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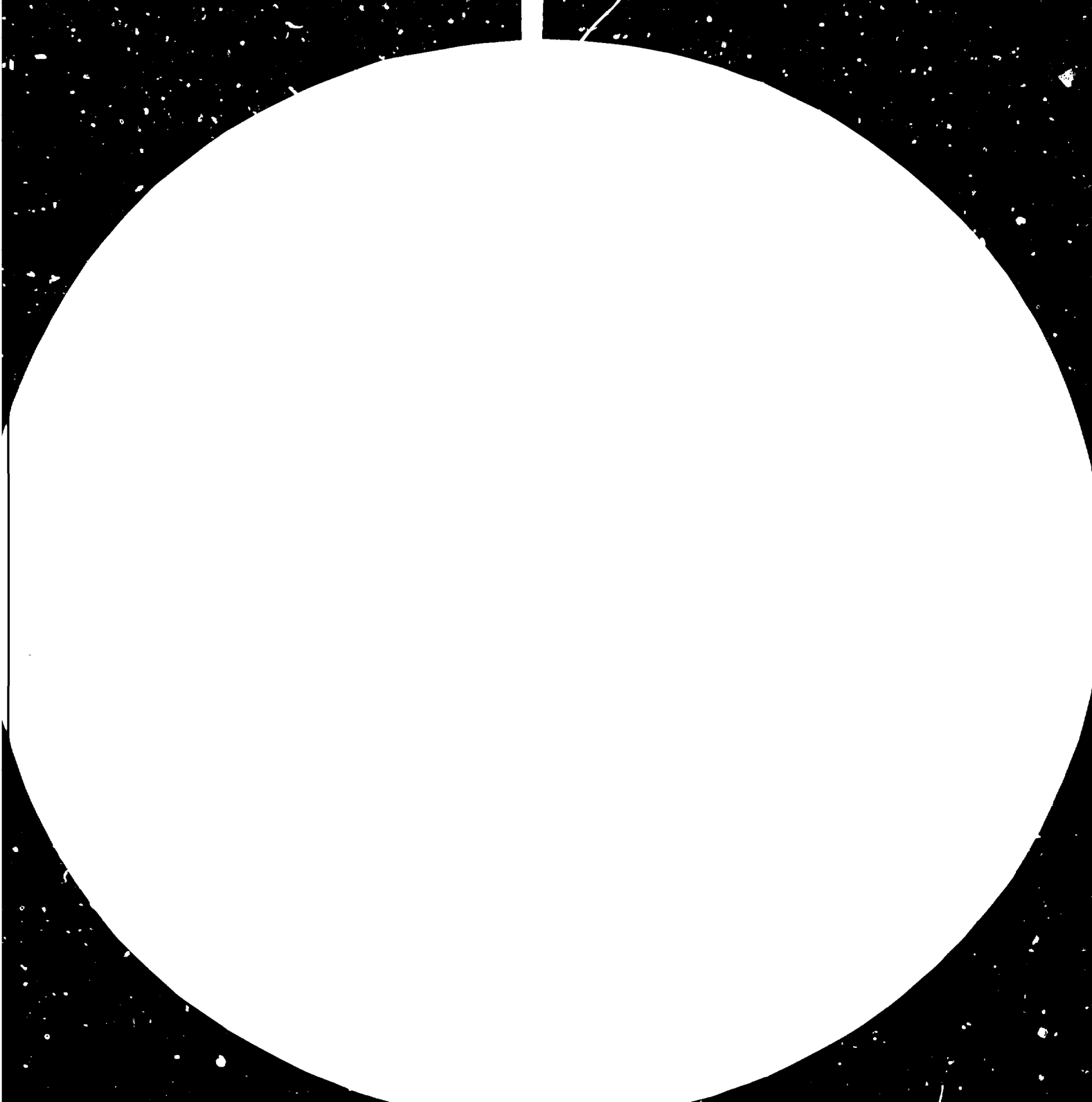
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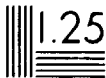
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10098



Distr.
LIMITED
ID/WG.330/28
17 November 1980
ENGLISH
Original: SPANISH

United Nations Industrial Development Organization

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

Beijing (China), 20-27 October 1980

ARGENTINA: THE STATUS OF ITS AGRICULTURAL
MACHINERY INDUSTRY *

by

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* The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the UNIDO Secretariat. It has been translated from an unedited original.

