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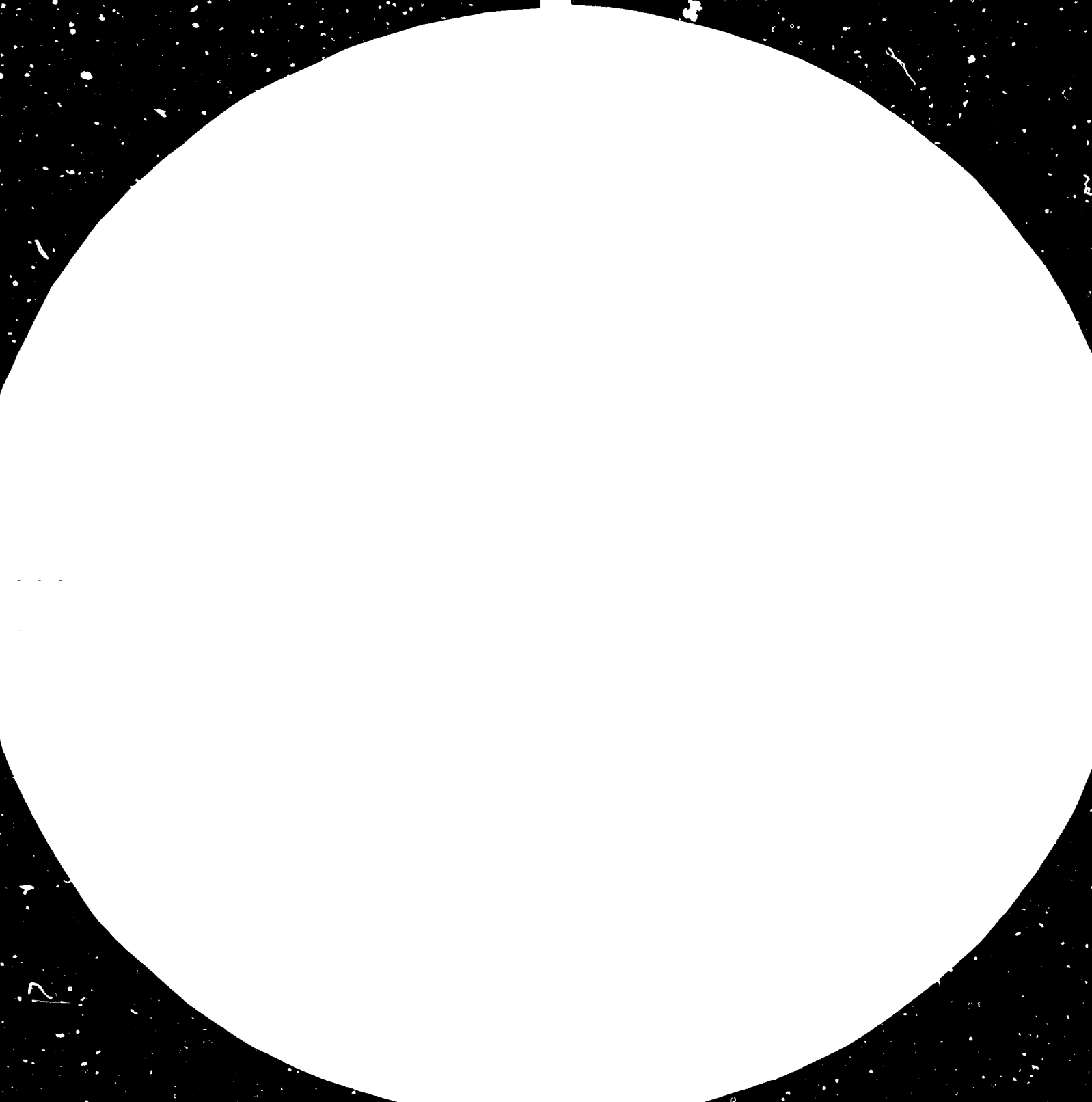
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Workshop on Design and Development
of Agricultural Equipment in Africa
Cairo, Egypt, 17-28 October 1982

REPORT */

(Workshop on
of Agricultural Equipment in Africa).

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2
Contents

<u>Chapter</u>	<u>Page</u>	<u>Paragraph</u>
Introduction.....	3	
I. Opening of the workshop.....	4	1 - 4
II. Technical visits.....	5	5 - 6
III. Other activities.....	5	7
IV. Presentations by the UNIDO secretariat and the participants.....	6	8 - 41
V. Summary of discussions.....	18	42 - 50
VI. Conclusions and recommendations.....	20	51 - 66
Annex I: List of participants.....	25	
Annex II: List of documents.....	28	

Introduction

The level of development of the agricultural machinery industry in Africa is very low, and the industry encounters many difficulties. Approximately 90% of the present demand for agricultural machinery is met through imports, while local production also remains heavily dependent on foreign supplies and technology. On the other hand, the potential demand for adapted machinery and equipment is very high. About 80% of the farmers are still using hand tools, 15% use animal-drawn implements, and only about 5% are benefiting from the use of powered machinery. Consequently, there is a unique opportunity for the local manufacture of agricultural equipment. The design function and the development of local engineering capability are vital for increasing the supply of locally manufactured equipment in order to meet the growing demand. This entails the adaptation of imported machinery and parts as well as designing appropriate products which meet the needs of small farmers. These can then be produced by local manufacturers using local technology. Design and development therefore appear to be key factors in raising agricultural output.

