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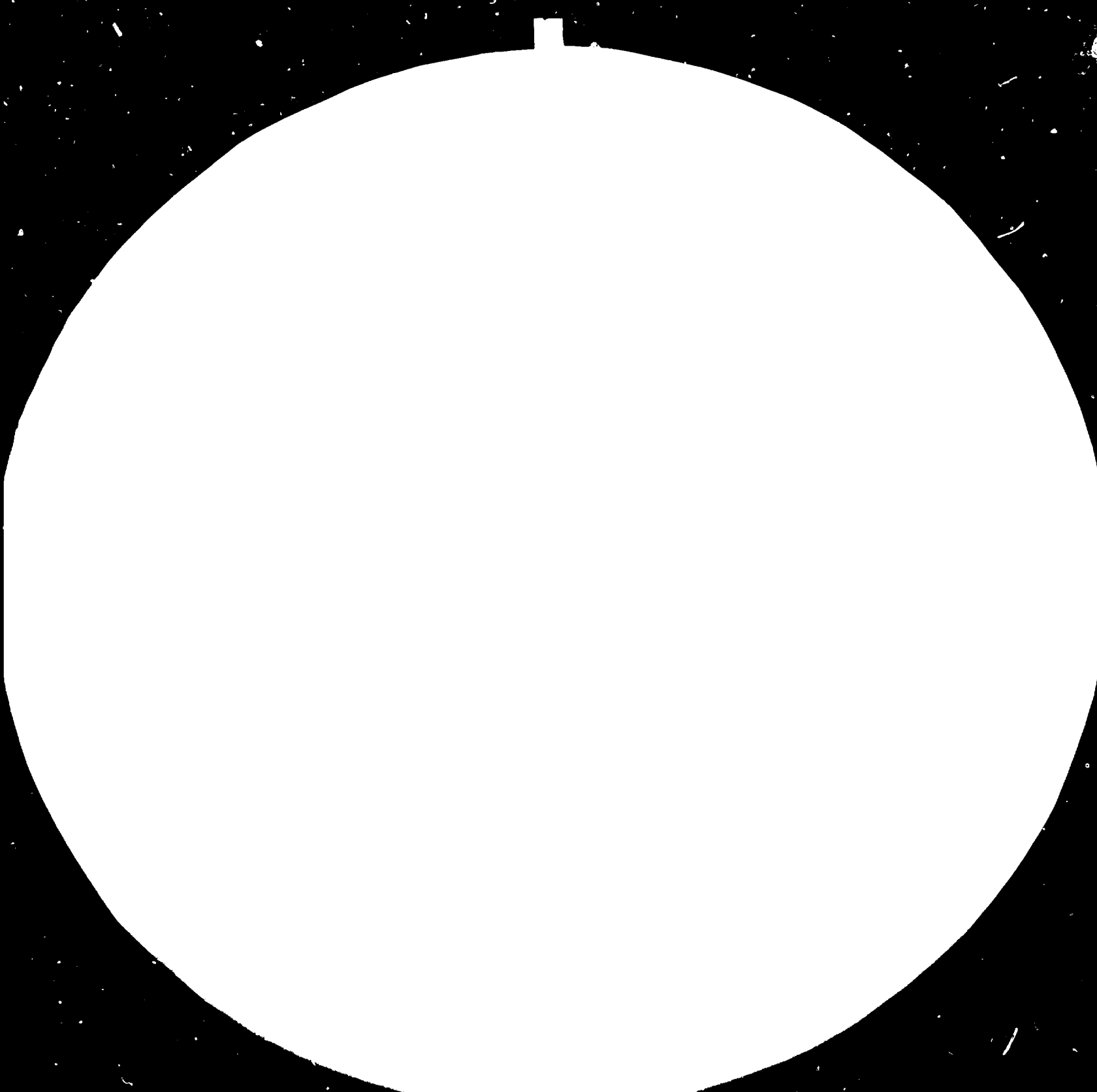
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THE [WORLD AGRICULTURAL MACHINERY INDUSTRY:

PROSPECTS FOR INTERNATIONAL CO-OPERATION ]

prepared by

the Secretariat of UNIDO \*

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\* This document has been translated from an unedited original.