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INTRODUCTION

With its temperate climate, its population and terrain, and its well-developed industry, Argentina is a country offering ideal conditions for agricultural mechanization, which has gradually and naturally been introduced in production.

In addition, Argentina has vast growing areas for fruit, rice, tobacco, cotton and other crops, which because of the intensive nature of their cultivation require a great deal of machinery.

The beginnings of the Argentine agricultural machinery industry date back over a hundred years. As early as 1929 an Argentine patent was granted for the world's first self-propelled combine, and more recently another Argentine invention, for picking maize, has been copied and produced in a number of highly industrialized countries.

Encouraged since the 1950s by a policy of import substitution, the agricultural machinery industry has experienced rapid growth and diversification, using a large proportion of domestic raw materials and components.

At the present time this industry has become large enough to be able, while still working at less than full capacity, not only to supply the domestic market, but also to make inroads, in competition with world-famous brands into such foreign markets as Brazil, Chile, Colombia, Cuba, Ecuador, Paraguay, Uruguay, Venezuela, and even the United States. This has on occasion required modification of some of the machines' technical characteristics to suit the terrains and crops of the purchasing countries.

The peak export value, recorded during the mid-1970s, was 40 million dollars, but given the almost marginal nature of the industry's foreign business, it is not the figures that should be emphasized but the technical capacity that lies behind them - particularly when one considers that Argentine companies have been successful in transferring technology, and even in setting up and operating plants outside the country.

Estimated demand over the next five years (1981-1985)

(Questions 1 and 2)

In view of the clear correlation between the rate of agricultural mechanization in Argentina and the income derived from agriculture, we should first analyse the likely growth of the gross domestic agricultural product over the next five-year period, considering that it is the enterprises in this sector that must decide on the investment to be made in machinery and implements.

Since the available arable land is already highly cultivated, no significant expansion of the area under cultivation can be expected during the next five years, so that the key factor will rather be increased productivity through greater yields per hectare.

Of interest in this context is the greater use of nitrogen and phosphorus fertilizers (which are becoming more common for grain crops and fodder) and the widespread adoption of improved seeds, both factors which have helped to make possible the high yields of recent years.

If one adds to this the improvement in fertility that has also been achieved in the Pampa Húmeda and other areas with the assistance of the National Institute of Agricultural Technology and the regional agricultural extension centres (CREA), it is reasonable to expect that the agricultural GDP will continue to grow in the 1980s at an even faster rate than in the 1970s.

As our basis for estimating the demand for agricultural machinery in the next five years we have taken the maximum domestic production, achieved in 1977, for each product within each category and have projected this figure as the average annual requirement for the next period.

The estimates arrived at in this way are given in the following table.

Average annual requirements for the principal agricultural
machines and implements (1981-1985)

<u>Category I</u>	<u>Implements ^{1/}</u>
Steel shovels	700,000
Shovels and small shovels, miscellaneous	40,000
Shovels for transplanting	10,000
Thistle-cutters	1,000
Hoes	70,000
Rakes	120,000
Axes	60,000
Weeders	130,000
Pruning shears	300,000
Harvesting shears	25,000
Small pruning axes	25,000
Picks	70,000
 <u>Category II</u>	 <u>Intermediate machinery</u>
Mouldboard ploughs	8,000
Disc ploughs	12,000
Harrow ploughs	3,000
Ploughs, miscellaneous	500
Disc harrows	6,000
Tooth harrows	14,000
Rotary harrows	1,000
Harrows, miscellaneous	600
Sprayers	7,000
Hillers	600
Cultivators	1,500
Mowers	1,500
Rotary cutters	2,500
Windrowers	900
Seed drills, fine-grain	3,000
Seed drills, coarse-grain	5,000
Seed drills, broadcast with seed hopper	3,500
Seed hoppers, miscellaneous	3,500
Dusters	1,000
Trailers, miscellaneous	4,000
Platforms, miscellaneous	3,000
Windmills	10,000
Silos, miscellaneous	3,000
 <u>Categories III and IV</u>	 <u>Powered machinery and specialized equipment</u>
Tractors	26,000
Internal-combustion engines	100,000 *
Water pumps	18,000
Pumps, miscellaneous	5,000

^{1/} For agricultural and other uses.

* These engines are used for agricultural purposes and in all types of industry except the motor industry.