This workshop has been organized to provide a forum to exchange knowledge and experience among designers and manufacturers of agricultural machinery and equipment from Africa and other developing countries which have gained valuable experience in this field. The main objectives of the workshop were:

- To contribute to the improvement of indigenous design and development capabilities of African designers and manufacturers of agricultural equipment.
- To make specific recommendations for national, sub-regional and regional actions to be taken and programmes to be developed within the framework of the "Plan of Action for the Development of Industries Producing Machinery and Equipment for Agriculture" which was adopted at the First Regional Consultation on the Agricultural Machinery in Africa (5-9 April 1982, Addis Abab, Ethiopia, Report ID/285).

This workshop falls within the framework of the Lagos Plan of Action and the programme for the Industrial Development Decade for Africa (1980-1990) which emphasizes harmonious interrelationships between agriculture and

industry and local development and production of industrial inputs for the agricultural sector.

This workshop has been organized under the UNIDO Project UC/UD/RAF/81/093 and in co-operation with the host institution EIDDC (Engineering and Industrial Design and Development Centre).

I. Opening of the Workshop

1. The Workshop on Design and Development of Agricultural Equipment in Africa was opened by the Egyptian Minister of Industry, His Excellency Mr. Foad Abou Zaghla. The Minister welcomed the participants^{1/} and thanked the organizers of the Workshop for asking Egypt to host the Workshop. He said that the development of the agricultural machinery industry in Africa was a vital factor in attaining self-sufficiency in food and in alleviating the malnutrition of millions of people in Africa. He emphasized that agricultural mechanization should be related to industrial development and should not further increase the dependency of African countries on the developed countries. He further acknowledged that agricultural mechanization had a priority role in increasing agricultural production and added that, given serious attention, the agricultural machinery industry could be the nucleus for African industrial development.

2. The representative of the Executive Director of UNIDO greeted the participants, thanked the Minister for his statement, and then put forward the terms of reference based on which the ensuing discussions were held.

3. Dr. Yusef K. Mazhar, Director, Engineering and Industrial Design and Development Centre (EIDDC), welcomed the participants in his capacity as the head of the host organization (EIDDC).

4. The meeting was also addressed by Dr.A. El Housary and Dr.A. F. El Sahrigy, the undersecretaries of the Egyptian Ministry of Agriculture. They

1/ The list of participants is given in Annex I.

gave a detailed exposé of the status of agricultural mechanization and manufacture of agricultural equipment in Egypt.

II. Technical visits

5. After the opening session, the participants were invited to an exhibition within the premises of the EIDDC of agricultural machinery designed and manufactured in Egypt. The participants also had the opportunity to visit the technical facilities of the host institution, the EIDDC.

6. The programme of the Workshop included technical visits to Egyptian companies involved in the manufacture of agricultural machinery and equipment. The following visits were organized:

a) Behera Company (Alexandria): This company is engaged in (among a wide range of other metal-working and construction activities) the construction of agricultural machinery and equipment.

b) NASR Automotive Manufacturing Company: This company is the sole and pioneer manufacturer of trucks, buses, passenger cars, agricultural tractors and trailers in the Arab Republic of Egypt.

c) In addition, a visit to the agricultural fair which was taking place in Cairo, was arranged. Exhibits at this fair included both locally manufactured and imported agricultural machinery and equipment.

During these visits, the participants had the opportunity to discuss a wide range of issues with the Egyptian industrialists and technical personnel engaged in the production of agricultural machinery (from both the State and the private Sectors).

III. Other activities

7. During the course of the seminar the participants were received by the Minister of State for Foreign Affairs, His Excellency Boutros Ghali. The Minister stressed the importance of inter-African co-operation to promote industry in general and the agricultural machinery industry in particular.

IV. Presentations by the UNIDO secretariat
and the participants^{2/}

Presentation by the UNIDO Secretariat

8. The presentation of the UNIDO secretariat consisted of two major parts:
- A summary of the diagnosis of the present situation and current problems of the agricultural machinery industry in Africa and an introduction to the paper prepared for this seminar^{3/};
 - Issues on information and co-operation.