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Résumé of principal questions put to the participants

Among the themes touched on in this document, four main points seem particularly noteworthy. They are:

The influence of the strategies of leading firms on the prospects for international co-operation;

The relation between the evolution of agricultural mechanization models and the future of the agricultural machinery industry;

The decisive role of States for the future of international co-operation;

The necessary renewal of agricultural machinery to meet the needs of the poorest countries and farmers.

On this basis, four main questions are proposed for the discussion:

Question 1: Given the current difficulties of the sector, in what ways do the strategies of firms influence the prospects for international and regional co-operation?

Question 2: How does the development of agricultural policies and types of mechanization affect the future of the agricultural machinery industry and the opening up of international co-operation to new partners (in particular small and medium-scale enterprises)?

Question 3: What are the essential reciprocal responsibilities \*/ of the "offering" and "receiving" States for the development of a mutually beneficial industrial co-operation, creating outlets for world industry and the manufacture of agricultural equipment in developing countries?

Question 4: What readjustments and priority actions on the part of the international community and development aid could help to foster an agricultural machinery industry adapted to the needs of agricultural mechanization and of rural development in the poorest developing countries?

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\*/ In particular the formulation of needs, the identification and bringing together of partners, the sharing of risks and the establishment of rules governing co-operation.

#### INTRODUCTION

1. The world agricultural machinery industry is going through a critical phase. To a large extent, the situation appears uncertain and unsatisfactory for the principal actors in the developed and still more in the developing countries. Unrestrained individualism and concentration on purely commercial considerations could only make the situation worse. If the industry is to have a future, reflection and concerted efforts at the international level would appear indispensable. The general question which must be answered is therefore: What are the fields and modalities of a renewed and strengthened international co-operation which would make it possible to "unblock" the existing situation, open up new markets, and face future challenges to the industry in conformity with the mutual interests of the principal partners involved?

2. Essential to the discussion, in the opinion of the UNIDO Secretariat, is the problem of the developing countries, where there is an enormous and perceived need for agricultural mechanization, rural development and the building up of indigenous capacity for the production of agricultural equipment.

3. This general question can only be answered effectively on the basis of a rational analysis of the main elements of the problem. Accordingly, this note invites each participant to consider and discuss a brief diagnosis of the agricultural machinery industry in the 1980s (Part I). On this basis, priority fields of co-operation have been identified and can be discussed by the participants (Part II).

4. The content of this note is based on the principal lessons drawn from the preparatory studies for this conference carried out by the UNIDO Secretariat. <sup>1/</sup> From these studies and from previous meetings on the agricultural machinery industry two ideas have emerged on which general agreement now obtains:

- the notion of agricultural machinery in a wider sense, covering not only equipment for tilling (in particular tractors and tractor-drawn machines) and harvesting (combine harvesters) but also all the equipment needed for agricultural and animal production, the storage, transport and (primary) transformation of agricultural materials, land development (irrigation equipment) and even traditional rural activities;

- the dual nature of agricultural machinery, at the interface between agriculture and industry, which means that it is necessary to bear in mind simultaneously the use (agricultural aspect) and the production/maintenance (industrial/artisanal aspect) of agricultural and rural equipment. In particular, coherence between agricultural/food policy, agricultural mechanization policy and industrial policy is of fundamental importance. <sup>2/</sup>

I. BRIEF DIAGNOSIS OF SITUATION AND TRENDS IN THE AGRICULTURAL MACHINERY INDUSTRY AND ITS MARKETS <sup>3/</sup>

The difficulties of the agricultural machinery industry

5. These difficulties, which appeared at the beginning of the 1970s, have grown more serious during the past five years. The situation varies, however, according to the region, country, agricultural production system and types of equipment concerned. The most obvious sign is a sharp downturn in the sales of equipment, especially tractors and combine harvesters, but also most items of tractor-drawn equipment. These difficulties affect the majority of developing countries, whose markets (notwithstanding a period of sustained development at the beginning of the 1970s) have not proved to be the abundant source of fresh demand on which manufacturers in the developed countries had been counting.

