical assistance and indicates the timetable for implementation. However, technical assistance activities financed under SIS and the UNIDO General Trust Fund or other sources are not included in the indicative planning figures of the country programme.

Except for activities financed under SIS, request for UNDP-financed technical assistance (either for large-scale or small-scale projects) in the field of agricultural machinery should be based on provisions included in the country programme. If a project is not included in the country programme as approved, the Government may submit a request for its inclusion in the revised programme that will be considered at the time of the UNDP's annual review of the country programme. It may also be possible to include projects in the field of agricultural machinery and implements, at the request of the Government, within the already approved programmes described, under a broad heading (e.g. assistance to industry, establishment of engineering design and development centres, establishment of metalworking industries development centres, assistance to automotive ancillary industry development, industrial estates, development of small-scale industry, rural industrialization, agroindustrial development, development of industrial inputs for agriculture, pilot demonstration workshops, general prototype fabrication centres, industrial studies and development centres).

UNIDO carries out both small-scale and large-scale projects, whose duration is normally up to five years, in partnership with the countries assisted. Such projects are government undertakings for which UNIDO provides the experts, consultants and equipment not locally available and also fellowships for training abroad. The Government provides the salaries of national counterparts, local cost components as well as buildings and infrastructural installations. With respect to the agricultural machinery industry, for example, such projects can consist of major industrial pre-investment (feasibility) studies, the estblishment

of agricultural machinery pilot plants and the creation of institutions to foster the application of agricultural machinery research, standards and quality control. Institutions and demonstration units are expected to continue to function with local resources after the UNDP Special Fund assistance has been terminated. The functions of the United Nations experts, the equipment component, the timing, subcontracts and all other elements relevant to a project are defined before the project begins in a "project document", which is essentially an agreement among the three principal parties - the participating country (or countries), UNDP and UNIDO. Projects can be considered for individual countries or for a group of countries in a region.

Small-scale projects are those for which the total UNDP contribution does not exceed $1 0,000. Such projects may, with certain exceptions, be approved by the UNDP resident representative located in the country concerned. Large-scale projects are those with a UNDP contribution of over $100,000. Such projects are subject to the approval by the UNDP Administrator or the Governing Council.

UNIDO General Trust Fund

The UNIDO General Trust Fund is based on voluntary contributions by Member States to promote specific activities in developing countries in the field of industrialization. Projects financed out of the General Trust Fund are operationally oriented. They are carried out in individual countries, or regionally, in co-operation with a group of developing countries or through government organizations. The General Trust Fund enables UNIDO to launch new programmes and pilot schemes that, after their soundness and feasibility have been proved, may be eligible for financing from traditional sources. Through this fund UNIDO may finance deliveries of industrial equipment and other physical units that would not have been covered under other programmes of assistance. Additional activities financed by the General Trust Fund include:

Plant design and laboratory investigations

Training projects, including in-plant training

Workshops and other technical meetings containing a training component

Collection and dissemination of industrial information and promotional activities

Industrial surveys and research

Expert assistance

Components of technical assistance

Through its programmes of technical assistance UNIDO provides experts, equipment and supplies, and fellowships.

Experts

Individual experts or teams of experts

An important portion of the resources of a technical assistance programme is devoted to providing advisory services of experts. Following requests from Governments, experts are made available to consult or advise on technical problems in all branches of the agricultural machinery and implements industry. Such experts are normally attached to a government authority, i.e. Ministry of Industry, Directorate of Planning, Ministry of Agriculture, which is directly responsible for industrialization. Experts can be provided individually or in teams. UNIDO maintains a list of experts in all branches of the industry who are available for assignments. This list is constantly reviewed and kept up to date.

Operational assistance (OPAS)

Countries often need operational, executive and administrative personnel that may not be available locally. Under the OPAS system, experts can be provided to Governments to act as their temporary civil servants; an expert may serve as a director of a national industrial service or as a plant manager, for example. The cost of OPAS personnel is borne by the recipient Governments according to the scale of national salaries for the respective posts; UNIDO will make up any difference in salary to the experts. Duration of such assignments is usually one to five years. The Government must provide counterpart personnel who will assume as soon as possible the functions temporarily entrusted to the foreign experts.

Experts through subcontracting with consulting firms

Services are provided through subcontracting for projects involving complex manufacturing techniques and several fields of specialization for

which individual experts are not readily available. Such projects frequently require the co-operation of various experts. In certain circumstances, a team of experts may best be obtained through specialized institutions or engineering firms. Contracts are awarded through the UNIDO Technical Equipment Procurement and Contracting Office. The costs are covered from resources allocated for the various programmes. UNIDO supervises the work of the contractors in consultation with the recipient Governments.

Associate experts

UNIDO also provides associate experts in specific branches of industrial activities (e.g. in agricultural machinery and implements) to work as an "assistant" to the UNIDO senior expert or the team of experts in a developing country. Seven industrialized countries have concluded an agreement with UNIDO to provide and pay the costs of such associate experts. The associate experts are fully qualified technical personnel with some experience in their fields.

United Nations volunteers programme

Under a scheme recently established by the United Nations, it may be possible to provide, within the framework of an existing or proposed UNDP-assisted project, United Nations volunteers in a specific branch of industry (example: agricultural machinery and implements). Certain local costs for such volunteers would, in most cases, be paid by the recipient Governments; the international costs of volunteers would be charged against the UNDP component of the project budget.

Equipment and supplies

UNIDO provides equipment in varying amounts for operational projects where such equipment is considered essential and not available in a country. The equipment thus provided must be used for demonstration or training purposes and is furnished only as an integral part of a specific project. Equipment is purchased by UNIDO under a system of international bidding. At the conclusion of the project, the equipment and supplies provided by UNIDO, which until that time remain its property, are subject to negotiations with a view to transferring title to the Government

or to an agency nominated by the Government. This applies particularly to equipment considered essential for the continued operation of the project or for activities resulting directly from the project.

Fellowships

UNIDO awards fellowships for individual study or for participation in group training programmes to nationals from developing countries who are already engaged in an industrial development activity and who will be able to apply their newly acquired knowledge in their home countries. The aim of the programme is to enable the fellows to take over the assignments undertaken previously by foreign experts. Fellowships are awarded in the fields in which expert advice is provided. For the agricultural machinery and implements industry such fields include: all aspects of manufacture; research, design, development, prototype fabrication and testing; and repair and maintenance. UNIDO is continuously developing contacts with appropriate agencies and institutions in the industrialized countries to make sure that the fellows will receive training in the skills actually needed.

How to obtain UNIDO's assistance

Although procedures for the submission of requests for assistance, and the character of the requests themselves, will vary from programme to programme, certain general procedures are followed in all cases. The UNDP resident representatives, the accredited representatives of the United Nations in matters of technical assistance, will advise Governments on these procedures.

The following points should be borne in mind when requesting UNIDO assistance:

(a) Assistance is granted only at the request of Governments in a formal communication emanating from the central authorities. Governments establish their own priorities.

(b) A request may be formulated through the combined efforts of the national authorities and technical assistance experts including UNIDO staff members, industrial development field advisers and the UNDP resident representative.

(c) Official requests normally contain a description of the project, its objectives, duration, the number of experts and the equipment required, and the nature or amount of local costs and counterpart contribution to be provided by the recipient Government.

(d) In each of the developing countries, a specific government department has been designated to co-ordinate the programme for technical assistance provided by the United Nations. The national authority so designated differs from country to country. It may be the Ministry of External Affairs or the Ministry of Planning. This office transmits all official requests that have obtained government approval to the UNDP resident representative in the respective country. The resident representative then transmits the official request to UNDP and UNIDO for examination and approval.

(e) Upon receiving the request, the resident representative conducts preliminary negotiations with the requesting Government on the nature of the request and the source and availability of funds.

(f) Requests for urgent short-term assistance may be made under the SIS programme, while medium-term advisory missions and pre-investment and pilot projects comprising provision of experts, fellowships and equipment can be financed from UNDP funds or other appropriate sources of financing.

(g) UNIDO reviews and comments on the technical aspects of the request. If further information or revision is needed, arrangements may be made to assist Governments in revising the request.

(h) Recruitment of experts is undertaken by UNIDO in co-operation with Member States. Recipient Governments approve the proposed candidates prior to appointment. In certain cases subcontracting is resorted to instead of individual recruitment.

Industrial development field advisers

In view of the complexity of many industrial projects, it has been found desirable to attach to the office of the resident representative specialized personnel who can advise on specific matters related to industry and thus facilitate the formulation of requests for technical assistance. UNIDO maintains close and direct contact with the field through several channels. Its field advisers are in direct contact with Governments and with the UNDP resident representatives on specific questions relating to industrial development and the formulation of requests for assistance.

Interregional advisers

Interregional advisers on various industries are stationed at UNIDO headquarters. The interregional adviser on agricultural machinery and implements provides advice on technical matters to the UNIDO secretariat, advises the developing countries on all aspects of the industry, and assists in formulating technical assistance projects.

II. UNIDO ACTIVITIES TO PROMOTE THE AGRICULTURAL MACHINERY AND IMPLEMENTS INDUSTRY

General features of the industry

The economies of most developing countries are characterized by the predominance of agriculture and the low degree of industrialization in general and the inadequate development of metalworking and engineering industries in particular. During the past few years, the changing agricultural pattern has created a demand for industrial inputs for agriculture. At the same time, the promotion of industrialization necessitates planning of priority sectors. Thus, in the next few years, the development of the agricultural sector will depend to a large extent on the availability of supplies from the industrial sector. Conversely, the development of the industrial sector in general and the engineering and metalworking sector, including the metallurgical sector, in particular can benefit to a large extent by agricultural growth. Agricultural machinery and implements are important industrial inputs. The agricultural machinery industry offers a wide choice of technologies appropriate to the level of industrialization in the developing countries. In most of the developing countries a priority has been awarded to the rational mechanization of agriculture and the local development of the agricultural machinery and implements manufacturing industry, since this industry diffuses technology throughout the countryside and gives employment to many.

In 1969, world trade in engineering products was approximately $76 billion, of which total machinery, non-electric, was around $32 billion.[1/] Agricultural machinery and implements and closely allied subgroups accounted for around $5.6 billion, or about 20 per cent of the total world trade described under "machinery, non-electric". Out of $2.6 billion worth of trade in agricultural machinery, 50 per cent represented

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1/ Economic Commission for Europe (1971) Bulletin of Statistics on World Trade in Engineering Products, 1969 (ST/ECE/ENG/10) (United Nations publication, Sales No. 71.II.E/Mim.6).

the trade in tractors and 40 per cent was concerned with machines for cultivating soil. In addition, it is estimated that the value of world trade in pumps and centrifuges was around $1.9 billion; in engines, $471 million; and in land development machinery, $587 million.

The value of exports of agricultural machinery and implements to developing countries according to region in 1969 was as follows: Africa, around $127 million; Asia and the Far East, $184 million; and Latin America, $297 million. This represents around 23 per cent of the total world trade in agricultural machinery and implements. In all three regions the import of tractors accounts for about 70 to 80 per cent of the trade in agricultural machinery. In fact, imports of tractors into the three regions account for 32 per cent of world trade in tractors. The volume of trade in agricultural machinery for cultivating the soil was relatively low (about 12 per cent), which reflects in part the restricted range of equipment employed and in part the satisfaction of regional needs through local manufacture.

Since the agricultural machinery and implements industry deals with a large variety of products - from hand tools, animal-drawn implements and hand-operated machines, irrigation equipment, crop-protection machinery to power machinery and equipment, such as tractors, power tillers, engines, harvesters and threshers - the problems of the industry vary in kind and magnitude. The agricultural machinery industry covers a wide spectrum of technology ranging from the simple technology of small workshops to that of multinational corporations. It involves the metalworking and metallurgical sector and the automotive and electrical engineering sector at different levels of product ranges. Since this industry is a basic one, government policies and planning at the national and regional levels must take it into account, particularly with respect to financing, investment promotion and export on the one hand, and research and development, training and management on the other hand, with special reference to the transfer of appropriate technology.

The machinery needed in agriculture can be supplied either through imports, or through domestic manufacture. The existence of a potential internal market can be used to foster the growth of a local farm machinery manufacturing industry. In most developing countries, a realistic aim is a judicious blend of imports and domestic manufacture with a definite policy of progressively raising the proportion of the market that is satisfied from within. In almost every country it is possible to match a production unit to a local demand for agricultural machinery and at a level of technology appropriate both to the manufacturers and to the farmers. In many cases, the manufacturer is able to handle only part of the chain of industrial activities between design and commercialization. If this limitation is recognized and steps are taken to assist the agricultural machinery industry within a national plan for development, it should be possible to accelerate industrialization and promote progress in the agricultural sector of the economy.

In the manufacture of agricultural machinery and implements three distinct levels of technology can be identified:

(a) Simple hand tools, hand-operated machines and selected animal-drawn implements that can be fabricated or manufactured in small workshops with relatively low investment;

(b) Most tractor-drawn implements, selected irrigation equipment including pumps, and crop-protection equipment that can be fabricated or manufactured on a batch basis in medium-size engineering production plants;

(c) Power equipment including tractors, power tillers and engines requiring relatively large investment in production facilities and demanding a higher volume of production to achieve economy of operation.