Current situation and problems of the agricultural machinery industry in Africa

9. The Secretariat recalled the main features of this situation, on the basis of the information collected and studies carried-out^{4/} for the First Regional Consultation on the Agricultural Machinery in Africa, convened at Addis Ababa, 5-9 April 1982^{5/}.

10. The secretariat stressed the point that in most of the African countries, the industrial production was meeting only a very limited part of the domestic demand (in average, 10% for the whole continent). This fact indicated a strong dependency on the foreign technologies and products. There were about 80 industrial enterprises in the subsaharan countries, producing mainly agricultural machinery; employing around 6500 people, with only 5 firms employing more than 300 people. Most of those enterprises were producing a wide range of products essentially for their internal markets.

^{2/} List of documents presented at the workshop is given in Annex II.

^{3/} UNIDO; The development of African capacities for the design and manufacture of basic agricultural equipment, UNIDO/IS.379 (This document has been based on the work done by M. Ogier, UNIDO consultant, CINAM, Montpellier, France).

^{4/} UNIDO; Agricultural machinery and rural development in Africa: A new approach to a growing crisis, UNIDO/IS.377 and, in particular, 16 case studies which were prepared by African experts.

^{5/} UNIDO; Report of the First Regional Consultation on the Agricultural Machinery Industry, ID/285, 1982.

They were carrying out simple technical operations, having a low local value-added and depending on imports of raw materials, basic mechanical components, etc. Their internal capabilities for design and adaptation were very limited, if existant. Besides these industrial units producing agricultural machinery (whose output represented less than 5/1000 of the African manufacturing value-added), there were artisanal manufacturers whose role remained very important for supplying the majority of farmers in rural areas.

11. The recent developments have indicated a situation of crisis; the enterprises had to face significant shrinkage of most markets, stronger foreign competition and increase in the cost of imported materials, components and equipment. In most of the African countries, the capacity utilization was very low (about 30%) and the sales are decreasing, making the future prospects of the domestic manufacturers very bleak.

12. One of the major causes of this situation was that the Governments were not giving high priority and providing sufficient financing to agriculture in general and to the development of traditional agriculture, food crops and small farming units, in particular. Similarly, there were not sufficient efforts to develop local industries to meet the farmers' basic requirements. These basic problems were also identified by the African head of states and the Lagos Plan of Action^{6/} requested a radical change in such attitudes, and showed a strong political will for improving the agricultural productivity, the conditions of life and employment in rural areas and the food self-sufficiency.

The development of African capacities for the design and manufacture of basic agricultural equipment.

13. The design of agricultural equipment was the key factor which permitted to take into account: (i) the requirements of the user, such as the level of performance expected, (ii) the conditions of use, (iii) the possibility to

^{6/} Lagos Plan of Action was adopted by the assembly of Heads of State and Government of OAU, Second Extraordinary Session, Lagos, Nigeria, April 1980.

produce and maintain the equipment by local productive forces using available materials. Appropriate design would also lead to the reduction of the number of pieces and decrease the technological dependence. Finally, the mastering of the design was the key to the development of an autonomous technology. The document^{7/} has first concentrated on the potentials and problems of the different production structures, such as artisans, small and medium-sized suburban enterprises and large-scale enterprises. Later were described the problems of local manufacture of seven different types of agricultural equipment, from hand tools to heavy tractors. It appeared that the scope for local manufacture was quite considerable, particularly if one went beyond the context of agricultural equipment in its strict sense and included all types of rural equipment. The guidelines to select the types of products for local manufacture were the following: The equipment which were free of competition from industrialized countries should be selected as an initial phase, the types of equipment which could be produced without costly parts or difficult machining, and were relying mostly on cutting and welding or boiler-making should be selected; tilling pieces made of special steels and complex mechanical components such as engines, gear boxes, pneumatic tyres should be imported and the possibility of finding an information source for detailed technical drawings and manufacturing plans should be researched.

14. A detailed analysis of the technical complexity of the different types of workshops and production structures was carried-out to identify the nature of necessary know-how, the requirements of investment and training, the types of manufacturing processes and the products manufactured. It appeared that the "level 4" workshop was offering a wide range of possibilities for a low cost of equipment (less than \$10,000 US) and little training. A level 4 workshop should be equipped with an arc welding set, a drill, a saw, disc grinders and some simple tools (no forging was required).

Information and co-operation

15. The UNIDO secretariat recalled that the lack of appropriate channels of

^{7/} Op. cit. 3/.

communication and hence the lack of exchange of information and experiences have constituted a major bottleneck impeding the development of agricultural equipment industry in Africa.

16. The secretariat further explained the possibilities within the UNIDO's industrial information services:

-Publications (e.g. Appropriate Industrial Technology Series, Development and Transfer of Technology Series, Guides to Information Sources Series, directories such as the Directory of Industrial and Technological Research Institutes of Africa, etc.);

-Inquiry services (INTIB -- Industrial and Technological Information Bank and TIES -- Technological Information Exchange System).

