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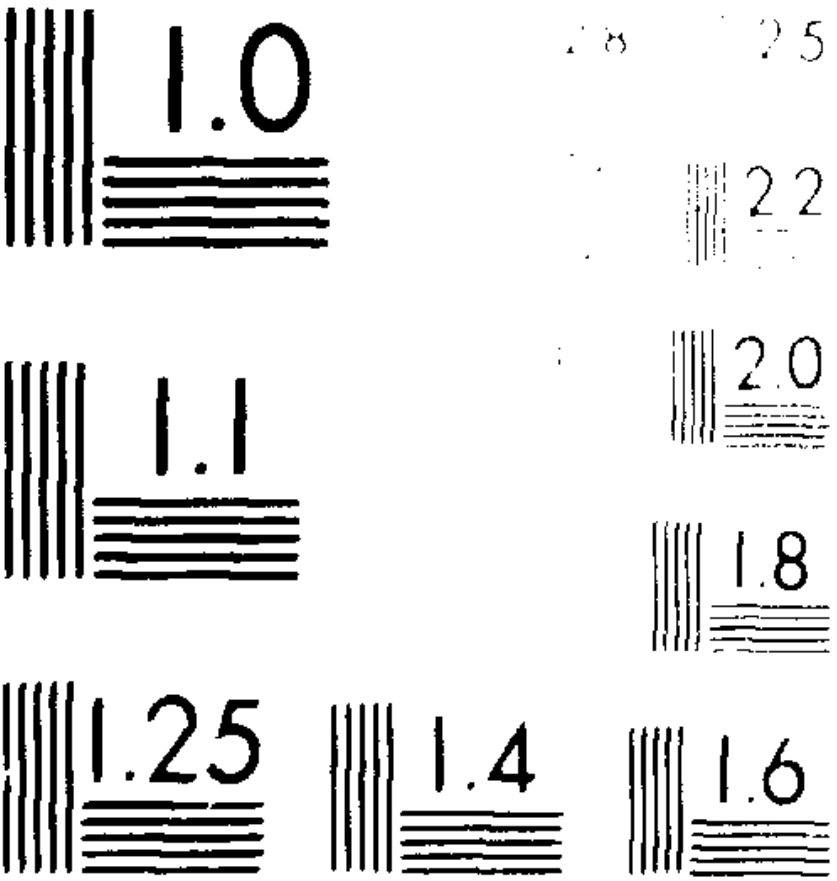
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BRAZILIAN AGRICULTURAL MACHINERY INDUSTRY[1/]

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1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. It was prepared to be utilized in the preparation of issue paper to be discussed at the Second Consultation Meeting on Agricultural Machinery Industry.

CONTENTS

APPENDIXES

GLOSSARY OF ACRONYMS

ABIMAQ - Associação Brasileira da Indústria de Máquinas e Equipamentos (Brazilian Association of the Machines and Equipment Industry)

ABRAVE - Associação Brasileira dos Revendedores de Veículos (Brazilian Association of Motor Vehicle Dealerships)

AMI - Agricultural Machinery Industry

ANFAVEA - Associação Nacional dos Fabricantes de Veículos Automotores (National Association of Automotive Vehicle)

BNDES - Banco Nacional do Desenvolvimento Econômico e Social national Bank for Economic and Social Development)

CACEX - Carteira de Comércio Exterior do Banco do Brasil (Banco do Brasil's Foreign Trade Department)

CDI - Conselho de Desenvolvimento Industrial (Industrial Development Council)

CIEF/SRF - Coordenação do Sistema de Informações Econômico-Fiscais e Secretaria da Receita Federal do Ministério da Fazenda (Economic-Fiscal Data Coordination System/Internal Revenue Department of the Ministry of Finance)

EMBRAPA - Empresa Brasileira de Pesquisa Agrícola (Brazilian Agricultural Research Enterprise)

EMBRATER - Empresa Brasileira de Assistência Técnica e Extensão Rural (Brazilian Technical Assistance and Rural Extension Enterprise)

FIBGE - Fundação Instituto Brasileiro de Geografia e Estatística (Brazilian Institute for Geography and Statistics Foundation)

IPEA/INPES - Instituto de Pesquisas Econômicas da Secretaria de Planejamento (Economic Research Institute of the Planning Ministry)

MVR - Maior Valor de Referência (Highest Value of Reference)

ORTN - Obrigação Reajustável do Tesouro Nacional (Indexed Treasure Bond)

PROFIR - Programa de Financiamento para a Aquisição de Equipamento para Irrigação (Irrigation Equipment Acquisition Financing Program)

SUDAM - Superintendência para o Desenvolvimento da Amazônia (Superintendence for the Development of the Amazon Region)

SUDENE - Superintendência para o Desenvolvimento do Nordeste (Superintendence for the Development of the Northeast Region)

TAB - Tarifas Aduaneiras Brasileiras (Brazilian Customs Tariffs)

SUMMARY

The agricultural machinery industry in Brazil is among the oldest in the country. It consolidated itself during the industrialization drive that gained momentum in the fifties within the strategy of imports substitution adopted.

Although it is not easy to clearly define the boundaries of this industry as it is most frequently inserted into other branches of the capital goods industries such as the metal mechanic, metallurgical, and automotive it was possible to identify about 340 firms, the lines of products of which were mainly agricultural machines and implements.

Due to the predominance of transnational corporations as well as the presence of large domestic companies the sector could preclude the help of regional co-operation agreements as regards technical assistance, using either technology transferred from their overseas headquarters or through the licenses to manufacture secured by domestic companies. According to ABIMAQ, at present, 80% of this industry's technology is from domestic origin.

As the industry was basically set up to cater to the domestic market the share of exports in total output is negligible. Likewise as regards imports, for the government policy requires that within a certain number of years a high degree of domestic content should be reached.

The main growth ingredients of the sector were the large size of the market and the agricultural policies in general, that stimulated farmers to mechanize and thus to demand agricultural machinery. Of course, conventional instruments like subsidized credit, high tarifs and the so-called "Law of Similars" that prohibited imports of industrial goods domestically produced were available, but they had a minor importance.

At present, both as a result of over ambitious expansion plans fostered by the government and of the recession, the sector has a very high level of idle capacity.

Introduction

The aim of this study is to provide information and contribute to the discussion on the agricultural machinery industry in Brazil.

The duration of the study and the large number of aspects to be covered imposed a rather selective treatment of the information, in the sense that use was made of only those that were most relevant to depict the Brazilian case. Moreover, as the Terms of Reference were meant for the study of various countries, it is obvious that it cannot be expected a perfect adherence of the study to the scope that was required, seeing that each country has its own characteristics that are not necessarily shared with the others.[1]

It is for example, the case of Brazil, where an extremely complex industrial sector was set up, with a strong and highly developed metal-mechanic industry. As the agricultural machinery and implement industry is inserted both in the metal-mechanic and metallurgical branches, at the level of the enterprise it is very often impossible to perceive exactly which branch of industry does it belong to. However, through crossed information from several sources was it possible to isolate a large number of firms that were considered belonging to the agricultural machinery industry.

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[1] As it was clearly spelled out in the Terms of Reference the need for the standardized treatment of information with a view to enabling the comparability of the various country studies, in the present paper the suggested titles of the chapters were maintained, even though, at times, because of the specificities of the Brazilian case, their contents depart a little from what was required.

Regarding statistical data, mainly those relating to production and sales, it was possible to obtain a good coverage of the mechanical branch, which includes, generally, more sophisticated companies which have their own manufacturers's associations, that are excellent sources of information. On the other hand, as to products related to metallurgical industry,e.g. hand tools, the situation is quite distinct. As in general the manufacturers of these items are small family enterprises (or, some times, metallurgical firms turning out inumerable products, out of which only a small fraction are hand tools) it is exceedingly difficult to collect data on this type of product.

Finally, throughout this study the reader should recall that Brazil is a highly diversified economy, whose powerful and sophisticated industrial sector exported in 1981, amid the international trade crisis, US$ 13.9 billion out of a total of US$ 23.3 billion!

I. STATISTICAL DATA

This chapter is composed of three large tables that present the basic data on the AMI.

The first of these tables is subdivided into two others, one on production, in terms of physical units of agricultural machinery, and the other on the value of its sales. The sources of these tables are the associations of manufacturers of machinery and equipment (ABIMAQ and ANFAVEA), and for this reason, hand tools are not included, since their manufacturers are not associated in a similar way.

The second table shows the number of some of the main agricultural equipment in use in the years of the censuses. The sole available source for this type of data are the Agricultural Censuses taken every five years by the FIBGE.

The third table is on foreign trade of agricultural machines and implements, covering all their items. The sources for these data are governmental agencies in charge of the control of the Brazilian international trade.

In the first two tables, the forms of presentation of the data by the sources did not permit a uniform presentation for all the years. However, one opted here for furnishing the largest possible number of information for the largest possible number of years provided that the comparability between the years could be ensured.

Table A-1

AGRICULTURAL MACHINERY: UNITS PRODUCED

(THOUSAND)

ITEMS	1974	1975	1976	1977	1978	1979	1980	1981
HAND OPERATED MACHINES	272.0	228.0	362.0	272.0	451.0	330.6	322.7	441.6
Sprayers,dusters and other similar items	272.0	228.0	262.0	272.0	451.0	327.4	314.6	439.3
Other hand operated machines	n.a.	n.a.	n.a.	n.a.	n.a.	3.2	8.1	2.3
ANIMAL-DRAWN EQUIPMENT	15.3	26.1	49.0	n.a.	n.a.	44.1	39.8	3.9
Ploughs	9.0	13.0	16.0	n.a.	n.a.	8.6	1.2	0.5
Cultivators	6.0	13.0	33.0	n.a.	n.a.	34.8	38.6	3.1
Sprayers	0.3	0.1	-	n.a.	n.a.	n.a.	n.a.	0.2
Other animal-drawn equipment	n.a.	n.a.	n.a.	n.a.	n.a.	0.7	0.1	0.1
POWER MACHINERY	93.6	127.5	147.9	56.0	52.9	112.8	145.8	253.9
Automotive Units	59.6	71.5	78.9	56.0	52.9	75.1	102.3	71.4
Self-propelled sprayers and dusters and other similar items	2.0	1.0	4.0	n.a.	n.a.	9.2	30.3	22.4
Self-propelled combines	7.0	8.1	7.1	n.a.	n.a.	4.6	6.3	5.2
Four-wheeled tractors	46.9	59.2	65.3	53.0	48.7	55.2	58.8	39.3
Cultivators	3.7	3.2	2.5	3.0	4.2	6.1	6.9	4.5
Irrigation Equipment	34.0	56.0	69.0	n.a.	n.a.	37.7	44.5	182.5
Sprinklers	34.0	56.0	69.0	n.a.	n.a.	36.2	43.0	179.9
Other irrigation equipment	n.a.	n.a.	n.a.	n.a.	n.a.	1.5	1.5	2.6
Components [1]	n.a.	n.a.	n.a.	n.a.	n.a.	974.9	115.7	259.3
TRACTOR DRIVEN EQUIPMENT	327.6	348.2	492.6	92.0	64.0	715.8	770.8	516.9
Tillage Equipment	203.8	192.8	360.9	91.0	60.0	335.2	263.5	68.4
Ploughs	44 0	50.0	53.0	64.0	42.0	27.2	36.1	13.3
Harrows	48.0	55.0	95.0	n.a.	n.a.	40.7	56.4	31.6
Ridgers	n.a.	n.a.	n.a.	n.a.	n.a.	0.3	0.6	1.1
Subsoilers	2.0	3.0	2.0	n.a.	n.a.	2.8	2.1	3.0
Cultivators	15.0	19.0	44.8	n.a.	n.a.	8.8	14.1	12.5
Land planes	42.0	35.0	121.0	27.0	18.0	11.8	14.1	6.9
Other tillage equipment	52.8	30.8	45.1	n.a.	n.a.	243.6	140.1	n.a.
Components [2]	n.a.	n.a.	n.a.	n.a.	n.a.	879.8	1,581.8	1,261.6
Seeding and Fertilizer Equipment	21.0	23.0	19.0	n.a.	n.a.	235.9	353.6	324.7
Fertilizer distributor	4.0	6.0	7.0	n.a.	n.a.	2.1	2.3	1.7
Planter-fertilizer	17.0	17.0	12.0	n.a.	n.a.	10.0	13.8	10.8
Fertilizer	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.3
Planter	n.a.	n.a.	n.a.	n.a.	n.a.	30.5	139.9	311.9

Table A-1 (cont.)

