

FEDERATIVE REPUBLIC OF BRAZIL
MINISTRY OF AGRICULTURE
ON
EXPORT COORDINATORS

1963

INTERNATIONAL TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

FEDERATIVE REPUBLIC OF BRAZIL
SURVEY REPORT
ON
EXPORT CORRIDORS

DECEMBER 1972

OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

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PREFACE

At the request of the Government of Federative Republic of Brazil, the Japanese Government accepted the investigation on the Export Corridors Plan which is in progress in Brazil with a view to promote the export of agricultural and live-stock products, and entrusted the Overseas Technical Cooperation Agency with this task.

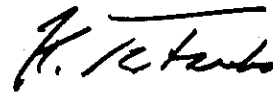
In order to implement this survey, the Overseas Technical Cooperation Agency organized a survey mission of the Export Corridors Plan of Federative Republic Brazil, comprising ten members headed by Mr. Yoshio Takeuchi, with the help of related agencies of the Japanese Government and other associations, and despatched the mission to Brazil on September 3rd, 1972 for one month.

The investigation was of a short period with a heavy-load. However, by the cordial assistance extended by the Brazilian Government and related people, the investigation was progressed smoothly, and the survey results have been summarized in the present Report.

It will be more than gratifying, if the report contribute to the future economic development of Federal Republic of Brazil and thus influence favorably upon the friendly relationship between Brazil and Japan.

Finally but not in the least our cordial thanks are extended to the Government of Federative Republic of Brazil and related people for their friendly and energetic cooperation given to the Mission.

December 1972



Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency

LETTER OF TRANSMITTAL

Mr. Keiichi Tatsuke, Director General
Overseas Technical Cooperation Agency

Dear Sir,

I am very pleased to submit herewith a report on the Export Corridors Plan of Federative Republic. For about a month from September 3rd, 1972, the Mission executed a field investigation in the projected regions of the Export Corridors Plan such as Minas Gerais, Espirito Santo, São Paulo, Parana and Rio Grande do Sul, while briefed by the Brazilian government and related people regarding the contents of their Export Corridors Plan.

On the basis of a vast volume of information and data obtained through this survey as well as the knowledge acquired from various materials made available before and after the investigation, the Mission studied structural and economic aspects of the Plan and summarized its observation in this Report.

The present Export Corridors Plan intends to build up an infrastructure and other facilities in connection with the export of agricultural products and related processed products, and ought to be interpreted as a concept rather than the Plan or Project so far understood in Japan. The Plan contemplated by the key members of Brazilian Government is a colossal structure. The essential features consist of : "stimulation to the farmers for production of soybean, corn, sorghum, orange, meat, etc.," "collection and storage of the products in up-country areas", "inland transport", "accessibility to the ports of large vessels" and "renovation of handling capacity enabling a quick despatch of vessels". The Brazilian Government has the policy of implementing projects successively according to the above concept, and in the order of readiness.

Brief evaluation of the Export Corridors Plan is as follows;

- a. We highly appreciate the fact that the Brazilian Government contemplated the Export Corridors Plan.
- b. We concluded that the projected yields of agricultural production can be more or less achieved and anticipate that the volume available for export will also attain to the target figures.
- c. As for loans from foreign countries, we judge that there will be no risk in respect to repayability, if the export targets of agricultural products is satisfactorily attained.

It is important to make an economic evaluation for individual projects forming part of the Plan, but so far as the present Plan is concerned, the more important point

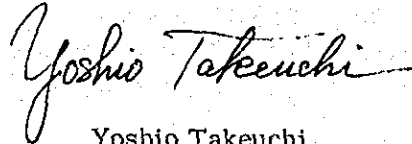
is the evaluation concerning the related economic policies to be executed by the Brazilian Government. Although it is stated that the loan repayment can be executed within the framework of the presented project with economic soundness, we have to point out that it is rather necessary to pay the primary attention to the Brazilian economy at present and in future.

From such point of view, the promotion of this Plan by the Brazilian Government must be highly evaluated and, we judge that Japan should pay attention to the large scale concept and enthusiasm of the Brazilian Government, instead of merely giving financial aids within the limits and on the basis of economic potentiality of individual projects.

In conclusion, our sincere thanks are expressed to officials of the Brazilian Government and related organizations for their valuable cooperation extended.

Your respectfully,

December 1972



Yoshio Takeuchi

Leader, Survey Mission
of Export Corridors in
Federative Republic of Brazil

SURVEY MISSION'S ITINERARY

The mission left Tokyo on September 3rd, 1972 and arrived in Brazilia on September 4th. After spending one month there for the investigation and collection of data, the party returned to Tokyo on October 2nd. The itinerary is as follows.