17. The following exchange of information possibilities were identified by the secretariat for further discussion by the Workshop:

-The compilation of a catalogue of agricultural machinery and equipment manufactured in Africa;

-The establishment of a framework making it possible to exchange designs, testing and evaluation results, manufacturing process sheets and prototypes (similar to the framework provided by RNAM -- Regional Network of Agricultural Machinery in Asia);

-The creation of channels of information to provide data on markets, manufacturing capacities, diversification plans, raw materials and ancillary industries.

18. Recalling the conclusions and recommendations of the First Regional Consultation^{8/} with regard to the co-operation issue, the secretariat suggested that several frameworks at various levels could be discussed, i.e.:

-National committees for agricultural machinery where all interested parties (such as farmers' associations, manufacturers, R and D institutes, bankers, government bodies, etc.) could meet and coordinate their activities;

-Sub-regional grouping of countries with similar agricultural conditions;

-Regional African networks.

^{8/} Op. cit. 5/.

Presentations by participants

19. The participant from United Republic of Cameroon started his presentation with an overview of agricultural and industrial developments in his country. He drew attention to the role of his institution CENEEMA as a design and engineering centre. He gave information on the designs made and prototypes completed and discussed the obstacles to the domestic manufacture of indigenously designed and adapted agricultural machinery. He further supported the idea of decentralized manufacturing in rural workshops and, in this connection, he indicated that a programme has presently been developed in his country.

20. The presentaton of the participant from Peoples' Republic of China was concentrated on the main lessons which sere learned in his country through agricultural mechanization programmes. Among others, he stressed the following:

- Mechanization and agro-equipment should be compatible with the local conditions. For example, China has been divided into nine regions, mainly according to soil, climate, rain, types of crops, density of population, each of which for main problems and priority equipment have been identified.

- It was impossible to realize a complete mechanization--it should be selective. Priority had to be given to small and medium-size simple implements since the average size of cultivated land was about 0,1 hectare/person. Then nearly 2000 models of small-size equipment were existant, covering almost all the needs of small farming units.

- It was essential to broaden the scope of mechanization and create side line activites and manufacture products in rural areas, such as poultry equipment, oil extractors, rural construction, etc.

- The procedures to be followed for design should stress field testing. In early stages, design was mainly adaptation. Only later could it aim at creating new products. New product designs were to be encouraged when adaptation was not possible.

- Standardization of equipment and parts was essential in order to ensure reliability and minimize breakdowns and range of spare parts.

- It was important to set up right end effective institutions

responsible for developing products. Co-operation was necessary between agriculturalists, designers and manufacturers.

- Training of all personnel involved in agricultural mechanization programmes was essential.

21. Five different presentations were made by participants from Egypt. The main points of these presentations were:

- The Egyptian agriculture was characterized by small land holdings without adequate roads, the practice of mixed cropping and very limited purchasing power of farmers.

- Rapid increase in wages and periodic labour shortages during the summer and fall peak seasons have promoted the introduction and development of the engine-powered agricultural mechanization.

- With regard to the manufacture of agricultural machinery and equipment in Egypt the following observations could be made:

The main producers (such as NASCO, Behera, Tanta Motors, etc.) were producing machinery mostly under license from industrial countries. The small-scale workshops, on the other hand, were interested only in short-term market prospects and were not ready to experiment with new designs. Therefore, there were obstacles to domestic manufacturing of the agricultural machinery designed in the well-established research and development institutes.

38. Participants from Egypt also introduced a plan of action for the development of domestic agricultural machinery manufacturing capabilities. The main elements of that plan were:

- The formulation of policies and strategies of agricultural mechanization should be the main task of the department of agricultural mechanization. This department should also identify the need for and the required characteristics of agricultural equipment. The suitability and quality of the domestically produced equipment should be checked by that department. Co-ordination of research efforts and providing training to village blacksmiths and farmers should be some of the other tasks.

- Action by research organizations should be aimed at supplying design and manufacturing process data mainly to small-scale producers. They should formulate the standard specifications for all types of adapted agricultural equipment. Furthermore, they should help manufacturers by giving assistance

to solve their specific problems.

- Agricultural machinery manufacturing support groups should be established at the district level. Those groups could assist the small-scale manufacturers and could organize after-sale repair and maintenance services.

- The co-operation between industrial and agricultural development banks was essential to manufacturers for their operations.

23. A participant from Egypt explained in detail the role of EIDDC (The Engineering and Industrial Design Development Centre) in Egypt.

