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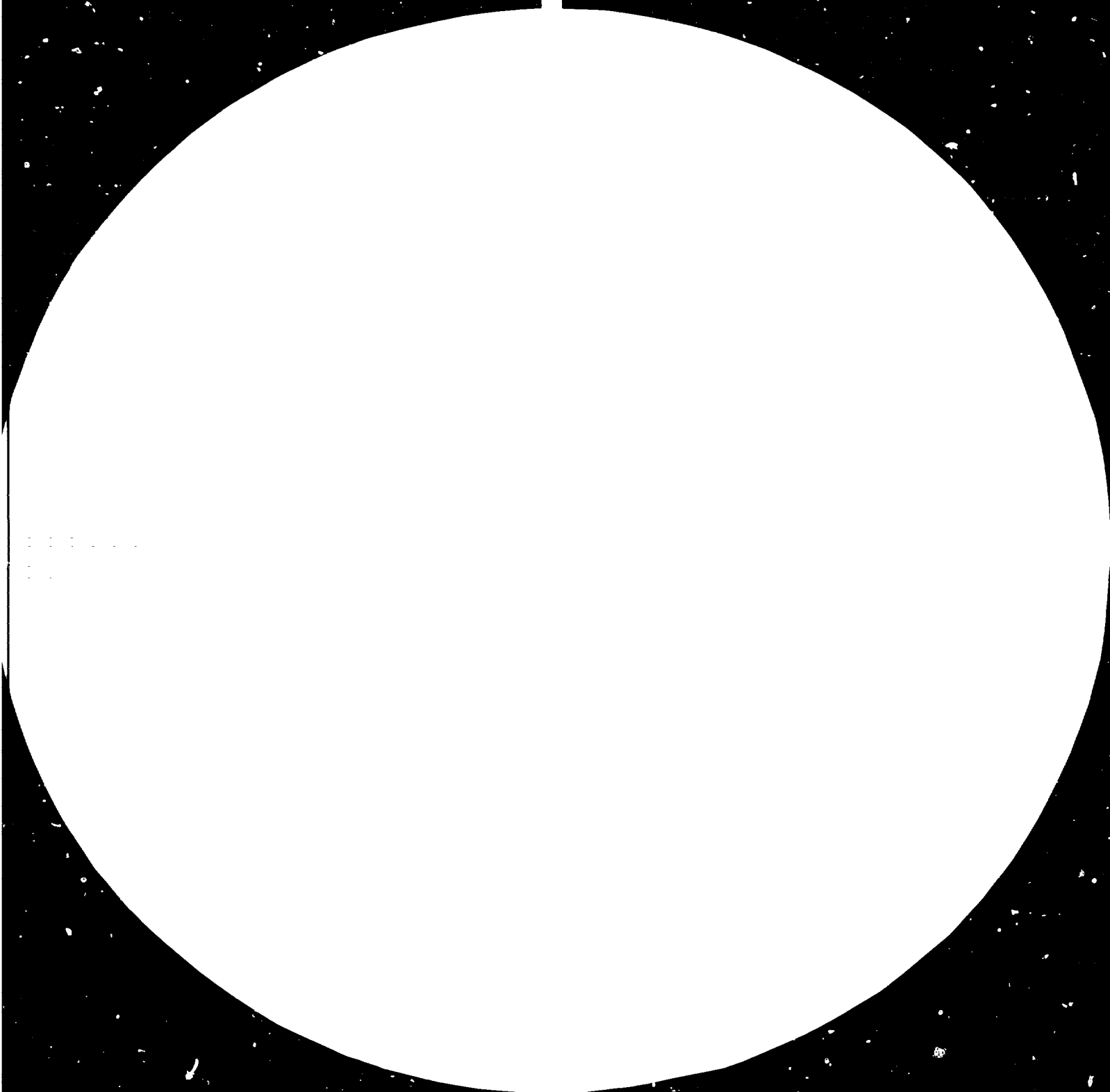
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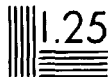
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Resolution Test Chart (NBS 1963-A)

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10065



Distr.  
LIMITED

ID/WG.330/7  
29 September 1980

United Nations Industrial Development Organization

ENGLISH

Meeting on Exchange of Experiences and  
Co-operation among Developing Countries in the  
Development of Agricultural Machinery Industry  
Beijing, China, 20 - 27 October 1980

COUNTRY SUMMARY - BRAZIL\*

by

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I. TECHNOLOGICAL DEVELOPMENT PROGRAMME FOR THE AGRICULTURAL MACHINERY INDUSTRY

The Brazilian Government has set, among its main priorities the increase of agricultural outputs for two main purposes:

- (a) ease the food supply to the population, and
- (b) improve the balance of payments through bigger exports.

To attain these purposes the Secretariat of Industrial Technology (STI) of the Ministry of Industry and Commerce is setting up a Technological Development Programme towards the agricultural machinery industry, considering the important role this industrial sector will play in Brazil in the near future.