AGRICULTURAL MACHINERY: UNITS PRODUCED

(THOUSAND)

ITEMS	1974	1975	1976	1977[3]	1978[3]	1979	1980	1981
Components	n.a.	n.a.	n.a.	n.a.	n.a.	192.7	197.6	n.a.
Plant Protection Equipment	15.0	14.0	16.0	n.a.	n.a.	23.3	11.7	10.7
Dusters, sprayers and other similar items	15.0	14.0	16.0	n.a.	n.a.	23.3	11.7	10.7
Harvesting and Threshing Equipment	6.0	6.1	13.1	n.a.	n.a.	43.1	20.4	16.7
Combines	1.0	1.1	7.1	n.a.	n.a.	0.3	1.4	2.0
Reapers	n.a.	n.a.	n.a.	n.a.	n.a.	37.1	1.6	0.1
Threshers	5.0	5.0	6.0	n.a.	n.a.	2.7	13.7	10.1
Other harvesting and threshing equipment	n.a.	n.a.	n.a.	n.a.	n.a.	2.7	2.9	3.8
Components	n.a.	n.a.	n.a.	n.a.	n.a.	0.3	0.8	0.7
Processing Equipment	49.1	71.1	48.6	1.0	2.0	47.0	84.6	70.6
Shellers and huskers	0.2	0.2	0.2	n.a.	n.a	0.3	0.4	0.7
Grain driers	3.0	1.0	2.0	1.0	2.0	2.0	1.0	1.8
Milling equipment	1.2	0.9	0.4	n.a.	n.a.	4.9	26.7	26.2
Other processing equipment	43.7	69.0	46.0	n.a.	n.a.	39.8	56.5	42.0
Grain Handling Equipment	3.0	5.1	7.0	n.a.	2.0	6.6	9.4	7.0
Silos	n.a.	n.a.	n.a.	n.a.	2.0	1.0	1.9	2.1
Elevators	-	0.1	5.0	n.a.	n.a.	2.7	2.1	2.9
Other grain handling equipment	3.0	5.0	2.0	n.a.	n.a.	2.1	4.5	1.0
Components	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	0.9	1.0
Transport Equipment	29.7	36.1	28.0	n.a.	n.a.	24.7	27.6	18.8
Trailers	17.0	17.0	14.0	n.a.	n.a.	10.6	13.9	8.3
Other transport equipments	12.2	18.7	11.0	n.a.	n.a.	10.7	10.4	9.5
Components	0.5	0.4	3.0	n.a.	n.a.	3.4	3.3	1.0
TOTAL OF AGRICULTURAL MACHINERY	708.5	729.8	1,051.5	1,306.0	1,308.0	1,203.3	1,280.1	1,216.3

Sources: ABIMAQ - Brazilian Association of Machine and Equipment Industry.
ANFAVEA - National Association of Automotive Vehicle Producers.

Notes: [1]This item is measured in meters, thus it is not considered with the other items.

[2]This item is not included in the total since it represents a sizeable number of parts and components with a negligible unit value, but wich would distort the grand total.

[3]For these years the available breakdown for the products does not allow the same presentation of the data as in the other years. However, the grand total covers all types of agricultural machinery.

Table A-2

AGRICULTURAL MACHINERY: VALUE OF SALES

(US$ million)

ITEMS	1974[1]	1975[1]	1976[1]	1977[2]	1978[2]	1979	1980	1981
HAND OPERATED MACHINES	18.8	12.2	15.6	n.a.	n.a.	19.8	17.3	22.7
Sprayers, dusters and other similar items	18.8	12.2	15.6	n.a.	n.a.	18.6	16.5	19.3
Other hand operated machines	n.a.	n.a.	n.a.	n.a.	n.a.	1.2	0.8	3.4
ANIMAL-DRAWN EQUIPMENT	0.8	1.1	2.6	n.a.	n.a.	3.9	3.8	0.7
Ploughs	0.3	0.4	2.1	n.a.	n.a.	2.9	2.6	0.4
Cultivators	0.4	0.7	0.5	n.a.	n.a.	0.8	1.1	0.1
Sprayers	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.1
Other animal-drawn equipment	-	-	-	n.a.	n.a.	0.2	0.1	0.1
POWER MACHINERY	124.1	176.7	196.0	147.6	155.5	224.9	231.5	293.9
Automotive Units	116.4	167.6	184.8	136.5	121.7	187.1	202.3	236.7
Self-propelled sprayers and dusters and other similar items	1.0	0.7	4.6	n.a.	n.a.	11.4	9.8	13.6
Self-propelled combines	15.4	166.9	180.2	136.5	121.7	175.7	192.5	223.1
Four-wheeled tractors	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cultivators	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Irrigation Equipment	7.7	9.1	11.2	11.1	33.8	37.8	29.2	57.2
Sprinklers	0.3	0.5	0.6	n.a.	n.a.	0.5	1.1	2.7
Other irrigation equipment	7.4	8.6	10.6	11.6	33.8	20.6	21.5	37.0
Components	n.a.	n.a.	n.a.	n.a.	n.a.	16.7	6.6	17.5
TRACTOR DRIVEN EQUIPMENT	176.0	215.3	281.3	114.9	117.3	315.9	346.7	337.0
Tillage Equipment	96.9	118.2	184.8	85.1	71.1	176.3	180.6	151.7
Ploughs	29.9	32.6	38.5	51.5	27.5	19.1	24.7	14.2
Harrows	23.5	31.2	71.4	15.5	28.5	62.6	66.5	44.1
Ridgers	0.1	0.2	n.a.	n.a.	n.a.	2.1	2.0	3.7
Subsoilers	1.3	1.9	0.8	n.a.	n.a.	2.3	1.1	3.1
Cultivators	2.4	2.2	7.9	n.a.	n.a.	8.9	15.9	19.7
Land planes	7.2	12.8	20.9	18.1	15.1	10.2	12.4	4.0
Other tillage equipment	31.6	35.7	41.9	n.a.	n.a.	38.6	29.4	32.3
Components								
Seeding and Fertilizer Equipment	22.2	29.3	24.1	n.a.	n.a.	25.7	40.4	26.1
Fertilizer distributor	n.a.	n.a.	n.a.	n.a.	n.a.	1.7	2.1	1.6
Planter-fertilizer	13.1	20.0	12.0	n.a.	n.a.	12.1	12.0	8.6
Fertilizer	n.a.	n.a.	n.a.	n.a.	n.a.	-	-	0.1
Planter	9.1	9.3	12.1	n.a.	n.a	11.5	24.9	16.8

Table A-2 (cont.)

AGRICULTURAL MACHINERY: VALUE OF SALES

(US$ million)

ITEMS	1974[1]	1975[1]	1976[1]	1977[2]	1978[2]	1979	1980	1981
Components	n.a.	n.a.	n.a.	n.a.	n.a.	0.4	1.4	-
Plant Protection Equipment	10.7	9.8	14.0	17.0	11.7	20.5	16.2	16.9
Dusters, sprayers and other similar items	10.7	9.8	14.0	17.0	11.7	20.5	16.2	16.9
Harvesting and Threshing Equipment	8.2	5.2	4.4	n.a.	n.a.	11.9	15.6	24.4
Combines	n.a.	n.a.	n.a.	n.a.	n.a.	2.4	5.0	8.3
Reapers	n.a.	n.a.	n.a.	n.a.	n.a.	2.5	0.6	0.3
Threshers	1.6	1.5	2.1	n.a.	n.a.	0.8	2.8	4.6
Other harvesting and threshing equipment	6.6	3.7	2.3	n.a.	n.a.	6.1	5.9	9.9
Components	n.a.	n.a.	n.a.	n.a.	n.a.	0.1	1.3	1.3
Processing Equipment	24.7	36.9	37.5	12.8	19.7	44.2	46.0	65.2
Shellers and huskers	0.1	0.1	0.2	n.a.	n.a.	0.5	0.3	0.7
Grain driers	10.6	14.2	15.0	1.28	19.7	13.5	6.5	20.2
Milling equipment	0.6	0.2	0.1	n.a.	n.a.	1.1	3.1	2.2
Other processing equipment	13.4	22.2	22.2	n.a.	n.a.	29.1	36.1	42.1
Grain Handling Equipment	0.1	0.4	0.2	n.a.	14.8	18.9	26.1	28.1
Silos	n.a.	n.a.	n.a.	n.a.	14.8	10.1	16.9	20.7
Elevators	n.a.	n.a.	1.0	n.a.	n.a.	7.8	3.2	7.1
Other grain handling equipment	0.1	0.4	0.2	n.a.	n.a.	0.2	0.5	0.3
Components	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	5.5	-
Transport Equipment	13.2	15.5	16.3	n.a.	n.a.	18.4	21.8	24.6
Trailers	8.8	10.1	7.8	n.a.	n.a.	8.0	8.5	6.9
Other transport equipments	2.9	4.0	6.0	n.a.	n.a.	8.8	12.1	17.2
Components	1.5	1.4	2.5	n.a.	n.a.	1.6	1.3	0.5
TOTAL OF AGRICULTURAL MACHINERY	319.7	405.3	505.5	533.8	546.0	564.5	599.3	654.3

Sources: ABIMAQ - Brazilian Association of Machine and Equipment Industry.

ANFAVEA - National Association of Automotive Vehicle Producers.

Notes: [1]These years relate only to the domestic market.

[2]For these years the available breakdown for the products does not allow the same presentation of the data as in the other years. However, the grand total covers all types of agricultural machinery.

Table B AGRICULTURAL MACHINERY IN OPERATION

(Census data)

AGRICULTURAL MACHINES	1970	1975	1980[1]
TRACTORS	165,870	323,113	530,691
Less than 10 hp	19,620	26,773	n.a.
10 to 50 hp	80,952	86,870	n.a.
50 to 100 hp	61,554	188,892	n.a.
More than 100 hp	3,744	20,778	n.a.
PLOUGHS	1,873,925	2,093,960	n.a.
Animal-drawn	1,718,041	1,758,051	n.a.
Tractor driven	160,884	335,909	n.a.
HARVESTERS (self-propelled and combines)	98,184	84,707	n.a.

Sources: FIBGE Censo Agropecuário - Brasil - 1970, Rio de Janeiro, 1975.
FIBGE, Censo Agropecuário - Brasil - 1975, Rio de Janeiro, 1979.
FIBGE, Sinopse Preliminar do Censo Agropecuário - Brasil-1980, Rio de Janeiro, 1982.

Note: [1]At this writing, the only results available for 1980 were those published in the "Preliminary Synopsis of the 1980 Census", in which the item tractors was not broken down and the other figures did not appear.

n.a.: not available

Table C-1

AGRICULTURAL MACHINERY: FOREIGN TRADE

EXPORTS (US$ THOUSAND)

	1970	1975	1978	1979	1980	1981
A- HAND TOOLS	36.8	1,832.7	2,506.6	2,374.0	2,205.8	2,820.1
Sickles	5.4	21.7	87.6	64.3	78.3	96.1
Rakers and other similar items	0.9	44.4	9.7	20.5	24.1	81.3
Spades, shovels and pick axes	5.9	1,640.3	2,201.3	2,098.5	1,871.3	2,379.5
Other hand tools	24.6	126.3	208.0	190.7	232.1	273.2
B- HAND OPERATED MACHINES	-	14.7	1,256.9	1,254.1	1,920.5	2,367.1
Hand pumps	n.a.	14.7	21.7	33.1	33.8	137.8
Dusters, sprayers and other similar items	a	n.a.	1,109.8	1,192.7	1,747.4	2,083.5
Other hand operated machine	n.a.	-	45.4	28.3	139.3	145.8
C- ANIMAL-DRAWN EQUIPMENT	1.1	n.a.	94.4	140.7	106.6	81.1
Ploughs	1.1	n.a.	94.4	140.7	106.6	81.1
D- POWER MACHINERY						
D.1- Automotive Units	247.4	10,961.0	54,341.7	71,640.2	102,106.4	119,020.4
Self-propelled sprayers, dusters and other similar items	a	n.a.	-	5.7	19.8	51.8
Self-propelled combines	-	4,793.2	6,211.3	8,473.9	12,234.7	16,491.0
Four-wheeled micro-tractors	247.4	195.6	537.2	858.4	321.6	6.7
Two-wheeled tractors		126.2	253.1	401.7	778.0	410.8
Four-wheeled tractors		5,846.0	47,340.1	61,900.5	88,752.3	102,060.1
E- TRACTOR DRIVEN IMPLEMENTS AND EQUIPMENT	1,065.1	6,418.4	14,791.4	19,106.2	28,694.1	26,446.4
E.1- Tillage Equipment	45.7	1,455.3	5,030.3	9,705.2	13,107.0	7,808.0
Disc ploughs	-	-	1,018.4	1,345.1	2,530.5	1,617.2
Disc harrows	24.3	1,128.2	3,541.9	7,855.6	8,805.3	4,863.2
Cultivators	21.4	-	242.6	192.6	171.3	367.6
Other ploughs	-	-	147.2	229.6	507.2	429.4
Other harrows	-	-	-	-	58.9	69.7
Other tillage equipment	-	238.5	80.2	82.3	1,033.8	1,892.6
E.2- Seeding and Fertilizer Equipment	149.8	1,834.6	1,888.4	3,040.1	4,954.2	5,815.3
Fertilizer distributors	-	14.6	6.0	41.3	341.8	351.7
Planter or Planter-fertilizer distributor	139.1	927.9	273.7	1,485.4	1,471.8	2,266.6
Components	10.7	647.2	453.5	799.5	1,825.6	1,732.7
Other seeding and fertilizer equipment	-	244.9	437.3	713.9	1,315.0	1,464.3
E.3- Plant-Protection Equipment	a	n.a.	4,174.3	3,551.1	4,610.9	3,894.0
Dusters, sprayers and other similar items	a	n.a.	3,434.3	2,648.9	3,229.5	2,898,3
Other plant-protection equipment	a	n.a.	740.0	902.2	1,381.4	995.7
E.4- Harversting and Threshing equipment	869.6	2,881.5	2,983.9	1.548.6	2,666.3	5,869.4
Combines	27.1	315.3	339.8	278.2	611.6	1,301.3
Reapers	6.9	4.4	76.4	35.4	93.7	352.3
Components	14.0	230.4	447.1	525.5	1,043.6	2,013.7
Other harvesting and threshing equipment	821.6	2,331.4	2,120.6	709.5	917.4	2,202.1