6. This shrinkage of markets has resulted in a competitive free-for-all and a marked worsening in the situation of manufacturers. World production capacity has had to take account of the reduction in demand, although the available supply is still some 20 per cent in excess of the present effective demand. Production in developing countries has registered only a slight overall increase. The manufacture of modern agricultural equipment remains massively concentrated in the industrialized countries, with the developing countries apparently accounting for only about 8 per cent of total world production. <sup>4/</sup> It should be noted, however, that the difficulties of the agricultural machinery industry proper do not necessarily apply to the metalworking, engineering and capital goods industries for agriculture. <sup>5/</sup>



Behaviour and strategies of suppliers

(a) The large firms <sup>6/</sup>

7. The degree of competition currently prevailing in the market leads to considerable pressure on prices and to constant efforts by the distribution circuits to outbid one another. Beyond these short-term constraints, the large firms have formulated identifiable strategies. The companies that are most highly organized at world level are entering into technical, economic and commercial agreements with one another in an endeavour to bar the market to outsiders. <sup>7/</sup> These operations, like the concentration of plant, show that these transnational companies prefer to maintain their hold on areas in which they are experienced and solidly established (large motorized equipment) rather than diversify or seek breakthroughs in markets whose solvency and/or credibility they doubt. This preference is also based on an optimistic view of future world demand for tractors, harvesting machinery and public works equipment, which they expect to be boosted by world economic recovery.

8. This is coupled with a thoroughgoing reorganization of industrial structures as these companies regroup around their traditional strong-points. This geographical concentration goes hand in hand with changes in manufacturing techniques, with increased emphasis on mass production and attempts to achieve enhanced productivity through technological innovations. The conquest of the world market through mass production of better-performing and more sophisticated equipment remains the main objective of these firms.

(b) Small and medium-scale enterprises producing specialized equipment

9. The vast majority of small and medium-scale agricultural machinery enterprises in the industrialized countries, which traditionally rely on domestic or small-order export markets, have also been affected by the reduction in their outlets. The economic crisis is tending to confirm these enterprises, most of which are family concerns, in their wariness of markets based on large-scale exports, transfers of technology and international industrial co-operation. They are aware of the risks of trading in unfamiliar and financially shaky markets. They are reluctant to transfer their expertise concerning a given type of equipment and manufacture without some basic guarantees. On the other hand they also have unused production capacity which can be mobilized for straightforward sales contracts.

10. By contrast, the internationalization of the market appears to favour the new manufacturers of food industry equipment (fixed capital installations for the treatment of harvests, processing of the biomass, milk tanks, integrated slaughter operations, etc.) can look forward to securing large, practically "new" markets at every level in the agricultural, food-processing and rural development process in numerous developing countries.

The diversification of types of mechanization and of agricultural machinery

11. The future of the agricultural machinery industry is closely linked with the quantitative but also qualitative development of its markets and, in particular, the agricultural mechanization models adopted by countries. Thus there is a fundamental relationship between these models, agricultural policies and methods of manufacture and industrialization. The economic crisis has shown that there is a large variety of mechanization models <sup>8/</sup> corresponding to the diversity of agricultural, ecological and social systems. The dominant model is the heavy mechanized model (coupling tractor and tractor-drawn machines), which has greatly enhanced agricultural productivity and been widely adopted in the developing countries, where it has attracted the largest share of effort, investment and manufacturing and marketing structures.

12. The economic crisis has revealed the limitations of this model as a means of satisfying the mechanization needs not only of the developing countries (traditional crops, intensive, largely non-mechanized cultivation, preservation of fragile tropical soils, etc.), but also of the different types of agriculture in the developed countries, calling for a diversification of the mechanical model. In general, the intensification of agricultural production leads to a comparative reduction in and redefinition of mechanization. While the heavy mechanization model basically concerns the classical agricultural machinery sector, the diversification of models entails a diversification of the industrial partners concerned, who may be industrialists in the metalworking and engineering sector producing capital goods (small and medium-scale enterprises manufacturing specialized equipment in small batches) and equipment for the food industry, or industrialists in the electrical or electronic industries (cold-chains, dairy equipment) and even industrialists concerned with the plant protection chemistry genetics and biotechnology.