Order of days	Date	Journey	Assignments
1	Sept 3	Leave Tokyo by PA-800	Departure
2	" 4	Arrive at Brazilia	Visited Embassy. Discussion about investigation schedule, etc.
3	" 5		(Morning) Preliminary meeting with representatives of Brazilian Govt. Final discussion about investigation schedule. (Afternoon) First general meeting with representatives of Brazilian Govt.
4	" 6		(Morning) Second general meeting with representatives of Brazilian Govt. (Afternoon) Sectional meetings: General economic and agricultural matters.
5	" 7	Brazilia to Rio de Janeiro (special plane of Air Force)	Field investigation: Port of Rio de Janeiro. Discussion: Investigation schedule, etc. with Japanese General Consulate.
6	" 8		(Morning) General meeting with GEIPOT. (Afternoon) Sectional meetings: Port-Handling facilities, Railway-Road Sections.
		Rio de Janeiro to São Paulo (special plane of Air Force)	Talking with representatives of Japanese firms.
7	" 9	São Paulo to Port of Santos, return trip (special train & coach)	Field investigation: Port of Santos

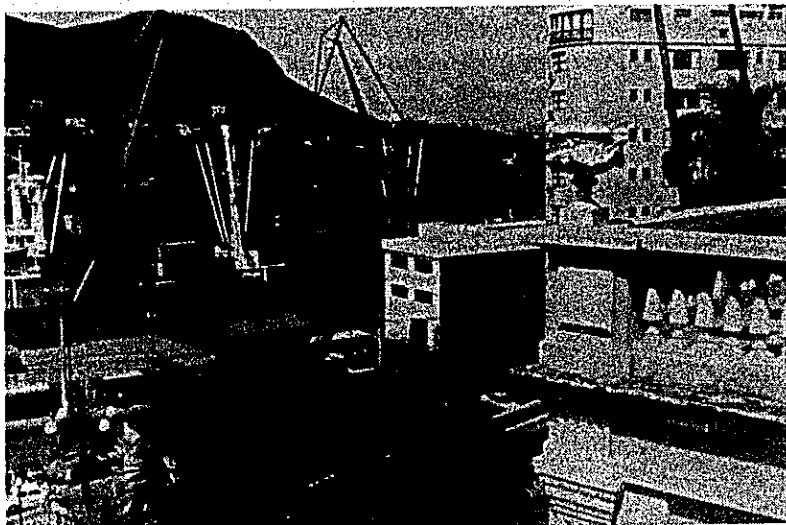
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|----|---|----|--|---|
| 8 | " | 10 | São Paulo to
Campinas, return
trip | Field investigation: Institute of Agricultural Research of Campinas, Higashiyama Plantation, etc. |
| 9 | " | 11 | | (Morning) General meeting with São Paulo State Govt.
(Afternoon) Discussion with DNPVN = Port-Handling facilities, Railway-Road Section. Discussion with State's Agricultural Dept. = Agriculture-Silo Section
Talking with General Consulate in São Paulo. |
| 10 | " | 12 | | Discussion with DNPVN = Port-Handling facilities, Railway-Road Section.
Field investigation at Industrial Cooperation of COTIA
Field investigation (special plane offered by State Gov.) at Ourinhos = Agriculture-Silo Section. |
| 11 | " | 13 | São Paulo to
Curitiba
(special plane of
Air Force) | (Morning) General meeting with Parana Gov.
(Afternoon) Sectional meetings = Port-Handling facilities, Railway-Road, Agriculture Section. |
| 12 | " | 14 | Curitiba to
Paranagua, return
trip (special train,
coach) | Field investigation: Port of Paranagua |
| 13 | " | 15 | Curitiba to Iguacu
(special plane of
Air Force) | Field investigation: Agriculture. |
| 14 | " | 16 | Iguacu to Londrina
(special plane of
Air Force)
Londrina to Curitiba
(special plane of
Air Force) | Field investigation: Agriculture, railway, road, etc. |
| 15 | " | 17 | Curitiba to Porto
Alegre (special plane
of Air Force) | Discussion with Rio Grande do Sul State Govt. about investigation schedule, etc.
Interim report and arrangement of investigation within the commission. |