Table C-1 (cont.) AGRICULTURAL MACHINERY: FOREING TRADE

EXPORTS (US$ THOUSAND)

	1970	1975	1978	1979	1980	1981
E.5- Processing Equipment	-	247.0	714.5	1,261.2	3,355.7	3,059.7
Grain selectors	-	104.1	377.8	696.8	2,231.0	904.2
Other processing equipment	-	142.9	336.7	564.4	1,124.7	2,155.5
TOTAL OF AGRICULTURAL MACHINERY	1.425.9	19,226.8	72,991.0	94,515.2	135,033.4	150,735.1

Source: CACEX/Banco do Brasil, Brasil, Comércio Exterior - Exportação, Rio de Janeiro, for various years.

Notes: a) In the case of sprayers dusters and other similar items, the information available for 1970 could not be brokendown into hand operated, animal-drawn and self-propelled categories. It is known that its total imports reached US$ 1,022 thousand and its exports US$ 75 thousand in the year 1970.

n.a.: not available

Table 3-2

AGRICULTURAL MACHINERY: FOREIGN TRADE

IMPORTS (US$ THOUSAND)

	1970	1975	1978	1979	1980	1981
A- HAND TOOLS	213.6	876.3	300.1	328.6	289.6	144.4
Sickles	69.0	68.3	4.5	4.7	3.4	7.0
Rakers and other similar items	1.6	15.7	20.8	43.0	1.3	0.3
Spades, shovels and pick axes	0.9	82.2	5.8	2.7	4.6	3.9
Other hand tools	142.1	264.6	269.0	278.2	280.3	136.2
B- HAND OPERATED MACHINES	-	455.5	412.9	339.9	198.6	278.5
Hand pumps	n.a.	379.6	131.6	134.6	108.0	131.2
Dusters, sprayers and other similar items	a	65.4	274.0	205.3	90.6	142.2
Other hand operated machine	n.a.	0.5	7.3	-	-	5.1
C- ANIMAL-DRAWN EQUIPMENT	0.7	-	-	-	-	-
Ploughs	0.7	-	-	-	-	-
D- POWER MACHINERY						
D.1- Automotive Units	11,877.4	52,240.1	3,526,4	803.7	970.1	105.2
Self-propelled sprayers, dusters and other similar items	a	5.8	285.3	89.6	34.8	-
Self-propelled combines	11,750.7	43,861.1	3,004.8	609.7	36.7	64.7
Four-wheeled micro-tractors		31.8	22.1	-	1.6	37.1
Two-wheeled tractors	126.7	0.8	33.2	5.0	7.0	3.4
Four-wheeled tractors		8,340.5	181.0	99.4	890.0	-
E- TRACTOR DRIVEN IMPLEMENTS AND EQUIPMENT	1,383.9	12:383.7	2,638.4	3,813.6	7,107.3	3,849.1
E.1- Tillage Equipment	250.2	224.9	93.7	21.1	53.2	6.5
Disc ploughs	-	6.3	-	2.8	0.4	1.6
Disc harrows	14.5	115.1	16.1	11.3	0.7	-
Cultivators	-	85.9	61.2	4.9	9.0	2.4
Other ploughs	2.1	4.3	12.6	0.3	17.6	1.5
Other harrows	-	-	-	-	-	-
Other tillage equipment	233.6	13.3	3.8	1.8	25.5	1.0
E.2- Seeding and Fertiliizer Equipment	258.9	1,508.4	756.5	878.3	736.6	622.9
Fertilizer distributors	40.4	94.7	17.0	22.5	12.7	1.4
Planter or Planter-fertilizer distributor	164.5	273.7	991.6	36.8	107.8	13.6
Components	36.4	369.8	434.0	404.3	414.5	426.1
Other seeding and fertilizer equipment	17.6	770.2	248.7	414.7	201.6	181.8
E.3- Plant-Protection Equipment	-	1,076.1	95.6	550.3	2,034.5	502.4
Dusters, sprayers and other similar items	a	669.4	95.6	259.4	2,007.2	367,5
Other plant-protection equipment	a	406.7	-	290.9	27.3	134.9
E.4- Harversting and Threshing equipment	874.8	9,368.4	1,610.3	1,808.4	4,144.7	2,611.1
Combines	n.a.	1,401.8	82.5	141.5	23.9	69.5
Reapers	181.6	1,556.7	373.9	351.2	720.1	295.9
Components	606.6	4,699.7	796.5	908.9	2,811,3	1,861.6
Other harvesting and threshing equipment	86.6	1,700,2	357.4	405.8	589.4	384.1

Table C-2 (cont.) AGRICULTURAL MACHINERY: FOREING TRADE

IMPORTS (US$ THOUSAND)

	1970	1975	1978	1979	1980	1981
E.5- Processing Equipment	-	205.9	82.3	555.5	138.3	106.2
Grain selectors	-	150.9	50.9	241.7	125.4	84.4
Other processing equipment	-	55.0	31.4	313.8	12.9	21.8
TOTAL OF AGRICULTURAL MACHINERY	14,498.1	65,945.6	6,877.8	5,285.8	8,565.6	4,377.2

Source: CIEF/SRF/Ministry of Finance, Comércio Exterior do Brasil - Importações, Brasília, for various years.

Notes: a) In the case of sprayers, dusters and other similar items, the information available for 1970 could not be brokendown into hand operated, animal-drawn and self-propelled categories. It is known that its total imports reached US$ 1,022 thousand and its exports US$ 75 thousand in the year 1970.

n.a.: not available

II - DOMESTIC POLICIES

A - Policies on agricultural mechanization

The incentive given to agricultural mechanization in Brazil is, basically, the result of the domestic rural credit investment policy and of the personal income tax legislation; more specifically, in the latter case, on the income derived from agricultural activities. Rural extension programs are also available, and could potentially encourage farmers towards a higher degree of mechanization.

A.1 - Rural credit

The main goals of rural credit in Brazil are to allow the economic strengthening of the small and medium-sized producers, as well as to stimulate the introduction of rational production methods, seeking to increase the productivity and enhance the standard of living of the rural population. To meet these goals, rural credit has been divided into three main categories - credit for current expenditures, marketing, and investment - as well as into several special programs. From the viewpoint of agricultural credit, agricultural mechanization is best encouraged by the credit for investments and by some of the special programs.

Investment credit serves a variety of purposes, such as irrigation; electric power and telephone systems for the rural areas; construction, remodeling or enlargement of permanent facilities; and, among other things, the acquisition of machines

and agricultural implements. These machines and implements may be new or revamped, with dealer warranty and must be produced domestically. Tractors, harvesting equipment and other agricultural machines, if not domestically produced, may only be financed if they are new and there are no similar products available domestically or if imported through government favors. Both cases rarely occur, though, since agricultural machinery imports are negligible

Presently, the finance periods range from 5 to 12 years. Tractors, harvesting equipment and other large machinery, however, have a maximum finance period of 8 years, with a 2 year grace period. According to World Bank estimates,[1] a five year credit given in 1975, at an interest rate of 15% p.a., would result in a subsidy of 54% of the principal! Subsidies granted by Banco do Brasil in 1976 for the acquisition of tractors totalled approximately US$ 250 million! Due to this excessive subsidy to the purchase of machines and equipment through government financing and the cost incurred, in 1979 the rules governing rural credit were modified. The last change in the legislation, in Dicember 1982, established a limit for credit operations relating to the acquisition of machines and equipment with subsidized interest.

Presently, the limit for subsidized credit is of 100

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[1] World Bank - Latin America and the Caribbean Regional Office "A Review of Agricultural Policies in Brazil". Washington, D.C. World Bank. 1982, p. 163.

MVR[1] - approximately 3,500 dollars - per applicant, per year. On the other hand, machines powered by alternative, domestically available, energy sources (e.g., gas generator and alcohol), are granted special treatment, with no fixed credit limit. The same treatment is given to irrigation equipment and expenses with the rehabilitation of used machines and equipment. These favored credits can finance from 40% to 100% of the total investments, depending on the status of the borrower (small, medium-sized, cooperatives, etc.) and pay an interest rate of 60% p.a. and, for the regions covered by SUDENE and SUDAM,[2] 35% p.a.. If the financing exceeds 100 MVR, the interest rate jumps to 8% p.a., plus monetary correction.[3] Since the inflation rate has been around 100% p.a. for the last 3 years, these credit terms (8% p.a. + monetary correction) are considered very onerous.

Considering that the credit limit for the acquisition of agricultural machinery and implements is 100 MVR (except for

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[1]The MVR or Highest Value of Reference is one of the several account units used in the indexation of the Brazilian economy. It is readjusted every six months (in May and November) concomitantly with the minimum wage. At present its value is equivalent to US$ 35,00.

[2]SUDAM (Superintendence for the Development of the Amazon Region) and SUDENE (Superintendence for the Development of the Northeast Region) are federal agencies created with the specific purpose of fostering regional development. As part of the incentives to the regions covered by SUDAM and SUDENE, the interest rates charged in most government financing contracts in those regions are considerably lower than the rates charged in the rest of the country.

[3]The form of indexation most used in Brazil is the one that applies the monthly change in the nominal value of the ORTN (Indexed Treasury Bonds) that is monthly fixed by the Monetary Authorities. At this writing one ORTN is worth slightly over US$ 8.00. In other words, generally speaking, the term monetary correction means indexation through the variation of the ORTN.

the few special cases mentioned before), and taking into account that this represents only 25% of the cost of a medium-sized wheel tractor, it is evident that, nowadays, the financial subsidies for the acquisition of machinery and implements have ceased to exist, as compared to the situation prior to the 1979 reformulation of the rules governing rural credit. The decrease in sales of large agricultural machines since 1980, as is the case of tractors, can be explained by, among other reasons, the increase in financing costs. In much the same way that a credit subsidy of almost 50% of the value of a tractor may have induced an excessive demand in the past, the present restrictions may be hindering sales of agricultural machines nowadays, especially the most expensive ones.

Besides the general rural credit for investments, there are several special rural credit programs that also finance agricultural machinery. Credit, within these special programs, is given only to applicants who fulfill a series of requirements, such as the presentation of projects explaining exactly what the credit will be used for. This credit may cover up to 100% of the budgeted value, but is usually restricted to 100 MVR, unless it is meant to finance "mechanized patrols",[1] no matter if these "patrols" are set up by cooperative organizations or companies specialized in providing agricultural services (tilling, harvesting, cropdusting, etc.). The government argues that "mechanized

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[1] "Mechanized Patrol" is a set of agricultural machines and implements owned by an entity (cooperatives, firms, etc.) that renders services to farmers in a certain region.

patrols" can make more efficient use of the agricultural machinery and, thus, deserve special treatment.

One of the special programs stands out from the rest. It is called PROFIR (Irrigation Equipment Acquisition Financing Program). The only limit established by PROFIR, of 400 MVR, is for the acquisition of machines and equipment which consume imported fuel. There is no credit limit if electricity or non-conventional energy sources are used. The financing terms are: 6 years, 2 year grace period and interest rates of 60% p.a. (25% for the regions covered by SUDAM and SUDENE). The credit terms are the same as for the general rural credit but, since there is no credit limit, they represent a sizeable incentive, especially if an inflation rate surpassing 100% is taken into account, considering the interest rates mentioned above.

A.2 - Personal income tax for rural producers

The Brazilian income tax legislation gives very special treatment to rural producers. This, in turn, provides a very strong encouragement towards agricultural mechanization.

Through a series of laws promulgated since 1969,[1] the federal government has provided a very strong incentive to agricultural activities, in general, and to the acquisition of equipment, in particular.