13. The problem that arises is therefore that of opening up the agricultural machinery sector to new industrial partners capable of participating alongside the main protagonists in the diversification of the technological model and of the equipment it uses. According to the needs and levels of countries, this diversification may concern relatively unsophisticated equipment (basic equipment for rural population, storage, primary transformation) or more complex technological packages implying RD and co-operation efforts among the industries concerned.

14. The world crisis has accentuated the imbalances in the supply and demand of agricultural machinery at world level. The crisis of outlets is greatly linked to the situation of world agricultural markets and to the policies of States, to the growing gap between the incomes of farmers and the costs of machinery, and to the limitations of the heavy mechanization model. This situation affects the strategic behaviour of enterprises which seek to strengthen their dominant position on the world market without changing their strategies (as in the case of the transnationals) or cautiously fall back on their traditional market (as in the case of small and medium-scale enterprises). These tendencies towards a hardening of positions seem unlikely to encourage the necessary diversification of the technological model and of products, which implies the opening up of the sector to other partners and a more creative internal dynamic. Nor do they seem likely to facilitate the opening up of new outlets and the development of production in the developing countries (see question 1 concerning this brief diagnosis as a whole).

## II. SELECTION OF PRIORITY FIELDS/ISSUES FOR INTERNATIONAL CO-OPERATION

15. We are living through a difficult decade. International co-operation takes place between unequal partners, with different interests, on the basis of relationships of force, or of a "conflict-co-operation" mix. <sup>9/</sup> However, international co-operation should also contribute to the achievement of certain priority voluntarist objectives of the international community where interests can be made to coincide. <sup>10/</sup> One interest common to all is the opening up of new markets for the agricultural machinery industry. This can be achieved in three main ways, depending primarily on the dynamic of change of the dominant mechanization model:

- The continuation of the trend towards heavy agricultural machinery;
- The diversification of agricultural machinery;
- The emergence of new approaches to agricultural machinery.

16. These three possible developments <sup>11/</sup> are bound up with geopolitical considerations and the policies of States. The first is the likeliest to occur, whereas the other two imply a voluntarist dimension. They may occur simultaneously at the world level and at the level of certain individual countries. Overall, it is clear that the evolution of agricultural machinery will continue to be dominated by the heavy mechanization model and by the big manufacturers, who are the principal partners of the developing countries.

Prospect A: Continuation of the trend towards heavy agricultural machinery

17. The probability of a continuation of this trend is obvious and has been explained. <sup>12/</sup> It corresponds to the needs and choices of certain large agricultural and industrial countries, but also to a laissez-faire or imitative attitude in the case of other countries. It implies a continuation of the existing framework of international economic relations.

18. At the same time it is clear that this trend is encountering structural limitations and that the existence of excess supply strengthens the bargaining power of purchasers. Accordingly the strength of this model goes hand in hand with doubts as to its ability to develop new outlets for itself and to meet the needs of countries that wish to control it more effectively (there is the problem of spare parts, for example), inter alia as regards the production of the necessary machinery in the developing countries.

Prospect B: The diversification of agricultural machinery

19. Heavy mechanization concerns only a limited part of the agricultural production process. On the other hand, the diversification of agricultural machinery is essential for countries that wish to control the agricultural and rural process at all its stages (handling, transport, pre-treatment, distribution, irrigation), especially in the case of agricultural intensification. This diversification at the same time increases the industry's outlets over a wider range of machinery, and involves the metalworking and engineering industries as a whole (see issue paper No. 2; ID/WG.400/5). It opens up industrial co-operation to other partners besides the large firms, especially small and medium-scale enterprises. However, the crisis has caused these enterprises, which often have neither the means nor the ambition to become partners or investors abroad where the risks are too great, to adopt more inward-looking strategies. Nevertheless, this is an essential aspect of the future of agricultural machinery and international co-operation, and should be studied in depth <sup>13/</sup> (see question 2).