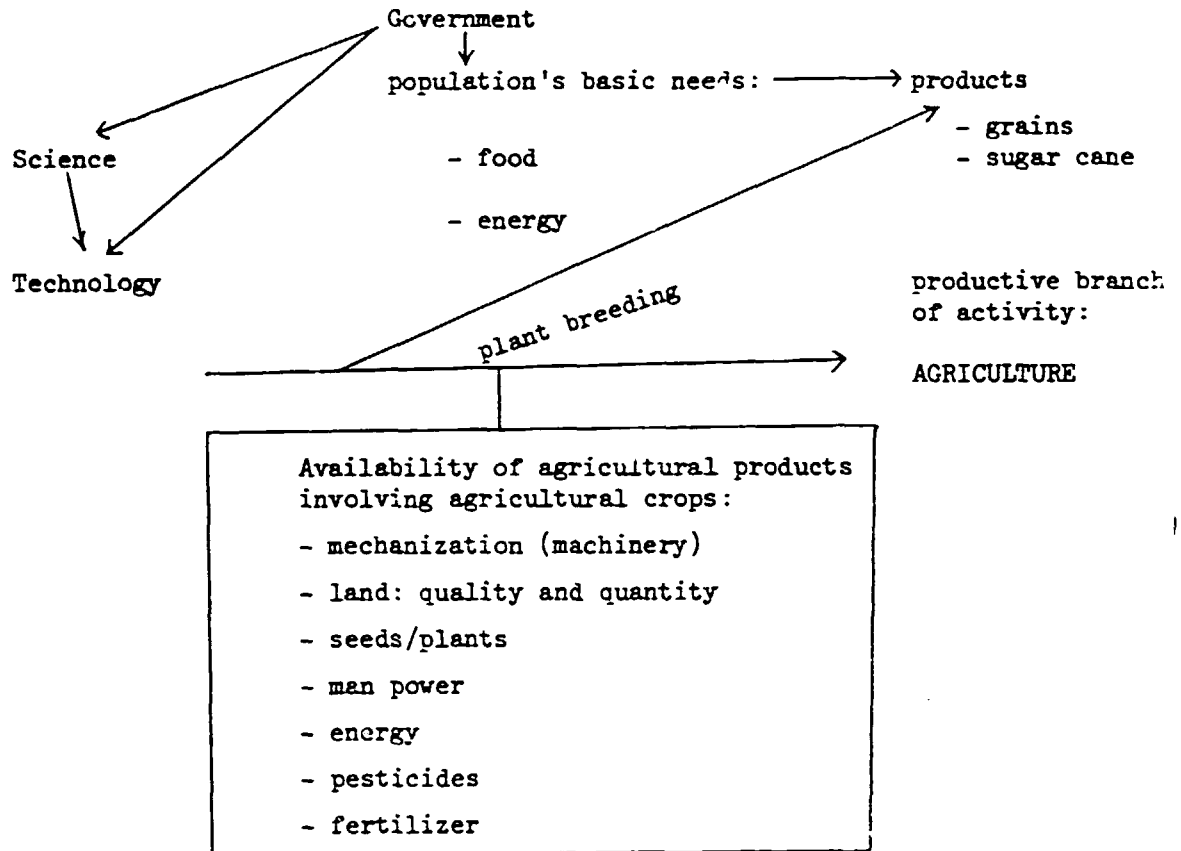
The main functions of the Secretariat of Industrial Technology (STI) are:

1. identify the existing potentialities and problems of science and technology in the industrial sector and suggest appropriate measures;
2. serve as a link between the Ministry of Industry and Commerce and the various institutions related to the industrial technological development;
3. elaborate plans, studies and programmes aimed at accelerating the industrial development through the use of the proper technology;
4. guide, co-ordinate and supervise the activities of the National Institute of Technology (INT), the National Institute of Industrial Property (INPI) and the National Institute of Metrology, Standardization and Industrial Quality (INMETRO).

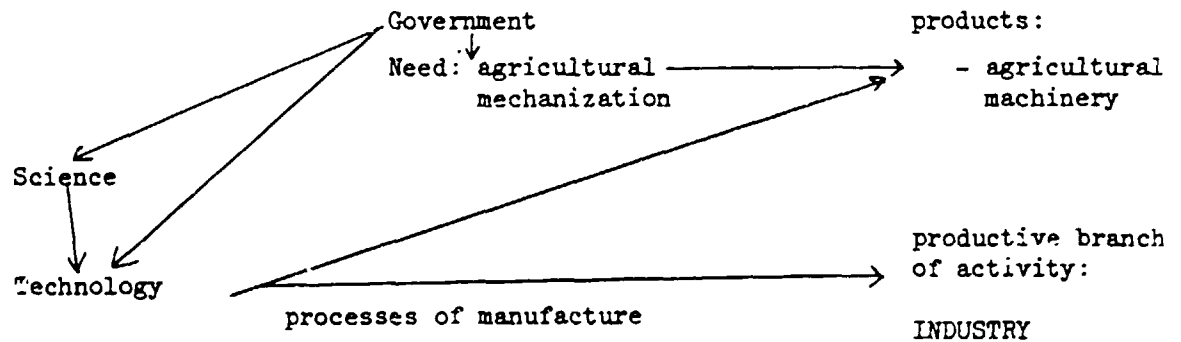
This programme is directed exclusively towards those considered as genuinely Brazilian companies of the agricultural machinery industry.

The lines of action established for this programme are as follows:

At agricultural production level:



At agricultural machinery production level:



Through the models presented it can be perceived that as to the technology aimed at the obtention of agricultural products, the mechanization should establish which parameters the machinery will need in order to become more suitable for the agriculture. Under "suitable" it can be understood that the machinery must be efficient in terms of agricultural production, that is, a seeder with a suitable design and proper use should not lead to a low germination rate; the use of a harvester should allow a low rate of losses. It is also understood that a suitable mechanization means the use of appropriate machines for the size of the agricultural land and in such a way that the costs of the products can be competitive.

On the other hand, it is expected that the agricultural machinery industry can provide products of a low cost and of good quality in terms of performance, durability and safety, and also a production capacity to satisfy the demand. The STI intends to take two kinds of action: firstly, on a short-term basis, to technically assist the industrial branch; the second, on a short and medium-terms, consists in obtaining agricultural machinery parameters - through experiments - when elaborating a technology for the agricultural machinery, to serve, at a further stage, as a basis for design of machines manufactured in large scale.

In Brazil there are several government institutions involved in the matter of the technological development of agricultural machinery and this implies a continuous follow-up by STI with these institutions to co-ordinate the different lines of action. The institutions involved in the technological activities may be classified as follows:

- registration agency of foreign technology;
- financing agency of industrial projects;
- financing agency of agricultural machinery;
- testing agricultural machinery;
- further developments of technologies at university, research centres, engineering consultancy and industry levels;
- development of human resources;
- spread of the use of agricultural technology.

Thus, by concerted action with those institutions, STI will establish a technological development plan to strengthen the capacity of the so-called technological infrastructure (universities, research centres engineering and consulting firms) which in turn will be able to support the agricultural machinery industry through technical assistance.