Categories III and IV (continued)Powered machinery and
specialized equipment
(continued)

Combine harvesters, self-propelled, for grains	3,000
Combine harvesters, self-propelled, special	300 **
Combine harvesters, not self-propelled, miscellaneous	1,000
Windrowers, self-propelled	100
Grain dryers, stationary and portable	300
Milking machines, mechanical	2,000
Forrage choppers, combined, self-propelled	50
Trailers for transporting agricultural machinery	200

Manufacture and imports(Question 3)(a) Production structure

Excluding tractor production, the agricultural machinery industry consists of 400 plants, which employ some 25,000 office and manual workers and create employment for an additional 25,000 persons in ancillary branches supplying spare parts, components, raw materials, etc. Some 40 per cent of the plants employ less than 10 persons each and account for 10 per cent of the total value of production, their principal activity being the repair of machinery and the manufacture of simple implements for local use. The 10 per cent of the firms which employ more than 50 persons each produce intermediate machinery and specialized equipment account for 50 per cent of the production value and are heavily reliant on ancillary industries.

Number of firms	Size by number of employees	Percentage of total production value
40 (10%)	More than 50	50%
200 (50%)	10 to 50	40%
160 (40%)	Less than 10	10%
400 (100%)	-	100%

Source: Asociación de Fabricantes de Maquinaria Agrícola

** Includes combines for marshland, rice, sugar cane, etc.

At the present time, the Argentine tractor industry consists of four plants whose maximum normal production capacity exceeds 32,000 units per year. This industry produced 300,000 tractors during the period 1957-1977. The highest annual output, was recorded in 1977, when 25,845 tractors, representing 85 per cent of the installed capacity, were manufactured. The peak figures for each company were as follows:

<u>Company</u>	<u>Year</u>	<u>Units</u>
Deutz Argentina S.A.	1973	6,000
Fiat Diesel S.A. Argentina	1960	12,154
John Deere Arg. S.A.	1974	4,919
Massey Ferguson Arg. S.A.	1977	8,399

Because of market considerations, tractors are manufactured in limited series. Some parts are produced at the plant, others are acquired locally from third parties, and the unit is then assembled.

The production process involves the work of 4,400 direct employees, in addition to 4,000 supplier firms, while distribution is in the hands of some 500 dealers, who in turn provide employment for about 10,000 persons.

Traditionally, Argentina has imported very little agricultural machinery, and in recent years imports have been equivalent to less than 5 per cent of domestic production, not only in the intermediate categories (ploughs, seed drills, etc.), but also for the more specialized items like tractors and combines. The current "open economy" policy has brought greater foreign competition; however, the present level of imports is not due to any production shortfalls but is rather the result of commercial considerations.

Argentine exports of agricultural machinery reached their record high in 1975, when they amounted to 40 million dollars, 27 million of which came from tractors. The following table shows the maximum quantities exported since 1965 for the major categories.

<u>Category</u>	<u>Year</u>	<u>Units</u>	<u>Value</u> (thousands of current US dollars)
Tractors	1974	4,396	23,961
Combines	1975	849	5,728
Choppers	1967	78	312
Seed drills	1972	393	432
Ploughs	1976	361	546
Harrows	1973	2,693	1,660

(b) Analysis by categoryI. Simple tools and implements

Annual requirements are amply satisfied through domestic production, there being no limitations in the area of manufacturing technology. The degree of sophistication achieved by Argentine industry is such that there is no need for foreign licensing arrangements or investment promotion in this category.

II. Intermediate equipment

The situation in this category is the same as in the preceding one. There is no gap between supply and demand. The main production lines were described in the section on estimated demand.

III. and IV. Powered machinery and specialized equipment

With the exception of certain highly specialized items, Argentina produces domestically all the equipment required for its agricultural sector. Although information on this category has already been given above, the following additional data on the tractor pool used in the mechanization of our agriculture may be of interest.