Thus, since 1970, the taxable income for rural pro-

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[1]Decree nº 902/1969, Decree nº 1074/1970, Decree nº 76186/1975, and Decree nº 85450/1980.

ducers is being determined through a series of steps. Firstly, the gross income of the agricultural producer is determined, and then all current expenses, such as taxes, interest and amortization, payroll expenses, etc., are deducted from it. Secondly, the investment expenses are deducted. Following is a list of the investment expenses relevant to this study:

Group of investments nº 2 - coefficient = 5

Items 01 - tractors
02 - implements and equipment
03 - trucks and all purpose vehicles
04 - engines and generators
05 - agricultural devices
06 - cropduster planes (domestically manufactured).

Group of investments nº 4 - coefficient = 2

Items 01 - equipment
02 - animal drawn vehicles
03 - draft animals
04 - implements that last at least 1 year.

This means, for example, that the expense incurred in the acquisition of a tractor may by deducted 5 times from the rural producer's gross income! On the other hand, in the case of animal drawn vehicles, the expense incurred may only be deducted twice. This denotes a clear incentive towards the acquisition of more sophisticated equipment.

Still in the process of determining the rural producer's taxable income, the legislation allows the net income to be divided by two, after all the deductions. Also, the taxable

net income is limited to 5% of the gross income, so that the producer may decide for a lower value in case his established net income after all deductions have been made is still above the 5% value. Thus, it is frequently possible that, after so many deductions, the rural producer comes up with a loss, for taxable purposes! In this case, the loss for a given year may be compensated in the statements for the three subsequent years. In the event the taxable net income is positive, it is then taxed according to the income tax schedule adopted in the country for all types of income, which taxes progressively up to the 55% bracket.

In the case of agricultural enterprises, the coefficients used for the deduction of the expenses are the same as the ones mentioned above, and the legislation taxes the operational result in 6%, in contrast with 30 to 35% for non-agricultural enterprises!

It has thus been seen the very special treatment given to agricultural activities by the income tax legislation, and the formidable encouragement given to the acquisition of agricultural machinery. However, it should be observed that the benefits are so generous that, in practice, they could even have their role of providing incentives reduced. Since, under normal conditions, the rural producer pays such an insignificant amount in terms of income tax, the acquisition of certain machines and implements may, in certain cases, benefit very little from these tax subsidies. In other words, a subsidy is valid only when it is an exception. When it is a rule, it partially loses its importance.

A.1.3 - Technical assistance programs

The two major institutions providing technical agricultural assistance in Brazil are EMBRATER - Brazilian Technical Assistance and Rural Extension Enterprise, and EMPRAPA - Brazilian Agricultural Research Enterprise. Researches are undertaken, either directly or through agreements with other institutions, and technical assistance is provided to producers. There are no explicit policies on the part of these institutions pertaining to agricultural mechanization. Their goal, though, is to strenghthen the rural producer's production capacity, to encourage the introduction of rational production methods, and to improve the standard of living in the rural areas of the country. Thus, it is a natural consequence that the effort provided by these institutions will have a positive effect in terms of increasing the use of agricultural machinery and implements.

B - Policies for the domestic production of agricultural machinery

Generally speaking, the agricultural machinery industry consolidated itself in the 50's, at a time when industrialization was moving at a very fast pace in the country, especially in the durable goods sector, such as the automotive industry, for example. The country's agricultural potential attracted Brazilian, as well as transnational corporations.

It is probable that the greatest attraction towards the agricultural industry was (and still is) the size of the domestic market. Besides this formidable market, the govern-

ment has adopted an imports substitution policy by levying on imports extremely high tariffs whenever similar goods were available domestically. Along with import restrictions, the government also aided those who decided to invest in the industrial sector. Upon approval of the project by the CDI (Industrial Development Council), the firm would obtain fiscal incentives such as the importation of machine tools necessary to the plant or the importation of parts and components of the products that were to be produced, with exemption or reduction of the customs duties. Aside from that, in the case of businesses with a majority of capital in the hands of Brazilian nationals, the medium and long term financings, provided mainly by the BNDES (National Bank for Economic and Social Development), had negative real interest rates, which in fact constituted a subsidy.

Despite some controls and limitations imposed on the remittance of profits by Brazilian branches of foreign companies, there were no major limiting factors nor discriminations against their installation in the country. A transnational corporation can operate in the country with 100% of its capital in foreign hands. The objective of the prevailing economic policy on foreign enterprises is to maximize the domestic production of goods, with the greatest possible index of domestic content. This policy gives preference to goods that are either basic to the domestic market or that have a good export potential. Due to the large number of transnational corporations operating in the agricultural machinery sector, especially in the production of more sophisticated goods, the competition in the sector enabled the

introduction of advanced technologies, without any encouragement on the part of the government.

The government gave strong encouragement to the development of the capital goods sector in the 70's. As to the BNDES, the agricultural machinery industry was then included in this sector, and thus was within the Bank's financing priorities. After 1979, however, the country starts to suffer from a severe crisis with the slowdown in the economic activity, a sharp rise in the inflation rate and the aggravation of the Balance of Payments situation. This caused the capital goods sector to operate at a very hign level of idle capacity. Then, the economic policy adopted by the present government shifted its priority to the agriculture, since it was viewed as the only sector capable of providing a solution to the crisis, throught exportable surpluses, production of non-conventional energy, reduction in food prices, etc.

The BNDES, the main industrial financing agent in the country began, therefore, to treat the agricultural machinery sector as part of the agricultural sector, as opposed to its previous position within the capital goods sector, maintaining, thus, its priority within the Bank's credit policies.

The agricultural machinery sector is not homogeneous, being inserted in the mechanical as well as in the metallurgical and transportation equipment sectors. However, nowadays almost the entire sector is experiencing difficulties. This is a direct consequence of the excessive investments in the sector in the last decade and its total dependence on the performance of

agriculture and, naturally, on the policies laid out for the agricultural sector.

In the last decade, based on ambitious development plans, the government led the sector towards a sharp rise in the production capacity (e.g., the tractor industry). Thus, the government threatened to allow the importation of tractors, therefore forcing the industry to increase its production capacity to 110.000 units per year. At present, the sector produces no more than 37.600 tractors per year! So, despite the government's declared priority to agriculture, the sector is going through a severe crisis. According to estimates made by the tractor industry, the present volume of sales is insufficient even to meet the depreciation of the existing machines. The change in the rural credit policies (see previous section), skyrocketing inflation, a weakly enforced minimum prices policy and the risks in price control have brought an uncertainty to the rural producer as to the future profitability of his activity, hindering, therefore, the acquisition of new agricultural machines.

The agricultural machinery sector, according to its manufacturers's association doesn't believe in the need for an explicit policy for the sector. What is believed to be fundamental to its survival is the adoption of a coherent agricultural policy that allows the capitalization of the rural producer, so that he may again have the capacity of acquiring the equipment he needs.

To conclude, there are no explicit policies pertaining to the domestic production of agricultural machinery. There is,

on the other hand, some financing of the sector through the BNDES and customs protection assuring the sector a reserved market. However, the most important policy for the sector is the agricultural policy in general.

The tables shown below present data on BNDES's financing for the sector and the import duties presently charged for the major categories of agricultural machinery.

BNDES's Financing to Agricultural Machinery Industry, 1979-1982

- US$ million -

	Agricultural Mechinery[1]	Total[1]
1979	5.6	4,163.6
1980	9.4	2,989.8
1981	6.1	3,147.0
1982	8.7	4,373.3

Sources: Relatório Anual do Banco Nacional do Desenvolvimento Econômico e Social (BNDES Annual Report), for various years.

Note: [1]Disbursed amounts in the year.

The table above shows that the funds allocated by the BNDES in the latest years to the agricultural machinery sector are ridiculously low if compared to its total disbursements!

Import Tax on Agricultural Machines*

A - Hand tools	85%
B - Animal drawn equipment	45%
C - Power machinery	
Dusters	30%
Harvesters	30%
Trators	30%
D - Implements	
Tillage equipment	30-45%
Seeding equipment	
Plant protection equipment	30%
Harvesting equipment	30%

Source: TAB - Tarifas Aduaneiras Brasileiras, Ministério da Fazenda.

* Existing structure in December, 1982.

In terms of protecting the domestic production of agricultural machinery, the Law of Similars is even more important than the import tax. According to this law, importation of machinery, nowadays, is restricted to those which are not produced or do not have a similar item produced domestically. This law is meant to restrict the market to the domestic industry as much as possible.

Aside from that, since some agricultural machines produced domestically depend on imported components, the CDI (Industrial Development Council) exerts a certain control over the companies which produce these machines, seeking to increase the index of domestic content within the established deadlines.

For rural credit purposes, the equipment approved by the CDI are the only ones eligible for official financing.

C - Existing plans for the capital goods industry and for agricultural mechanization

As regards agricultural mechanization, as previously mentioned in section A, the are no explicit policies nor plans. Agricultural mechanization may pick up its pace if the government decides to adopt clear policies to capitalize the rural producer and increase the credits for the acquisition of agricultural machines.

As for the capital goods industry, it is in even worse shape than the agricultural machinery sector. At present, the fundamental goal is survival. The main preoccupation right now is to guarantee the physical integrity of the existing plants. Since the high degree of idleness in the sector is caused by the depression that is presently hitting the country, due mainly to the reduction in the investments by the government and the state-owned companies, the solution for the sector is dependent upon the solution of the economic crisis as a whole. With Brazil's decision to seek financial aid from the International Monetary Fund and with the consequent austerity policies adopted, there is very little likelihood that the situation will improve in the near future.

Since the factors which affect the agricultural machinery industry are somewhat diverse from the ones which affect the capital goods industry, it is unlikely that either

one of the sectors might have an important role in solving the other sector's problems.

D - Strategies for development of the AMI

As mentioned in section B, the agricultural machinery industry in Brazil experienced a natural development process. The existence of a formidable domestic market and an industrialization policy based on the substitution of imports and the restriction of the market through customs barriers, plus government financing, allowed the industrial sector, in general, and the agricultural machinery industry, in particular, to develop at a very fast pace. There have been several official development plans, but all of them vague in the specific case of agricultural machinery. In fact, despite the tremendous industrial progress experienced by Brazil in the last quarter of a century, and the existence, since 1964, of a Planning Ministry, industrial development as a whole and development of the agricultural machinery industry in particular was not the result of an efficient, consistent, and interrelated planning process. The government obviously had a decisive participation in the process through a series of policies regarding incentives, protection, financing, etc.. The process was not integrated, however. To a great extent, the crisis that is presently being experienced by both the capital goods and agricultural machinery industries, operating nowadays at a very high level of idle capacity, is the direct consequence of poor planning.

In other words, no specific and deliberate policy was followed with the objective of developing the agricultural ma-

chinery industry. There was, merely, a general industrialization policy, based on imports substitution.

E - Main obstacles and constraints

Technically, there are no major obstacles to the development of the agricultural machinery sector. The agricultural machinery industry belongs to the industrial branches of metallurgy, mechanics and transportation equipment, sectors that are relatively developed and sophisticated in terms of the Brazilian economy. Thus, the industrial linkages are strong and the dependence on foreign parts is not significant, with the production in the sector being horizontally integrated.

Potentially, the domestic market is wide and, given the great number of producers of the various machines, there exists a reasonable competition, which stimulates the improvement in the quality of the products.

The rate of agricultural mechanization in Brazil is low and has stagnated in the last 3 years. Taking the number of tractors per hectare as an example, 0,01 units,[1] one sees that it is low by international standards.

There has been an increasing expansion of the country's agricultural frontier towards the Midwestern and Northern regions of the country, areas which technically demand a higher degree

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[1] Data from 1980 Agricultural Census - FIBGE, Sinopse Preliminar do Censo Agropecuário - Brasil, IX Recenseamento Geral do Brasil - 1980, Volume 2 - Tomo 1 - Número 1, Rio de Janeiro, 1982, p. 3.

of mechanization. There also is a production capacity which is way above the actual level of production nowadays.

In essence, the problem lies in the fact that the rural producer lacks the means to buy the agricultural machinery he definitely needs.

III - REGIONAL CO-OPERATION

The Brazilian agricultural machinery and implement industry is not recent, and is well structured, comprising a large number of firms, small, medium and large. One can even say that among the mechanical industries, the agricultural machinery industry is one of the oldest. Another interesting feature of this industry is that the great majority of medium and large sized firms does not manufacture only agricultural machines, but also several metal-mechanic items. Hence, it is a well interrelated branch of industry, not only in terms of its backward and forward linkages but also because its major firms are active in other industrial activities.

The very evolution of the agricultural machinery sector that occurred pari passu with the industrial development of the country has not favored the creation of regional co-operation agreements. Historically, the sector benefitted from the industrial development policies that favored, among other things, foreign direct investment and securing of licenses for manufacturing foreign models domestically. For this reason, the technological evolution of the domestic agricultural machinery industry was independent from regional co-operation agreements.