In this connection, the Government will finance (without return or with a low rate of interests) the technical development of the industries directly or through the technological infrastructure. Due to the technical differences of the private sector of the agricultural machinery industry in Brazil, the technological needs are extremely diversified. The main requirements consist of:

- Industrial engineering (lay-out, quality, control, industrial costs, etc.)
- Manufacture engineering (use of machinery-tool welding and foundry, etc.)
- Product engineering (mechanical design - basically - industrial design, standardization of component parts, performance tests).

On the other hand, STI should be the link between research centres of agricultural products and the agricultural machinery industry through the financing of prototypes.

Through the link between the National Center of Agricultural Engineering (CENEA of the Ministry of Agriculture) with Banco do Brasil, the main financial source for the acquisition of agricultural machinery is also expected to be enlarged. At this stage Banco do Brasil only finances tractors, combine harvesters and sophisticated implements if these machines have received an approval from CENEA. The enlargement consists of creating an advisory committee by science and technology institutions aimed at improving inefficient machinery.

One possibility of enforcing this improvement consists in testing equipment designed for the same purpose but of different manufacturers. These results would be made available to the consumer for comparison.

Presently INMETRO is consulting with CENEA to determine, by mutual agreement, what official standards are needed for the performance tests.

In the Brazilian standardization system the 'Associação Brasileira de Normas Técnicas' (ABNT) has the role of the country's forum for the discussion and elaboration of technical standards, at project level. These projects are forwarded to INMETRO for approval and accepted as Brazilian standard.

Adaptation of Imported Equipment

Imported equipment needs the following adaptations:

(a) The equipment has to be stronger for several reasons:

- shortage of skilled workers;
- irregular maintenance;
- prolonged use of the equipment and its use under conditions not foreseen in the original design. For example - deforestation - as a result of the enlargement of new agricultural boundaries, has as a consequence that the soil is full of roots that lower the lifetime of the machinery.

(b) Reasons for adapting the equipment:

- lack of qualified workers for the maintenance of more sophisticated equipment;
- substitution of spare parts by other less sophisticated parts to enable a higher degree of national content.

(c) Several adaptations needed due to:

The irregularities of the Brazilian soil, where the equipment will be used, are sometimes greater than in the country where it was designed.

The conversion of imported spare parts is often performed with the intention to use those parts already being manufactured in Brazil by the automobile industry.

Locally Manufactured Equipment

Tractors and combine harvesters have high percentage of indigenous parts as shown in the table below.

In Brazil the period of the substitution of imported equipment has almost ended and the presently engineering designs are being substituted in privately owned factories. The policy of import substitution through the progressive increase in national production of the component parts brought as its consequence that the last items to be handled are the products of technical sophistication, such as hydraulic motors, hidrostatic transmissions and torque converters, which require big capital investments.

MINIMUM NATIONALIZATION, IN PERCENTAGE, DURING 1980

IMPOSED BY INDUSTRIAL DEVELOPMENT COUNCIL AT THE END OF 1980:

CATEGORIES	WEIGHT	VALUE
SUGAR CANE COMBINE HARVERSTERS	95%	95%
GRAIN COMBINE HARVERSTERS	96%	96%
CRAWLER TRACTORS - CATEGORY I: - with weight equal or less than ten tons and power and net power equal or less than 73,5 kw (100 CV)	85%	90%
CRAWLER TRACTORS - CATEGORY II: - with weight larger than 100 ton or equal or less than 20 tons and net power larger than 10 CV and equal or less than 270 CV	80%	85%
CRAWLER TRACTORS-CATEGORY III: - weight larger than 20 tons and net power larger than 200 kw	50%	50%
TRUCK-FORESTRY TRACTORS	96%	97%
PULLER FORESTRY TRACTORS	92%	91%
TRUCK AGRICULTURAL TRACTORS	95%	93%
MOTORIZED TILLERS	98%	98%
AGRICULTURAL WHEEL TRACTORS-CATEGORY I: - two-wheel drive of any power, and for -wheel drive with net power larger than 40 CV and less than 110 CV	98%	96%
WHEEL-DRIVE TRACTORS - CATEGORY II: - four-wheel drive and net power equal or less than 40 CV	96%	94%
WHEEL-DRIVE TRACTORS-CATEGORY III: - four-wheel drive and net power greater than 110 CV	85%	92%
CHAIN SAWS	95%	95%

Source: CDI-MIC

II. TYPES OF AGRICULTURAL MACHINERY PRODUCED: NATIONAL AND FOREIGN DESIGNS

Agricultural tractors

There are two manufacturers of powered tillers in Brazil, for which the capital investment and designs are linked to Japanese companies.

Light-weight tractors, which represents about 6% of the Brazilian tractor market, have been manufactured by a single company disposing of a national majority of capital and design of their models.

The main manufacturers of medium and heavy weight tractors base their production on a two-wheel drive tractors. In decreasing order of annual production quantities, such factories have their capital originated from: Canada, Finland, United States of America and Brazil.

It is interesting to observe that the Brazilian branch of the Finlander manufacturer is at the present time, four times bigger than the headquarters in regard to tractor production. The Brazilian manufacturer group which shares about 10% of the tractor market pales started its tractor production under an American Company licence. Later this agreement was changed, when gas been developed in the country.

Two companies manufacture heavy weight tractors. One of them is depending on national capital and technology, while the other is based on North-american capital and technology.

Grain Combine Harvesters

There are two factories with 100% foreign capital: one of them is Canadian, but component parts of their models are made in several countries. The other factory with North-american capital, has designed its basic model on Belgian origin.

There are two factories with national majority capital. One has national designs for their models. However, after the entry of the North-american minor partner, it started to receive technical assistance from this partner. This factory participates with 35% of the grain combine harvesters market. The other plant uses the design of its combine harvesters under German licence. It is useful to observe that a minor foreign partner, who also manufactures combine harvesters, started in this company, after the Germany licensing. There is only one manufacturer with 100% national capital who initially produced combine harvester under North-american licence.