Prospect C: The emergence of new approaches to agricultural machinery

(a) The farming and food challenge in the developing countries

20. The international economic crisis, but also the structural imbalances and inequalities existing between countries, have had grave consequences for the situation in the majority of developing countries: dependence on food imports, malnutrition, reduced productivity of agricultural workers, increased under-employment and unemployment, collapse of agricultural incomes. Approximately two-thirds of the world's farming population have to rely on archaic techniques or the adoption of a heavy mechanization model which can have irreversible consequences when it is badly handled. <sup>14/</sup>

21. These problems can be expected to become still more serious in future, especially if one considers the prospects for population growth. Thus, the population of the low-income countries alone is expected to rise from 2.1 billion in 1980 to 3.1 billion in the year 2000, given a mean annual growth rate of 2.6 per cent. <sup>15/</sup> In order to meet the food needs of the developing countries, FAO has calculated <sup>16/</sup> that agricultural production would have to be increased by at least 80 per cent, which would require a five-fold multiplication of the production factors used and of investment. Such objectives imply something like a revolution in agricultural techniques.

22. As regards mechanization, the power input needed for agriculture would have to increase seven-fold between 1980 and the year 2000. The number of tractors in use would have to increase from 2.3 million to 9.9 million in 90 developing countries. But this form of mechanization would have only a limited impact, since in the year 2000 it would still account for only 7 per cent of the power input used in agriculture in the low-income countries, as against the 68 per cent contributed by man and the 25 per cent contributed by animals. <sup>17/</sup> Men, women and children will continue to perform most of the work required in agriculture. <sup>18/</sup>

23. Thus, the mechanization of agriculture in the poor countries will require a considerable expansion in the existing range of traditional or motorized technology and products, linked with the intensification of production, the boosting of productivity in terms both of the land <sup>19/</sup> and of the people who work it, the mechanization of small and medium-scale farms and the promotion of rural community development.

(b) The new dimension of agricultural machinery

24. In this future context, the traditional approach to agricultural mechanization will no longer do. Instead of concentrating exclusively on productivity and on increasing the quantities produced, it will be necessary to provide farmers and rural communities with production equipment adapted to the priority needs of the farming world. The objectives are the improvement of living and working conditions, farming incomes <sup>20/</sup> and the overall efficiency of the farming system, the exploitation of the various resources of the vegetable and animal biomass, and the preservation of the ecological and environmental balance. The necessary machinery and equipment will have to be manufactured and repaired within the country by a network of industrial and artisanal enterprises, participating in the country's industrial and technological development. New links between the artisan, small and medium-scale industry and large-scale industry will have to be established.

25. For each developing country, progress in either modern or traditional agriculture through the use of industrial equipment and products involves three complementary levels:

Agricultural machines in the strict sense;

The whole body of stationary and mobile equipment manufactured by capital goods industries in the metal-working and engineering sector

and required for agricultural production and other rural activities (transport, storage, primary transformation) and for rural community development (buildings, communications, energy production);

The whole range of industrial inputs, including those of chemical origin (fertilizers, plant protection products, plastics), and of biological and genetic origin (seed, cattle food).

26. The second of these levels, too often ignored, is essential. Products of engineering industries are in fact thought to account for 40 to 50 per cent of agricultural investment in the developing countries, one half of which is for agricultural equipment. 21/

27. There are three preconditions for the achievement of these agricultural modernization objectives:

- A rechannelling of financial resources (both national and external-assistance) towards the agricultural and rural sectors, and the provision of the necessary means to enable farmers to formulate and pay for their requirements;
- A situation in which the demand generated by investment and infra-structural development programmes is matched by supply, especially that available from national industries, since the increasing difficulties of financing are drastically reducing import possibilities;
- The ability to develop techniques and products tailored to the specific nature of the demand.

28. It will be necessary for each country to effect a major reorientation of industry towards the needs of farmers and the rural world. The agricultural and food development policies of countries unable to do this could be doomed to failure.

(c) The necessary renewal of international co-operation and of development aid

29. If there is to be some hope of meeting this agricultural and industrial challenge in the developing countries, the various forms of regional and international co-operation will have to be mobilized and redirected. The purely mercantile, short-term and piecemeal approach will need to be replaced by an approach linking both sides in a long term "co-development" process based on new development strategies. It is clear that this is more than can be expected of a private individual partner and that the key protagonists will have to be the governments of the developing and the developed countries.