- 16 Sept 18 (Morning) General meeting with Rio Grande do Sul State Govt.
(Afternoon) Sectional meetings = Port-Handling facilities, Railway-Road, Agriculture-Silo Sections.
Discussion with General Consulate in Porto Alegre about investigation schedule, etc.
- 17 " 19 Porto Alegre to Pelotas (special plane of Air Force) Field investigation: Institute of Agricultural Research, Farming in neighboring area of Pelotas.
Pelotas to Port of Rio Grande, return trip (coach) Field investigation: Ports of Rio Grande and Pelotas = Port-Handling, Railway-Road Sections.
- 18 " 20 Pelotas to Santa Maria (special plane of Air Force) Field investigation: Railway, Road, etc.
Santa Maria to Porto Alegre (special plane of Air Force) Field investigation: Port of Alegre.
Pelotas to Ijuí (special plane of State Govt.) Field investigation: Farming in Ijuí district = Agriculture Section.
Ijuí to Porto Alegre (special plane of State Govt.)
Porto Alegre to Vitória (special plane of Air Force) Move to Espírito Santo State
- 19 " 21 (Morning) General meeting with Espírito Santo State Govt.
Sectional meetings = Port-Handling facilities, Railway-Road, Agriculture Sections.
(Afternoon) Field investigation: Ports of Vitória and Tubarão.
Prof. Yoshikawa jointed.
Vitória to Belo Horizonte (special plane of Air Force)
- 20 " 22 (Morning) General meeting with Minas Gerais State Govt. Discussion about agricultural matters.
(Afternoon) Sectional meetings = Railway-Road, Silo Sections.

		Belo Horizonte to Uberaba, return trip (special plane of State Govt.)	Investigation from plane: Agricultural situation = Agriculture Section.
21	Sept 23	Belo Horizonte to Itabira, Sete Lagoas, road.	Field investigation: Agriculture, railway, road.
		Belo Horizonte (coach)	Interim report and arrangement of investigation within the Commission.
22	" 24	Belo Horizonte to São Paulo	Arrangement of interim report.
23	" 25		Mr. Kubota, advisor, arrived.
24	" 26		Arrangement of interim report.
25	" 27	São Paulo to Rio de Janeiro	Consulate in Rio de Janeiro.
26	" 28	Rio de Janeiro to Brazilia	Talking with Japanese Embassy.
27	" 29		Interim report to Japanese Embassy and to the representatives of Brazilian Govt.
28	" 30	Leave Brazilia	Departure. Prof. Yoshikawa returned to Recife.
29	Oct 1		
30	" 2	Arrive Tokyo	



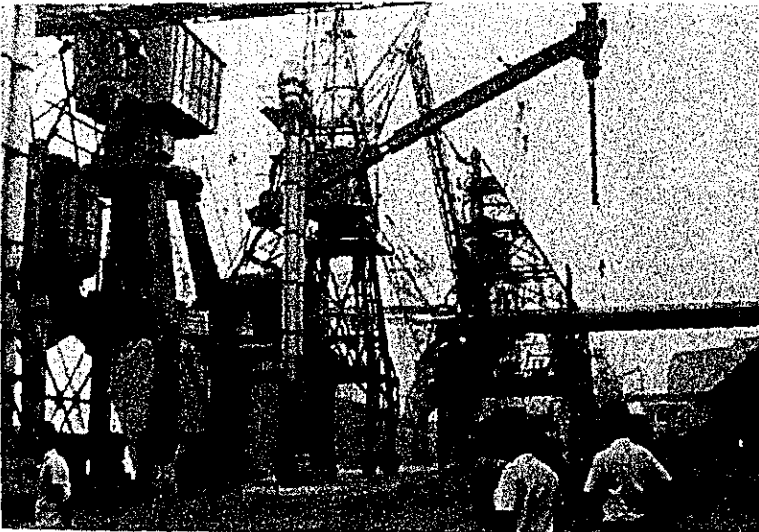
No. 1 Commercial Quay at Vitoria Port



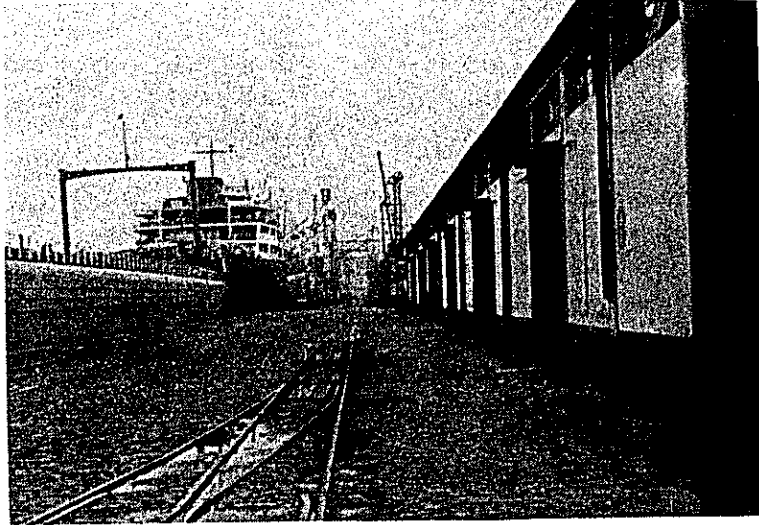
No. 2 Iron Ore Loading Facilities at Tubarão District of Vitoria Port