### Sugar Cane Combiner Harvester

There are two manufacturers with only national capital: their designs are national; one of them manufactures self-propelled sugar cane pickers and the other a not self-propelled equipment which is intended to harvest unbroken sugar cane.

There is also a "Joint Venture" with foreign (Australian) counter part design. The combine harvester is self-propelled, the sugar cane is cut and picked at the same time.

### Diesel Engines

The majority of diesel engines in the agricultural machinery are manufactured by factories established with Canadian, North-american, German and Japanese capital and their own designs. There is only one factory with national capital producing engines up to 22 HP, under German licence, for tractors.

The Aerospace Technical Center of the Aeronautical Ministry (CTA/MA) designed an engine powered by alcohol. However, CTA is waiting for financial support for its manufacture.

### Implements

Some more sophisticated implements, for example, sprayers, sickles and ballers are manufactured under foreign licence by factories with fully national capital. The implements and hand tools are in the great number by companies with national capital and so are the designs indigenous or copied from other machines. There are some exceptions where the capital is of foreign origin. The Industrial Development Council is making a survey of the Brazilian machinery industry which will show how true the composition of national and foreign designs in the Brazilian industries are.

### The Demand for Suitable Equipments

There typical crops in Brazil calling for mechanization, for which equipment are not available in the country.

#### Examples:

- With the increasing shortage of rural man-power it becomes necessary to mechanize coffee harvesting.
- With the plan to obtain alcohol, there is need to have great plantations of cassava and so to mechanize such a crop.

- With the increase of food demand, the bean crops, basic nourishment of Brazilian people have mechanized through adaptation of foreigner harvesting machines.

The priority number one of the Brazilian Enterprise of Technical Assistance and Rural Extension - EMBRATER of the Ministry of Agriculture, is the development of appropriate technologies for small farms.

Yet, there is at the present time great interest to implement the animal traction in agriculture. Moreover, due to the energy crisis, animal power, motorized tillers and light tractors are very much in demand, at the present time. The question of how to supply suitable machines has been answered by the fact that small industries placed near the sugar cane plantations are continuously informed of the equipment usage and are able to achieve an adequate situation between the machines and the system of agricultural production. However, frequently it is to the contrary, the farmer is forced to work with machines not adapted to his environment.

### III. BRAZILIAN EXPERIENCE

Some examples of the success with machines designed and produced in Brazil:

- Sugar Cane Harvesters, where the producer used the knowledge of sugarcane planters. It is important to observe that, initially, the design was Australian.

- The fabrication of a pulled corn harvesting machine (not self-propelled) attached to an original system of threshing. However, management problems are creating a situation of financial difficulties to manufacturer.

- The agricultural mechanization of small and medium size farms through the use of light tractors have effected the installation of a medium-size plant, specially oriented to also produce implements covering all tractor uses.

- The participation (20%) of a North-american firm in the biggest Brazilian combine harvesters manufacturer provided the transfer of drawings, specifications, patents and manufacturing processes. Furthermore, one North-american engineer works permanently in the factory which is situated in one of the regions in the South of the country, far from the big

industrial cities, but having reached a high sophisticated degree in the fabrication through the possession of special numerical control machine tools.

To eliminate coffee rust fungus, it was necessary to develop an application technique of fungicides and consequently a sprayer. The Brazilian Aeronautical Enterprise (EMPRAER) developed an aircraft specially designed for agricultural uses.

#### IV. RECOMMENDATIONS

In the various recommendations made by UNIDO in favour of co-operation in the development of machines industry and agricultural implements, two of them are of great importance to Brazil, which is now in the position to use them:

- (a) to promote technologies which would be between the local development and the simple purchase of fabrication licence;
- (b) To create technical body to develop specific activities in the field of co-operation in agricultural machineries.

The recommendations are detailed explained as follows:

- (a) Creation at UNIDO of one documentation center of technology package in regard to product engineering, manufacture of machines and agricultural implements. This bank would have the function of advising developing countries, if so requested to develop their own product starting from a mixing of external technologies, instead of buying technological packages.

The justification for that recommendation is based on the fact that it is possible to make a product starting from a mixing of available technologies at a lower cost than to work on new development.

- (b) Creation of a technical body by the industry ministries of the developing countries, which would have the function of divulgence and dissemination of co-operation in agricultural machines and implements production.

Thus, the task of the technical body would be:

- have manufacturers registered with UNIDO and divulge their disposable technologies in design and fabrication processes to interested countries;
- have on roster of universities, research centres and experts, to divulge their researches and developments for changing

experiences and collaboration with other countries;

V. SOME ENCOUNTERED DIFFICULTIES

One of the biggest national agricultural manufacturer bought a fabrication licence of one English designed plow, but encountered problems in its use, as the necessary adaptations had not been made. It became not competitive because it now weighs approximately 300 kilograms more than specified for the original design.

One industry, basically a manufacturer of railway cars tried, about 15 years ago, to diversify his production by buying fabrication licence of agricultural implements and combine harvesters. Now they continue manufacturing implements and combine harvesters under their own trade-mark and technology. But the licensors established other factories in Brazil, being benefited by the divulgence of their trade-marks, made by the national company.