	<u>1977</u>	<u>Increase</u>	
		<u>Over 1970</u>	<u>Over 1960</u>
Serviceable agricultural tractors (up to 12 years old)	159,356	21%	60%
Total tractor horsepower (millions)	10,339	49%	150%
Average power of the pool (horsepower)	64.88	23%	56%
Number of farmers	650,000	11%	38%
Number of tractors per farmer	0.24	-	44%
Number of horsepower per farmer	15.19	26%	81%
Area sown 1977-1978 (thousands of hectares)	28,385	1.3%	4.9%
Area sown per tractor (hectares)	178	16%	37%
Horsepower per area sown (HP per hectare)	0.36	46%	140%

At the end of 1977, Argentine agriculture had some 160,000 serviceable tractors, i.e., ones less than 12 years old; by adding to this another 45,000 tractors which, although technically obsolete, are still fully operational, the figure could be increased to 205,000. The coefficient of applied power, in relation to the area sown, would be 0.36 HP per hectare in the first case and 0.47 HP per hectare in the second, this latter figure being very close to the minimum of 50 HP per hectare that has been set by international experts.

Design and development, adaptation, testing and evaluation

(Question 4)

Regarding this point, in addition to the work being carried out by private enterprise, we might also mention the activities of the departments of agricultural mechanization at the various universities, but the key factor is the services provided by INTA, whose basic objective is to contribute to the harmonious development of agriculture as a whole.

The Institute has 35 experimental stations and 220 rural extension agencies all over the country, which provide experimental and extension services geared to the requirements of the various areas.

Among the programmes of this kind that are being carried out, several are concerned with problems in the area of agricultural mechanization, to which some 20 of the Institute's staff of about 1,100 technical specialists are assigned.

INTA also has a National Centre for Agricultural Research at Castelar (Buenos Aires Province), which operates 12 institutes for basic research in the different aspects of cropgrowing and stock-raising.

One of these is the Institute of Rural Engineering, where, in addition to research and training at professional level, agricultural machinery is tested. Particular mention should be made of the work the Institute has been doing for more than 25 years with tractors, as a result of which 328 different makes and models have so far been tested. Test certificates, based on IRAM Standard No. 8005, are now issued.

The Institute's staff consists of 11 technical specialists and 25 auxiliary, administrative and field personnel.

It is believed that the most effective way of supporting INTA's efforts in this area would be to arrange for fellowships for the further training of its technical staff at centres engaged in similar work in developed countries.

Engineering and manufacturing technology

(Question 5)

Work similar to that done by INTA for agriculture is carried out for industry by the National Institute of Industrial Technology (INTI).

INTI operates a number of central laboratories and a system of research centres for this purpose.

INTI's central laboratories are located at its Migueletes Industrial Estate (Buenos Aires Province) and include a number of technical departments and special sections, namely: industrial physics and metrology, chemistry, structural engineering, mechanics, thermodynamics, food, computation and calculation, plans and prototypes, electrical materials and plastics.

The research centres have been established by INTI with the participation of official agencies and business organizations in response to specific needs on the part of industry. Some of the centres at present in operation are engaged in research in the following areas: acoustics and illumination engineering, technical assistance to small and medium-scale business, marine biology, meat, rubber, cellulose, electronic components, industrial design, environmental engineering, fruit and vegetables, dairy industries, machines and machine-tools, materials, minerals and others.

A number of these centres are located at Migueletes Industrial Estate and the others in the towns of Buenos Aires, Córdoba, Mar del Plata, La Plata, Mendoza, Puerto Deseado and Santa Fe.

Thanks to this well-developed infrastructure, INTI is able to extend its activities over the most diverse fields, tackling problems at various levels in support of the industrial sector.

As in the case of INTA, one way of supporting the work of this organization might be to arrange fellowships for the training of its technical personnel at organizations of a similar kind in developed countries.

Repair, maintenance, and spare parts supply

(Question 6)

There exist in Argentina a large number of workshops and small and medium-sized enterprises engaged in repair, maintenance and the supply of spare parts, frequently of their own manufacture. They are scattered all over our vast country and are quite capable of meeting local requirements.

One indication of this is that 22 per cent of the total tractor pool is still fully operational, despite the fact that, being more than 12 years old, it may be regarded as technically obsolete.

It is precisely this long service life the Argentine farmer succeeds in getting out of his machinery that is so surprising to international experts, to the point that many of them regard Argentina as a unique case,

since "in other countries this machinery either would have been considered obsolete and therefore replaced, as happens in developed nations, or, would be unserviceable for lack of spare parts, maintenance and mechanical skills, as is often the case in developing countries".

The experience gained by our country in this area is certainly of interest and deserves attention by other countries wishing to develop their domestic industries.