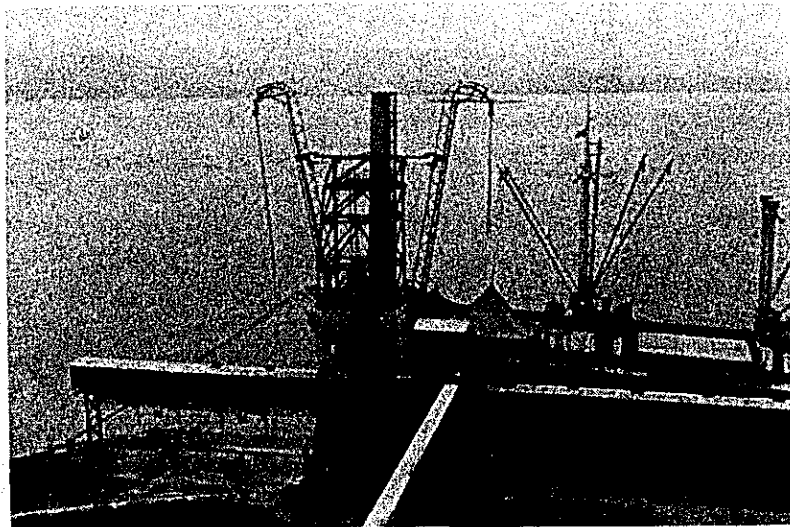
No. 3 Wharf Construction at Santos Port



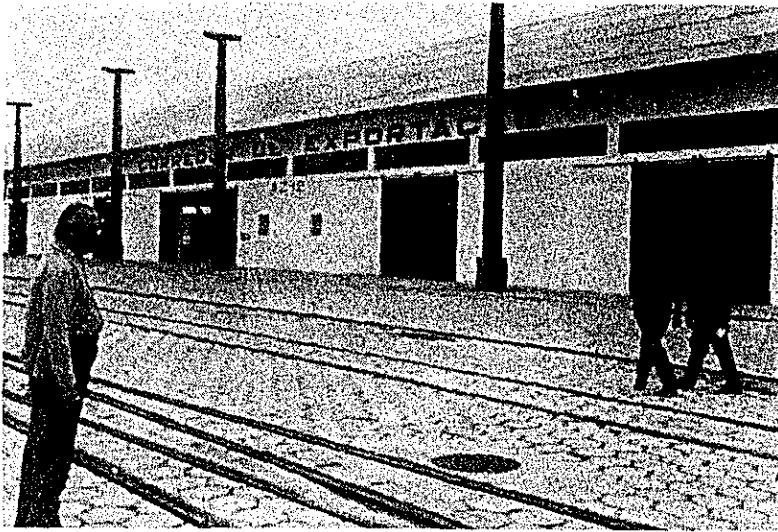
No. 4 Grain Loaders at Santos Port



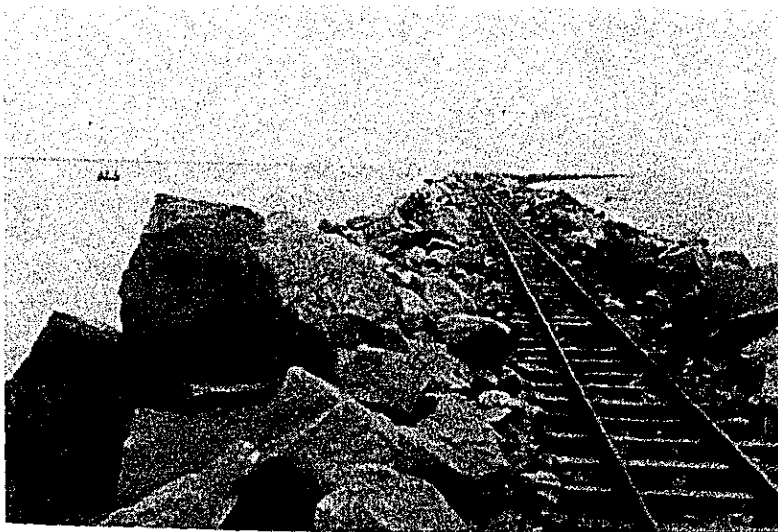
No. 5 Grain Wharf at Paranagua Port



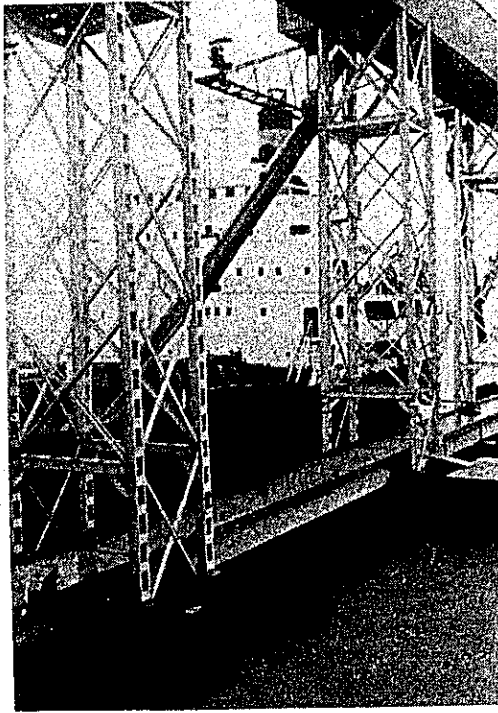
No. 6 Grain Loading Wharf at Paranagua Port