CHART 1.1 - PRODUCTION AND PRODUCTIVITY OF SOME SELECTED CROPS

	1950		1961		1970		1976	
	AREA (ha)	PRODUCTION (t)	AREA (ha)	PRODUCTION (t)	AREA (ha)	PRODUCTION (t)	AREA (ha)	PRODUCTION (t)
rice	1.964.160	3.217.690	3.174.040	5.392.411	5.136.230	7.481.920	6.456.000	9.560.390
frijol beans	1.883.000	1.283.000	2.580.570	1.744.500	3.697.300	2.304.800	4.059.100	1.942.260
corn	4.681.827	6.023.550	6.885.740	9.036.237	10.205.700	15.381.360	11.066.173	17.844.680
wheat	652.453	532.350	1.022.234	544.858	1.760.670	1.657.290	3.547.523	3.225.830
saybean	-	-	240.920	271.488	1.221.840	1.461.780	6.417.000	11.225.000
peanuts	127.428	118.190	436.380	584.432	670.716	903.207	389.000	513.900
castor bean	233.160	184.000	283.405	207.801	350.000	360.000	258.272	212.861
cotton	2.689.185	774.091	3.233.780	1.828.475	4.514.900	2.173.000	3.464.758	1.246.970
sugar (100 kg/t sugar-cane)	828.182	3.267.000	1.366.640	5.938.000	1.938.750	9.111.300	2.097.880	10.665.000
onion	23.760	125.780	30.000	180.000	43.000	330.000	57.120	430.000
tomato	13.521	135.645	29.327	390.992	42.000	800.000	46.774	1.163.000
potato	147.740	707.160	191.255	1.080.310	213.675	1.571.277	183.000	1.815.827
sweet potato	102.265	834.360	133.000	1.300.000	160.800	2.134.000	182.000	2.100.000
cassava	957.493	12.532.480	1.381.330	18.058.380	2.071.205	31.180.836	2.126.000	26.445.150
TOTAL								
a) without cassava	13.346.681	17.190.836	19.607.291	28.499.630	29.975.581	45.669.994	38.224.600	61.857.718
b) with cassava	14.304.174	29.735.316	20.988.010	46.558.010	32.046.786	76.850.830	40.350.600	88.297.868
AVERAGE PRODUCTIVITY (kg/ha)								
a) without cassava	1.289		1.454		1.474		1.533	
b) with cassava	2.079		2.218		2.399		2.188	

SOURCE: FIBGE

CHART 1.2 - IMPORTANCE OF SOME AGRICULTURAL PRODUCTS

CULTURE	AREA (1976) (MILLION ha)	EXPORTS (1975) (MILLION US\$)	EXPORTS (1976) (MILLION t)
COFFEE	1,0	935	0,778
SOYBEAN	6,4	1303	11,200
SUGAR-CANE	1,9	1100	107,000
CORN	9,7	131	17,800
RICE	6,5		9,560
WHEAT	3,6	-351	-3,200
MALT		- 68	
CASSAVA	2,3		26,500
FRIJOL	3,95		1,840
TOMATO	0,042		1,170
ONION	0,057		0,430
POTATO	0,185		1,000
COTTON ARB.	2,3		0,368
COTTON HERB.	1,0	158	0,889
JUTE & MARLLOW	0,1		0,980
SISAL & AGAVE	0,3		0,165
ORANGE	0,300	82	4,500
PINEAPPLE	0,021		0,349
BANANA	0,290		0,401
TOBACCO	0,104	142	0,296
CASTOR BEAN	0,250		0,213
CACAO	0,460	60	0,222
BLACK PEPPER	0,010		0,030
FIREWOOD			43,000
CHARCOAL			2,086

SOURCE: EMBRAPA

CHART 1.3 - DISTRIBUTION OF THE OCCUPIED AREAS IN BRAZIL, BY SECTORS - 1975

OCCUPATION	PERCENTAGE OF TOTAL AREA	OCCUPIED AREA (ha 10 <sup>6</sup> )
FOREST	59,9	510,0 (*)
CULTIVABLE	24,9	212,15
CROPS	4,6	38,8
permanent	1,0	8,3
temporary	3,6	30,5
PASTURES	20,9	177,9
OTHER AREAS - ABANDONED LANDS, TOWNS, ETC.	15,5	129,05 (*)
T O T A L	100,0	851,20

SOURCE: IBGE

(\*) FAO'S ESTIMATION

CHART 1.4 - AREAS OF PERMANENT AND TEMPORARY CROPS, IN ACORDANCE WITH THEIR SIZE - 1975

SIZE OF LAND (ha)	PERMANENT		TEMPORARY	
	(ha)	%	(ha)	%
Up to 10	971.013	11,7	4.832.913	15,8
10 - 100	3.609.242	43,5	12.568.739	41,2
(10-50)	(2.462.323)	(29,7)	(9.144.945)	(30,0)
(50-100)	(1.146.919)	(13,8)	(3.423.794)	(11,2)
100 - 1.000	2.826.076	34,1	9.617.224	31,6
1.000 - 10.000	687.726	8,3	3.227.896	10,6
Above 10.000	200.352	2,4	261.897	0,8
T O T A L	8.294.408	100,0	30.508.669	100,0

SOURCE: IBGE

CHART 1.5 - DISTRIBUTION OF THE POPULATION AND THOSE ECONOMICALLY ACTIVE (ABOVE 10 YEARS OLD)

YEAR	1950	1960	1970	1975	1980 (*)
POPULATION					
TOTAL	51.944.397	70.119.071	93.139.037	107.145.000	123.032.000
RURAL	33.161.506	38.987.526	41.054.053	43.055.000	44.879.000
(%)	(63,8)	(55,6)	(44,1)	(40,2)	(36,4)
URBAN	18.782.891	32.204.017	52.084.984	64.090.000	78.153.000
(%)	(36,2)	(46,4)	(55,9)	(59,8)	(63,6)
ECONOMICALLY ACTIVE, TOTAL	17.117.362	22.651.263	29.557.224	34.286.400	39.000.000
RURAL	10.254.245	12.165.057	13.090.358	13.848.000	14.749.000
(%)	(59,9)	(53,7)	(44,3)	(40,5)	(37,8)
URBAN	6.863.117	10.488.206	16.466.866	20.391.600	24.251.000
(%)	(40,1)	(46,3)	(55,7)	(59,5)	(62,2)
TOTAL POPULATION	5,06	5,77	7,12	7,74	8,34
RURAL WORKER INCREASE (INDEX)	(100,0)	(114,0)	(140,7)	(153,0)	(164,8)