International aid has an essential role to play since it is capable of conceiving the types of strategy required, setting up co-operation programmes and providing the necessary finance. <sup>22/</sup>

30. It would be useful for the participants to discuss this new approach together (see question 4), in particular with reference to the needs of the different regions, especially the Least Developed Countries. Priority actions could be identified and their implementation analysed. <sup>23/</sup>

#### International co-operation and the role of States

31. The role of the State in the development of the agricultural machinery industry has been decisive in the countries with planned economies, while the market mechanisms, investments and RD of the private sector have dominated the process in the other producing countries. In all cases, the public authorities play a decisive indirect role (import policy/protection of local industry, foreign investment regulations, orders from the State and publicly owned enterprises, organization and policy of the agricultural and rural sector, export credits, aid to industry). There have, however, been few examples in the developing countries of a planned growth of agricultural machinery; all too often, national demand has been expressed piecemeal, being left to importers, agricultural executives or para-public bodies, none of whom have wide enough responsibilities to enable them to take a global view and to rationalize local manufacture or demand in a long-term national perspective.

32. For the future, the main problem of the developing countries will be that of reconciling autonomous development with the need for external co-operation. This problem, which will have to be methodically tackled, is a matter for the State, the sole party in a position to determine national development objectives and co-ordinate the necessary action vis-à-vis organized and powerful negotiating partners. In the case of agricultural machinery, the State and the State alone is responsible for mechanization strategy, which must be an integrated strategy, since it will have to cover both the agricultural and the industrial aspects. <sup>24/</sup> It is up to the State to formulate clearly its objectives and needs and to choose its partners accordingly. A strategy exclusively geared to the development of the "modern" agricultural sector based on the mechanization of extensive crops implies the choice of heavy mechanization and a transnational company as principal partner. An integrated agricultural development strategy, especially one following certain agro-food routes, implies a diversification of equipment and of partners. A



development strategy based on the upgrading of traditional agriculture calls above all for the mobilization of national technological resources at both the artisanal and the industrial levels.

33. Irrespective of national agricultural and industrial policy, it is essential for the government of a country on the "receiving" end of international co-operation in the field of agricultural machinery to intervene at the following levels:

- Precise formulation of needs within the framework of national mechanization policy;
- Determination of a framework for industrial co-operation in the light of national development objectives;
- Identifying potential partners and sources of useful information;
- Bringing the partners into contact with one another;
- Participation in the shared risks (economic and industrial) of co-operation;
- Financing.

34. In the case of the supplier countries (mainly developed countries), the role of the State in promoting mutually beneficial industrial co-operation should also be strengthened and transformed. The strategies of enterprises are in any case largely conditioned by governments (export assistance and finance, nationalized or publicly financed enterprises). These countries should establish a positive compromise between the need to boost exports (in many countries, economic difficulties are aggravating unemployment and the downturn in business activity) and the implementation of the principles of a new economic order and of new co-operation relations with developing countries. The development of bilateral agreements for economic and industrial co-operation between a developed and a developing country considerably increases the ability of the governments of the developed countries to influence the nature of the possible partners and of the terms and conditions of co-operation (amount of public financing, risk coverage, dissemination of information on markets, assistance in the receiving countries). In particular, the participation of small and medium-scale enterprises in industrial co-operation largely depends on the effort made to encourage such participation and on the technical and financial conditions established by the supplying countries.

35. In the new, internationalized dialectic of the development of agricultural machinery, and in view of the strategies of firms which are not prepared to shoulder the costs and risks of industrialization in the developing countries, it will be for the governments of the supplying and receiving countries to assume, individually and collectively, the main responsibilities for the development of international co-operation (see question 3).