Small workshops engaged in manufacture at the first two levels can be found in most developing countries. In most cases they work under great handicaps compared with their counterparts in industrialized countries. The only materials available to them are timber and mild steel in a limited range of sheets and sections. There are no design facilities, and quality control is frequently absent. Not surprisingly, the hand tools and implements produced by such workshops cannot compete in quality with imports from established manufacturers in the industrialized countries. The main competitive advantage of local workshops is their ability to undersell the imported

machines. A paradox of agricultural machinery manufacture is that even well-designed and engineered machinery that is produced locally but has to carry development charges, usually faces competition in price from copies produced in small workshops. A characteristic feature of such workshops is that they serve a predominantly local need either by modifying equipment from a national supplier to meet an unconventional demand or by manufacturing a cheap local replacement for a conventional machine. They may also engage extensively in maintenance work and repair. The strength of such workshops is usually that of the owner, who combines mechanical ingenuity, local knowledge and a flair for commercial activity.

In the developed countries, such workshops flourish and are a source of both new ideas and useful machines. However, in developing countries, the quality of the products is usually unreliable because the workshops lack facilities for quality control; they use a very limited range of steels; and the design of the products tends to be either inventive or imitative without too much attention to details. In a developing country, small workshops are likely to function in a similar way to those in the industrialized countries, but are relatively more important in the over-all context of industrial development. However, in the developing countries, because of inadequate management, it is unlikely that they can produce a range of agricultural machinery unaided. They might be helped in the following ways:

(a) By supplying working drawings of well-designed machines suited to the level of mechanization in the country and manufacture with limited facilities;

(b) By offering practical training courses in production technology;

(c) By providing loans for the purchase of equipment;

(d) By providing assistance in co-operative commercialization.

Certain agricultural implements are not required in large quantities in a wide range of design, and the demand is seasonal; as a result, they are produced in batches, mostly in medium-size production units. There are obvious advantages in concentrating production on a narrow range of products. It allows economies in the use of machines and jigs, simplifies the stock that has to be kept and reduces the problems in quality control associated

with transferring staff from one product to another. The design and production teams increase their effectiveness by mastering the problems in a specialized area of manufacture. However, it is not easy to produce only a small range of machinery and operate at full capacity. Therefore, the manufacture of agricultural machinery may have to be combined with that of other products of the metalworking industry. In addition, the following alternative methods of production and commercialization may be explored:

(a) Concentration on a small number of items whose production exceeds national demand. Excess production is exported to a regional market, if such a market can be developed. Thus, the technological advantages of manufacturing a limited range are balanced against the marketing disadvantages of spreading over a wide area.

(b) Concentration of manufacture on a small number of products, probably with exports to a regional market, in order to obtain the technical advantages of specialization, but marketing complementary lines in order to obtain better utilization of a dealer network. There is often an imbalance between an economic scale of manufacturing and an economic scale of marketing. An obvious solution is for the manufacturer to enter into marketing agreements with manufacturers of complementary lines of agricultural machinery, which can be handled by his dealers and should enhance their turnover and profit.

(c) Selection of a product mix that gives an efficient and balanced manufacturing - marketing operation on a predominantly national scale. This is probably the most difficult of the compromises to reach successfully because to achieve uniform activity during the whole year, it is necessary to produce both cultivation and harvesting machinery. Transport, sowing, spraying, drying and storage equipment may be regarded as intermediate between cultivation and harvesting equipment. A suitable product mix is most likely to be based on either cultivation or harvesting machinery as the main line of activity, supplemented by some products of an intermediate kind.

Capital-intensive, mass-production and assembly plants are found mainly in engine, power tiller and tractor manufacture where the methods and organization are very similar to those in automobile manufacture. The operations within the parent plant are usually casting and machining of the major parts of the tractor and the final assembly and dispatch. However, the manufacturer usually depends on specialist suppliers for many of the components of the tractor. The relationship between the manufacturer and his suppliers should be that of the closest technical co-operation in design,

materials, quality control and scheduling of production. The principal manufacturer is responsible for the basic design of the vehicle, marketing and service in addition to his own production and assembly operations. The financial and organizational problems in creating such a mass production industry are obviously great. Some of the prerequisites for its success are a good infrastructure in iron and steel production; skill in metalworking, machining and assembly; experience in marketing; and an adequate market to sustain the scale of operation at a commercially viable level.

Assistance provided by UNIDO

UNIDO provides assistance to the agricultural machinery and implements industry within the framework of its over-all programme to promote industrialization in the developing countries. Upon request, UNIDO will assist and advise a Government on all phases of the agricultural machinery and implements industry, laying particular emphasis on the industry's close relationship with the metalworking and agricultural sectors as industrialization proceeds. In co-operation with the regional economic commissions and other United Nations agencies in general, and with the Food and Agriculture Organization (FAO) in particular, UNIDO assists developing countries to achieve self-sufficiency in the manufacture of agricultural machinery and implements, with special reference to the transfer of appropriate technology

Co-operation with FAO

To define the respective responsibilities of FAO and UNIDO in the field of industrial development, and also to foster co-operation in specific areas, an agreement establishing guidelines for co-operation between the two organizations was drafted which came into effect on 9 July 1969.[2/]

The agreement defines UNIDO's responsibilities as follows:

"UNIDO, under General Assembly Resolution 2152 (XXI) has responsibilities to assist in, promote and accelerate the industrialization of the developing countries, with particular emphasis on the manufacturing sector, by

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2/ "Agreement setting out guide-lines for co-operation between FAO and UNIDO in the field of industrial development", July 1969 (UNIDO document ID/INF 6)

undertaking activities which include industrial planning, programming and research, application and adaptation of technology, training, management, technical and economic feasibility studies and assistance in obtaining finance for industrial projects."3/

The responsibilities of FAO are defined as follows:

"FAO, according to its Constitution, is responsible for raising levels of nutrition and standards of living, securing improvement in production and distribution of all food and agricultural products, and for this purpose it shall promote national and international action with respect to, inter alia, the improvement of the processing, marketing and distribution of food and agricultural products ...."4/

The agreement identified agricultural machinery and implements as one of the "complementary areas", offering a scope for joint action, and states that "production of agricultural...machinery...would be the responsibility of UNIDO in close consultation with FAO on requirements of designs and utilization."5/ The agreement specifically states that "UNIDO's responsibility in the manufacture of agricultural machinery and equipment is recognized. However, there is a need for co-operation between the two Organizations because of FAO's interest in the use, selection, improvement and preventive maintenance of such equipment and machinery as well as responsibility for training personnel in their actual use".6/

Therefore, UNIDO, whenever appropriate, carries on discussions with FAO on exchange of technical information and project identification, formulation and implementation. In certain cases, joint technical assistance programmes are formulated. In addition to the discussions on policy that take place at regular intervals in the UNIDO-FAO Inter-Secretariat Committee, the substantive aspects are discussed at regular UNIDO-FAO technical consultation meetings. A number of projects and activities have been discussed in the six technical consultation meetings held up to March 1972. Many activities that fall within the scope of UNIDO's responsibilities are formulated and implemented by UNIDO in co-operation with FAO, and six joint UNIDO-FAO projects have been initiated.

3/ Ibid., para.3.

4/ Ibid., para.2.

5/ Ibid., para.8(a).

6/ Ibid., para.9(a).

Types of UNIDO activities are described below. The following examples of technical assistance activities undertaken by UNIDO are selected to indicate what types of projects UNIDO has assisted.

Exploratory missions

The aim of these fact-finding, project-identification or sectoral-development missions is primarily to obtain a bird's-eye view of the situation, highlight the major areas that need attention, identify projects for technical assistance and recommend action to implement the project. These missions analyse agricultural mechanization; present and future demand; trends in designs and general production specifications; status of existing facilities for design, development, adaptation, testing, maintenance and repair; the need for strengthening existing facilities; and the scope for local manufacture.

Market-survey missions

The objective of market-survey missions is to establish the present demand for agricultural machinery, future requirements and product specifications and to recommend a suitable manufacturing programme and over-all policies. To achieve this objective, it is necessary to analyse the existing pattern and future trends in agriculture, land development, irrigation extension, crop pattern, rural economy, use of agricultural machinery, government plans for mechanization, rural credit, data on imports, sales and existing production of agricultural machinery. It is also necessary, based on the above analysis, to identify present and future trends in the level of mechanization, designs, production specifications and over-all needs and to estimate the annual demand for selected agricultural machinery and implements.

Manufacturing feasibility study

A manufacturing feasibility study is carried out when the demand for a product or a group of products is identified and established. However, it may be desirable to re-examine information on existing demand, design, specifications and data on future requirements and design trends in order to establish the basis for the manufacturing study. It may be necessary to evaluate already existing proposals for manufacture. This study involves an analysis of the availability of raw materials, the status of supporting and ancillary industries and the level of technical skill available. With this

background, the study aims at establishing the criteria for manufacture, taking into account the production volume, product mix, installed capacity and possibilities for expansion, cost of manufacture, finances and general economic aspects.

Pre-investment analysis

Pre-investment analysis includes formulation of a manufacturing programme based on data available, analysis of production volume, manufacturing schedule, techniques, machine-tool requirements, raw material availability, manpower requirements, and a financial analysis of the manufacturing proposal.

Rationalization of manufacturing programme

This involves analysis of proposals for manufacture, analysis of existing manufacturing facilities (including supporting and ancillary industry), establishing correlation between demand figures and production volume and plant capacity, analysis of raw material, substitution of local materials for imports and a phased manufacturing programme.

Establishment of manufacturing unit: planning

Based on the pre-investment analysis, the activities for establishing and commissioning of a manufacturing plant may include design of plant layout, selection and installation of machine tools and equipment, production planning and control, quality control, cost control, engineering services (industrial, tool, development, plant, production, material control), organization, operation and management.

Design, development and adaptation

The purpose of design, development and adaptation activities is to suit a manufacturing programme to local conditions and to assist small and medium-sized industrialists to become self-reliant in matters of engineering design and development and in adaptation of technology acquired from abroad. Even if a basic design of a machine is available, it cannot always be used without alteration; to adapt the design and manufacture the machine requires engineering capabilities. The modification of designs may be a major task, especially in terms of selection of materials, since it may involve further design and development. Thus, activities in this field consist in

establishing not only the physical facilities but also programmes for training local personnel in engineering techniques. It may be necessary in the beginning to analyse existing facilities and items to be manufactured, identify future design requirements and formulate projects. A design, development and adaptation programme may be integrated with a manufacturing enterprise or treated as an independent activity depending on the needs of the country concerned.

Testing, quality control and evaluation of product performance

Quality control is an essential part of any industrialization programme. It serves both the manufacturer and his customer by ensuring that the product conforms to its design specification. Laboratory and field tests show how the product performs in use and suggest how the design should be altered. Ultimately, quality control activities affect every aspect of the enterprise. But quality control requires many sophisticated facilities: testing equipment, knowledge of statistical procedures, standards of measurement, and, most of all, an engineering approach to problems of design.

Maintenance and repair

The two main problems in maintenance and repair are the establishment of adequate workshops, mobile and stationary, and the integration of maintenance and repair schedules in the over-all industrialization programme. Diverse activities are involved: training of personnel, spare parts manufacture and control, selection and operation of specialised tools, machine rebuilding and technical organization. In certain cases such allied products as crawler tractors and heavy earthmoving and road-construction equipment will be included with agricultural machinery and implements in the maintenance programme.

Marketing, sales, service, commercialization

Marketing, an integral part of a manufacturing activity, is a link between production and product design. The demonstration of the product

(agricultural machinery and implements) and its popularization are the responsibility of the marketing division of a manufacturing organization. Only by encouraging manufacturers to be directly involved in marketing is it possible to build up an integrated system of service and performance feedback.

Activities at the plant level

Product design, process planning, product planning and control, plant layout and construction, selection of processes and equipment, quality control, standardization, cost control, modernization of plants and other related activities in industrial engineering, tool engineering, maintenance engineering, development engineering are some of the activities carried out at the plant level.

Pilot plants

Establishment of pilot plants, for the purpose of training in engineering and production, with special reference to the transfer of appropriate technology, is essential.

Development of institutions

UNIDO assists in the establishment of new or upgrading of existing institutions dealing with various aspects of agricultural machinery and implements such as planning, development, design and adaptation, repair and maintenance. Special attention is given to engineering institutions in the metalworking sector.

Fellowships

UNIDO awards fellowships for individual study as well as fellowships for in-plant group training to candidates from the developing countries.

Seminars, workshops and expert group meetings

UNIDO organizes seminars and other meetings to provide an opportunity for exchanging information. This activity assists UNIDO as well as developing countries in formulating suitable programmes in various fields.

Publications

UNIDO publishes reports of the meetings it organizes as well as monographs on a variety of technical subjects. An Industrial Branch Report on Agricultural Machinery Industry in the Developing Countries is scheduled for publication in 1972/1973.

Examples of UNIDO activities

Surveys, studies, meetings

During 1968/1969 a UNIDO-ECAFE Fact-Finding Mission on Industries Manufacturing Agricultural Machinery and Implements visited 12 countries in the ECAFE region. For the first time the status of the agricultural machinery industry, its problems, future plans, demand and need for expansion were analysed, and recommendations regarding the development of the industry at a country level and regional level were submitted to the Governments concerned. In 1969, UNIDO organized an Expert Group Meeting on Agricultural Machinery Industry in Developing Countries in Vienna. The meeting, which was attended by participants representing 31 developing and developed countries, discussed various aspects of agricultural mechanization and of the manufacture of machinery and implements and drafted guidelines for the development of this industrial sector. The meeting specifically recommended that UNIDO send fact-finding missions on the agricultural machinery and implements industry to developing countries in various regions with a view to analysing the status of the industry and recommending suitable actions for its development.