SOURCE: FIBGE

(\*) ESTIMATION

CHART 1.6 - OCCUPATION OF THE ECONOMICALLY ACTIVE  
POPULATION, BY AGRICULTURAL SECTOR - 1970

OCCUPATIONS	POPULATION ECONOMICALLY ACTIVE	
	Nº	(%)
<u>ADMINISTRATIVE</u>	<u>244.187</u>	<u>1,9</u>
<u>TECHNICAL &amp; SCIENTIFIC</u>	<u>1.613</u>	<u>0,0</u>
<u>CROPS AND CATTLE RAISING</u>	<u>12.800.463</u>	<u>97,8</u>
QUALIFIED WORKERS (agricultural technicians, ploughers and tractors operators)	57.825	0,4
NON QUALIFIED WORKERS (farm hand)	11.220.860	85,7
NON QUALIFIED WORKERS (cattle breeding)	735.422	5,6
NON QUALIFIED WORKERS (hunters, fishers, truck farmers and gardeners)	786,356	6,1
<u>OTHER OCCUPATIONS</u>	<u>44.095</u>	<u>0,3</u>
<b>T O T A L</b>	<b>13.090.358</b>	<b>100,0</b>

SOURCE: IBGE - 1970

CHART 1.7 - DISTRIBUTION OF THE AGRICULTURAL PROPERTIES IN BRAZIL,  
IN 1960 AND 1975, IN RELATION TO THE OCCUPIED AREAS

AREA (ha)	NUMBER OF PROPERTIES		TOTAL AREA (ha)		% OF TOTAL AREA	
	1960	1975	1960	1975	1960	1975
Up to 10	1.499.545	2.616.575	5.923.077	9.000.617	2,2	2,8
10 - 100	1.494.548	1.897.511	47.697.859	60.105.695	18,0	18,6
100 - 1.000	315.119	444.970	86.291.939	115.907.267	32,5	35,9
1.000 - 10.000	31.175	40.078	72.794.549	91.261.087	27,4	28,3
Above 10.000	1.710	1.824	72.743.376	46.346.330	19,9	14,4
Non declared areas	7.387	18.377	-	-	-	.
<b>T O T A L</b>	<b>3.349.484</b>	<b>4.924.019</b>	<b>265.450.800</b>	<b>322.621.000</b>	<b>100,0</b>	<b>100,0</b>

SOURCE: IBGE

CHART 1.8 - SIZE OF PROPERTY AND AGRICULTURAL PRODUCTION

BRAZIL - 1972

PRODUCTS	QUANTITY HARVESTED IN PERCENTAGE	
	PROPRIETIES UP TO 100 ha	PROPRIETIES MORE THAN 1000 ha
COFFEE	58,9%	7,9%
CORN	66,2%	7,5%
SUGAR-CANE	17,9%	41,8%
RICE	34,7%	25,2%
COTTON	45,9%	13,7%
WHEAT	48,8%	12,1%
FRIJOL	71,8%	5,2%

SOURCE: INCRA, 1972/REVISTA EXAME, Nº 149, 1978.



Chart 2.1 PRODUCTION OF TRACTORS

By Unities

YEARS \ TYPES	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Motorized Tillers	-	751	1.240	1.110	1.765	2.403	3.336	2.500	2.463	1.946	2.065	2.190	2.196	3.466	5.463	5.606	5.275	5.394	5.522
Micro Tractors	-	-	-	-	-	260	291	72	148	335	409	366	1.570	2.062	2.986	2.172	2.149	2.391	2.281
Light Tractors	-	25	1.984	3.990	1.329	241	96	57	71	32	-	-	-	-	-	820	1.478	1.850	1.721
Middle Tractors	37	1.574	4.779	4.179	7.947	5.810	6.668	4.077	4.625	3.386	4.648	7.000	9.426	12.236	9.642	8.720	11.581	8.634	4.266
Heavy Tractors	-	80	823	1.739	2.261	2.070	2.305	2.089	5.014	6.139	9.400	15.122	19.716	24.447	34.168	47.454	50.119	39.915	40.634
SUBTOTAL	37	2.430	8.826	11.018	13.302	10.804	12.696	8,795	12.282	11.828	16.522	24.678	32.908	42.211	52.259	64.772	70.602	58.181	53,824
Tractors 4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	196	576
forestry Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	20
Crawler Tractors	-	-	-	-	-	-	13	73	106	91	185	770	1.419	1.957	2.548	3.791	4.763	3.453	2.626
TOTAL	37	2.430	8.826	11.018	13.302	10.804	12.709	8.868	12.388	11.919	16.707	25.448	34.327	44.168	54.807	68.563	73.365	61.853	57.076