Bibliographical Notes

- 1/ See in particular the document entitled "The agricultural machinery industry in the 1980s - factors for international co-operation". a/ This note is based on the recommendations of the first consultation meeting held at Stresa, Italy, from 15 to 19 October 1979 (see the report of that meeting, document ID/WG.307/9/Rev.1) and the conclusions of the first world-wide study on the agricultural machinery industry. b/ The regional consultation on the agricultural machinery industry in Africa, c/ which was held at Addis Ababa, Ethiopia, from 5 to 9 April 1982, shed considerable light on the situation of the sector in Africa and adopted a regional sectoral development plan d/ including an outline scenario for international co-operation looking forward to the year 2000. The studies e/ carried out by UNIDO in 1983 on various countries and zones of Latin America and the rest of the world have contributed to the geographical knowledge of this sector. Since 1979, effective collaboration has been established with a number of international and national organizations, in particular FAO, several of whose studies shed light on the situation and future prospects of the agricultural machinery industry. f/
- 2/ The development of the agricultural machinery industry in each country/region in fact constitutes a test of the ability of States and of the international community to apply development strategies based on the complementarity and synergy of agriculture and industry.
- 3/ See the documents specified in a/ and e/ for world and regional (Latin America) analyses.
- 4/ With a very high concentration in certain countries, such as China, India, Turkey, Brazil, Mexico, Argentina. This ratio does not take account of artisanal production which remains very important in a number of countries, especially for supplying small-scale farmers with hand tools and simple equipment.

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a/ Document ID/WG.400/1.

b/ UNIDO/ICIS.119, 29 June 1979.

c/ See report ID/235 and the study UNIDO/IS.377 of 25 March 1983 entitled: "Agricultural Machinery and Rural Equipment in Africa - A New Approach to Growing Crisis".

d/ Document ID/WG.365/7, 30 March 1983.

e/ See especially the documents entitled "A Diagnostic Appraisal of the Current Global Situation in the Agricultural Machinery Sector" and "A General Appraisal of the Latin-American Agricultural Machinery Industry".

f/ Study: "Agriculture - Horizon 2000" and Bulletin No. 45: "Agricultural Mechanization in Development: Guidelines for Strategy Formulation". 1981, Rome, FAO.

- 5/ The markets for miscellaneous equipment (e.g. for dairy production, the preparation of cattle food, storage and handling ...) have often remained profitable. These outlets in the developing countries are linked with agricultural production for solvent markets (income crops, urban markets, agriculture in the new industrial countries) and with infrastructural development works (irrigation schemes, storage and distribution networks ...). Small and medium-scale manufacturing enterprises are particularly active in the more rapidly developing countries (Brazil, Republic of Korea, India, Mexico ...).
- 6/ Useful information will be found in the study by the United Nations Centre on Transnational Corporations entitled: "Transnational Corporations in the Agricultural Machinery and Equipment Industry". New York, 1983, ST/CTC24.
- 7/ Sharing of the range of products among large manufacturers under a single commercial label, increased cross-furnishing of parts and components, conclusion of numerous marketing agreements with small and medium-scale manufacturers of tractor-drawn machines as a means of gaining access to specialized machine markets from which they have hitherto been absent.
- 8/ See document ID/WG.400/1, part II, entitled "The agricultural machinery industry in the 1980s - Factors for international co-operation".
- 9/ Concept developed by Professor François Perroux in his book "Pouvoir et Economie".
- 10/ This document concerns international co-operation in its global and geopolitical context, with special emphasis on relations between agriculture and industry. The specifically industrial dimension will be developed in issue paper No. 2 (ID/WG.400/5).
- 11/ See document ID/WG.400/1, part IV.
- 12/ See document ID/WG.400/1, part IV.1.
- 13/ As regards industrial co-operation with small and medium-scale enterprises:

The lessons drawn from past experience of industrial co-operation with small and medium-scale enterprises will need to be analysed. The question of their autonomy of action or of the need for collective action, or action in association with other partners (transnational corporations, technical centres, consulting engineering firms, public bodies in the industrialized countries, international aid organizations) will be considered. The conditions that must be fulfilled by countries on the demand side will be analysed: existence of market information, guarantees, risk sharing, industrial and financial partners, role of the receiving State, etc. The successive stages of industrial co-operation will be reviewed (study of markets, importation of products, adaptation of products, partial manufacture, training of personnel, modalities of investment and transfer, etc.). For the receiving country to benefit fully from this kind of co-operation, it would seem necessary for it to replace the piecemeal approach by a properly co-ordinated industrial strategy looking forward to the development of the country's metal-working and engineering industry as a whole, the gradual development of an indigenous industrial base, the creation of a range of enterprises

producing the main equipment required for the country's agriculture, food industry and rural development generally and establishing increasingly close industrial relations among themselves (see issue paper No. 2; ID/WG.400/5). The various sorts of agricultural and food industry equipment could be organized in sub-groups responding to agricultural and food production routes: development of a cold chain, of animal or dairy production chains, equipment and mechanization of certain agricultural or rural zones, etc. Co-operation programmes will then be differently defined and will imply different types of partners according to their nature. It is the essential responsibility of States to be in a position to formulate their needs clearly and equip themselves with the necessary negotiating tools.