In 1970, a UNIDO-UNESOB Mission on Agricultural Machinery Industry visited six countries in the Middle East and identified aspects of the industry that should be developed. In 1971, UNIDO, in co-operation with the Industrial Development Centre for Arab States (IDCAS) extended the survey in the Middle East to five countries in North Africa. The UNIDO-IDCAS Agricultural Machinery Mission analysed the problems of these countries with special reference to regional co-operation. UNIDO also assisted IDCAS in the preparation of its report on lorries, tractors, engines and agricultural machinery. As part of the regional development of the agricultural machinery industry, an Agricultural Machinery and

Implements Mission to the countries of the Andean Group[1/] was organized in 1971 in co-operation with the Andean Group and the Economic Commission for Latin America (ECLA) The mission started its visit in December 1971 and completed it in early 1972.

Also in 1971, UNIDO commissioned five studies to assess the requirements for agricultural machinery and implements, including storage and transportation facilities, in the ECAFE region. The studies deal with design and development,
repair and maintenance, storage and transportation, agricultural engineering professional societies, and the activities of manufacturers' associations.

UNIDO will carry out in 1972 a regional study and convene an expert group meeting in 1973 on the Design and Manufacture of Wet-land (Rice) Harvesting and Threshing Machinery in the Developing Countries at the Agricultural Machinery Division of the International Rice Research Institute, (IRRI), the Philippines, as a joint UNIDO-IRRI project, in co-operation with ECAFE and FAO. The study will analyse the specific problems of developing the local manufacture of agricultural machinery and implements, including storage, transport and handling equipment, to meet the needs generated by the "green revolution". The study will also identify local manufacturers who may be interested in diversifying their production or expanding their manufacturing facilities. The participants in the proposed 1973 expert group meeting will primarily be small and medium-scale entrepreneurs from the developing countries, manufacturing organizations from the industrialized countries and representatives of financial institutions. The meeting will formulate a programme for development, adaptation and manufacture of suitable machinery and equipment in selected developing countries. As a follow-up to this meeting, UNIDO proposes to explore the possibilities of supplying suitable machinery and implements to the developing countries and assist further in prototype fabrication and adaptation with the objective of eventual local manufacture.

In 1972, subject to availability of funds, UNIDO proposes to organize a joint UNIDO-ECA Agricultural Machinery and Implements Mission in co-operation with the Common Afro-Malagasy Organization.

1/ Bolivia, Chile, Colombia, Ecuador and Peru.

The activities proposed for 1973, described below, are subject to approval by the relevant policy-making authorities and also subject to the availability of funds. UNIDO proposes to organize a Manufacturing Development Clinic for Animal-Drawn Implements and Hand-Operated Agricultural Machines, since several of the least developed countries are interested in establishing small and medium-scale units for the manufacture of simple tools and implements. The objective is to bring potential entrepreneurs and government officials (Ministry of Agriculture and the Ministry of Industry) in contact with medium-scale manufacturers to select product lines that may be appropriate to their country. This clinic may be held in a developing country, for example, India. In addition, a UNIDO-commissioned paper concerning plant requirements for production of specific animal-drawn agricultural implements will be reviewed. As a follow-up to this meeting, UNIDO is considering supplying these countries with a set of selected items and critical components needed for prototype fabrication. In addition, UNIDO proposes to assist them in product-performance analysis and in the fabrication of prototypes.

Another project proposed is a Workshop on Selection of Stationary and Mobile Maintenance and Repair Workshops for Agricultural Machinery and Implements to be held possibly in Moscow in connexion with an international exhibition on the Organization of Technical Service and Repair of Automotive Equipment. UNIDO will request the exhibition authorities to include in the exhibition special repair and maintenance equipment for tractors, agricultural machinery and implements. Participants from the developing countries will be those who have expressed a desire to establish national repair and maintenance programmes. During the workshop, the participants will discuss with UNIDO experts the organization and operation of repair and maintenance programmes. They will, with the assistance of the experts, select equipment and machinery suitable for their needs and formulate preliminary plans for establishing stationary repair and maintenance workshops including mobile units and technical training.

A third project proposed is a Manufacturing Promotion Meeting on Small, Low-Cost Agricultural Tractors and Power Tillers. Since 1971, UNIDO has been

trying to ascertain the interest of developing countries in introducing more mechanical power into agriculture through the use of small, low-cost tractors. UNIDO has requested the countries to forward details of their concept of such a tractor. In preparation for the meeting, UNIDO staff is securing information on product specifications as outlined by the developing countries; on development and adaptation work undertaken by agricultural engineering institutions; and on product specifications of small, low-cost tractors produced or under development by selected manufacturers in the industrialized countries. The meeting will discuss product specifications, necessary adaptation work and possibilities for further production in close co-operation with selected manufacturers in developing countries and will formulate an action-oriented programme. Participants in this manufacturing-promotion meeting will include manufacturers who have indicated their interest in exploring the possibilities of developing or adapting their existing products to meet the needs of the developing countries; representatives of agricultural machinery research and development institutes who are working to develop a small tractor; and representatives of developing countries who have indicated their interest in exploring the possibilities of local manufacture of such tractors. The International Commission of Agricultural Engineering will be invited to participate in the meeting.

Operational technical assistance activities

Several countries have requested technical assistance aimed at the establishment and development of manufacturing and service facilities for agricultural machinery and implements, with special reference to their linkage to the metalworking sector. These requests are the result of the awareness of the developing countries of the need to manufacture equipment suited to local soil conditions and crop patterns, and to utilize the locally available resources to the fullest extent. The developing countries are also interested in enhancing local engineering capabilities in design and adaptation and in establishing suitable facilities for testing product performance. It is also evident that the developing countries have placed emphasis on national repair and maintenance programmes. UNIDO co-operates with FAO, wherever appropriate, in implementing these technical assistance

activities. As of the middle of October 1971, UNIDO had received 41 requests for technical assistance in the following categories:

(a) Manufacturing feasibility study:
13 requests for a duration of 52 man/months of expert assistance;

(b) Design, development, adaptation and testing:
4 requests, 34 man/months;

(c) Manufacture of hand tools and animal-drawn equipment:
7 requests, 30 man/months;

(d) Manufacture of tractors, power tillers, engines and tractor implements:
8 requests, 40 man/months;

(e) Maintenance and repair:
7 requests, 39 man/months;

(f) Commercialization, marketing and sales distribution:
2 requests, 9 man/months.

These requests are being implemented.

UNIDO has organized several regional meetings to promote industrial projects in Asia and Africa during the past two years. At these meetings investors from industrialized countries had an opportunity to discuss with counterparts from developing countries projects concerned with agricultural machinery and implements (tractors, engines, implements and hand tools). UNIDO organizes such meetings regularly.

Magnitude of the requirements, demand and investment

In forecasting the demand for agricultural machinery and implements, two different, but very simplified, market situations can be distinguished - static and dynamic. When agricultural production is static, regardless of its level of sophistication, the market is largely one of replacement. Dynamic agricultural production and a rapid rate of industrialization must be envisaged for the developing countries, if the levels of output postulated by the FAO in its Indicative World Plan (IWP) are to be attained for both the period to 1975 and the following decade. The figure of 0.5 hp/hectare is widely used as a threshold value of the specific power required for agricultural mechanization. The available power in all the developing countries is far below the desired norm. The existing hp/hectare is estimated to be 0.27 in Latin America, 0.20 in Asia and 0.05 in Africa. The Report of the UNIDO Expert Group Meeting on Agricultural Machinery Industry in Developing Countries[8/] estimates assuming

8/ 18-22 August 1969, Vienna (UNIDO document ID/47).

a compound growth rate in production of 6 per cent and a depreciation rate (on the farm) of 7 per cent that to meet the desired hp/hectare, the following machinery must be manufactured: 1.2 million tractors and 0.27 million power tillers in Latin America by 1986; 2.56 million tractors and 1.9 million power tillers in Asia by 1998; and 2.47 million tractors and 0.047 million power tillers in Africa by 1998. It is estimated that the sales value of these tractors will be around $26 billion and that a capital investment of at least $900 million will be required for large-scale assembly/manufacturing with subcontracting for components.

The UNIDO-ECAFE mission mentioned earlier estimated that in 12 countries of Asia and the Far East, the annual demand by 1975 will be as follows:

	Thousand items	
Tractors		118
Power tillers		102
Engines (all types)		1,002
Petrol		
1-2 hp	186	
3-5 hp	161	
Diesel		
3-15 hp	472	
12-36 hp	63	
25-75 hp	117	
Pumps		1,373
power (3-15 hp)	820	
deep well	135	
hand	418	
Threshers		416
power wheat	65	
power paddy	148	
paddle paddy	203	
Sprayers		844
knapsack	204	
hand	640	

Existing production capacity and known planned capacity by 1975 in this region are far below the anticipated demand.

A UNIDO-UNESOB-IDCAS mission to 12 Arab countries of the Middle East and North Africa estimated that by 1973-1974, the annual demand in this region will be around 25,000 tractors, 35,000 implements, 25,000 seed drills

and fertilizer distributors, 8,000 threshers and harvesters, and 10,000 trailers plus a large number of small engines, crop-protection equipment and other implements. Again, the existing manufacturing capacity and the known plans for new units may not meet the anticipated demand.

In India alone, during the Fourth Five-Year Plan (1969-1974) the total cumulative demand is estimated as follows:

	Thousand items	
Tractors		385
Crawler tractors		5
Power tillers		230
Implements and equipment (46 types)		1,430
Engines, all types, 3-100 hp		1,460
3-10 hp	1,305	
Irrigation pumps		2,100
Crop-protection equipment		2,003
power equipment	303	
hand-operated equipment	1,700	

Therefore, it can be seen that the agricultural machinery and implements industry occupies a very significant place in the total industrial sector in general and in the engineering industries in particular. FAO has estimated in its Indicative World Plan that investments in machinery for agriculture in the period 1962-1985 should amount to $40,000 million at 1962 prices.

Projections for the 1970s in developing countries

Agricultural machinery and implements enhance agrioultural production through the efficient and economic application of inputs. In their programmes for expanding local manufacture, the developing countries will give priority to products that can be substituted for imports and thus save foreign exchange. They will emphasize the development of ancillary industry and labour-intensive production. Agricultural machinery and implements satisfy the requirements in these respects.

The least developed of the developing countries will emphasize product lines based on small-scale production and use of intermediate technology.

Such countries will continue to import tractors, engines, pumps and power equipment on a limited scale. They will increase local production of hand tools such as shovels, spades, rakes, pickaxes, matchets; simple hand-operated machines such as corn shellers, chaffcutters, winnowers, peanut shellers, threshers, hand pumps, hand sprayers; and animal-drawn implements such as plows, cultivators, harrows, bullock carts, seed drills. More information on and assistance in the manufacture of these items will flow from the more developed of the developing countries to the least developed countries, since most of the industrialized countries have ceased manufacturing hand-operated machines and animal-drawn equipment.

In the intermediate developed of the developing countries in addition to tools, hand-operated machines and improved animal-drawn implements, the local manufacture of certain simple tractor-drawn implements will be increased: irrigation pumps, power threshers, small engines and selected crop-protection equipment. Tractors and other power equipment will continue to be imported. The countries will look for foreign collaboration in the manufacture of small engines and, in some cases, of pumps. These countries will emphasize improvement of the existing metalworking industry and diversified production programmes, including agricultural machinery and implements production. They will continue to import steel and will use mostly mild steel or in some cases medium carbon steel. However, existing or new small foundries will meet the requirements for grey iron castings. These countries will also emphasize the development, adaptation, prototype fabrication of hand-operated machines and animal-drawn as well as simple tractor-drawn implements. Therefore, the facilities of the existing institutions in this field will be reinforced. These countries will also encourage co-operative use and rental of tractors and power machinery. They will establish more repair and maintenance workshops, utilize mobile units and promote the training of mechanics.

In the more developed of the developing countries, emphasis will be placed in general on local assembly and manufacture of the full range of agricultural machinery and implements except combine harvesters, bailers, mowers, hay conditioners. Most of these countries will continue to produce hand tools, hand-operated and animal-drawn implements in the small-scale industry sector with protection. However, selected tools requiring special steel, forging and heat-treatment facilities will be manufactured in larger

units. Owing to increased demand, the countries will expand production facilities or establish additional manufacturing facilities for pumps, small engines for agricultural use, power crop-protection equipment and tractor-drawn implements. Foreign collaboration will be sought only for the manufacture of small engines and power crop-protection equipment.

In addition to expanding the existing production volume of tractor-drawn implements such as cultivators, harrows and mould-board plows, emphasis will be given to the manufacture of disc plows, multi-seed drills and fertilizer distributors; row-crop planters and specialized equipment for beet, sugar-cane, potato and seed treaters, dryers as well as storage bins and grain-handling equipment and trailers. Most of these countries will also put great emphasis on the development and local manufacture of machinery for wet-land rice production, e.g. puddlers, rotovators, transplanters, broadcasters, and harvesters. In certain countries two-wheel walking tractors will also be assembled or manufactured. Maximum attention will be paid to the local assembly and manufacture of tractors. Although 40 and 60 hp four-wheel standard tractors will be assembled and manufactured with foreign collaboration, serious attention will be given to the development or identification of small, low-cost tractors for local manufacture. This is because the larger tractors may be economic only on larger private holdings and through co-operative use or hiring systems.