Policy, planning, strategy and co-ordination

(Question 7)

National policy-making and planning in the area of agricultural machinery is a function of the State Secretariat for Industrial Development (SEDI), which operates jointly with the State Secretariat for Agriculture and Stock-Raising under the Ministry of Economic Affairs. There is permanent co-ordination between the two secretariats. In view of the long history of Argentina's agricultural machinery industry, there are no special promotional arrangements for this sector, which in fact operates within the general guidelines laid down in the industrial policy.

At the province level, the Federal Agriculture Board maintains co-ordination and liaison, working together with the provincial authorities. In April 1978 the Board decided to establish a body called the Agricultural Technology Policy Co-ordinating Committee and to call on public and private, national and provincial agricultural research and extension organizations to appoint representatives to it. Invitations were sent to public and private institutions, such as the universities, producers' associations, technical and professional societies, foundations and chambers.

Interregional co-operation

(Question 8)

A. It is clear from the foregoing remarks that Argentina is technically advanced enough to provide assistance to other developing countries not merely by supplying suitable equipment, parts and components, but also in the broader areas of the transfer of technology ^{2/} and new cultivation

2/ As used here, the term "transfer of technology" refers mainly to the following: licensing, know-how, trade marks, patents, technical assistance, basic and detailed engineering, training, and administrative and management services.

methods. Its experience is backed up by the country's internationally recognized and extensive managerial capacity at all levels, the mechanical skills of its industrial and agricultural workers, and the technical qualifications of its specialists.

(i) Argentina is in an excellent position to transfer its intermediate technology (and a certain amount of more sophisticated technology) in the manufacture of agricultural machinery, because of the wide range of industries in our country engaged in this activity, many of which are of small and medium size. This point regarding the size of the enterprises is important because such firms generate more jobs and do more to promote the geographical dispersion of industry than do large production units. The technology in question ranges from new plants and complete production lines to products and components, in addition to techniques for product improvement, which can be adapted to the various requirements of the developing countries.

Argentina can also offer training for local craftsmen, farmers, agricultural technicians and industrial workers, and provide assistance with business management in the area of the manufacture, use, repair and maintenance of agricultural equipment appropriate to the local conditions of the developing countries.

(ii) Supply of equipment, machinery, parts and components

With their previous experience in exporting to Latin American countries and an installed capacity in excess of domestic demand, the majority of medium and large-scale manufacturers of agricultural machinery are interested in encouraging a growing trend towards the export market. The quality of Argentine manufactured goods is generally very good, although there may be considerable differences from one company to another. The best of these manufacturers produce items which are in every sense on a par with those available on the international market, while the majority, although they may perhaps fail to reach such a high standard in sophistication of design and finish, turn out machinery which is durable and simple to operate and requires a minimum of maintenance. Because of these characteristics, this equipment is particularly well suited to the countries of the developing world, where reliability counts for a great deal more than technical sophistication.

In addition, because of their size (even the largest Argentine manufacturer is small by comparison with the giants of international industry), our country's manufacturers are in a far better position to adapt their products to the special requirements of the domestic and foreign markets. This flexibility, together with simplicity of design, represents a major competitive advantage, which the mass producers of the developed nations cannot economically emulate.

Finally, careful study should be given to the possibility, which has been mentioned before, of putting the chronic idle capacity of Argentine tractor manufacturers to use in producing spare parts and components for the maintenance of models whose production has been discontinued by the parent companies in Europe and the United States. Such replacements and spare parts for discontinued models are difficult to obtain and very dear.

(iii) Technical co-operation

The extensive experience of a large number of Argentine firms and technological research and development institutions provides a good basis for offering technical co-operation in the intermediate mechanization and strengthening of small and medium-scale production units, called for by UNIDO as a form of co-operation among developing countries. To this end, in addition to individual initiatives, global technological assistance agreements might be envisaged, which should not overlook Argentine experience in the area of agricultural extension services and in new cultivation and crop-management techniques which make it possible to use less machinery. An example that might be cited here is the minimum tilling system, which was developed in the United States and introduced to Argentina in recent years. The same applies to the extension of the planting period for certain crops, such as wheat, or the inclusion of other crops, which together mean less use of tractor power each season.

B. With respect to Argentine requirements in the area of co-operation among developing countries, particular mention should be made of technical assistance for:

- (a) Bringing marginal lands into production;
- (b) Recovery of arid and flooded lands with climates and soils of which our country has little experience.