24. In his presentation, the participant from Ethiopia said that due to the importance of agriculture (85% of the population were engaged in it) and the fragmentation of the forces, Ethiopia was giving high priority to the simple agricultural equipment, in general and especially animal drawn. ARDU (Arsi Rural Development Unit) and other institutions have started to carry-out research in improving designs, testing and popularizing several agricultural implements such as animal drawn mould-board ploughs, non-cleaning metal threshers, simple carts, harrows, etc. Diverse obstacles were met in the popularization of those equipment. He added that associations of peasants had their own "Service Co-operatives", which have purchased and distributed simple and improved agricultural equipment at lower than market prices. These Service Co-operatives have established a number of "Rural Skill Centres" which have provided repair and maintenance and popular training, assembled semi-finished carts and produced traditional and improved implements. A National Centre for the development of agricultural equipment has also been established. This Centre would tackle some of the major problems hindering the development of the agricultural machinery industry in Ethiopia.

25. In presenting his paper the participant from India drew attention to the statistical agricultural data of his country and indicated that the trend was towards decreasing size of land holdings, (averaging less than 2 hectares per household with an increasing number of households). However, he stressed that the mechanization was taking place in both large and small farms, leading to an average power of 0.85 HP per hectare in 1981. This was a substantial increase over the 1951 figure of 0.39 HP per hectare. He also indicated that tractor mechanization has provided increased employment contrary to the

earlier expectations of increasing unemployment. He added that the present tractor production of over 52 thousand was realized in 13 plants. He explained that the purchase of agricultural machinery was made possible for farmers through substantial government subsidies. He also stressed that the manpower development was one of the most important elements of the agricultural mechanization. He drew attention to the necessity of training at village level together with the higher training provided by universities, technical colleges, etc. He concluded that for a successful mechanization programme, the end user should be motivated to play an important part in decision making.

26. The participant from India also made reference to South-East Asian co-operation programme on agricultural mechanization (RNAM the Regional Network of Agricultural Machinery). He explained that the objectives of the programme were designing, testing-adopting-modifying the agricultural machinery and promotion their local manufacturing; manpower development, popularization of locally produced equipment and information dissemination. He added that within the framework of that programme, sample equipment prototypes were supplied free of charge to other participating countries for evaluation.

27. The participant from Kenya made the following comments:

- Considering the large unsatisfied demand for Hand Tools and Animal Drawn Equipment in various regions of Africa, the first priority should be for the localized development of these items to meet the potential market.

- Having regard to the local constraints on availability of raw materials and suitable processes, specifications and designs should be so chosen, as to make their local manufacture feasible with low investment levels. Drafting of appropriate standards and specifications in view of these constraints, would need to be taken up on priority.

- Assistance was to be provided to local manufacturers for upgradation of quality of tools, by suitable changes in process and technology capable of quick implementation in the region. At the same time necessary protection to local industry should be provided against competition with imports from the developed world.

- Designs of standard, simple acceptable equipment, should be freely

made available to local manufacturers, to widen the range of products currently available.

- With the progressive availability of prime movers in the region such as diesel engines and electric motors, the second stage of development of simple powered machinery could be introduced.

- A survey should be conducted on local manufacturing capabilities with a view to identify focal points for development of prototypes of manually operated animal and tractor drawn implements.

- Assembly of tractors and other complex machinery based on SKD and CKD imports should be considered on a regional basis, as an adjunct to an existing vehicle assembly unit, as necessary skills and services would be readily available.

- A time bound programme should be drawn up for the development and commercial manufacture of specific types of equipment, viz. hand tools, animal drawn equipment and power operated units, after identifying local production units capable of manufacture of the individual items. A periodic review of progress should be carried out and action should be initiated for removal of problems that the units might encounter.

- It was only by a concerted effort of all the agencies involved, particularly the manufacturers, the government and the users, that positive results could be achieved in meeting the goals of self-sufficiency in farm equipment in the African region.

28. The presentation of the participant from Madagascar started with an overview of agricultural mechanization of the country. He then introduced the main domestic producer CEDEMA and its production programme. The main problems of domestic production were difficulty to obtain raw materials (in particular steel), lack of transport facilities and hence poor sales network and insufficient financial and technical assistance given to the local industry.

29. The participant from Mauritius indicated that with the exception of a few equipment for sugar cane, all agricultural machinery was imported. He added that the very small size of the domestic market was hindering the local production. He said that some new joint venture projectives were under consideration to promote local manufacturing.

30. The participant for Nigeria drew attention to the specific problem of huge loss of crops due to insufficient storage facilities. He gave technical details of different storage techniques and explained the practical realization possibilities. He referred to the related research and development efforts in his country and the success of pilot operations.

31. The participant from Somalia indicated that while the most of the agricultural hand tools were produced locally, the domestic manufacture of animal-drawn equipment was very limited. He added that there was no power machinery production in his country.