Certain countries will introduce local manufacture of side-mounted combined harvesters and self-propelled combined harvesters. All these countries will reserve their foreign exchange to set up joint ventures for the local manufacture of combined harvesters, tractors, power tillers, engines and, in very few cases, specialized implements. Therefore, more attention will be paid to the local development, adaptation and, in some cases, design of all required agricultural activities in the metalworking, electrical and automobile industries. In this connexion, ancillary industry will be developed in order to facilitate a phased local manufacturing programme. Such ancillary industry will be included in industrial estates.

Although the manufacture of agricultural machinery may commence under one roof initially, in order to increase the percentage of parts manufactured locally, subcontracting of components will be undertaken at a later stage. In addition, attention will be paid to the development of

foundry to produce malleable and white iron castings, as well as agricultural discs with imported steel. Also forging, heat-treatment facilities will be further developed. The existing steel mills normally producing only mild steel rods may explore the possibilities or producing mild steel section, angles and sheels as well as steel with specifications of EN-1A, EN-3, EN-8, EN-9, EN-42, EN-45. However, special steels such as EN-16, EN-18, EN-34, EN-43, SAE-5140, SAE-8620 and steels required for discs, mould boards, gears, shafts etc. will be imported.

These relatively more developed of the developing countries will pay greater attention to the management aspects of industries, especially purchase, quality control, tool engineering and marketing. Special emphasis will be given to plant maintenance as well as marketing including repair and maintenance of products. In general, Governments and the manufacturers will establish central and regional repair and maintenance workshops, and importance will be given to spare parts production and supply. In these countries, various professional agricultural engineering societies and manufacturers' associations will be founded and national centres established for national agricultural research and the design, development, adaptation, prototype fabrication and testing of agricultural machinery and implements. Training and higher education in agricultural engineering will be intensified.

It is difficult to foresee regional or interregional co-operation in manufacture or ancillary component subcontracting among these countries in the 1970s. However, such co-operation can be anticipated in carrying out group in-plant training, market surveys, exchange of information and especially in establishing regional development adaptation and prototype fabrication centres for agricultural implements, regional centres for training in maintenance and repair, and regional agricultural engineering professional and technical societies.

Role of UNIDO in the 1970s

UNIDO's plans for promoting the agricultural machinery and implements industry in the 1970s are outlined below.

The needs of the individual countries with respect to specific products will be analysed in order to project the present and future demands and trends in design specification. Based on this preliminary analysis, pre-investment studies on specific product lines and investment analysis will

be carried out. Ways of expanding the agricultural machinery and implements industry and of diversifying products will be explored in order to assist in the optimum utilization of existing manufacturing capacity. It is also necessary to identify manufacturing projects in the public sector and encourage local entrepreneurs to invest in them. To assist local manufacturers, a programme in design, development, adaptation and testing is foreseen. Above all, an active investment-promotion programme to encourage judicious licensing arrangements is recommended.

In addition, the following assistance to institutions will have to be promoted:

(a) Formation of national and regional agricultural engineering institutions;

(b) Creation of regional centres for agricultural machinery and implements design, development, adaptation and service;

(c) Formation of national and regional associations of manufacturers of agricultural machinery and implements and allied equipment;

(d) Establishment of permanent develcpment agencies for farm mechanization and promotion of local manufacture in the regions.

UNIDO programmes of assistance will vary depending on the level of development of a country. They may be outlined as follows:

In the least developed countries

(a) Assistance in manufacture of hand tools, hand-operated machines and animal-drawn implements;

(b) Promotion of transfer of products and technology from developing countries to the least developed countries;

(c) Assistance in repair and maintenance activities at the national level.

In the intermediate developed countries

(a) Assistance in expansion of production in hand tools, hand-operated machines and animal-drawn implements;

(b) Assistance in establishing manufacturing units for pumps, threshers, crop-protection equipment and selected tractor-drawn implements and simple parts;

(c) Promotion of licensing and foreign collaboration in the manufacture of pumps and small engines;

(d) Reinforcing existing facilities in development, adaptation and testing, repair and maintenance and commercialization.

In the more developed of the developing countries

(a) Expansion of existing facilities for manufacture of high-quality hand tools, pumps, engines, implements, crop-protection equipment, trailers and in some cases tractors and power tillers;

(b) Promotion of licensing and foreign collaboration in the local manufacture of tractors, power tillers, engines, combine harvesters, dryers and crop-handling equipment and transplanters and special implements for selected crops;

(c) Promotion of manufacture of low-cost, small tractors and power tillers;

(d) Development of ancillary industry, agricultural disc manufacture, patents and licensing for manufacture of proprietary items;

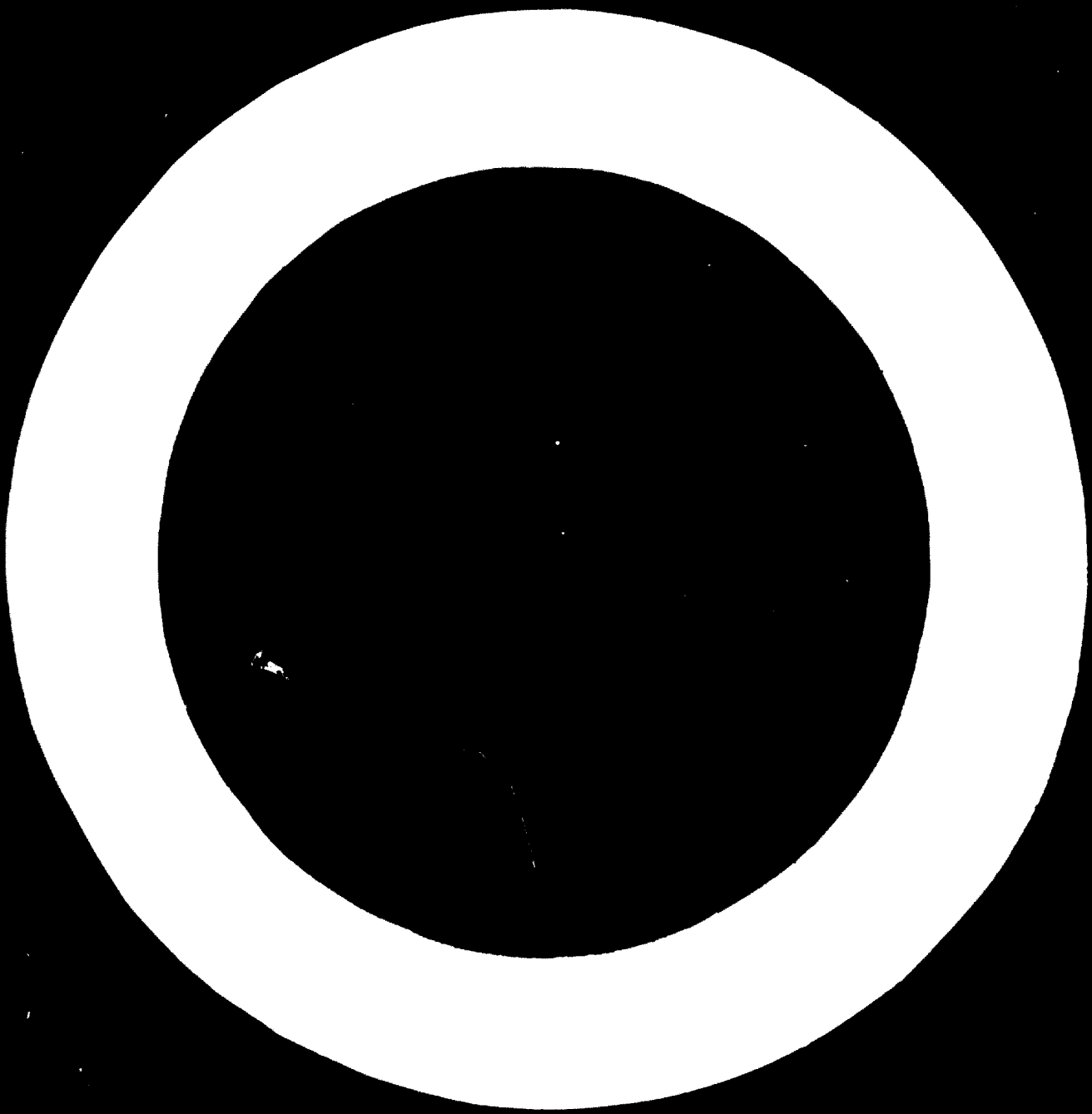
(e) Assistance to institutions: design, development and prototype-fabrication centres, maintenance and repair, manufacturers associations, and professional agricultural engineering societies;

(f) Assistance at the plant level and management development;

(g) Development of steel manufacture for agricultural tractors, machinery and implements;

(h) Promotion of regional co-operation and exchange of information.

Through these field programmes in manufacturing agricultural machinery and implements, it is anticipated that developing countries will be assisted towards self-reliance in manufacture with special emphasis on adaptations of large-scale technology to the medium- and small-scale sector. UNIDO activities to promote the manufacture of agricultural machinery and implements are designed to contribute - in a modest way - to the success of the "green revolution" in developing countries. In its endeavours, UNIDO welcomes co-operation from manufacturers, research, design and development institutions and other national and international organizations, from both industrialized and developing countries.



PART TWO

SPECIALIZED INFORMATION

III. RANGE OF AGRICULTURAL MACHINERY AND IMPLEMENTS COVERED BY UNIDO PROGRAMMES AND OTHER ASPECTS OF UNIDO ASSISTANCE

Range of machinery and implements

The term "agricultural machinery and implements" covers a wide range of products - from simple hand tools to power machinery. The list of farm equipment and machinery given below indicates which items are included in UNIDO technical assistance programmes. Specimen project data sheets to be used when requesting assistance are given in chapter IV.

Hand tools

Spades; shovels; pickaxes; steel baskets; rakes; hoes; weeders; sickles.

Hand-operated machinery

Hand pumps; dusters; sprayers; maize shellers; groundnut decorators; foot-operated threshers; seed treaters; chaffcutters; transplanters.

Animal-drawn equipment

Mould-board ploughs; cultivators; harrows; ridgers; seed drills with fertilizer distributors; planters with fertilizer distributors; toolbars; levellers; paddy puddlers; mowers; harrow threshers; carts.

Power machinery

Automotive units: rubber wheel riding tractors - less than 15 hp, 15-25 hp, 25-45 hp, 45-65 hp, 65-85 hp above 85 hp; track-type agricultural riding tractors - 35-50 hp, 50-80 hp, above 80 hp; power tillers - less than 5 hp, 5-10 hp, above 10 hp; self-propelled combines.

Irrigation equipment: pumps - centrifugal, volume type; turbine/submersible 6-12 in.; low head paddy pumps - propellor type; sprinkler irrigation units.

Diesel engines: 5-15 hp, 12-30 hp, above 30 hp.

Petrol engines: micro 1-2 hp, 2-5 hp, 5-15 hp.

Agricultural implements and equipment (tractor-drawn)

Tillage equipment: pudaleis; mould-board ploughs; disc ploughs; cultivators; ridgers; harrows; subsoilers; post-hole diggers; levellers; land planes.

Seeding and fertilizer equipment: seed/fertilizer drills; planter/fertilizer distributors; special fertilizer applicators; special crop-planting equipment; manure spreaders.

Plant-protection equipment: dusters; sprayers; low-volume sprayers.

Harvesting and threshing equipment: mowers; reapers; hay conditioners; chaffcutters; forage choppers and blowers; combines; special crop-harvesting equipment (potato, groundnut, cotton, sugar-cane).

Processing equipment: seed cleaners; seed treaters; grain driers; shellers and huskers; milling equipment.

Grain-handling equipment: grainbins; silos; elevators; blowers.

Transport equipment: trailers; transport boxes.

Mechanization equipment for special crops: sugar-cane; cotton; groundnut; potato; tobacco; paddy; hybrid seed.

Other items: windmills; paddy transplanters; dozer attachments; loader attachments.

Areas of UNIDO technical assistance

All activities listed below relate to the manufacture of agricultural machinery and equipment.

Feasibility studies

Market analysis; product indentification; product mix; projected demand for farm machinery; development of ancillary and supporting industries; quality control; indigenous [progressive] manufacture; import substitution; standardization; manufacturing policy; manufacturing techniques; manufacturing set-up; organization and management; technical know-how and personnel; productivity; cost control; marketing; export.

Product design

Research; design and development; adaptation of design; prototype fabrication; modification; design techniques.

Production planning and control

Purchasing ancillary and locally produced components through subcontracting; phased programme of local manufacture; import substitution; inventory control; cost control; production schedule; organization and management.

Plant layout and construction

Selection of location; analysis of layout; assistance in plant layout and construction of factories.

Selection of process and equipment

Process planning and equipment, machinery, machine-tool selection; assistance in various aspects of industrial engineering in production.

Pilot and demonstration plants

Identification of product and product mix; establishing pilot and demonstration manufacturing plants.

Quality improvement testing and cost reduction

Inspection techniques; statistical quality control; quality control laboratory and equipment; testing procedures and equipment; cost-reduction techniques.

In-plant standardization

Standardization of techniques and processes; efficiency of production analysis; assistance in product engineering, industrial engineering, tool engineering, production engineering.