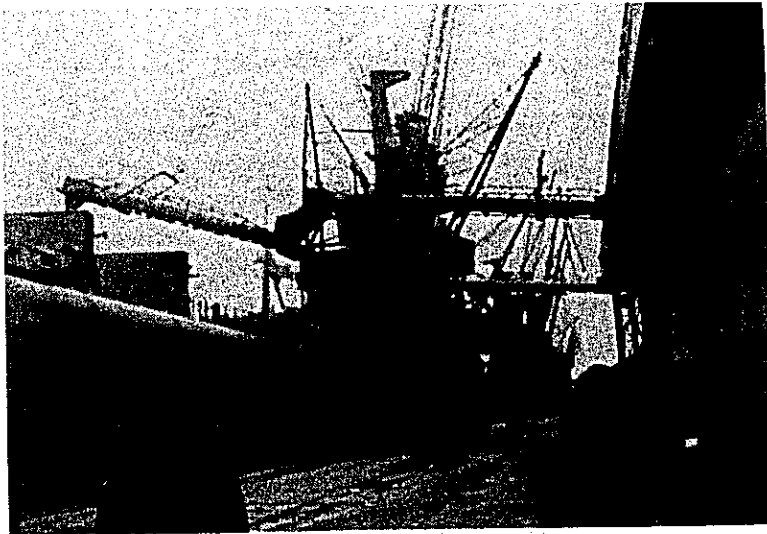
No. 7 Horizontal Grain Silo at Paranagua Port



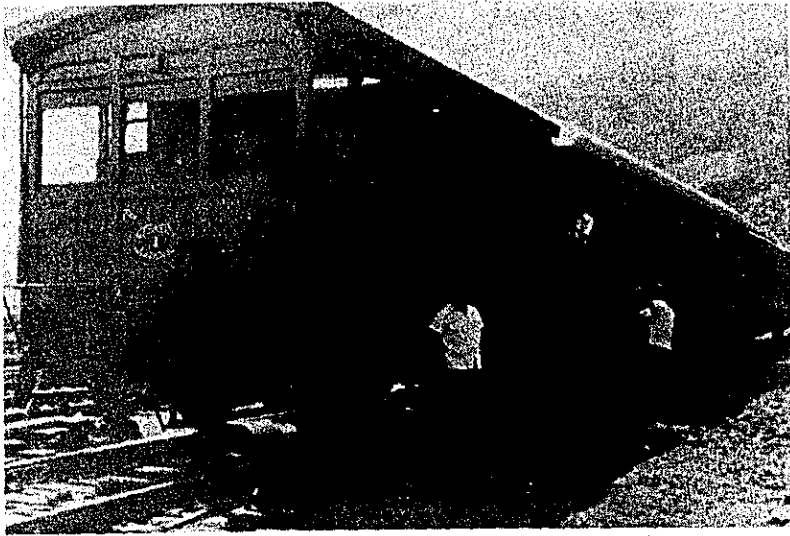
No. 8 Training Dyke of Rio Grande Port



No. 9 COTRIJUI's Dolphin Berth at Rio Grande Port



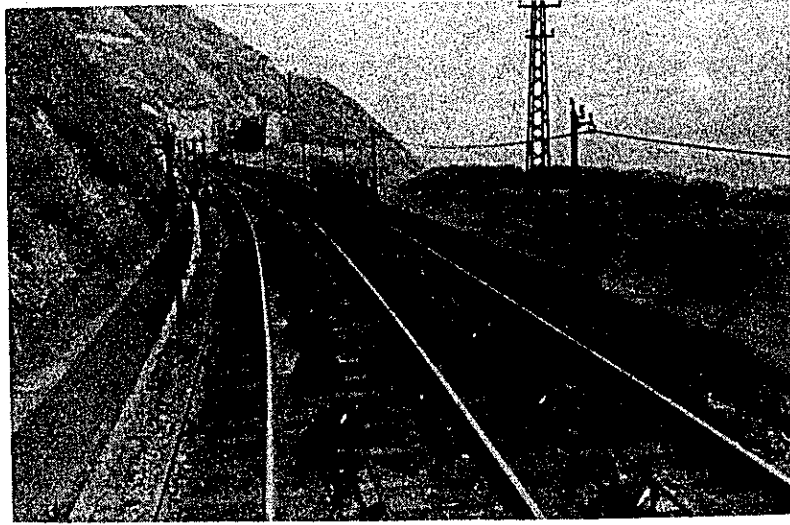
No. 10 Grain Loading Operation in New Port Area of Rio Grande Port



No. 11 A rope-type railway of Santos. (1) Jundiá Line of Federal Railways serving between Alto da Serra and Cubatão.