- 14/ For example, the destruction of fragile tropical soils, the destruction of the social and cultural environment, the increase in the number of landless farmers, the abandonment of subsistence crops and non-mechanizable polyculture for the monoculture of cash and export crops, etc.
- 15/ These data are taken from the World Bank's "World Development Report 1982".
- 16/ All the data concerning agriculture are taken from two basic FAO documents: "Agriculture - Horizon 2000" and bulletin No. 45: "Agricultural Mechanization in Development and Guidelines for Strategy Formulation".
- 17/ Proportional breakdown of different sources in the total power input required for agriculture in developing countries.

Region	1980			2000		
	Labour	Draught animals	Machines	Labour	Draught animals	Machines
90 Developing countries	66	29	5	67	20	13
Africa	81	16	3	81	11	8
Far East	64	34	2	67	25	8
Latin America	55	25	19	49	13	38
Near East	63	25	12	68	13	19
Low income countries	63	35	2	68	25	7

Source: FAO Agricultural Services Bulletin No. 45, Rome, 1981, page 16.

- 18/ According to population and tractor estimates for the low-income countries, in 1980 there were 400,000 tractors for 1.5 billion agricultural workers, i.e. one tractor for 3,750 agricultural workers! In the year 2000, according to FAO's voluntarist and normative estimates, there would still only be one tractor for every 1,100 agricultural workers.

- 19/ The arable area per agricultural worker is 1.3 hectares in the developing countries, 8.9 hectares in the developed countries.
- 20/ In 1975, 60 per cent of the farmers in developing countries had an annual income of less than 100 dollars. Source: FAO.
- 21/ These proportions have been estimated on the basis of FAO studies of agricultural investment in the developing countries. In 1990, for example, gross investments requirements for vegetable and animal production in 90 developing countries would be as follows (table 8 of the statistical annex to the FAO study "Agriculture - Horizon 2000" - scenario B - millions of 1975 US dollars):
- Development of new agricultural land: 4,023 - Irrigation: 10,520 -  
Agricultural machinery: 12,017 - Hand-tools and equipment for draught animals: 4,038 - Livestock: 10,108 - Storage and marketing: 4,491 -  
Transport and first-stage processing: 19,332 - Miscellaneous: 5,598 -  
Total: 70,325.
- 22/ See, for example, the reflections of the European Community and its partners in the developing countries regarding the renewal of the Lomé II agreement.
- 23/ In the case of the African continent, UNIDO, with the collaboration of FAO, has attempted to formulate an approach, namely a regional development plan for agricultural machinery and equipment, based on the Lagos Plan of Action, which was adopted by the participants in the consultation meeting held at Addis Ababa in April 1982. National, subregional and international programmes were identified and proposed. An early concrete result has been the formulation (currently in progress) of a ten-year plan for agricultural and rural mechanization in the United Republic of Cameroon. This is only one example, but it is well worth taking into account. Numerous experiments have been carried out by countries, in a national or subregional framework (see, for example, the regional network for agricultural machinery in the ASEAN countries). A concerted effort to exchange information on these experiments, to develop information on needs and markets, the products manufactured by enterprises, research/development programmes, new prototypes and their performance, the industrial partners existing in the various countries (developed and developing), should be organized and implemented. Information on the studies and programmes of international organizations and assistance bodies in the different regions and countries should be co-ordinated and disseminated. To organize these various efforts, it might be desirable to establish an International Committee for the Study of Industrial Development in the Service of Agriculture, with special emphasis on the capital goods/agricultural machinery industries.
- 24/ See first world-wide study on the agricultural machinery industry, document UNIDO/ICIS.119, chapter IV.