32. The participant from Sudan drew attention to the fact that almost all agricultural machinery and equipment used in his country were imported. He indicated that this situation promoted the establishment of many repair and maintenance centres. He further gave information on the tractor assembly plant project which was delayed because of financial problems.

33. The presentation of the participant from Swaziland was focused on the design, development and manufacture of the small TINKABI tractor. He explained the development stages of the project and current problems of production as follows:

- The design and development of the TINKABI tractor was started in 1968, following a decision to move directly to tractor mechanization through the provision of a low cost, front drive tractor which would be designed and manufactured locally.

- The design has matured in 1972 and a prototype batch of 20 tractors was produced.

- Since 1972, 800 tractor units have been manufactured and sold in over 16 countries; local design of other equipment has also continued, including disc ploughs, disc harrows, planters, trailers, tankers, hammermills, front-end loaders, etc.

- The major problems of the domestic production were:

- . Limited manpower resources,
- . Lack of sufficient working capital,
- . Limited access to foreign markets and lack of export credit facilities in Swaziland,

- . Difficulty of maintaining regular supply of raw materials,
- . Poor co-operation between developing countries.

34. The participant from Togo gave detailed information on the establishment of the company UPROMA which was producing mainly animal drawn equipment. He explained that the production facility could be set up within a period of 18 months since a proven design and manufacturing process files (these were transmitted from Upper Volta -- ARCOMA operation), financial and technical assistance (UNDP, UNIDO and EEC have provided assistance) were available. He drew attention to some of the characteristics of the project: the annual production was 1500 units, local value added was 55%, 40 people were employed and around 10% profit was made. He indicated that their intention was to diversify and therefore they would need proven designs and manufacturing files for other equipment. He added that UPROMA was ready to provide all information on its products to the interested parties. He stressed the need for closer co-operation between developing countries and asked for exchange of experts, information catalogues, etc.

35. The participant from Uganda first drew attention to the large drop of agricultural output of his country during the 1971-80 period and the urgent need to restore production. He indicated that although Uganda had fairly good engineering facilities, including capabilities to produce agricultural tools and implements (e.g. UGMA Engineering Corporation with a capacity of 8,600 tons of steel for hoes, axes, shovels and Uganda Hoes Limited with 6,000 tons of steel, etc.), all facilities required up-dating and were utilizing a very small portion of their capacities. He said that the Low Cost Farm Equipment Project (LCFEP) was started in 1976 to produce ox ploughs, hammer mills, etc. He added that the major objectives of that project were to design and develop agricultural equipment in co-operation with Busimeta Agricultural Mechanization College and to manufacture them at their Soroti plant. The project stalled due to the war so the production plant required rehabilitation

36. The participant from Zaire indicated that the domestic capacities in his country for the production of agricultural machinery and equipment were not developed and were unable to meet the demand. He drew attention to the fact that adaptation of tools and equipment to the local conditions has been one of

the major problems. He added that the very low purchasing power of farmers was making it impossible for them to purchase even the simplest priority equipment. He said that all power driven equipment was important and there were repair and maintenance problems in connection with such equipment. He indicated that the Government of Zaire signed development agreements with two producers (IMAZ and CHANIMETAL) and was establishing an agricultural credit bank to give momentum to mechanization and food self-sufficiency efforts.

37. The presentation of the participant from Zambia started with an overview of agriculture and agricultural mechanization in his country. He indicated that hand tools and some animal drawn equipment were domestically manufactured. He said that copying has been the main source of designs but more indigenous design and development efforts were needed. He felt that design efforts outside the industry could not be very successful unless full co-operation of the manufacturers was achieved. He indicated that limited financial resources and difficulties in supply of raw materials were hindering the development of Zambian agricultural machinery industry.

38. The participant from Zimbabwe explained that the industry in Zimbabwe was relatively sophisticated compared with most countries in Eastern and Southern Africa. He said that local industry was capable of producing good quality engineering products but most manufacturers were lacking facilities for agricultural machinery. He indicated that close relations between the research institutes and manufacturers have led the development of different agricultural machines. He thought that an interesting approach was that of competitions with detailed performance specifications where manufacturers were invited to produce samples of their designs to be tested. Such competitions were held for ox ploughs, ox rippers, tractor reversible disc-ploughs, etc.). He felt that the development of techniques and the production of machinery was only a part of the overall effort and should be accompanied by major extension operations. He added that a main development in Zimbabwe has been the development of minimum tillage techniques and equipment in this regard.

39. The participant from ARCEDEM (African Regional Centre for Engineering Design and Manufacturing) explained how his organization was established by the support and participation of 22 African Governments and UN. He explained

that the main activities of ARCEDEM were to design and adapt products and promote industries. He added that a major activity within its mandate was training.