No. 12 A rope-type railway. (2)



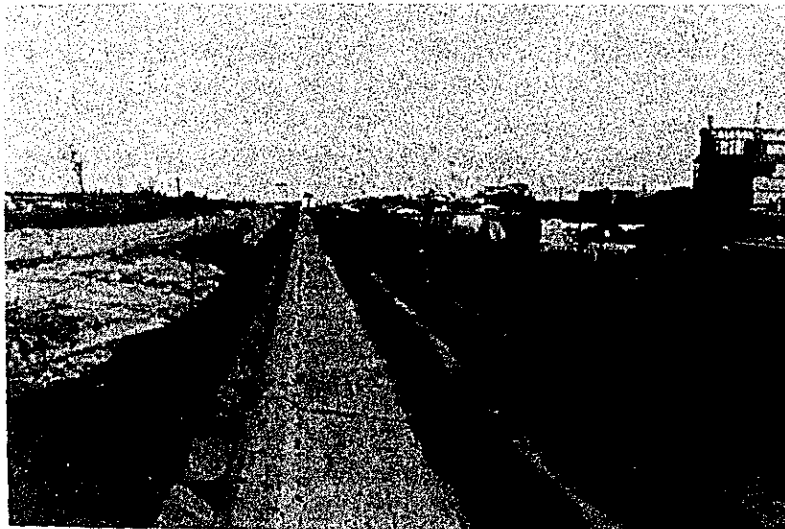
No. 13 A rope-type railway. (3)



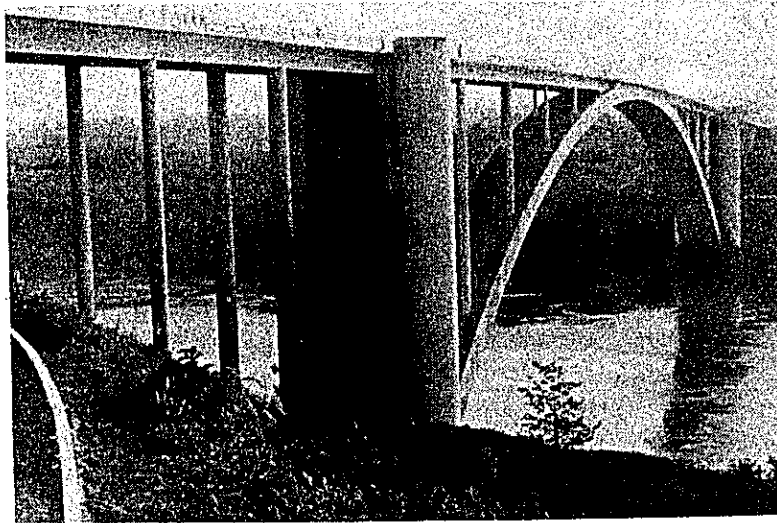
No. 14 A rope-type railway. (4)



No. 15 Cargo yard at Santa Maria, Parana State. With a new yard constructed elsewhere, this yard is being gradually made smaller in size.



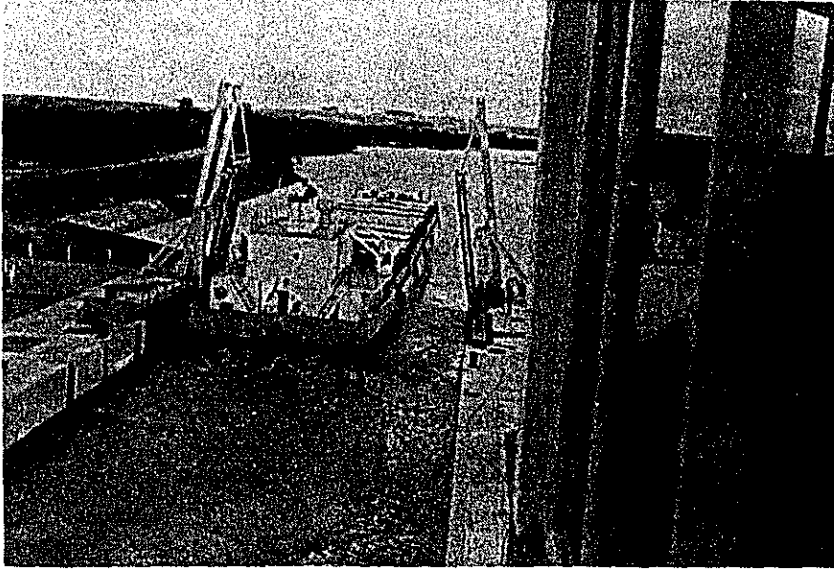
No. 16 Railway line of Comphania Vale do Rio Doce.