Source: ENBRANEC

Chart 2.2 TYPES OF AGRICULTURAL TRACTORS

T Y P E	MANUFACTURES	MARK	MODEL	POWER		WHEIGT KG	KG/CV	Span's height cm	Smaller range	
				CV	RPM					
MOTORIZED TILLERS	Yanmar	Yanmar	TC-10	12	2.300	400	33,3			
	Kubota Tekko	Tobatra	M-130	13	1.800	373	28,7		48	
MICROTRACTORS	Agrale	Agrale	4100	16	2.750	950	59,4	22	73	
LIGHT TRACTORS	Agrale	Agrale	4200	36	3.000	1.740	48,3	38	93	
MIDDLE TRACTORS	Santa Matilde	Brasitalia	300 CR/CRC	43,5	2.400	2.200	50,6		135	
	Massey-Ferguson	MF	235	44	2.250	1.740	39,5	24	106	
	Valmet	Valmet	Cafeeiro	52	1.900	1.800	34,6	33	105	
	Ford	Ford	4600	55	2.200	2.032	36,9	44	132	
	Valmet	Valmet	65 id	58	2.300	2.120	36,5	41	140	
	Massey-Ferguson	MF	265	61	2.000	2.160	35,4	31	127	
	Santa Matilde	Brasitalia	400 CR	61	2.000	2.300	37,7		135	
	CBT	CBT	2070	61,4	2.200	2.900	47,2	32	140	
	Massey-Ferguson	MF	270	65	2.200	2.240	34,4	35	132	
	CBT	CBT	2080	65	2.200	3.000	46,1	41	140	
	HEAVY TRACTORS	Massey-Ferguson	MF	275	70	2.000	2.250	32,1	35	132
		Massey-Ferguson	MF	285	75	2.000	2.500	33,3	36	137
Ford		Ford	6600	75	2.200	2.488	33,2	41	132	
Valmet		Valmet	85 id	78	2.300	2.520	32,3	50	140	
Massey-Ferguson		MF	290	79	2.200	2.640	33,4	40	157	
Valmet		Valmet	86 id	80	2.300	2.520	31,5	50	140	
Massey-Ferguson		MF	95x	100	2.200	3.900	39,0	45	137	
CBT		CBT	2100	100	2.000	4.000	40,0	28	154	
CBT		CBT	2105	105	2.200	4.000	38,1	28	154	
Massey-Ferguson		MF	296	114	2.250	3.900	34,2	55	150	
Valmet		Valmet	110 id	116	2.300	3.800	32,7	46	152	
CBT		CBT	2400	120	2.200	4.900	40,8	28	164	
TRACTORS 4x4	Hércules	TTA PARTULE	3000/45	44	2.250	1.750	39,8	31	125	
	Case	Case	2470	200	2.200	7.280	36,4		206	
	Müller	Müller	TM-25	243	2.100	11.200	46,1		131	
	Engesa	Engesa	EE-312	243	2.100	10.400	42,8		194	
FORESTRY TRACTORS	Valmet	Valmet	110 TA	116	2.300	9.000	77,59	65		
	Valmet	Valmet	880 TA	116	2.300	12.000	103,45	65		
	Müller									
	Engesa	Engesa	EE 510	130	2.800	10.000	76,9	59	210	
CRAWLER TRACTORS CATEGORY I	Santa Matilde	Brasitalia	300C	43,5	2.400	1.910	43,90			
	Komatsu	Komatsu	D.0E-16B	74	2.400	7.400	100,00			
	Caterpillar	Caterpillar	D4-D	76	1.900	6.840	90,00			
	Fiat-Allis	Fiat-Allis	AD 7-0	88	2.000	8.900	101,14			
	Komatsu	Komatsu	D50A-15C	91	2.100	11.300	124,18			
CATEGORY II	Caterpillar	Caterpillar	D6-D	142	1.900	11.000	77,46			
	Komatsu	Komatsu	D60A-6B	142	1.600	15.750	110,92			
	Fiat-Allis	Fiat-Allis	AD 14C	150,0	2.000	14.600	97,33			
	Komatsu	Komatsu	D60E-6B	162	1.700	17.000	104,94			

Source: ENBRAMEC

Chart 2.3 IMPORTATION OF TRACTORS

TIPOS	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Motorized Tillers	-	-	1.309	1.083	442	183	20	5	4	11	38	44	3	1	-	3	7	1	6
Micro Tractors	-	-	-	-	-	-	-	-	-	-	-	64	2	-	4	32	185	45	1
Light Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Middle Tractors	10.550	6.348	1.714	1.330	1.341	374	639	342	990	423	60	184	228	258	347	801	191	62	161
Heavy Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SUBTOTAL	10.550	6.348	3.023	2.413	1.783	557	659	347	994	434	98	292	233	259	351	836	383	108	168
Tractors 4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forestry Tractors	-	-	1.085	794	632	864	1.820	1.013	2.317	2.180	3.268	12	13	12	51	10	27	12	32
Crawler Tractors	-	-	-	-	-	-	-	-	-	-	-	2.753	3.457	2.937	4.314	5.051	1.763	553	453
TOTAL	10.550	6.348	4.108	3.207	2.415	1.421	2.479	1.360	3.311	2.614	3.366	3.057	3.703	3.208	4.716	5.927	2.173	673	653

Source: EMBRAMEC

Cart 2.4 EXPORT OF TRACTORS

By Unities

TYPES \ YEARS	YEARS																			
	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	
Motorized Tillers	-	-	-	-	-	-	-	10	89	57	76	10	31	22	49	101	220	123	149	
Micro Tractors	-	-	-	-	-	-	-	-	-	-	-	-	10	29	83	75	60	88	160	
Light Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Middle Tractors	-	-	-	1	2	-	6	31	7	7	41	104	188	316	668	671	390	4.350	5.700	
Heavy Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SUBTOTAL	-	-	-	1	2	-	6	41	96	64	117	114	229	367	800	847	670	4.561	6.009	
Tractors 4x4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Forestry Tractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	
Crawler Tractors	-	-	-	-	-	-	-	-	-	-	4	2	13	88	175	176	44	202	206	
TOTAL	-	-	-	1	2	-	6	41	96	64	121	116	242	455	975	1.023	716	4.764	6.215	

Source: EMBRAMEC

CHART 2.5 - AGRICULTURAL MACHINERY INDUSTRY

PRODUCTION OF PRINCIPAL PRODUCTS

DISCRIMINATION	UNTIES		
	1976	1977	1978
<u>1. PREPARATION OF SOIL</u>			
Chain Saw	14.992	16.980	21.420
Clod breaking harrow	43.728	18.047	11.747
Plow discs (detached)	-	-	241.816
Harrow discs (detached)	-	-	829.816
Flat discs for plow furrow - wheels	-	-	13.640
Front blade	4.143	1.834	7.480
Furrower	2.726	2.299	2.433
Harrow - tractor drawn	4.290	24.105	18.071
Levelling harrow	18.508	8.507	5.641
Plow - animal drawn	273.530	292.720	195.557
Plow - tractor drawn	53.467	63.676	41.652
Plowing harrow	28.285	9.607	2.537
Rear blade	121.440	26.910	18.234
Ripper	1.952	2.997	710
Rotary Cutter	13.233	15.125	13.973
Rotary floe	12.669	4.817	3.632
Rotary rake	16.138	15.654	10.500
Sub-soiler	1.508	3.420	1.307
<u>2. SEEDING, PLANTING AND FERTILIZING</u>			
Auger for digger	-	-	5.231
Combine drill	11.759	11.284	10.433
Combine drill-lime spreader	-	3.564	1.367
Drill and planter discs	-	-	195.028
Fertilizing planter	42.224	53.345	17.938
Hole digger	-	-	2.641
Lime Spreader	6.606	4.375	2.521