Maintenance and repair of machinery and equipment

Plant engineering; maintenance techniques and procedures.

Rationalization and modernization of plants

Reorient changes in plant layout; increase in production capacity; expansion programme; procurement and erection of additional equipment and machinery; analysis of idle and unused production capacity; analysis of technical and technological problems, management and performance; assistance in promoting domestic financing and in obtaining external financing; project preparation.

Metallurgical engineering

All aspects of development of foundry for agricultural castings, iron and steel selection, forging, heat treatment and analysis of technological problems with respect to raw materials and introduction of engineering techniques of production.

Training and fellowships

Training of technical and of other categories of personnel; fellowships to candidates from developing countries, in all aspects of production, design, and development and commercialization in industrialized countries; in-plant training (either through individual or group fellowships)

Industrial information

Preparation of technical literature, documents and reports; dissemination of technological innovations and know-how; answering questions, through correspondence, related to specific problems- technological problems, investment, product ranges etc.; organizing fairs and exhibitions.

Institutions

Establishing or strengthening industrial development institutions concerned with planning, programming, project formulation and evaluation, engineering and design development, testing, quality control, management.

Industrial estates and small-scale industry

Development of ancillary industrial enterprises; establishment of small agricultural implements manufacturing units in rural sectors; introduction of manufacture of agricultural implements and tools in industrial estates; establishment of common technical service facilities; introduction of management techniques and mobilization of finances and resources.

Surveys

Macro- and micro-level surveys of possibilities for industries based on agriculture, and industrial inputs for agriculture either at regional or national level and at sectoral or subsectoral level.

Investment promotion and finances

Establishment of contact with manufacturers; formulation of tender specifications; tender analysis; financial analysis; contact with financial institutions; contract and licensing negotiations; establishment of subcontracting manufacturing system (example: tractors, engines, pumps, power machines, implements).

Market and export analysis

Domestic market analysis; analysis of export potential; programmes directed towards increased exports of agricultural machinery and implements with specific reference to regional demand.

Programming and policies

Macro- and micro-level analysis of industrial policies with reference to industries based on agriculture, and manufacturing of industrial inputs for agriculture at a national or regional level; formulation of national policies required for the development of this sector in relation to metalworking and engineering industries as well as total industrialization programme with specific reference to rural and technical employment, development of rural areas and mobilization of resources.

Organization of seminars, workshops and expert group meetings

Exchange of information and generation of technical assistance programmes; assistance in promoting, organizing and participating in such activities.

Selected technical assistance projects completed or under implementation

Algeria: Agricultural Machinery Project Formulation Mission (ALG 70/760 ALG-11)

A UNIDO staff member (2 weeks) assisted the Government in formulating technical assistance projects in the fields of design and development and maintenance and repair of agricultural machinery and implements. As a result of this mission, the Government has submitted requests for technical assistance in design and development and in repair and maintenance.

Burundi: Agricultural Tools Manufacturing Feasibility Study (SIS/69 BUR-8) UNIDO-FAO joint project

A two-member UNIDO-FAO team completed the mission (UNIDO 3 months, FAO 1.5 months) in 1971 and recommended a comprehensive programme for mechanization and expansion of existing production of hoes and other hand tools. The Government has approved the report and the recommendations of the mission and is taking the necessary steps to strengthen existing manufacturing facilities and expand product ranges.

Ceylon: Rationalization of Agricultural Machinery Manufacture Tractors and Power Tillers (SIS 70/810 CEY-17) - UNIDO-FAO joint project

A UNIDO expert (3 months) in manufacturing and a FAO expert in mechanization completed a mission and recommended an integrated programme for the manufacture of agricultural machinery, including tractors and power tillers

Central African Republic: Exploratory Mission on Maintenance of Agricultural Machinery and Implements (70/930 CEAF-11)

A UNIDO expert completed a one-month mission and recommended steps to be taken to establish repair and maintenance units.

Chad: Evaluation of Proposals Received with Respect to Manufacture of Agricultural Tools (SIS/71/1187 CHAD-8)

A UNIDO expert (3 weeks) assisted the Government in 1971 to analyse manufacturing proposals and recommended a detailed programme for establishing local manufacturing facilities for hand tools and animal-drawn implements.

Fiji: Metal Products (agricultural implements) Development
(SIS 70/531 FIJI-1)

A UNIDO expert (1 year) assisted the Government in the expansion of production of (sugar-cane knives and ploughs and also assisted selected manufacturers in improving their production techniques.

Gambia: Manufacture/Assembly of Small Agricultural Implements
(SIS 70/1389 GAM-4)

A UNIDO expert (3 months) is assisting the Government in formulating a programme to establish a manufacturing/assembly unit for small animal-drawn agricultural implements.

Iraq: Design and Development of Agricultural Machinery
(SIS 70/983 IRQ-16)

A UNIDO expert (1 year) is assisting the Government in the development of agricultural implements and in formulating a policy on manufacture of tractors and implements.

Lebanon: Agricultural Machinery Design, Development and Testing
(SIS 70/1113 LEB-7)

A UNIDO expert (4 months) assisted the Government in formulating a national programme for development, adaptation and testing of agricultural implements that would benefit small manufacturers.

Madagascar: Agricultural Machinery Manufacturing Feasibility Study
(SIS 70/1039 MAG-15) UNIDO-FAO joint project

A UNIDO expert (4 months) in manufacturing and a FAO expert (2 months) in mechanization are assisting the Government in the formulation of an agricultural machinery programme and in the expansion of the existing plant.

Mauritius: Agrioultural Machinery Manufacturing Feasibility Study
(SIS 70/943 MAR-13)

A UNIDO expert (1.5 months) assisted the Government in the formulation of a programme for the development of the metalworking industry and manufacture of agricultural hand tools.

Morocco: Agricultural Machinery Manufacture Feasibility Study
(SIS 70/1137 MOR-18) UNIDO-FAO joint project

A UNIDO expert (4 months) in manufacturing and a FAO expert (3 months) in mechanization are assisting the Government in the development of the agricultural machinery industry with special reference to design, development and local manufacture.

Nepal: Production of Agricultural Machinery
(SIS 71/1305 NEP-8)

A UNIDO expert (6 months) is assisting the Government in the expansion of the existing manufacturing unit.

Sudan: Agricultural Machinery Manufacturing Feasibility Study
(SIS 70/1128 SUD-19) UNIDO-FAO joint project

A UNIDO expert (3 months) in manufacturing and a FAO expert (1 month) in mechanization assisted the Government in formulating policies with respect to the production of hand tools, tractor-drawn implements and tractors.

Syria: Production Engineering Assistance to Engineering Works at Aleppo
(SIS 69/607 SYR-23)

A UNIDO expert (1 month) assisted the Government in formulating manufacturing policies with reference to the tractors and engine industrial complex at Aleppo.

Thailand: Manufacture of Small Internal Combustion Engines
(SIS 71/1163 THA-27)

A consulting firm commissioned by UNIDO is carrying out a manufacturing feasibility mission with the aim of developing local manufacture.

Thailand: Manufacture of Farm and Artisan Hand Tools
(SIS 71/1162 THA-26)

A consulting firm commissioned by UNIDO has studied the feasibility of manufacturing hand tools and indicated which steps must be taken to start production.

United Arab Republic: Repair and Maintenance of Technical Apparatus and Equipment at Agricultural Research Stations
(SIS 68/373 UAR-23)

A UNIDO expert (9 months) completed the study and recommended various measures to improve repair and maintenance, including spare parts supply and manufacture and training of local personnel.

United Republic of Tanzania: Market Survey of Agricultural Machinery and Implements
(TAN-121-SHC SF/ID)

A UNIDO expert has been attached to the Industrial Studies and Development Centre at the request of the Government. The expert, who is on a 6-month assignment, is assisting the Government, the UBUNGO Farm Implements Factory and TAMTU Centre in the development of local industry through a comprehensive market analysis. In addition, UNIDO has made available two mobile workshops financed from voluntary contributions and two repair and maintenance experts under SIS financing for 6 months each. (SIS 71/1247 TAN-8)

Western Samoa: Agricultural Tools Manufacturing Feasibility Study
(SIS 70/888 WESA-1)

A UNIDO expert assisted the Government (1.5 months) in analysing the possibilities for developing the hand tools industry in the country and recommended measures to be taken to establish a small manufacturing unit.

Examples of assistance to institutions

The following types of institutions concerned with agricultural machinery and equipment are assisted:

- Design and development institutes
- Manufacturing, adaptation and technical service centres
- Pilot plants
- Performance, evaluation and quality control centres
- Machinery testing stations
- Maintenance and repair centres
- Industrial estates
- Development, promotion and investment centres
- Standards institutes
- Feasibility study centres/missions
- Agricultural engineering societies
- Manufacturers associations

Selected job descriptions

The following are examples of job descriptions used by UNIDO when seeking expertise to meet a Government's request for assistance. The duration of the assignment may vary. UNIDO can render technical assistance in all areas of agricultural machinery and implements detailed above. (For specimen project data sheets to be used when requesting technical assistance, please refer to chapter IV).

Agricultural machinery manufacturing feasibility study: 3 months, possible extension. Duties: Study industry's present mechanization and status; identify use, design and market trends and suitable products for manufacture; analyse manufacturing feasibility and formulate projects; recommend action by industry and UNIDO assistance.

Agricultural machinery design and development: 6 months, possible extension. Duties: Analyse existing institutions for design and development and machinery in use; identify trends; recommend line of action: formulate project to reinforce existing facilities; assist in the project.

Agricultural machinery manufacturing rationalization: 1 year, possible extension Duties: Analyse existing facilities, data related to sales and plans for growth and diversification; recommend future manufacturing capacity, a phased programme, import substitution, quality control and cost.

Agricultural machinery manufacturing: 1 year, possible extension. Duties: Formulate manufacturing programme for selected machinery and implements; select equipment, plant layout, organization and manpower requirements; analyse investment and engineering needed; recommend schedule and assistance.

Agricultural machinery product-performance evaluation: 1 year, possible extension. Duties: Analyse existing facilities for quality control, testing and product-performance evaluation, the testing and evaluation codes and procedures followed, the equipment and instruments available and their utilization, and the level of technical skill of personnel available in selected testing and quality control centres. Identify locally manufactured products, major imported products and products anticipated for manufacture that require testing, quality control and evaluation. Formulate a project for reinforcing existing testing and performance evaluation facilities. Qualifications: Degree in agricultural and/or mechanical engineering, extensive experience in quality control, testing and product-performance evaluation of agricultural machinery and implements. Knowledge of test codes, procedures, equipment and instruments, metallurgy, product development and substitution of material.

Repair and maintenance of agricultural machinery, implements and allied items: 1 year, possible extension. Duties: Analyse existing facilities for maintenance and repair and the policies, systems followed, organizational structure, equipment and technical skill of the personnel

in selected major centres. Identify major products and product ranges that are to be considered and analyse the volume, distribution pattern and density. Recommend a policy on the division of responsibility between manufacturers and others in the repair and maintenance programme. Formulate a project for reinforcing existing repair and maintenance facilities through mobile and central stationary workshops. Qualifications: Degree in agricultural and/or mechanical engineering; extensive experience in major repair and maintenance of agricultural machinery, implements and allied items; knowledge of workshop practices, welding, fabrication, foundry and metallurgy with respect to indigenous substitution; elementary knowledge of repair and maintenance of internal combustion units and fuel-injection system.

The qualifications for these six positions are: Degree or equivalent in agricultural and/or mechanical engineering; extensive experience in one or more of the following: hand tools, hand-operated and animal-drawn machinery and implements; mechanized implements and machinery; irrigation machinery; crop-protection equipment; engines; power tillers, tractors; and harvesting, threshing and drying equipment.

Foundry industry planning and operations: 1 year, possible extension. Duties: Study and assess the local demand for foundry castings destined for the production of agricultural machinery and implements; evaluate locally available raw materials suitable for foundry operation and advise on their effective utilization; determine the volume of foundry shop(s) needed to meet the demand for such castings; prepare a programme of foundry industry development either through the extension of the existing shops or through the establishment of a new foundry; select foundry equipment and machinery; analyse capital and operating costs; recommend project implementation schedule; train local personnel. Qualifications: University degree or equivalent in metallurgy; extensive practical experience in iron and steel casting foundry operations at senior level; experience in pre-investment analysis of foundry industry development.

Industrial inquiry service

One of UNIDO's activities is to disseminate technical information to interested persons and organizations in the developing countries. Those interested are encouraged to write to UNIDO regarding the various problems they face. UNIDO will endeavour to provide the information and technical guidance within its limitations. The manufacturers, research, development and testing institutions and others engaged in any aspect of the production of agricultural machinery and implements may request information from UNIDO on the activities detailed earlier in this chapter.

The following is an example of an inquiry on the selection of steel and heat treatment and UNIDO's reply:

Inquiry

"We wish to manufacture tractor-drawn mould board plows in our metalworking workshop" (full background information on the factory, product range and production volume and production facilities). "We wish to know the specification of steel and heat treatment recommended for forged ploughshares...."

Answer

The following are the typical materials used for ploughshares,

(a) Rolled-section ploughshare: C-1095 Heat treatment: Heat, quench, draw to Brinell 415-477. Advantages are low cost with high wear resistance.

(b) Forged ploughshare:

(i) C-1024 Carburize, quench and draw to Rockwell C:58-62. Advantages are homogeneous material for good strength with good wear resistance.