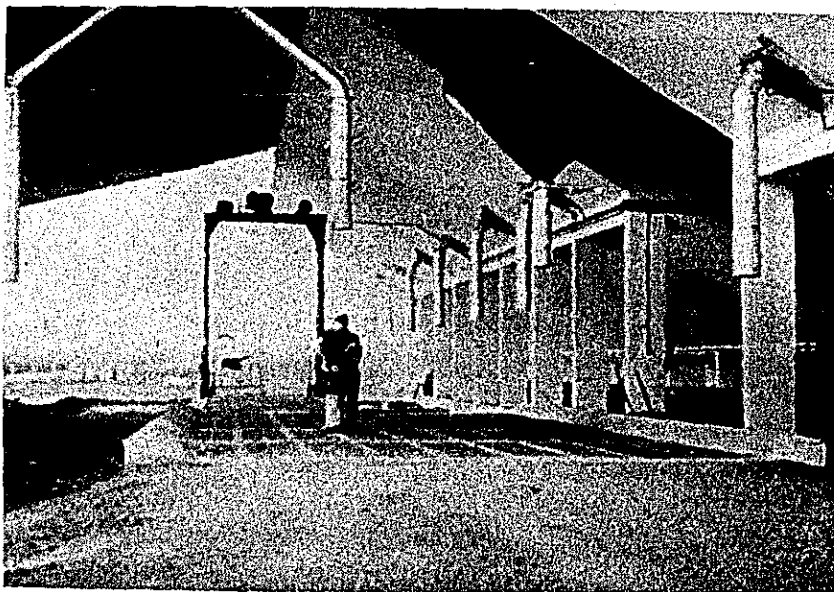
No. 17 A road-bridge constructed on the Brazil-Paraguay border in 1964 and called the "Bridge of Friendship". Foz do Igacu is the nearest Brazilian town to this bridge.



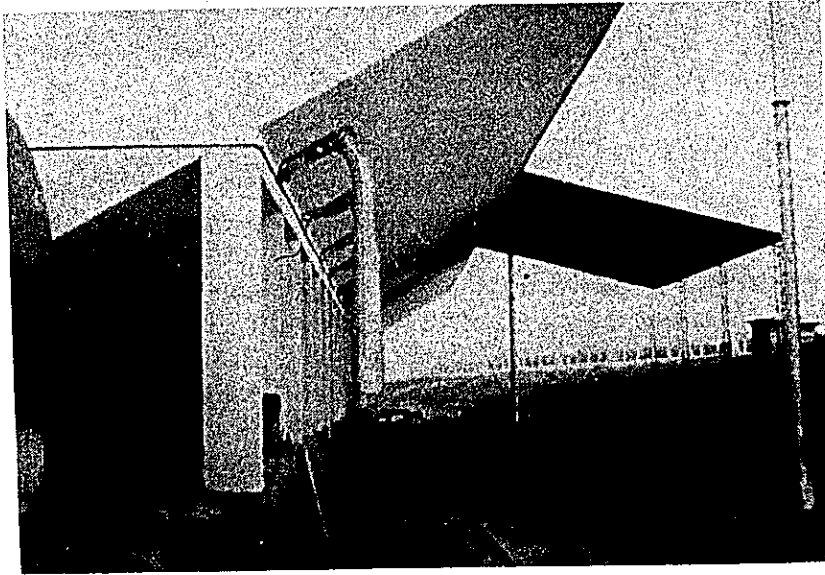
No. 18 Arterial road linking Brazilia and Belo Horizonte.



No. 19 Lock Gate



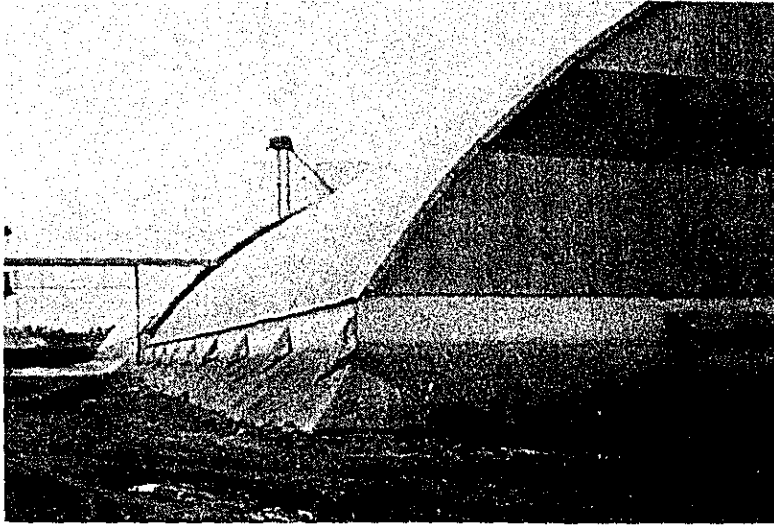
No. 20 Bulk cargo receiving facilities of OURINHOS warehouse, São Paulo.