CHART 2.5 - CONTINUATION

DISCRIMINATION	UNITIES		
	1976	1977	1978
<b>3. <u>CULTIVATION</u></b>			
Cultivator - animal drawn	33.174	8.208	33.861
Cultivator - tractor drawn	9.923	5.670	5.592
Rotary weeding machine	-	-	593
Tool-bar	1.017	3.055	739
Weeder's frame	-	-	1.414
Weeding discs machine	845	1.600	615
<b>4. <u>PESTICIDE APPLICATORS</u></b>			
Herbicide applicator	-	-	1.017
Knapsack or manual sprayer	168.794	271.672	450.700
Manual duster	188.241	224.866	38.927
Air blast sprayer	5.623	6.852	5.286
Speed sprayer	-	-	2.252
Sprayer - tractor drawn	1.457	1.845	3.750
Sprayer with hose and gun	3.817	3.754	5.553
Trailed boom sprayer	14.964	19.197	10.755
<b>5. <u>HARVESTING</u></b>			
Grain self-propelled combine harvester	7.279	4.800	4.287
Grain towed combine harvester	-	1.008	243
Hay baling machine	-	-	468
Peanut machine	92	214	134
Sugar cane self-propelled harvester	58	86	74
<b>6. <u>TRANSPORTATION AND HANDLING</u></b>			
Auger elevator	-	-	811
Bucket elevator	6.606	4.375	2.521
Farm Wagon	14.426	17.712	12.955
Front-loader	7.745	1.385	2.944
Loader platform	7.355	3.243	2.011
Rear crane	1.672	5.594	3.198
Sugar cane loader	901	1.110	1.061

CHART 2.5 - CONTINUATION

DISCRIMINATION	UNITIES		
	1976	1977	1978
<u>7. PROCESSING AND STORING</u>			
Forage chopper and grinder	2.144	3.829	5.211
Grain dryers	1.856	1.420	1.653
Grinder	-	-	2.351
Mice Sheller	5.504	4.948	3.248
Rice processing machine	778	1.999	1.656
Sugar cane chopper	2.745	1.385	2.944
Silage chopper blower	37.996	26.112	26.113
Thresher	1.672	5.890	5.340
<u>8. WATER SUPPLY AND IRRIGATION</u>			
Automatic valve (for irrigation)	-	-	42.275
Irrigation pipe with quick complers	-	-	626.426 (meter)
Moto-pump	34.963	42.617	31.386
PTO-driven pump	4.980	5.510	4.972
Rain gun self-propelled	-	-	30
Sprinkler	69.206	40.614	46.950

SOURCE: DEE/ABIMAQ - SINDIMAQ

Informers: 104 industries

CHART 2.6 - AGRICULTURAL MACHINERY INDUSTRY - SALES OF PRINCIPAL

PRODUCTS ON THE EXTERNAL MARKET - QUANTITY

DISCRIMINATION	UNITIES		
	1976	1977	1978
<u>1. PREPARATION OF SOIL</u>			
Chair saw	76	115	2.729
Clod breaking harrow	604	19	499
plow and harrow disc	2.383	4.835	15.356
Flat disc for plow furrow wheels	36	-	310
Furrower	31	7	33
Harrow - tractor drawn	184	84	557
Levelling harrow	105	46	191
Plow - animal drawn	4.000	910	397
Plow - tractor drawn	884	622	510
Plowing harrow	184	84	557
Rear blade	65	71	419
Ripper	6	28	44
Rotary cutter	85	159	198
Rotary hoe	103	18	32
Sub soiler	4	25	50
<u>2. SEEDING, PLANTING AND FERTILIZING</u>			
Combine drill	99	247	417
Fertilizing planter	155	5.208	431



CHART 2.6 - CONTINUATION

DISCRIMINATION	UNITIES		
	1976	1977	1978
<b>3. <u>CULTIVATION</u></b>			
Cultivator - animal drawn	184	-	1.092
Cultivator - tractor drawn	85	510	427
<b>4. <u>PESTICIDE APPLICATORS</u></b>			
Herbicide applicator	-	1	116
Knapsack or manual duster	1.154	1.391	3.535
Knapsack or manual sprayer	6.443	16.548	52.169
Air blast sprayer	60	234	1.174
Speed sprayer	-	-	108
Sprayer - tractor drawn	5	-	310
Sprayer with hose and gun	10	58	288
Trailed boom sprayer	216	1.226	2.196
<b>5. <u>HARVESTING</u></b>			
Grain self propelled combine harvester	111	238	217
Grain towed combine harvester	-	25	24
Peanut combine	2	50	-
Sugar cane self propelled harvester	5	5	14
<b>6. <u>TRANSPORTATION AND HANDLING</u></b>			
Auger elevator	-	-	45
Bucket elevator	-	27	111
Sugar cane loader	12	28	37

CHART 2.6 - CONTINUATION

DISCRIMINATION	UNITIES		
	1976	1977	1978
<b>7. <u>PROCESSING AND STORING</u></b>			
Forage chopper and grinder	102	412	27
Mice sheller	384	421	312
Rice processing machine	36	62	108
Silage chopper blower	982	4.835	15.356
Thresher	42	237	8
<b>8. <u>WATER SUPPLY AND IRRIGATION</u></b>			
Irrigation pipe with quick coupler	-	-	4.000 (meter)
Moto-pump	88	145	282

SOURCE: DEE/ABIMAQ - SINDIMAQ

Informers: 104 industries

CHART 2.7 - PRINCIPAL AGRICULTURAL MACHINERY IMPORTED IN 1979

Combined sets for preparation or cultivation of the soil - 107 unities - US\$ 424.235 CIF

Self - propelled combine harvester: 51 unities - US\$ 653.486 CIF

Any other combine harvester: 66 unities - US\$ 159.640 CIF

Mower and Baler machines: 1.052 unities - US\$ 407.312 CIF

Separated parts for harvester machines - US\$ 1.075.834 CIF

Other machines for agricultural products harvesting: 296 unities - US\$ 401.793 CIF

Source: Secretaria da Receita Federal