(ii) Soft centre C-1095 over C-1010 with C-1080 point. Heat, quench and draw to Rockwell C:58-62. Advantages are full hardness to greater depth on wearing surface for high wear resistance.

(c) Crucible: C-1080 Heat and air cool to Brinell 240-305. Advantages are low cost and good resistance to breakage.

(d) Cast steel ploughshare: Alloy steel. Heat, quench and draw to Brinell 375-450. Advantages are high strength and good wear resistance with lower manufacturing cost for small volume requirements.

(e) Cast-iron ploughshare: Gray cast iron with chilled cutting edge, no heat treatment. Advantages are low cost and high wear resistance qualities for obstruction-free light soils.

IV. UNIDO TECHNICAL ASSISTANCE PROJECT DATA SHEETS

The following specimen project data sheets relating to technical assistance to the agricultural machinery industry are presented here for reference and to assist developing countries to formulate suitable technical assistance projects. Each of the project data sheets provides for one or two experts for a relatively short duration. If a team of experts or equipment or fellowships are required, the data sheets can be modified to include these requests.

When it submits requests for technical assistance, the Government is asked to supply background information relevant to the project and to justify the request.

The specimen project data sheets appear in the following order:

1. Project formulation*
2. Market survey*
3. Techno-economic advice on manufacturing*
4. Manufacturing feasibility study (general)*
5. Manufacturing feasibility study (involving castings)*
6. Manufacturing feasibility study (UNIDO-FAO joint project)*
7. Pre-investment analysis of manufacturing unit*
8. Pre-investment study for manufacture of small engines**
9. Reinforcement of design and development facilities*
10. Rationalization programme*
11. Reinforcement of facilities for evaluating product performance*
12. Organization and operation of industry*
13. Techno-economic advice on production and commercialization of tractors*
14. Feasibility study of manufacture of light agricultural machinery and assistance in setting up project**
15. Assistance in forging, quality control and expansion planning**
16. Project tender proposal, product specification and financial evaluation of manufacturing project**
17. Reinforcement of programme for maintenance and repair*
18. Two mobile workshops for maintenance and repair**

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* May be implemented through an individual expert.

** May require a team of experts; it is recommended that these projects be implemented through subcontracting to an engineering consulting firm.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 1

Reference No.: Country:

1. Project title: Agricultural machinery project formulation

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: In consultation with Government officials, representatives of industry and members of research development institutions, the expert will carry out the following tasks:

   (a) Discuss specific areas of development of the agricultural machinery and implement industry;

   (b) Identify specific projects and explore possibilities for UNIDO technical assistance;

   (c) Formulate specific technical assistance projects in consultation with the Government and recommend the necessary follow-up action to the Government and UNIDO.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in agricultural machinery project formulation	2 weeks	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 2

Reference No.: Country:

1. Project title: Market survey of agricultural machinery and implements

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert, who will be attached to an industrial research and development institute, will, in consultation with the officials of the Ministry of Agriculture, Food and Co-operation, Ministry of Commerce and Industry, farm implement manufacturing units, rural workshops and other manufacturing plants and other experts will carry out the following tasks:

   (a) Collect all available information on the status of the agricultural machinery and implement sector, such as reports and surveys, statistical data on imports, local production, existing population and estimated future demand, present annual sales;

   (b) Classify the above information, with respect to product lines (hand tools, hand-operated equipment, animal-drawn implements, crop protection machinery, engines, pumps and power equipment such as power tillers, tractors, stationary threshers); subclassify the information according to specific tools, implements and machinery in detail (for example: hand tools - hoes, matchets, axes, grass slashers, sisal knives, sickles, spades, shovels, rakes; animal-drawn equipment - ploughs, harrows, cultivators, seed drills, carts; power equipment - pumps, threshers, hammer mill, tractors);
   (Note: The above list is not exhaustive.)

   (c) Secure, in consultation with the relevant authorities, the necessary information on factors affecting future demand, design specifications and requirements (for example: mechanization trend, government plans for and policies on industrialization, local manufacture of agricultural machinery and implements, agricultural expansion programme, financing, marketing and service facilities);

   (d) Determine, with the above basic information, the current and future demand of already identified agricultural machinery as well as prospects for other implements and machinery in the country; evaluate also the scope for animal-drawn equipment and optimum distribution pattern between ox-drawn and other equipment;

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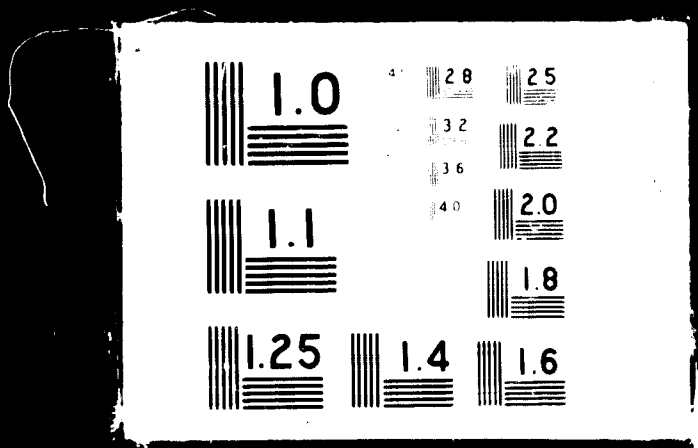


(e) Formulate and recommend a general programme for marketing, sales and service (either improvement of existing organizations or establishment of a new one at both the national level and the plant level);

(f) Recommend suitable action to initiate a rational work programme for design, development, adaptation and testing; planning and design of agricultural machinery industry supporting units; assistance to manufacturing plant; assistance to implement unit; and provide a guideline on possible future programmes for diversifying products and establishing new manufacturing units;

(g) Submit recommendations on future technical assistance activities.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in agricultural machinery market survey	6 months	

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 3

Reference No.: Country:

1. Project title: Techno-economic advice on manufacturing

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will be expected to assist the Government in carrying out a tractor manufacturing project (tractor is an example only) through participation and advice on final evaluation of the manufacturing proposals, negotiations, selection of the location and establishment of an integrated tractor factory. The expert may be attached to the Ministry of Industries. He will work in close co-operation with officials of the Ministry of Planning and Employment and Ministry of Agriculture and will carry out the following tasks:

   (a) Assist and advise in drawing up the standard specifications of tractors to facilitate securing final proposals;

   (b) Assist and advise in final evaluation of the bids;

   (c) Assist in the negotiations for manufacture;

   (d) Assist in the formulation of a phased local manufacturing programme and establishment of a list of components to be manufactured locally (subcontracted or made in the main factory);

   (e) Assist in the selection of machine tools required for local manufacture and processes;

   (f) Determine whether additional production machinery should be imported for the factory; this task should be completed as early as possible after the detailed data have been collected in order to allow time for quotation and delivery;

   (g) Assist in the selection of the location of the factory;

   (h) Assist in the organization of the factory and formulation of work schedule and plant layout;

   (j) Assist in the start-up and commissioning of the tractor factory.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Techno-economic adviser on tractor and agricultural machinery manufacturing	12 months	

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 4

Reference No.: Country:

1. Project title: Feasibility study of agricultural machinery manufacture

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert (either a staff member or a consultant from UNIDO) will carry out the following tasks:

   (a) Analyse the existing level of mechanization of agriculture;

   (b) Identify future trends in design of and market potential for agricultural machinery and implements;

   (c) Study the status of existing agricultural machinery manufacturing industries;

   (d) Identify suitable products for manufacture and assist in establishment of product specifications;

   (e) Analyse manufacturing feasibility and conduct pre-investment studies;

   (f) Formulate feasible manufacturing projects;

   (g) Recommend future measures to establish new manufacturing units.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in agricultural machinery manufacturing feasibility	3 months	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 5

Reference No.: Country:

1. Project title: Feasibility study of agricultural machinery manufacture (engines, pumps and machinery involving castings)

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: A team consisting of two members:

An expert in agricultural machinery (pumps and engines)

An expert in foundry castings for agricultural machinery

Consultants from UNIDO will carry out the following analysis of agricultural machinery and implements (pumps and engines):

Part A: Analysis of the existing status of the industry (pumps and engines), demand and design trends;

Part B: Identification of suitable products, product specification (pumps and engines) and feasibility study for manufacture;

Part C: Analysis of foundry casting shops and recommendations on reinforcement of foundry casting production facilities.

It is expected that parts A and B will be carried out by the expert in agricultural machinery and part C by the expert in foundry castings.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in agricultural machinery (pumps and engines) feasibility study	4 months	
Expert in foundry technology	4 months	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 6

Reference No.: Country:

1. Project title: Feasibility study of agricultural machinery and implement manufacture (UNIDO-FAO joint project)

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: A two-member team will be expected to assist the Government in formulating rational development policies on the manufacture of agricultural machinery and implements, development and adaption and repair and maintenance. In addition, they will identify projects for UNIDO technical assistance.

The team leader will be an expert in the manufacture of agricultural machinery and implements from UNIDO and will be assisted by an expert in the utilization of agricultural machinery and implements from FAO. In consultation with the relevant government officials, representatives of agricultural and industrial organizations and members of appropriate institutions, the team will carry out the tasks described below.

The expert in utilization (from FAO) will assist the expert in manufacture (from UNIDO) by undertaking the following:

(a) Study of mechanization of agriculture;

(b) Identification of agricultural machinery implements and tools suitable for local agriculture;

(c) Selection, adaptation and/or modification of designs suitable for local agricultural conditions;

(d) Determination of present demand for specific machinery, implements and tools and the forecast of future demand and design trends;

(e) Survey of local facilities for service, distribution and repair of agricultural machinery, implements and tools.

The manufacturing expert (from UNIDO) will first familiarize himself with work being carried out by the FAO expert. Simultaneously, the UNIDO expert will carry out the following:

Phase 1: Analysis of existing manufacturing facilities and capabilities:

(a) Analysis of existing major manufacturing facilities in agricultural machinery and allied metalworking industry including foundry, forging and supporting industries;

(b) Analysis of existing plans for expansion, diversification and establishment of new units in the agricultural machinery industry.

Phase 2: Identification of product line for local manufacture:

(c) Advise and assist the Government in identifying a product line suited to local manufacture, based on the work of the FAO expert and information provided by the Government;

(d) Assist in the establishment of guidelines for production volume;

(e) Assist the Government in the formulation of a manufacturing proposal based on the government plans for developing local manufacture and the analysis carried out in phase 1;

(f) Advise the Government on ways and means to implement effectively the recommendations approved by the Government, including possible UNIDO assistance.

Phase 3: Establishment of supporting services for the manufacturing industry: (design, development and testing; repair and maintenance and product distribution network)

(g) Analyse on the basis of present requirements, existing and proposed manufacturing facilities and future trends in design and demand, the existing service facilities, including design, development, adaptation and testing centres, repair and maintenance workshops and product distribution network;

(h) Assist the Government in formulating proposals to reinforce existing facilities or establish new units for the supporting services detailed above;

(j) Recommend ways and means of implementation of the above recommendations including further UNIDO assistance.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in agricultural machinery manufacture (UNIDO)	6 months	
Expert in agricultural machinery utilization (FAO)	2 months	

9. Request approved:

For UNIDO Date For FAO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 7

Reference No.: Country:

1. Project title: Pre-investment analysis of agricultural machinery manufacturing unit

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will carry out the following analysis of the agricultural machinery and implements industry:

   (a) Formulation of a manufacturing programme for selected items of agricultural machinery and implements;

   (b) Determination of production volume, manufacturing level, production schedule, manufacturing techniques and raw materials;

   (c) Selection of machine tools and equipment, plant layout and formulation of organizational and technical manpower requirements;

   (d) Analysis of investment and engineering requirements;

   (e) Recommendations regarding project schedule and assistance in execution of the project;

   (f) Formulation of future line of action and recommendations on assistance required.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in establishing agricultural machinery manufacturing unit	12 months	

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 8

[Note: This is a project data sheet for use in connexion with possible UNIDO technical assistance through subcontracting to a consulting firm. Subcontracting is recommended wherever the assignment calls for a team of experts in different disciplines. Similar project data sheets may be applicable for any product types detailed in chapter III.]

Reference No.: Country:

1. Project title: Pre-investment study for manufacture of small internal combustion engines

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: A contractor will provide a team of experts.

5.01 The contractor shall undertake and carry out the following services:

(a) Secure all available information on product line specifications, present demand and future requirements concerning the small internal combustion engines industry that has already been collected and/or projected and rationalize the data.

(b) Assess the present status of this industry, taking into account pertinent factors such as:

Physical facilities

Technical skill of managerial and technical personnel

Production techniques

Quality control

Investment represented by present facilities

(c) Conduct a techno-economic feasibility study for the establishment of a new manufacturing unit with provision for its expansion, together with development of ancillary and supporting industry such as foundry and forging.

(d) Formulate steps that should be taken to assure development based on the recommendations of the study, with special reference to investment, finances, licensing, management and marketing.

5.02 Considering that the manufacture of small internal combustion engines is closely related to the foundry industry, the contractor will also determine and analyse the following factors:

(a) Relevant information on the Government's policies and plans for the expansion of this industry;

(b) Present status of the foundry industry;

(c) Recommendations on the future action to be taken by the Government concerning development of the foundry industry with a view to satisfying future requirements.