Nowadays, due to the presence of numerous transnational corporations as well as large sized domestic companies in the sector, it can be safely said that those firms have modern and efficient technology, acquired either through their headquarters abroad or through research carried out domestically. To a certain extent the transnational corporations themselves undertake some

technological research in the country as for instance the adaptation of their own technologies to the specific conditions of the Brazilian market. A good example is the case of the adaptation of tractor motors and similars to the use of ethanol as a fuel, responding to the national policy of substituting imported fuels.

Actually, the present technological stage of the agricultural machinery industry enables Brazil to participate in regional agreements with third world countries as a supplier of technology. As a matter of fact, there was a recent consultation on the part of the Brazilian Ministry of Foreign Affairs to the manufacturers of tractors with the objective of making them interested in an ample programme of co-operation with countries of Austral Africa. The scope of such a programme included not only the installation of subsidiaries in some of those countries but also the rendering of technical assistance services. However, the present delicate situation that the manufacturers of agricultural machinery are facing made them rather cautious vis-a-vis something that a few manufacturers considered to be a highly risky investment proposition.

IV - IMPLICATIONS OF PRESENT GLOBAL SITUATION

The foreign market is of little importance to the agricultural machinery industry. As shown by the statistics for the past few years, both imports as well as exports of agricultural machinery are almost negligible if compared to the domestic production. In fact, in 1981, the share of exports as a percentage of total sales, in terms of units sold, was under 6%; the total of imports, for the same year, was US$ 4.4 million, FOB, at current prices, that is, 0.7% of the country's total sales of agricultural machinery.

The difficulties experienced by the manufacturers of agricultural machinery within the developed countries were of no significance to the domestic market, due to this independence with respect to the foreign sector. On the other hand, if the preference given to the domestic market by the agricultural machinery industry was responsible for this positive aspect, it was also responsible for leaving it vulnerable to the ups and downs of the nation's agriculture. In fact, the growth of agriculture in the past few years did not correspond to the expectations of the agricultural machinery industry, thus generating a tremendous growth in the production capacity of the industry parallel to a decline in agriculture and, consequently, in the demand for agricultural machinery. The Brazilian agriculture has recently suffered a series of blows of all different sorts, which seriously undermined the capitalization of the sector; going from the break in the harvest of a series of crops due to climactic problems, to the fall of the international prices of

the country's main export crops, specially soybean, a crop which requires a high degree of mechanization. Hindered in their capacity to capitalize and pay their debts, rural producers started demanding less of the agricultural machinery industry which, in turn, had invested heavily on the increase of its production capacity.

Thus, it was in this sense that the world crisis affected the domestic agricultural machinery industry. On the one hand, it affected the prices of Brazil's export crops, strong demanders of agricultural machinery and, on the other hand, it took away the possibility of gaining acess to the foreign market at a time of retraction in the domestic market.

It might be expected that, pressed by the world crisis and by the difficulties they must face as a consequence of this crisis, small and medium-sized producers of agricultural machinery in the developed countries would seek to establish cooperation agreements with developing nations (or with companies operating in these nations) with the intent of increasing their markets. However, as previously mentioned, the degree of development of the agricultural machinery industry in Brazil has no need for this type of cooperation. If the small and medium-sized companies are interested in the Brazilian market, they will have to install subsidiaries in the country and compete harshly with the existing domestic and transnational companies, many of which are sophisticated and large.

From a sample of the main companies operating in the

agricultural machinery sector in 1981,[1] in terms of net worth, selected from the ones associated to ABIMAQ, giving a total of 58 companies, we observe the importance of the transnational ones.[2]

As shown by the table below, Brazilian firms dominate in terms of number of companies. However, if sales and number of employees are also considered as valid criteria to evaluate the importance of transnational firms, the situation is altogether different.

SALES AND EMPLOYMENT BY OWNERSHIP OF CAPITAL, 1981

OWNERSHIP OF CAPITAL	FIRMS		SALES		EMPLOYMENT	
	Number of Firms	%	US$ Millions	%	Number of Employees	%
Brazilian Firms	43	74	571.7	38	21,545	49
Brazilian Firms with minor participation of foreign capital	7	12	155.5	10	3,683	8
Transnational Firms	8	14	780.5	52	18,744	43
Total of the Sample	58	100	1,507.7	100	43,972	100

Sources: ABIMAQ - Brazilian Machine and Equipment Industry Association and "Quem é Quem na Economia Brasileira", Ed. Visão, São Paulo, 1982.

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[1] The companies which comprise this sample are listed in Appendix 2.

[2] For the purposes of this study, transnational firms are considered to be firms with 50% or more of its capital owned by foreign investors or those which, despite having less than 50% participation of foreign capital, have the rest of the capital pulverized among Brazilian nationals or national groups, so that control is maintained by foreign capital.

Transnational firms (14% of the total sample) account for 52% of the sales and employ 43% of the workers hired by the firms considered. The average sales for a transnational firm were US$ 97.5 million in 1981, while the amount for a Brazilian firm (including firms with minor foreign participation) was US$ 14.5 million. Another interesting point is the sales/employee ratio. Transnational firms averaged US$ 41.6 thousand/employee whereas Brazilian firms only averaged US$ 28.8 thousand.

Thus, one sees that transnational companies lead the agricultural machinery industry in Brazil. In fact, if one ranks the 58 firms contained in the sample according to sales, one sees that the first three are transnational, and account for 39% of the sales of the entire sample. One also sees that, out of the top ten firms, 5 are transnational, 4 are fully national and 1 has minor foreign participation.

Actually, this tendency observed for the agricultural machinery sector is common to most of the modern branches of the Brazilian industry. Transnational companies dominate the mechanical, electrical and communication materials, transportation equipment, plastics, pharmaceutical and veterinary products, and food products sectors; private domestic firms, on the other hand, dominate the traditional sectors: timber, furniture, paper and cardboard, leather and furs, beverages, printing, and publishing.[1]

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[1] VILLELA, A.V. and BAER, W., O Setor Privado Nacional: Problemas e Políticas para seu Fortalecimento, Rio de Janeiro IPEA/INPES, 1980, pp. 2-6.

V - PATTERNS OF DEMAND AND NEEDS FOR AGRICULTURAL MACHINERY

At present, as already mentioned, the agricultural machinery sector is facing an unprecedented slump. The sector, as a whole, has been producing well below its installed capacity and it does not envisage the possibility of a recovery unless agriculture overcomes the prevailing crisis.

In such a framework, the traditional methods of estimation and projection of demand do not apply. The extrapolation of historical trends is hampered because the latest years were exceedingly atypical for the Brazilian economy, which after a period of accelerated growth that lasted up to the middle of the seventies, has experienced falls in real GDP for 1981 and 1982 (although the final data for this last year are not yet available).

As regards the structure of investment in agriculture it is obviously dependent on the availability of capital. As mentioned in the previous chapter, farmers are short of investible funds, and rural credit, the modalities of which were described in chapter II should be the main source for financing investment needs. However, in spite of the rural credit system, the overall amount of resources allocated to rural credit tends to decrease because of the prevailing economic difficulties.

Thus, future investments in agriculture will depend on a wide variety of factors such as the recovery of international

export prices of agricultural products, the availability of resources for rural credit, the internal rates of interest, etc.[1] In other words, it is impossible to transform the expectations on the behaviour of these factors in predictions of the evolution of agricultural investments, and therefrom, to project the needs for agricultural machinery.

It is very illustrative the example of the Associação Brasileira de Indústria de Máquinas e Equipamentos (Brazilian Association of Machine and Equipment Industry) - ABIMAQ, which a few years ago used to estimate the demand for the coming year, and as the discrepancies were considerable, stopped those exercises.

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[1] Nowadays that the inflation rate in Brazil exceeds 100% per year, many people defend the abolition of subsidies, including those for agriculture (in the form of negative interest rates), as a way to reduce price rises.

VI - IDENTIFICATION OF PRODUCTION CAPABILITIES FOR AGRICULTURAL MACHINERY

It is very difficult to precisely demarcate the Brazilian agricultural machinery sector. According to a publication sponsored by the Federation of Industries of the State of São Paulo (the most industrialized state in the country), and covering the entire nation,[1] 341 companies produced agricultural machinery in Brazil in 1982. Many of these companies have a very diversified production line, turning out several other items besides agricultural machines. Many of them, especially the ones which produce hand tools as well, have agricultural machinery as a small fraction of their total production. For this reason, and also because it does not take into account producers of hand tools, the list of agricultural machinery manufacturers registered at ABIMAQ - Brazilian Machine and Equipment Industry Association comprises 193 companies. Other specialized publication[2] provides financial and accounting data on the main Brazilian companies by activity sector. In these publications, the agricultural machinery sector is usually composed of around 40 companies, on average, due mainly to 3 reasons: some companies are classified in other sectors due to the small participation of agricultural machines in their line of products, others are below the minimum

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[1] "Anuário das Indústrias do Brasil - 1983", 18ª Edição, Editora Pesquisa e Indústria Ltda., São Paulo, 1983.

[2] "Quem é Quem na Economia Brasileira", Ed. Especial da Revista Visão, Agosto de 1982, Editora Visão Ltda., São Paulo. "Balanço Anual", Ano V - nº 5, Editora Jornalística Gazeta Mercantil S.A., São Paulo, 1981. "Maiores e Melhores", Ed. Especial da Revista Exame. Abril - Tec Editora Ltda., São Paulo, 1981.

limits established by the publication[1] and, finally, the limited responsibility companies are not required by law to publish their balance sheets and did not supply them to the publications.

To estimate the size of the companies within the sector, it would be necessary to collect financial and accounting information on each of the 341 manufacturers of agricultural machinery, as well as data relating to their production; which, evidently, would be beyond the scope of this study.

Through the intersection of the above mentioned sources, more detailed information were obtained on 58 companies operating within the sector.[2] The major manufacturers of agricultural machinery are considered in this sample.

It can be assumed, with a small margin of error, that the majority of the companies not included in the sample due to lack of information available on them, is small. In fact, if it is taken into account that one of the main conditions for a firm to be included in the sample is a net worth over US$ 1.1 million, and that limited responsbility companies (not required by law to disclose their balance sheets and, therefore, not considered by the specialized publications) are usually small family enterprises, it is easy to see that this assumption is well-founded.

Thus, arbitrarily assuming the limit of US$ 1 million

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[1] In the case of "Quem é Quem na Economia Brasileira", the most complete of the publications refered to, the limit established for a company to be listed is a net worth of US$ 1.1 million.

[2] These are the 58 companies which comprise the sample discussed in Chapter IV and listed in the Appendix 2.

net worth as the criterion to separate small from medium-sized firms and US$ 10 million to separate medium-sized from large firms, and also assuming 341 firms to be the universe of the agricultural machinery industry, it is seen that the industry is distributed as follows: 83% small firms, 13% medium-sized firms, and 4% large firms.

According to this criterion, the selected sample is composed of large and medium-sized firms exclusively and the table below shows how sales, net worth, and number of employees are distributed according to company size in 1981.

Distribution of Sales, Net Worth and Number of Employees, 1981 According to Company's Size

Size	Sales		Net Worth		Employment		Number of Firms	
	US$ Millions	%	US$ Millions	%	Number of Employees	%	Number	%
Large firms	1,168.5	78	351.1	69	28,764	65	15	26
Medium firms	339.2	22	159.0	31	15,208	35	43	74
Total of Sample	1,507.7	100	510.1	100	43,972	100	58	100

Sources: "Quem é Quem na Economia Brasileira", op. cit.
"Anuário das Indústrias do Brasil", op. cit.
ABIMAQ - Brazilian Machine and Equipment Industry Association.

Taking into account the three indicators selected, the predominance of large firms is flagrant. Even though they are only 15 companies as opposed to 43 medium-sized firms, they participate in the sample with 78% of the sales, 69% of the net worth and 65% of the total of employees.

Previously, in Chapter IV, the same sample was examined from the ownership of capital viewpoint. At this stage, it is worth considering company size in conjunction with ownership of capital, in order to better understand the structure of the agricultural machinery sector. This is done in the table below.

Sales, net worth and Number of Employees According to Company's Size and Ownership of Capital, 1981

Size and Ownership of Capital	Sales		Net Worth		Employment		Number of Firms	
	US$ Million	%	US$ Million	%	Number of Employees	%	Number	%
Large Firms	1,168.5	78	351.1	69	28,764	65	15	26
Brazilian firms	294.4	20	124.7	25	8,915	20	7	12
Brazilian firms with minor participation of foreign capital	110.9	7	63.1	12	1,943	4	2	3
Transnational firms	763.2	51	163.3	32	17,906	41	6	10
Medium Firms	339.2	22	159.0	31	15,208	35	43	74
Brazilian firms	279.1	18	119.4	23	12,630	29	36	62
Brazilian firms with minor participation of foreign capital	44.6	3	25.5	5	1,740	4	5	9
Transnational firms	15.5	1	14.1	3	838	2	2	3
Total of the Sample	1,507.7	100	510.1	100	43,972	100	58	100

Sources: "Quem é Quem na Economia Brasileira", op. cit-
"Anuário das Indústrias do Brasil", op. cit.
ABIMAQ - Brazilian Machine and Equipment Industry Association.