40. The participant from CEEMAT (Centre d'Etudes et d'Experimentation du Machinisme Agricôle Tropical) introduced his organization. He explained that CEEMAT from its foundation in 1862 has been identifying the needs of farmers and transmitting them to manufacturers with the aim to increase agricultural production.

41. The participant from FAO made a statement expressing that FAO considered the design and development of agricultural equipment in Africa to be of paramount importance to the development of agriculture within this huge continent, and throughout its history, FAO has attempted to advise member countries on farm mechanization and has executed and is executing many projects in this field. He indicated that farm mechanization has been the subject of many technical FAO meetings. These meetings have often reflected the need for appropriate design and development of agricultural equipment, not only for Africa but also for the rest of the developing world. He added that FAO has in fact supported, in collaboration with UNIDO and ILO, projects where this aspect of farm machinery has played an important role. He also stressed the necessity of establishing teams consisting of agriculturalists, designers and manufacturers, and, providing these teams with financial support. He felt that the African countries should give higher priority to the design and manufacture of animal and tractor drawn implements than to the tractor itself.

V Summary of discussions

42. All participants agreed that in order to develop an agricultural machinery industry, it was necessary first to formulate an agricultural mechanization strategy which would take into account all different aspects of mechanization. It was added that the success of agricultural mechanization depend on the establishment of all appropriate institutions and providing the financial means. The participants stressed that purchasing power of farmers could be increased through those means and hence the real demand for agricultural machinery could be developed.

43. The participants explained that there was scope for the local production of some agricultural machinery in African countries. It was suggested that first priority should be given to simple, robust and good quality equipment which would meet the immediate demand of many farmers.

44. All the participants stressed that the design and development efforts of agricultural machinery could only be successful if co-operation between farmers, agriculturalists, extension service personnel, designers and manufacturers was realized. In this connection, it was felt that the exchange of information between agricultural mechanization programmes, field testing centres, design and development institutions and manufacturers was essential.

45. Considering the high cost and time consuming nature of design and development processes, it was suggested by the participants that African countries should give more emphasis on the field testing and evaluation of existing machinery and should allocate their limited resources to adaptation of such equipment to their specific conditions and needs.

46. Some participants drew attention to the necessity of providing producers with the manufacturing process sheets and data files as well as the design documentation and prototypes. They stressed that this would motivate the producer to diversify and/or expand his production capability and ensure uniform and good quality.

47. All participants felt that there was mutual interest between countries which had similar agricultural conditions to exchange adapted designs, prototypes and manufacturing process files. Attention was drawn to similar programmes successfully operating within RNAM (Regional Network for Agricultural Machinery) and between Upper Volta and Togo.

48. While commenting on the secretariat's presentation of decentralized production of agricultural machinery and rural equipment in rural workshops, the participants stressed that the workshops should be a complementary activity to the larger-scale centralized operations. They felt that consolidation and development of existing facilities should be given priority.

49. The participants agreed that the government should play an important role to promote the rural workshops. Financing, training, supply of raw materials and parts, etc. were all important areas requiring action by the government.

50. The participants stressed that the lack of exchange of information was an obstacle to the co-operation efforts between the African countries and to the development of agricultural machinery industry in the region. There was consensus observing the necessity to provide the appropriate information channels and to promote the exchange of information within the region and between the African countries and other developing countries.

VI. Conclusions and recommendations

51. Following the presentations by the participants and the UNIDO secretariat, the meeting has decided to focus its attention on two main issues: (i) Decentralized small-scale production of basic agricultural equipment in Africa, and (ii) information and co-operation.

A. Decentralized small-scale production of basic agricultural equipment in Africa

52. To meet the challenge of developing considerably the local production of agricultural equipment, most of the African countries have to rely on two basic and complementary solutions:

a) Consolidating and developing the existing manufacturing units located in urban centres. Although such enterprises are in most of the cases facing difficulties, they should be given full support to improve their design and manufacturing capabilities.

b) Promoting decentralized production in rural areas to supply specifically the diverse priority needs of the vast majority of farmers.

Conclusions

53. The participants of the Workshop agreed with the content of the document

presented by the UNIDO secretariat^{9/} and endorsed the recommended promotion of decentralized small-scale units of production of agricultural and rural equipment when appropriate.

54. The decentralized production of simple equipment was complementary to the development of centralized large-scale units addressing other types of markets. Furthermore, the latter could supply the rural workshops with several mechanical components. However, it was necessary to co-ordinate both types of production units.

55. It was stressed that the establishment and operation of such rural workshops required a strong involvement of government in areas such as: financial and technical assistance, banking services, training programmes, extension services, supply of raw materials, supply of production equipment, availability of design data and manufacturing files, protection against imported equipment, etc.

56. It was emphasized that the skills of the rural workshop operators should be upgraded through the improvement of manufacturing processes (e.g. use of jigs and fixtures, etc.) and training programmes. It was observed that the work force of the rural workshops would draw on the local human resources in general and rural craftsmen in particular.