5.03 In fulfilling his obligations as set forth under 5.01 and 5.02 hereof, the contractor will undertake an economic and technical analysis as follows:

Economic analysis

Analysis of demand for small internal combustion engines

Review of existing country and regional data and information concerning this market demand;

Re-assessment by type, size, power and quality rating of products.

Prerequisites for manufacture

Viability and profitability

Potential location of the new plant within the country and its essential ancillary requirements

Manpower and technical expertise needed

Capitalization and availability of working capital

Optimum size of the plant

Availability of raw material

Required supporting and ancillary industries such as foundries and forges

Technical analysis

Analysis of factors to be considered when establishing a new plant

Type, size and power of small combustion engines recommended for production and the optimum capacity of the plant

Components to be imported

Possibility of subcontracting components to local manufacturer

Components and spare parts to be manufactured in the new plant and process planning

Selection of machinery and machine tools

Number required

Neutral specification to enable call for bids on an international basis

Approximate costs in US dollars

Organization: management organization chart; number of engineers, technical personnel, semi-skilled and unskilled workers for optimum production capacity

Manufacturing layout: machine shop; welding and fabrication, quality control and inspection, industrial engineering, assembly, purchasing, accounting, sales

Requirements of the new plant

Layout of the plant (drawings of the building, location of machines, flow chart for raw materials and components) including: stores, manufacture, assembly, inspection, offices

Supplies required annually for a successful manufacturing programme: raw materials (type and specification), electric power, fuels, water

Investment and return in US dollars: Capital requirements - fixed capital (land, building, machinery installation), working capital, total capital, foreign currency, local currency

Employment - direct, indirect, total

Fixed investment per employee

Total annual gross sales

Total annual costs

Gross annual profit - total, percentage of total capital, percentage of gross sales

Foreign currency - annual needs, annual savings

Value added - per annum, percentage of gross sales

Capital-output ratio

Analysis of production cost for each item and recommended sales price

Analysis relating to future expansion of the plant

Scope of production volume expansion (complete engines and components)

Additional building space required

Additional equipment and machinery required

Layout for additional machinery and equipment

Components to be imported after the expansion

Components to be subcontracted to local manufacturers

Components to be manufactured after the expansion of the new plant

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Contractual services		

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 9

Reference No.: Country:

1. Project title: Reinforcement of design and development facilities in agricultural machinery and implements industry

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will carry out the following tasks:

   (a) Analyse the status of existing institutions for research, design, development and adaptation of agricultural machinery and implements;

   (b) Analyse existing agricultural machinery and implements in use;

   (c) Identify future trends in design and market potential;

   (d) Recommend future line of action in design, development and adaptation of products needed and to be manufactured;

   (e) Formulate a project for the reinforcement of existing design and development facilities (organization, work programme, counterpart and local personnel training).

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in design and development of agricultural machinery	1 year	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 10

Reference No.: Country:

1. Project title: Rationalization programme for agricultural machinery and implements industry

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will carry out the following tasks:

   (a) Analyse existing manufacturing facilities (agricultural machinery and implements, allied metalworking industry, foundry, forging, necessary ancillary and supporting industries);

   (b) Analyse existing information and data on present demand, imports, sales and future demand for agricultural machinery and implements;

   (c) Analyse existing plans for expansion, diversification and establishment of new units;

   (d) Correlate future demand and existing and proposed manufacturing capacities;

   (e) Make recommendations on future manufacturing capacity (full utilization of resources, distribution of products and rationalization of manufacture);

   (f) Make recommendations on phased manufacturing programme, substitution of local for imported materials, quality control and cost.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in rationalization of agricultural machinery manufacturing	1 year	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 11

Reference No.: Country:

1. Project title: Reinforcement of facilities for evaluating the performance of agricultural machinery and implements

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will carry out the following tasks:

   (a) Analyse existing facilities for quality control, testing and product performance evaluation, both in industry and other testing and quality control centres;

   (b) Analyse the testing and evaluation codes and procedures followed; equipment and instruments available and utilization; level of technical skill of personnel available in selected institutions and testing and quality control centres;

   ( ) Identify products manufactured locally and major products imported, and products anticipated for manufacture that require testing, quality control and evaluation;

   ( ) Formulate a project for reinforcement of existing testing and performance-evaluation facilities (organization, work programme, equipment and instruments, physical facilities, test codes and procedures, quality control and inspection techniques, liaison with industry, technical training of local personnel and finances);

   (e) Draft recommendations to the Government and to UNIDO.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in evaluating performance of agricultural machinery	1 year	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 12

Reference No.: Country:

1. Project title: Organization and operation of tractors, implements and allied engineering industries

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: To assist the State Company for Engineering Industries of the Ministry of Industry to formulate an integrated programme of UNIDO technical assistance for the efficient start-up and operation of an industrial complex. In consultation with management officials of the State Company for Engineering Industries, the expert will carry out the following tasks:

   (a) Examine the entire project and particularly the manpower needed for adequate technical and commercial management, production, quality control, training etc., with a view to identifying and analysing personnel needs;

   (b) Assist the present management in formulating an integrated technical assistance programme to be financed from multilateral or bilateral sources;

   (c) Advise the management as required on the over-all organization and operation of the industrial complex.

6. Background information: The State Company for Engineering Industries, a wholly owned government organization, owns all the production facilities of the industrial complex.

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Senior expert in the organization and operation of engineering industries	3 months	

9. Request approved:

For UNIDO Date For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 13

Reference No.: Country:

1. Project title: Techno-economic advice on production and commercialization of tractors and implements

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The UNIDO expert will be attached to the State Planning Organization. He will work in close co-operation with the government agricultural equipment organization, the Ministry of Agriculture, the universities, the State Planning Office, other experts of United Nations agencies, particularly FAO, and international and national organizations working in this field and manufacturers of agricultural machinery and implements. He will carry out the following tasks:

Preliminary study

(a) Secure all available information, data and statistics on:

(i) Agriculture and agricultural machinery, including various reports and surveys already conducted, and systematize the information collected. This will include agricultural machinery, population, imports, sales, present production, present demand, product specifications, future trends and future demand;

(ii) Costs, marketing, import policies, investment policies, commercialization and marketing, including spare parts availability, rural credit and government plans for developing the local industry and systematize the information thus collected.

Techno-economic study

(b) Conduct independent analysis of:

(i) Present and future trends in agricultural machinery and implements design and demand, including product specifications, demand development and credit availability;

(ii) Present status of the agricultural machinery and implements manufacturing industry in the large-scale sector and in the small- and medium-scale sector with a parallel analysis of the problems faced (production volume, raw material supply, finances, tax structure, product diversification and expansion programme, imports, foreign exchange and investment problems, technical and organizational aspects);

(iii) Problems of the industry in the large-scale sector and in the small- and medium-scale sector with reference to costs of production, quality, competition, spare parts supply and manufacture, commercialization, including marketing, financing, repair, maintenance and service, and capacity in relation to the expected demand.

Final analysis

(c) Prepare, on the basis of the above-detailed analysis, a comprehensive report on the techno-economic aspects of developing the agricultural machinery and implements industry in the country with special reference to costs of production, marketing, competition, capacity in relation to expected demand, spare parts manufacture and supply;

(d) Make recommendations on the over-all policies that the Government might pursue with respect to developing the local agricultural machinery industry (rationalization of manufacture, incentives, raw material imports, finances, commercialization).

6. Background information:

7. **Relationship with other technical assistance projects or requests:**

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Techno-economic adviser on tractors and implements	1 year	

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 14

Reference No.: Country:

1. Project title: Feasibility study of manufacture and/or assembling of light agricultural machinery and assistance in setting up project

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: Two successive stages are foreseen: feasibility study and the establishment of a pilot workshop.

Stage 1

An expert will undertake a light agricultural machinery feasibility study for three months. He will study and evaluate the present stage of light agricultural machinery (animal-drawn multipurpose tool frames and attachments) requirements and elaborate plans for future local manufacturing assembling of this type of product. Specifically, the expert will carry out the following tasks:

(a) Revise the information and data already available on the current and potential markets (local, and possible neighbouring markets) of light agricultural machinery, in particular animal-drawn tool frames and attachments;

(b) Analyse the local market requirements for this type of product, the imports of related products, the improvements resulting from the use of standardized and locally adapted multipurpose tool frames (ox-drawn), the economic and technical advantages of establishing a local manufacturing unit;

(c) Evaluate the type of machinery and attachments most likely to be needed in view of the present and forthcoming government plans for expansion and diversification of agriculture, and for possible export to countries in the subregion;

(d) Estimate the future manufacturing capacity required in terms of the market, the distribution, the utilisation of semi-skilled manpower available locally, the type of management needed for the operation, and the buildings and supporting facilities existing locally;

(e) Visit, if necessary, an agricultural machinery factory in a neighbouring country and to explore the possibilities of co-operation between the two countries in developing the local industry.

(f) Recommend further steps the Government might take to set up a suitable manufacturing programme.

Stage 2

This stage will depend on the results of stage 1. To implement stage 2, another mission of one expert or a team of experts may be required. It may be necessary:

(a) To provide an expert who would start the operation as Project Manager (2 years), and an agricultural engineer (2 years);

(b) To secure three fellowships for in-plant training for local counterparts and future managers of the workshops;

(c) To provide necessary equipment for the pilot workshop;

(d) To finance and provide facilities for design development, with opportunities for close liaison with an institution in an industrialized country;

(e) To promote an extension service for farmers, by providing facilities for trade outlets and product promotion, and possibly by aid in the form of credit.

6. **Background information:**

7. **Relationship with other technical assistance projects or requests:**

8. **Project components, duration and estimated cost:**

Field of activity	Duration	Cost
Stage 1: Expert in feasibility study for light agricultural machinery;	3 months	
Stage 2: Number of experts, fellowships and items of basic equipment. (Can be more accurately determined after completion of stage 1.)		
Tentative requirements		
1 Project manager	2 years	
1 Agricultural engineer	2 years	
1 Associate expert		
2 United Nations volunteers		
3 Fellowships		
and various items of equipment		

9. **Request approved:**

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 15

[Note: This is an example of technioal assistance in the field of production that may be implemented by subcontracting to a consulting firm. Similar assistance in all fields of production and allied activities in general, and in foundry, machine shop, assembly, expansion in particular is provided at request.]

Reference No.: Country:

1. Project title: Assistance in forging, quality control and expansion planning (factory producing tractors, engines and pumps)

2. Date formal request recorded:

3. Government department submitting request:

4. Government agenoy oonoerned with the project:

5. Description of the project: To assist in developing factory producing tractors, engines and pumps and a forging and foundry industrial complex, a team consisting of a production expert, a quality control expert and an expansion planning expert will undertake the following tasks:

Production expert

The production expert will be primarily responsible, together with the quality control expert, for developing modern production techniques at the existing plant and, as a second step, for formulating requirements for the proposed reorganization of the factory. Specifically, the expert will carry out the following tasks, in close oo-operation with the quality oontrol expert:

(a) Study the documents prepared by the authorities on the present status of the forge shop;

(b) Analyse the existing production programme and techniques used;

(c) Analyse the machine tools, toolroom and industrial engineering facilities available, existing technical skill of the personnel and complete methodology followed in production from receipt of raw materials to finished oomponent in the forge shop, with special reference to utilization of jigs and fixtures, heat treatment and quality control systems;

(d) Recommend the necessary steps to be taken on a priority basis, in order to reduce the rejection percentage in the forge shop; subject to approval by the plant authorities, assist in the implementation of these recommendations;

(e) With reference to the reorganization and expansion of the forge shop, analyse the total requirements regarding integrated production (equipment, industrial engineering facilities, such as tooling, jigs and fixtures, technical manpower, methodology and control systems, and finances);

(f) Recommend a comprehensive production programme incorporating the latest technological standards and techniques.

Quality control expert

(a) Analyse the existing production programme and quality control and inspection techniques and systems used;

(b) Analyse the laboratory equipment and testing facilities available, existing technical skill of the personnel and complete methodology followed in quality control and inspection from receipt of raw materials to finished component in the forge shop;

(c) With reference to the reorganization and expansion of the forge shop, analyse the total requirements regarding quality control and inspection (equipment, testing facilities, technical manpower, methodology and control systems, and finances);

(d) Recommend a comprehensive quality control and inspection programme incorporating the latest technological standards and techniques.

Expansion planning expert

(a) Study and analyse the reports and recommendations of the quality control expert and the production expert;

(b) Analyse organizational and technological aspects of the existing forge shop production programme (raw material purchase and supply, storage and inventory control, process planning and production, industrial and tool engineering, quality control and inspection, heat treatment and finishing);

(c) Review the selection of equipment, factory layout and manufacturing programme proposed for reorganization; taking into account the existing facilities and recommendations of the other two experts, assist in the formulation of an integrated reorganization programme, which will include the latest technological and management techniques;

(d) Recommend specific steps to be taken by the authorities to carry out the proposed reorganization;

(e) Subject to approval by the authorities, assist in the implementation of the recommendations.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in forging		
Expert in quality control and inspection for forge shop		
Expert in forge shop planning and expansion		

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 16

[Note: This is an example of technical assistance for a complete analysis of a complex capital-intensive industrial project such as the manufacture of tractors and engines. This may require a team of experts and may be implemented by subcontracting to an engineering consulting firm.]