With respect to large firms, we notice a clear predominance on the part of transnational companies. In terms of sales, for example, they are responsible for over 50% of the sample. For large firms, the number of transnational firms is similar to the one of fully Brazilian firms, due to the concentration of transnational firms at the top of the distribution according to size, as mentioned before.

In the medium-sized firm bracket, on the other hand, the predominance is of fully domestic firms, which account for 62% of the sample. This predominance also occurs for the remaining indicators (sales, net worth, and number of employees), though not as strongly. In terms of medium-sized firms, the three types of ownership of capital are similar. The average medium-sized transnational firm has the same volume of sales as its fully Brazilian counterpart, that is, US$ 7.8 million, having, however, a larger net worth and a larger number of employees. National firms with minor participation of foreign capital, on the other hand, on the average, have a higher volume of sales than the other two, US$ 8.9 million. The average net worth and number of employees are, respectively, US$ 5.1 million and 348 employees for this type of firms.

To sum up, one could say that transnational companies have significant weight in the Brazilian agricultural machinery industry. This predominance is not in terms of number of companies, but rather in terms of size. Transnational companies concentrate at the top of the distribution by company size, detaining, as seen before, the majority of sales, net worth and employment of the sample, even though they represent only 10% in terms of number of companies.

VII - FACILITIES FOR REPAIR AND MAINTENANCE OF AGRICULTURAL MACHINERY[1]

Maintenance services and repairs of agricultural machinery are performed, basically, by the dealerships established throughout the country. These dealerships commercialize tractors, harvesters, and power equipment in general. They are all affiliated to the Brazilian Association of Vehicle Dealerships (ABRAVE), an entity which also comprises all car and truck dealerships in the nation.

There are, besides ABRAVE, a series of agricultural machinery dealership associations at the manufacturers level, that is, every tractor manufacturer, for example, has its dealers affiliated to an association that deals with issues pertaining specifically to the sales and technical assistance of its products. There are also, though not very expressive, independent parts distributors and maintenance firms not affiliated to ABRAVE.

Power machinery manufacturers, as well as automobile manufacturers, have to sell their products through dealerships, since Brasilian law prohibits direct factory sales. These dealerships, besides selling power machinery, frequently sell other agricultural equipment as well. All dealerships also sell

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[1]This chapter was based on interviews with an ex-director of of International Harvester do Brasil (a firm which no longer operates in the country), who is presently managing director of a firm dealing with parts distribution and maintenance of agricultural machinery, and with a vice-diretor of ABRAVE, who is also the owner of several agricultural machinery dealerships in the southern part of the country.

parts and components, perform maintenance work, and provide technical assistance.

The manufacturers of tractor and other power machinery have established a network of dealerships, divided by geographic region, so as to assure efficiente sales and technical assistance infrastructures. When dealing with relatively simple problems, or with distant farms, dealerships usually send a team of technicans to provide on the spot maintenance. When the problem is serious, though, the machine must be taken to the dealership.

The most developed technical assistance and sales dealerships are located in the Southern states: Rio Grande do Sul, Santa Catarina, Paraná, and São Paulo. This region has the highest population of tractors in the country. This network is very well developed and constantly expanding. Besides the sales of machines, parts, and maintenance and repair services, many dealerships are also developing training activities, such as tractor operation and machine maintenance courses. These activities are performed in conjunction with the factories.

The Brazilian Midwest is an area which is presently experiencing a fast expansion in sales and maintenance activities; especially the states of Mato Grosso do Sul and Goiás, which are rapidly expanding their agricultural frontiers. Assistance is poor, however, despite the growing market, due to its distance from the already established Southern region. It is the region which most absorbs new machines, as a direct result of an inadequate maintenance network. The rural producer prefers to use new machines, since the probability of a breakdown is lower.

Manufacturers of agricultural machinery know that the first one to arrive in a given region will always have substantial advantages over future competitors. Most companies, therefore, have been taking action in terms of establishing dealerships in this agricultural frontier region. At present, strong competition is occurring, with aggressive sales campaigns, which indicates that the region will soon be well developed in terms of technical assistance.

Though executed by dealerships, everything having to do with technical assistance is controled by the manufacturers of agricultural machinery. Generally speaking, the manufacturer's marketing director, besides controlling sales and publicity, has technical assistance as one of his responsibilities. This shows that maintenance and technical assistance are taken very seriously by the manufacturers, since they are assential to a good marketing strategy.

As sales of new machines are sluggish nowadays, there occurrs a rise in maintenance activities, mainly in the Southern and Southeastern regions. The tendency now is to assist rural producers in increasing the lifespan of the existing equipment, since the crisis has taken away their buying power and credit to acquire new machines.

VIII - AGRICULTURAL MACHINERY INDUSTRY WITHIN THE EXISTING CAPITAL GOODS INFRASTRUCTURE

Presently, Brazil is considered to be the world's tenth largest economy, possessing a fairly wide and sophisticated industrial sector. The agricultural machinery industry in particular, is comprised of around 340 companies, 16 of which specialized in the production of tractors. According to ABIMAQ, the agricultural machinery sector is at a stage in its development in which approximately 80% of its technology is domestic. In terms of more sophisticated machinery, however, most manufacturers are either transnational companies or joint-ventures with domestic capital.

As previously mentioned, the agricultural machinery sector in Brazil is considered to be within the metallurgical, mechanical and transportation materials sector. According to ABIMAQ, agricultural machinery accounts for 10% of the mechanical sector.

The degrees of integration are rather variable with respect to products and producers, but are considered to be somewhat horizontal. The parts and components sector is wide and sophisticated, with an even participation of domestic as well as transnational companies.

It is very difficult to determine a clear standard over the integration levels with the other sectors of the capital goods industry. There is a large and traditional domestically owned industry which, besides producing several types of agricultural machines, also produces train coaches, guardrails for

highways and even sportscars. There is another manufacturer who, aside from producing tractors, is also considered to be the largest producer of wheeled armored cars in the western world. Most manufacturers of tractors for agricultural purposes also manufacture tractors and machines for other purpose as well, such as bulldozers, forklifts, etc.. Some tractor manufacturers produce their own engines, others buy them elsewhere. The same situation occurs for agricultural equipments in general: most producers are metallurgical companies with a vast line of products, among which are included agricultural equipment. Very few manufacturers opted for the creation of subsidiaries to handle the exclusive production of agricultural equipment.

It is difficult to ellaborate in greater detail about the integration of the agricultural machinery sector with the other branches of the capital goods industry, since the spectrum of the sector is rather wide, going from sophisticated self-propelled combines to a simple sickle.

The tendency towards integration is increasing, though, due to the high degree of sophistication achieved by the capital goods industry, already capable of manufacturing gigantic turbines for hydroelectric power plants, special alloys, numeric control machines, etc.. The restriction of imports, caused by the aggravation of the Trade Balance, also contributes to a higher integration within the industrial sector.

No substantial investments are being made in the agricultural machinery industry, given the stagnation of the industrial sector as a whole. This situation also affects technolo-

gical improvements. It is clear, however, that the agricultural machinery sector no longer depends exclusively on the transfer of foreign technology. Domestic technology, at present, satisfactorily caters to the country's needs.

Finally, it is clear that the subject in question is fairly wide and difficult, given the fact that it is not easy to determine the industrial interrelationships of the somewhat complex Brazilian industry. Besides, technology is not easy to define, much less quantify. A more complete analysis of this subject would require a longer and more detailed study.

Appendix 1

EXCHANGE RATES (Annual Average[1])

Years	Cr$/US$
1970	4.579
1971	5.271
1972	5.934
1973	6.126
1974	6.790
1975	8.126
1976	10.670
1977	14.138
1978	18.063
1979	26.870
1980	52.699
1981	93.015
1982	178.443

Source: Banco Central do Brasil, Boletim do Banco Central do Brasil, Brasília, for various years.

Note: [1]The average rate is calculated considering the weighted average using the working days of the period during which the adjustment was in force.

Appendix 2

AGRICULTURAL MACHINERY SECTOR:

MAJOR FIRMS

1) MASSEY FERGUSON PERKINS S/A

Address: Estrada de Campo Limpo, 6197 Phone:(011)211-7022
05 787, São Paulo, SP Telex: 011-21464

Ownership of capital: 98% Massey Ferguson Ltd. (Canada)

Line of products: trators and agricultural implements;industrial machines; self-propelled harvesters. and diesel engines.

Financial data for 1981 (US$ million)
Sales: 331.7
Net worth: 37.6
Net profit: 1.1
Employees: 3,700

2) SPERRY S/A (New Holland Division)

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 100% Sperry Rand Corp. (USA)

Line of products: n.a.

Financial data for 1981 (US$ million)
Sales: 163.8
Net worth: 12.6
Net profit: (31.2)*
Employees: 7,000

3) VALMET DO BRASIL S/A IND. E COM. DE TRATORES

Address: Av. Senador Queirós, 96/8º andar Phone:(011)227-2522
01 026, São Paulo, SP Telex: 011-21400 VMET BR

Ownership of capital: 32.5% Domestic capital, 67.5% Valmet OY (Finland)

Line of products: agricultural and industrial tractors;pallets

Financial data for 1981 (US$ million)
Sales: 113.5
Net worth: 22.2
Net profit: 0.4
Employees: 1,456

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*Data in brackets mean losses.

n.a.: not available

4) CIA. INDUSTRIAL SANTA MATILDE

Address: Bairro Santa Matilde Phone: (031) 721-2111

36 400, Conselheiro Lafaiete, MG Telex: 031-2637

Ownership of capital: 100% Domestic capital

Line of products: train wagons; electric train units; electric and hydraulic ship cranes; automobiles; harrow ploughs; self-propelled harvesters; rubber wheeled and crawler tractors

Financial data for 1981 (US$ million)
Sales: 89.3
Net worth: 36.0
Net profit: (3.5)
Employees: 2,600

5) SLC S/A IND. E COM.

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 100% Domestic capital

Line of products: n.a.

Financial data for 1981 (US$ million)
Sales: 80.0
Net worth: 46.2
Net profit: 21.2
Employees: 1,163

6) FMC DO BRASIL S/A IND. E COM.

Address: Al.Campinas, 463 Cjs. 1A/B Phone: (011) 285-2932

01 414, São Paulo, SP

Ownership of capital: 100% FMC Corporation (USA)

Line of products: agricultural machines

Financial data for 1981 (US$ million)
Sales: 77.4
Net worth: 18.3
Net profit: (9.7)
Employees: 3,100

7) KOMATSU DO BRASIL S/A

Address: Av.Paulista, 854/1º andar — Phone: (011) 285-0330

01 310, São Paulo, SP — Telex: 011-23300

Ownership of capital: 100% Komatsu Manufacturing Co. Ltda. (Japan)

Line of products: crawler tractors, cast and forged products.

Financial data for 1981 (US$ million)

Sales: 63.7
Net worth: 10.9
Net profit: 5.0
Employees: 1,350

8) MARCHESAN - IMPLEMENTOS E MÁQUINAS AGRÍCOLAS TATU S/A

Address: Av.Marchesan, 1979 — Phone: (0162) 82-2411

15 990, Matão, SP — Telex: 0166-437 MATT BR

Ownership of capital: 100% Domestic capital

Line of products: animal-drawn equipment

Financial data for 1981 (US$ million)

Sales: 50.6
Net worth: 34.2
Net profit: 1.7
Employees: 1,500

9) KEPLER, WEBER S/A

Address: Rua Herrmann Meyer, 43 — Phone: (055) 375-2322

98 280, Panambi, RS — Telex: 055-2349 KEWE BR

Ownership of capital: 100% Domestic capital

Line of products: grain driers and cleaners; belt conveyors; elevators; metallic silos; containers; and other agricultural equipment.

Financial data for 1981 (US$ million)

Sales: 50.3
Net worth: 20.6
Net profit: 1.5
Employees: 1,715

10) "ASBRASIL" - ASPERSÃO NO BRASIL S/A

Address: Rua João Duprat, 431 Phone:(011)457-4399

09 720, São Bernardo do Campo, SP Telex: 011-4230 ASBR BR

Ownership of capital: 10% Kochendörfer & Kiep (W. Germany), 50% J.L. Kiep (W. Germany), 40% Perrot Regnerbau GmbH (W. Germany)

Line of products: sprinklers; pumps; irrigation self-propelled equipment; irrigation sets and metallurgic products.