57. It was recognized that the regular and adequate supply of raw materials, the financial support, the availability of managerial skills and manufacturing files and market application were the basic prerequisites for setting up rural workshops.

Recommendations

58. The Workshop recommended that UNIDO, in co-operation with other agencies and institutions, should implement an action-oriented programme as outlined below:

^{9/} Op. cit. 3/.

59. Operational study of rural workshops: This study would cover the following areas:

a) Investigation of basic characteristics of rural workshops to prepare operational files for pre-feasibility study and to attract the interest of the African decision-makers.

b) Evaluation of experiences of existing rural workshops operating in the general engineering and sales service and production of agricultural equipment areas and compilation of available technical information.

c) Identification of basic configurations of rural workshops and specifying the following parameters: the technical specifications of the products to be manufactured; capacity of production; other major activities such as repair, stores for spare parts, etc; details of the manufacturing processes and required production equipment (costs and list of possible suppliers, if available); details of a model building; the layout of the production machinery; the specifications and amount of the required raw materials; mechanical parts and possible suppliers; the qualifications of the required manpower and training programmes; the economical analysis of the operation taking into account the market analysis, etc.

60. Setting-up pilot workshops: The effectiveness of this approach should be field tested by establishing a limited number of pilot workshops in some African countries which show an interest and where the decentralized mode of production is given a priority. The experience and evaluation of pilot workshops should be made available to all other African countries.

61. The creation of a data base of manufacturing plans for basic agricultural and rural equipment for rural workshop production: The rural workshop could not develop product and process design capabilities. Therefore, it is necessary to provide it with the operational manufacturing files of priority rural equipment. Creation of a bank of manufacturing files of agricultural equipment which are not produced by central large-scale industries would make it possible for rural workshops to produce and to diversify.

62. Up-grading existing production: UNIDO should undertake a study to investigate ways and means of up-grading quality and quantity of existing productions in order to meet a larger proportion of local demand and to increase the range of products.

B. Information and co-operation

Recommendations

63. It was recommended that an experimental scheme of exchange of information should be devised. In this connection:

a. The participants of this workshop were requested to submit to UNIDO before the end of January 1983 their respective country information on locally produced agricultural equipment, manufacturers, their capacities and diversification plans (if any), research and development activities, existing designs and prototypes, etc.

b. This raw data should be compiled by UNIDO and made available to all contributors. It was hoped that this activity would initiate immediate multilateral contacts leading to fruitful co-operation between the parties including the exchange of designs, manufacturing files and prototypes.

c. If the scheme would prove to be successful, it should be extended to cover all African countries.

64. The Workshop recommended that action should be taken to develop a sectoral data bank for Africa. For this purpose:

a) All existing information sources should be surveyed, relevant African agricultural equipment industry data retrieved and up-dated; and publications, catalogues and files should be compiled.

b) UNIDO, in consultation with other agencies and institutions, should investigate the feasibility of preparation, publication and distribution of a

periodical newsletter serving to up-date the sectoral data.

65. As discussed and recommended at the First Regional Consultation on the Agricultural Machinery Industry in Africa (Addis Ababa, Ethiopia, 5-9 April 1982)^{10/}, the existence of effective focal points at national and subregional levels was a prerequisite. The Workshop recommended that the feasibility of founding national, subregional and regional associations for the promotion of agricultural equipment should be investigated.

66. Taking into account the importance and effectiveness of the direct contacts in bridging the information gap, it was recommended that study tours for professionals within Africa should be promoted.

^{10/} Op. cit. ^{5/}.

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List of Documents

1. Aide Mémoire
2. Present situation, prospects and strategical choices for the development of agricultural machinery in Africa in the context of the Lagos Plan of Action (ID/WG. 365/1).
3. Measures for promoting the agricultural machinery capabilities in Africa (ID/WG. 365/3).
4. Tentative proposal for the formulation of an African Development Plan for Agricultural Machinery and Equipment (1982-1990) (ID/WG.365/7).
5. Diagnosis of the present situation and trends of production and utilization of agricultural machinery in Africa (UNIDO/IS.288).
6. The development of African capacities for the design and manufacture of basic agricultural equipment (UNIDO/IS.379).
7. Information sources on the agricultural implements and machinery industry (1973) (UNIDO/LIB/SER.D/8).
8. Appropriate industrial technology for agricultural machinery and implements (1979) (ID/232/4).
9. Appropriate industrial technology for light industries and rural workshops (March 1981) (ID.232/11).
10. Directory of industrial and technological research institutes in Africa, prepared for INTIB-the Industrial and Technological Information Bank (23 March 1982) (UNIDO/IS.299).
11. Case studies:
 - a. China
 - b. Egypt
 - c. India
 - d. Zimbabwe