Reference No.: Country:

1. Project title: Evaluation of project tender proposal, product specification and financing of manufacturing project

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: A comprehensive, comparative evaluation of the proposals submitted requires that they be studied under three headings as follows:

Product proposals

Manufacturing proposals

Financial and legal proposals

Each of these areas requires specialized competence. A team of experts is therefore recommended, including:

An agricultural engineer (agricultural tractor specialist)

A production engineer (manufacturing specialist)

An industrial economist/financial expert

Although each expert will have his individual area of responsibility, it is essential that they work together as a team. It is also highly desirable that they have previously worked together as a team in project evaluation. For this reason, negotiation with an engineering consulting firm to provide these services is recommended.

Such a team will:

(a) Report direct to the officer in charge of the tractor manufacturing project in the Ministry of Industry and Commerce;

(b) Treat the proposals submitted to them for evaluation as "strictly confidential" and undertake not to discuss them in any way with persons either in the Ministry of Industry and Commerce or outside it, other than with persons authorized by the officer in charge of the tractor project to enter into such discussions;

(c) Analyse each proposal from the respective viewpoints of the three experts;

(d) Prepare a consolidated report dealing with the merits and demerits of each proposal and recommending proposals that may be considered favourably in order of priority;

(e) Recommend changes in the proposals that would make the project more effective;

(f) Be available for consultation with officers of the Ministry of Industry and Commerce regarding all phases of the project before a contract is signed with the successful bidder;

(g) Assist the Ministry of Industry and Commerce in negotiating the contract with the firm or firms selected by the ministry;

(h) Identify areas where further advice and assistance may be required in executing the project;

The agricultural engineer will undertake the following tasks:

(a) As the product specialist on the team, the expert will be directly responsible for the comparative evaluation of the tractor models proposed for manufacture by each bidder. In evaluating the product line proposed he will give particular consideration to the following factors:

(i) Considering the tractor models proposed as a group:

Horsepower range covered and its adequacy for the market in the country, but also for the region

Standardization of basic assemblies - clutch housing, transmission, rear axle housing etc. - between models, relative to lowering production costs and minimizing the number of different individual parts

Standardization of implement mounting and control facilities, thus permitting interchangeability of implements between models

Adaptability to different types of farming - open field work, raw crops, vineyard

(ii) Considering each model individually:

Performance specifications

Maximum drawbar and power take-off (PTO) horsepower; maximum pull and wheel slippage in each forward speed; fuel consumption at maximum power and at ½ maximum power; number of forward and reverse gears and speed in each gear at rated engine rpm; total gross weight and weight distribution; minimum ground clearance; tread - front and rear - and method of altering tread; turning radius; 3-point hitch system - conformation to international physical standards, hydraulic draft and/or position control, pump capacity and pressure, lift capacity, controls; external hydraulics - type, availability and cost; operator comfort and safety and convenience of controls.

Technical specifications

Engine:

Displacement; rated rpm; power and torque curves; fuel system - type, operating pressure, capacity; lubrication system - type, capacity and protective devices used; cooling system - capacity, adequacy for hot climates; accessibility for servicing; electrical system - battery voltage and rated capacity, type of generator and rating, rating of starter and safety features.

Clutch:

Type; area; facing material; adjustability; Adaptability to torque converter drive.

Transmission:

One-step or 2-step type; gears synchronized or not; size and type of gears, shafts and bearings; special lubricants required.

Rear axle assembly:

Type; ratio; lubricants required; provision for mounting attachments.

Brakes:

Type; braking surfaces; dry or oil bath; adjustability.

Tires:

Size - front and rear; number of plies - front and rear; options.

Adaptability to light industrial applications:

Front loaders; rear-mounted backhoes.

Styling.

History of production

Countries in which model is now in production; year in which production began in each country; units produced in each country in 1971; average annual rates in past 2 years (1970-1971), world-wide.

(b) The expert will evaluate the line of implements the tractor companies propose to manufacture in the country to determine its appropriateness. He will evaluate these implements from the following standpoints:

Completeness and adaptability to agricultural requirements in the country

Product design, specifications and cost

Source of procurement

(c) The expert will analyse and evaluate the points in the proposals submitted by the bidding companies:

Distribution and marketing facilities and organization in the country

Spare parts and repair facilities and organization in the country

Training facilities and programme for operators and mechanics in the country

Export proposals (number of units of each model in each year for the first 5 years after start of production - by country

The production engineer will undertake the following tasks:

As the manufacturing specialist on the team, the expert will be directly responsible for analysing the sections of the proposals that deal specifically with plant and equipment and manufacturing processes and costs. In evaluating the proposals in this sector he will give particular attention to the following points:

Supply of basic plant requirements - water, electricity, transport etc.

Raw materials - sources and cost

Feasibility of proposals related to balance between in-plant production and subcontracted or purchased items and imported components - castings, forgings, metal stampings, electrical components etc.

Buildings - design, cost

Process planning and machine layout

Machine tools specification, source and cost

Production tools - source, cost

Feasibility and acceptability of the proposed programme of nationalization

Quality control system and procedures

Staff establishment (manufacturing) - management, technical, labour

Foreign managerial and technical staff in manufacturing - number, remuneration and period required

Training programme for manufacturing staff

Production levels related to staff and equipment

The industrial economist/financial expert will undertake the following tasks:

(a) The expert will be directly responsible for the analysis and comparative evaluation of the financial and legal aspects of the proposals submitted. These will include proposals regarding:

Levels of fixed and working capital relative to rate of capital turnover and profits

Source and costs of long-term and short-term financing

Amortization of plant and equipment

Proposed yearly operation budget breakdown - management, engineering, manufacturing, marketing

Licensing agreements and fees for same

Fees for technical assistance and know-how - amount and duration

Proposals regarding repatriation of foreign capital and earnings

(b) The expert will work closely with the industrial engineer in analysing the following points in the bids:

F.o.b. factory cost in the country of origin for each of the proposed tractor models

F.o.b. factory cost submitted for each part which in total equal the F.o.b. factory cost of the complete tractor in the country of origin

Analysis of the production costing system and data used in each proposal

Verification of proposed local sources of component costs

Balance between direct and indirect costs

(c) The expert will assist the team leader to prepare the final report and make recommendations regarding the project.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Product specialist		
Production engineer		
Industrial economist		

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 17

Reference No.: Country:

1. Project title: Reinforcement of programme for repair and maintenance of agricultural machinery, implements and allied items.

2. Date formal request recorded:

3. Government department submitting request:

4. Government agency concerned with the project:

5. Description of the project: The expert will carry out the following assignments:

(a) Analyse of the status of existing facilities for maintenance and repair in industry, private and governmental sectors;

(b) Analyse the policies, systems followed, organizational structure, equipment and technical skill of the personnel in selected major centres;

(c) Identify major products and product range, volume, distribution pattern and density that are to be considered when introducing an effective repair and maintenance policy and programme;

(d) Recommend how responsibility should be divided between manufacturers and other sectors in repair and maintenance programme;

(e) Formulate a project to reinforce existing repair and maintenance facilities - through both mobile and central stationary workshops (organization, work programme, equipment instruments and tools, physical facilities, major repair and maintenance, major overhauling, codes and procedures, spare parts, liaison with industry, technical training of local personnel and finances);

(f) Assist in realization of the above project through recommendations to the Government and UNIDO.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in repair and maintenance of agricultural machinery, implements and allied items	1 year	

9. Request approved:

For UNIDO Date

For UNDP Date

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

Project Data Sheet 18

Reference No.: Country:

1. Project title: Two mobile workshops for maintenance and repair of agrioultural machinery and implements.

2. Date formal request recorded:

3. Government department submitting request:

4. Government agenoy concerned with the project:

5. Description of the project: A team consisting of two members:

An expert on mobile workshops for maintenance and repair of agricultural machinery

An expert in organizing repair and maintenance programmes for agricultural machinery

The experts will visit repair and maintenance workshops in the country and will be expected to carry out the following tasks:

(a) The expert on mobile workshops will assist in training personnel to utilize the mobile repair shop and will work out a programme for extending this system;

(b) The expert in organization will study conditions in existing repair workshops and will draw up plans for a maintenanoe and repair programme;

(c) Both experts will recommend measures to improve maintenance and repair of agrioultural machinery and implements.

6. Background information:

7. Relationship with other technical assistance projects or requests:

8. Project components, duration and estimated cost:

Field of activity	Duration	Cost
Expert in mechanical, agricultural or automotive engineering with experience in operation of mobile workshops and machine tools	6 months	
Expert in mechanical or agricultural engineering with experience in organizing and operating large maintenance workshops	6 months	

9. Request approved:

For UNIDO Date

For UNDP Date

For further information on specific questions, communication may be addressed to the appropriate office indicated below at the following address:

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
P.O. Box 707
A-1011 Vienna
Austria

Technical personnel

Those wishing to be considered for the roster of qualified candidates for positions as experts may obtain information on procedures from:

Personnel Service

Consulting firms and commercial organizations

Firms and organizations interested in being listed on UNIDO's roster of qualified firms from which UNIDO obtains teams of experts on equipment through subcontracting may write to:

Chief of Technical Equipment, Procurement
and Contracting Office (TEPCO)

Agricultural machinery and implements manufacturing firms

Manufacturing firms interested in making their activities known to the developing countries through UNIDO may write to:

Chief of Industrial Information Section
Industrial Services and Institutions Division

Offer of services for in-plant training

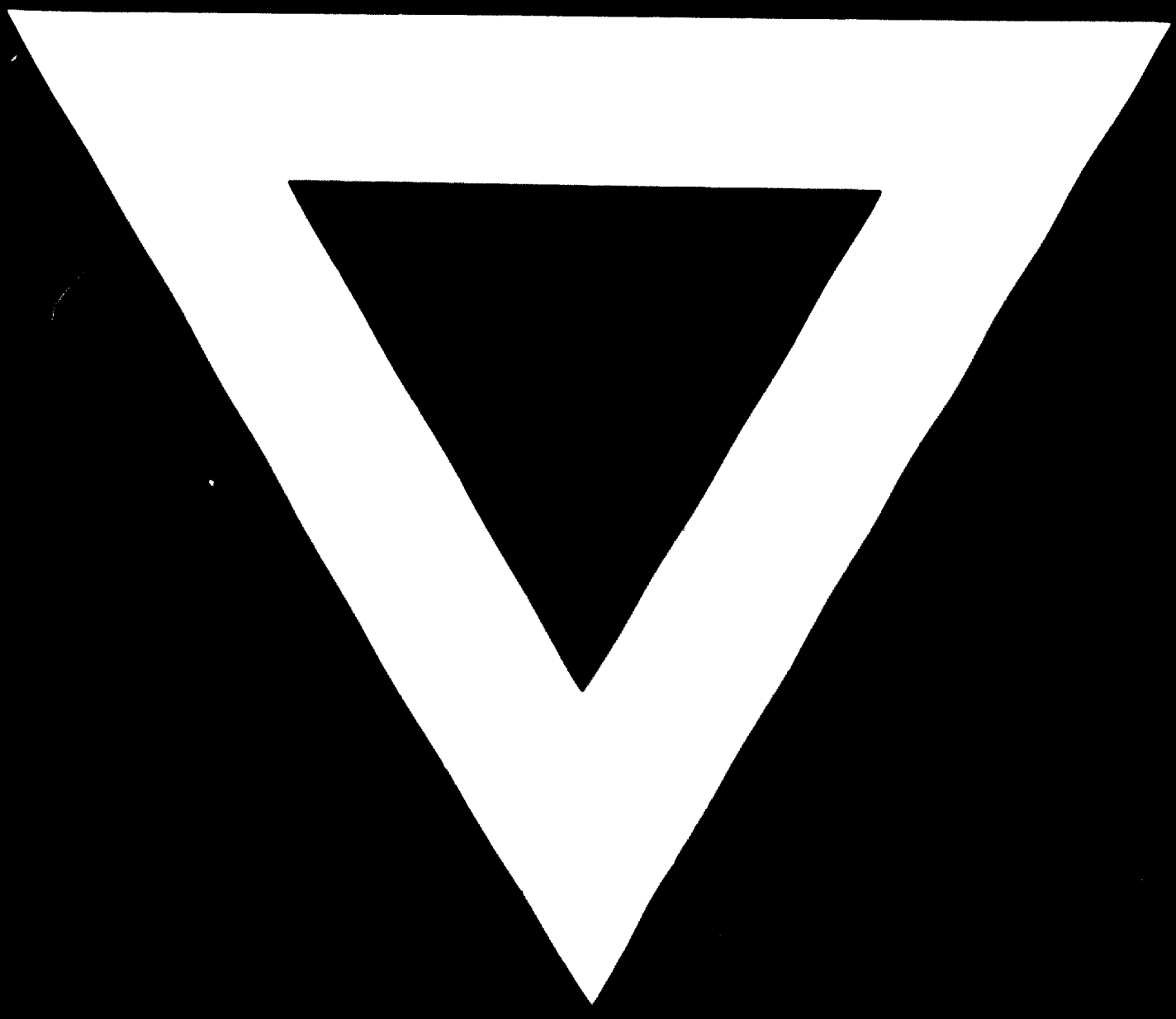
Manufacturing firms and industrial institutions wishing to offer their services and facilities for individual or group in-plant training programmes through UNIDO for fellows from developing countries may write to:

Chief of Industrial Training Section
Industrial Services and Institutions Division

Industrial inquiries

Manufacturing firms and industrial institutions seeking information and technical advice on specific technological and engineering problems may write to:

Chief of Industrial Information Section
Industrial Services and Institutions Division



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