Financial data for 1981 (US$ million)
Sales: 36.5
Net worth: 7.9
Net profit: 6.0
Employees: 1,000

11) MÁQUINAS AGRÍCOLAS JACTO S/A

Address: Rua Dr.Luis Miranda, 1650 Phone:(0144)52-1911

17 580, Pompéia, SP Telex: 0142-184 MAIA BR

Ownership of capital: 100% Domestic capital

Line of products: sprayers; dusters; atomizers and harvesters.

Financial data for 1981 (US$ million)
Sales: 35.4
Net worth: 27.7
Net profit: 4.0
Employees: 800

12) YANMAR DO BRASIL S/A

Address: Av.Dr.Gastão Vidigal,2001 Phone:(011)261-0911

05 314, São Paulo, SP Telex: 011-24080 YNMR BR

Ownership of capital: 18% Domestic capital; 82% Yanmar Diesel Engine Co. Ltda. (Japan)

Line of products: diesel engines; engine cultivators;sprayers and other agricultural machines

Financial data for 1981 (US$ million) Sales: 33.1
Net worth: 23.1
Net profit: 1.2
Employees: 1,300

13) AGRALE S/A TRATORES E MOTORES

Address: Via BR-116, Km 125 Phone:(064)221-3500

95 100, Caxias do Sul, RS Telex: 0542-156 AGRA

Ownership of capital: Domestic control, partic.Regie Nationale des Usines Renault (France)

Line of products: tractors; micro-trators; diesel engines; small trucks; motor bycicles and components

Financial data for 1981 (US$ million) Sales: 30.9
Net worth: 16.9
Net profit: 1.7
Employees: 780

14) JUMIL - JUSTINO DE MORAIS IRMÃOS S/A

Address: Rua Ana Luzia, 568 Phone:(016)761-4000

14 300, Batatais, SP Telex: 0166-388 JUBA BR

Ownership of capital: 100% Domestic capital

Line of products: planter-fertilizer machines; planters cultivators; threshers; ploughs; and other agricultural machines.

Financial data for 1981 (US$ million) Sales: 27.9
Net worth: 10.0
Net profit: (0.5)
Employees: 600

15) BALDAN - IMPLEMENTOS AGRÍCOLAS S/A

Address: Av.Baldan, 1500 Phone:(0162)82-2577

15 990, Matão, SP Telex: 0166-435

Ownership of capital: 100% Domestic capital

Line of products: harrows; ploughs; cultivators; planters; planter-fertilizer and cultivator-ferlilizer; and other agricultural implements.

Financial data for 1981 (US$ million) Sales: 25.2
Net worth: 17.9
Net profit: 0.1
Employees: 500

16) INDÚSTRIA DE MÁQUINAS AGRÍCOLAS IDEAL /SA

Address: Via RS-344, Km 1 Phone:(055)512-1161

98 900, Sta. Rosa, RS Telex: 051-1410 IDAL BR

Ownership of capital: 68% Domestic capital, 32% International Harvester Co. (USA)

Line of products: self-propelled harvesters

Financial data for 1981 (US$ million) Sales: 18.8
Net worth: 5.7
Net profit: 0.2
Employees: 433

17) CIA BRASILEIRA DE TRATORES

Address: Faz.S.Francisco, Km 249 Phone:(0162)71-1133

13 560, São Paulo, SP Telex: 0166-269 CBTR BR

Ownership of capital: 100% Domestic capital

Line of products: industrial and agricultural tractors and components

Financial data for 1981 (US$ million) Sales: 15.7
Net worth: 16.9
Net profit: (0.4)
Employees: 1,200

18) NODARI S/A COMERCIAL E INDUSTRIAL

Address: Via BR-116, Km 404 Phone:(041)22-5922

80 000, Curitiba, PR Telex: 041-5196

Ownership of capital: 100% Domestic capital

Line of products: hydraulic claws for loaders

Financial data for 1981 (US$ million) Sales: 15.1
Net worth: 5.5
Net profit: (3.2)
Employees: 400

19) CIVEMASA S/A INDÚSTRIA E COMÉRCIO

Address: Rua Frederico Reugger, 181 Phone: (0195) 41-2500

13 600, Araras, SP Telex: 019-1874

CIVE BR

Ownership of capital: 100% Domestic capital

Line of products: plougher and leveller harrows; subsoiler sets; cultivators; fertilizers; tool bars; ploughs and sugar-cane harvesters.

Financial data for 1981 (US$ million) Sales: 14.5
Net worth: 5.3
Net profit: 1.5
Employees: 317

20) INDÚSTRIA DE MÁQUINAS D'ANDREA S/A

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 100% Domestic capital

Line of products: n.a.

Financial data for 1981 (US$ million) Sales: 13.1
Net worth: 8.6
Net profit: 0.5
Employees: 574

21) USIMECA - USINA MECÂNICA CARIOCA S/A

Address: Via Pres.Dutra, Km 18 Phone: (021) 768-2585

26 000, N.Iguaçu, RJ

Ownership of capital: 100% Domestic capital

Line of products: agricultural implements

Financial data for 1981 (US$ million) Sales: 13.0
Net worth: 5.1
Net profit: 0.9
Employees: 610

22) CASP S/A INDÚSTRIA E COMÉRCIO

Address: Rua Sebastião Gonçalves Cruz, 477

13 900, Amparo, SP Phone: (0192)70-3022

Telex: 019-1684

Ownership of capital: 100% Domestic capital

Line of products: seed cleaners; silos; lumber furnace and other agricultural implements.

Financial data for 1981 (US$ million) Sales: 12.9
Net worth: 2.5
Net profit: 4.2
Employees: 2,500

23) HATSUTA SUZUKI INDUSTRIAL S/A - H.S.I.

Address: Av.Monteiro Lobato, 2700 Phone:(011)209-2133

07 000, Guarulhos, SP Telex: 011-33758 HBR

Ownership of capital: 58.2% Suzuki Motor Co. Ltd. (Japan), 41.8% Domestic capital

Line of products: Moto-saws; sprayers and sprayer pumps; portable motor atomizers.

Financial data for 1981 (US$ million) Sales: 12.9
Net worth: 9.6
Net profit: 0.1
Employees: 738

24) EQUIPAMENTOS HIDRÁULICOS MUNCK S/A

Address: Via Raposo Tavares, Km 20 Phone:(011)268-7122

05 400, São Paulo, SP Telex: 011-23130

Ownership of capital: 100% Domestic capital

Line of products: agricultural machines and hydraulic equipment

Financial data for 1981 (US$ million)
Sales: 12.1
Net worth: 4.0
Net profit: 0.3
Employees: 400

25) SANTAL EQUIPAMENTOS S/A IND. COM.

Address: Av.dos Bandeirantes, 384 Phone:(016)34-2255

14 100, Ribeirão Preto, SP Telex: 166314 SAEQ BR

Ownership of capital: 66% Domestic capital, 34% Rio Tinto Zinc Corp. Ltd. (UK)

Line of products: harvester and sugar cane loaders, hydraulic claws; falling-back wagons for sugar cane and motor graders.

Financial data for 1981 (US$ million)
Sales: 11.7
Net worth: 8.5
Net profit: (2.1)
Employees: 423

26) COPEMAG - CIA. PENHA DE MÁQUINAS AGRÍCOLAS

Address: Av.Brasil, 1724 Phone:(016)626-8400

14 100, Ribeirão Preto, SP Telex: 0166-209

Ownership of capital: 100% Domestic capital

Line of products: harvesters; maize shellers and other agricultural equipment.

Financial data for 1981 (US$ million) Sales: 11.4
Net worth: 3.9
Net profit: 0.4
Employees: 250

27) INDÚSTRIA DE MÁQUINAS AGRÍCOLAS FUCHS S/A

Address: Av.21 de Abril, 775 Phone:(055)332-1233

98 700, Ijuí, RS Telex: 055-2198

Ownership of capital: 100% Domestic capital

Line of products: ploughs; planters; other agricultural implements and components.

Financial data for 1981 (US$ million) Sales: 10.5
Net worth: 3.2
Net profit: (1.3)
Employees: 250

28) INDÚSTRIA E COMÉRCIO GUARANY S/A

Address: Av.Imperatriz Leopoldina, 112

05 305, São Paulo, SP Phone:(011)261-1922

Telex: 01132752 IGGU BR

Ownership of capital: 100% Domestic capital

Line of products: hand operated sprayers; portable motor atomizers and other non-agricultural products.

Financial data for 1981 (US$ million) Sales: 10.5
Net worth: 3.2
Net profit: (0.4)
Employees: 400

29) HAUPT SÃO PAULO S/A INDUSTRIAL E COMERCIAL

Address: Rua Othão, 174/290 Phone:(011)260-4040

05 315, São Paulo, SP Telex: 011-30402 HAUP BR

Ownership of capital: 100% Domestic capital

Line of products: vacuum and submersible hydraulic pumps; electric engines for submersible pumps; gas engines; and various garden and forestal equipment.

Financial data for 1981 (US$ million) Sales: 10.5
Net worth: 5.7
Net profit: 0.2
Employees: 400

30) NICOLA ROME MÁQUINAS E EQUIPAMENTOS S/A

Address: Rua Cel.Diogo, 525 Phone: (0196) 55-1367

13.730, Mococa, SP Telex: 019-1545 RONI BR

Ownership of capital: 51% Domestic capital, 49% Wyman Gordon Co. (USA)

Line of products: harrows and tool bars; components for tractors and pallets; and other non-agricultural products and components.

Financial data for 1981 (US$ million) Sales: 10.0
Net worth: 1.9
Net profit: 0.3
Employees: 659

31) DANTAS INDÚSTRIA E COMÉRCIO S/A

Address: V.Pres.Castelo Branco, Km 24,4

06 400, Barueri, SP Phone: (011) 421-5122

Telex: 011-23392

Ownership of capital: 100% Domestic capital

Line of products: sprinkler and other irrigation sets; self-propelled irrigation sets; motor pumps and diesel/electric generating sets and other equipment.

Financial data for 1981 (US$ million) Sales: 9.2
Net worth: 2.3
Net profit: 0.6
Employees: 400

32) IRMÃOS NOGUEIRA S/A MÁQUINAS AGRÍCOLAS E MOTORES

Address: Rua XV de Novembro, 741/81

13 970, Itapira, SP Phone:(0192)63-1500

Telex: 011-30901 INOG BR

Ownership of capital: 100% Domestic capital

Line of products: disintegrators; chaffcutters; crushing mills and other agricultural equipment.

Financial data for 1981 (US$ million) Sales: 8.3
Net worth: 2.7
Net profit: 1.0
Employees: 273

33) INDÚSTRIA DE MÁQUINAS AGRÍCOLAS PINHAL

Address: Rua Br.de Mota Paes, 489 Phone:(0196)51-1079

13 990, E.S.do Pinhal, SP

Ownership of capital: 100% Domestic capital

Line of products: cleaners; driers; and other special equipment for coffee, soybean, wheat, corn and tea processing.

Financial data for 1981 (US$ million) Sales: 7.8
Net worth: 4.4
Net profit: 2.3
Employees: 367

34) BOMBAS ESCO S/A

Address: Rua Barra Funda, 887/1001 Phone:(011)825-1822

01 152, São Paulo, SP Telex: 011-22876

Ownership of capital: 100% Domestic capital

Line of products: centrifugal vertical pumps; submersible and helix pumps and other similar items.

Financial data for 1981 (US$ million)
Sales: 7.7
Net worth: 2.5
Net profit: 0.5
Employees: 240

35) INDÚSTRIAS "MACHINA ZACCARIA" S/A

Address: Rua Laranjal, 180
13 480, Limeira, SP
Phone: (0194) 41-5026
Telex: 019-2120 ZACC BR

Ownership of capital: 100% Domestic capital

Line of products: cereal processing equipment.

Financial data for 1981 (US$ million)
Sales: 7.6
Net worth: 6.8
Net profit: (0.5)
Employees: 329

36) MOTOCANA S/A MÁQUINAS E IMPLEMENTOS AGRÍCOLAS

Address: Av.1º de Agosto, 343
13 400, Piracicaba, SP
Phone: (0194) 34-3088
Telex: 019-1675

Ownership of capital: 100% Domestic capital

Line of products: loaders, planter-fertilizer, claws and hydraulic cranes for sugar-cane; motor irrigation and other non-agricultural machinery

Financial data for 1981 (US$ million)
Sales: 7.5
Net worth: 2.5
Net profit: 1.1
Employees: 160

37) CEMAG - CEARÁ MÁQUINAS AGRÍCOLAS S/A

Address: Av.Gaudioso de Carvalho, 217
60 000, Fortaleza, CE
Phone: (085) 228-2377
Telex: 085-1533 CMGL

Ownership of capital: 100% Domestic capital

Line of products: equipment for groundnut , bean and sugar cane

Financial data for 1981 (US$ million) Sales: 7.2
Net worth: 7.0
Net profit: 0.7
Employees: 340

38) MENEGAZ S/A INDÚSTRIA E COMÉRCIO

Address: Distrito Industrial João Menegaz

99 100, Passo Fundo, RS Phone: (054) 313-1100

Telex: 054-2353 EGAS BR

Ownership of capital: 100% Domestic capital

Line of products: ploughs; subsoilers; and other agricultural implements.

Financial data for 1981 (US$ million) Sales: 6.4
Net worth: 4.9
Net profit: 0.1
Employees: 700

39) CIA. MULTI INDUSTRIAL

Address: Via BR-369, Km 7 Phone: (0432) 27-5000

86 100, Londrina, PR Telex: 0432-239

Ownership of capital: 100% Domestic capital

Line of products: cleaners, driers and silos for cereals; silos; screw conveyors and elevators.

Financial data for 1981 (US$ million) Sales: 5.6
Net worth: 1.9
Net profit: 0.2
Employees: 230

40) ARTEFATOS HÉRCULES S/A INDÚSTRIA E COMÉRCIO

Address: Rua Dois, 310 Phone:(031)333-7700

32 200, Contagem, MG Telex: 031-1530 ARHE

Ownership of capital: 100% Domestic capital

Line of products: industrial and agricultural equipment.

Financial data for 1981 (US$ million) Sales: 5.1
Net worth: 2.4
Net profit: 0.2
Employees: 179

41) JOSÉ J. SANS S/A INDÚSTRIA E COMÉRCIO

Address: Rua J.Kubistchek de Oliveira, 1450

13 450, S.Bárbara d'Oeste, SP Phone:(0194)63-2622

Ownership of capital: 100% Domestic capital

Line of products: animal drawn and power driven ploughs and disc ploughs.

Financial data for 1981 (US$ million) Sales: 5.1
Net worth: 2.9
Net profit: 0.5
Employees: 186

42) YOK EQUIPAMENTOS S/A

Address: Rua Chanceler Osvaldo Aranha, 200

80 000, Curitiba, PR Phone:(041)246-8822

Telex: 041-5733

Ownership of capital: 100% Domestic capital

Line of products: belt conveyors; metallic silos; cereal driers; elevators; corn mills; and equipment for poultry raising.

Financial data for 1981 (US$ million) Sales: 4.9
Net worth: 4.2
Net profit: 0.4
Employees: 254

43) CAETANO BRANCO S/A INDÚSTRIA E COMÉRCIO

Address: Av.Caetano N.Branco, 3800 Phone: (0495) 22-1322

89 600, Joaçaba, SC Telex: 492347

Ownership of capital: 100% Domestic capital

Line of products: threshers; disintegrators and crushing mills.

Financial data for 1981 (US$ million)
Sales: 4.7
Net worth: 3.8
Net profit: 0.3
Employees: 174

44) FÁBRICA NACIONAL DE IMPLEMENTOS HOWARD S/A

Address: Rua João Batista de Oliveira, 219

06 750, Taboão da Serra, SP Phone: (011) 491-3122

Telex: 011-33645
FNIH BR

Ownership of capital: 18.2% Domestic capital, 45.6% Howard Machinery Ltd(UK), 36.2% Commonwealth Development Co. (UK)

Line of products: agricultural equipment

Financial data for 1981 (US$ million)
Sales: 4.5
Net worth: 2.6
Net profit: (1.0)
Employees: 100

45) PIRATININGA IMPLEMENTOS AGRÍCOLAS

Address: Via BR-290, Km 78 Phone: 21-3253

96 750, Butiá, RS Telex: 051-1629

Ownership of capital: 40% Massey Ferguson Ltd.(Canada), 60% Domestic capital

Line of products: spades for cultivators, discs for ploughs and other implements.

Financial data for 1981 (US$ million) Sales: 4.1
Net worth: 1.8
Net profit: (0.9)
Employees: 200

46) MÁQUINAS VITÓRIA

Address: Rua Oito, 2001
Distrito Industrial
96 100, Pelotas, RS

Phone: (0532) 21-0344
Telex: 0532-391

Ownership of capital: 100% Domestic capital

Line of products: cleaners, driers and sílos for cereals; elevators; pallets; and other agricultural equipment.

Financial data for 1981 (US$ million) Sales: 4.1
Net worth: 1.7
Net profit: 1.0
Employees: 500

47) MADAL S/A IMPLEMENTOS AGRÍCOLAS E RODOVIÁRIOS

Address: Via RS-122, Km 72
95 100, Caxias do Sul, RS

Phone: (054) 221-4766
Telex: 054-2305

Ownership of capital: 100% Domestic capital

Line of products: sugar cane loaders; land planes; and other non-agricultural equipment.

Financial data for 1981 (US$ million) Sales: 3.7
Net worth: 1.4
Net profit: 0.2
Employees: 80

48) MÁQUINAS SUZUKI S/A

Address: Rua José Zacura, 223

18 900, S.C.do Rio Pardo, SP Phone:(0143)72-1533

Telex: 0142-473

MASU BR

Ownership of capital: 100% Domestic capital

Line of products: threshers for pepper and groundnut;

huskers and other agricultural machines.

Financial data for 1981 (US$ million) Sales: 3.3
Net worth: 1.4
Net profit: 0.1
Employees: 130

49) MONTELEONE S/A TRATORES E IMPLEMENTOS

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 100% Domestic capital

Line of products: n.a.

Financial data for 1981 (US$ million) Sales: 2.8
Net worth: 1.2
Net profit: (0.0)
Employees: 60

50) INDUMEC S/A INDÚSTRIA MECÂNICA

Address: Rua Randolfo Serzedello, 58 Phone:(041)276-7122

80 000, Curitiba, PR Telex: 041-6342

IMEC BR

Ownership of capital: 100% Domestic capital

Line of products: agricultural machines.

Financial data for 1981 (US$ million) Sales: 2.6
Net worth: 1.7
Net profit: 0.1
Employees: 217

51) PUGLIESE S/A MÁQUINAS E EQUIPAMENTOS

Address: Rua Joaquim Carlos, 527 Phone:(011)291-5111

03 019, São Paulo, SP

Ownership of capital: 100% Domestic capital

Line of products: driers for coffee and cereals and other non-agricultural equipment.

Financial data for 1981 (US$ million)
Sales: 2.6
Net worth: 1.3
Net profit: (0.1)
Employees: 100

52) INDÚSTRIAS PEGORARI S/A

Address: Rua Dr.Francisco de Paulo M.Borges, 755

13 970, Itapira, SP Phone:(0192)63-0210

Ownership of capital: 100% Domestic capital

Line of products: spades; hoes; maize shellers; and other non-agricultural machines.

Financial data for 1981 (US$ million)
Sales: 2.4
Net worth: 2.1
Net profit: 0.1
Employees: 100

53) CIA. OLSEN DE TRATORES AGROINDUSTRIAIS

Address: Rua Brasília, 971 Phone: 217

89 500, Caçador, SC

Ownership of capital: 100% Domestic capital

Line of products: tractors and its components and other non-agricultural equipment.

Financial data for 1981 (US$ million)
Sales: 2.1
Net worth: 1.5
Net profit: 0.1
Employees: 143

54) DE ANTONI S/A MÁQUINAS E IMPLEMENTOS AGRÍCOLAS

Address: Rua Moreira César, 902 Phone: (054) 221-6988

95 100, Caxias do Sul, RS

Ownership of capital: 100% Domestic capital

Line of products: leveller harrows; planters and planter-fertilizers; ridgers; sprayers and trailers

Financial data for 1981 (US$ million)
Sales: 1.9
Net worth: 1.2
Net profit: 0.1
Employees: 70

55) METALÚRGICA FAULHABER S/A

Address: Rua Herman Faulhaber, 292 Phone: n.a.

98 280, Panambi, RS

Ownership of capital: 100% Domestic capital

Line of products: hand-operated sprayers and dusters and non-agricultural equipment.

Financial data for 1981 (US$ million)
Sales: 1.6
Net worth: 1.1
Net profit: 0.2
Employees: 40

56) MECÂNICA RITTER S/A

Address: Rua Catuipe, s/n Phone: (055) 312-1432

98 800, S.Ângelo, RS Telex: 055-2412 MRTR BR

Ownership of capital: 100% Domestic capital

Line of products: hydraulic ploughs; ploughs; planter-fertilizer; silos; elevators and other non-agricultural equipment.

Financial data for 1981 (US$ million)
Sales: 1.5
Net worth: 1.7
Net profit: (0.2)
Employees: 167

57) MÁQUINAS AGRÍCOLAS SPERANDIO

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 100% Domestic capital

Line of products: n.a.

Financial data for 1981 (US$ million) Sales: 1.5
Net worth: 1.9
Net profit: 0.2
Employees: 50

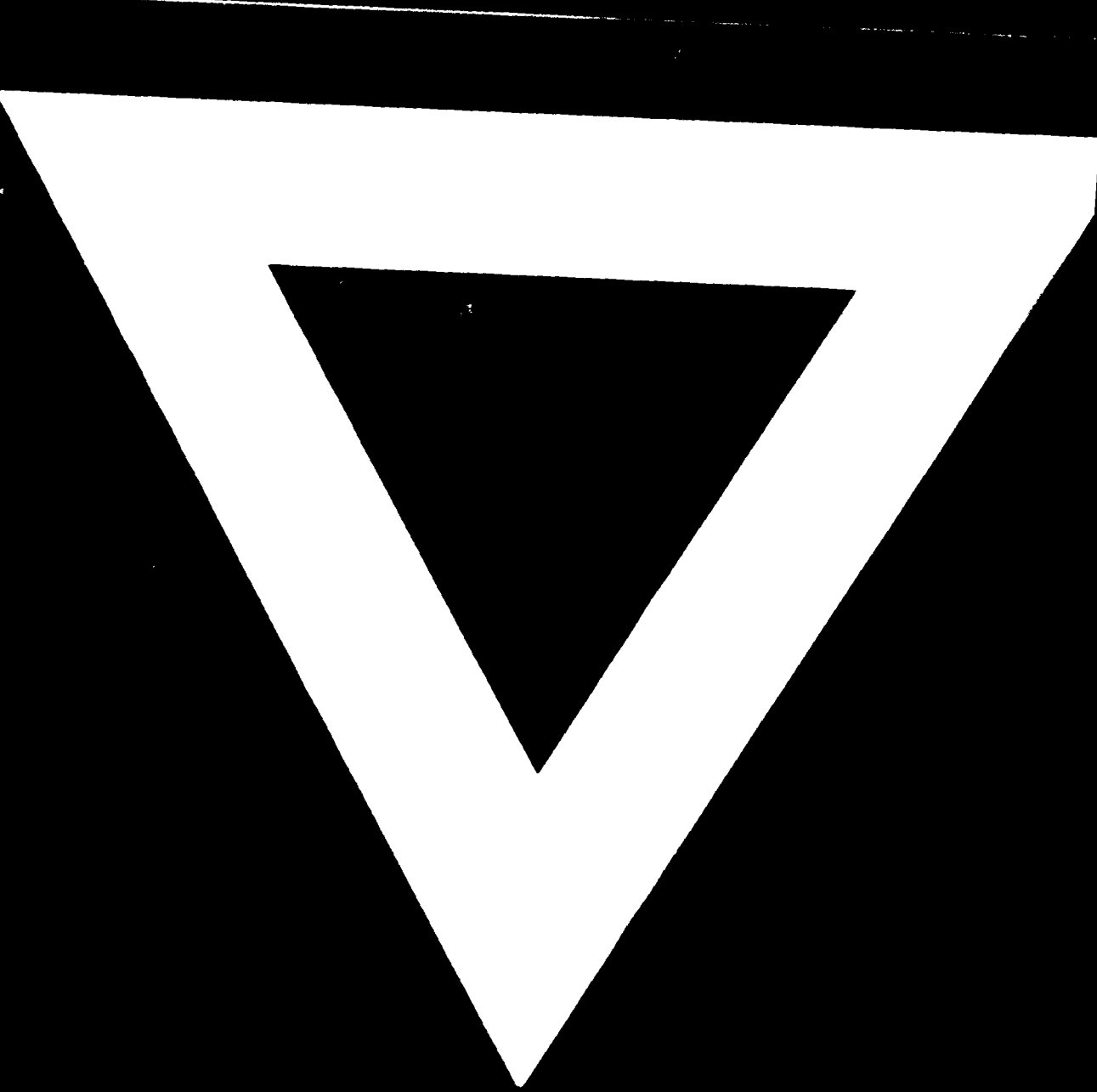
58) PETROGARD IMPLEMENTOS AGRÍCOLAS S/A

Address: n.a. Phone: n.a. Telex: n.a.

Ownership of capital: 17.6% Gard Père et Fils (France),10.2% Mouzon Frères (France) e 72.2% Domestic capital

Line of products: n.a.

Financial data for 1981 (US$ million) Sales: n.a.
Net worth: 7.6
Net profit: n.a.
Employees: 25



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