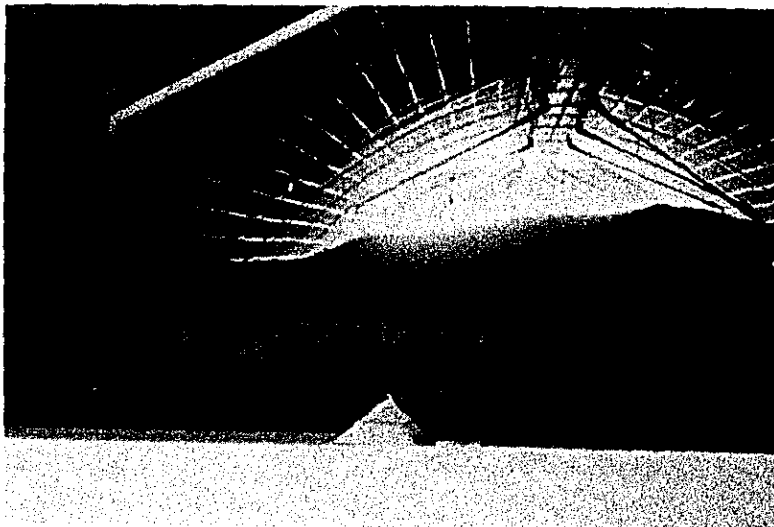
No. 21 Bulk cargo loading facilities of OURINHOS warehouse, São Paulo.



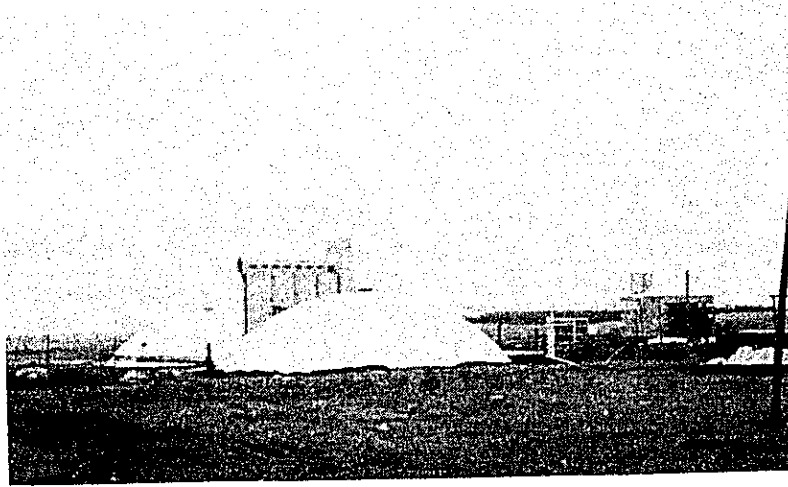
No. 22 Wheat growing area, Parana State.



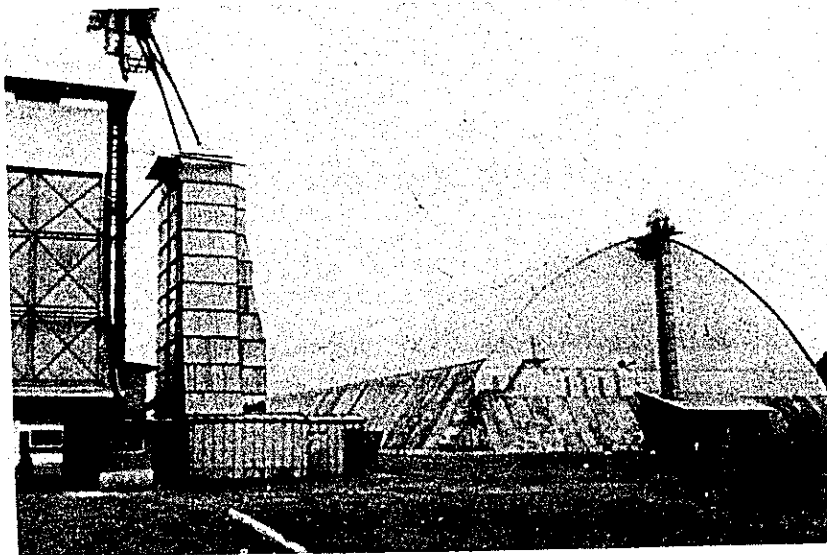
No. 23 Bulk grain warehouse, Parana State.



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No. 26 Bulk cargo warehouse and drier, IJUI, Rio Grande do Sul State.

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PART 1

I FOREWORD

**II OUTLINE AND DESCRIPTION OF
EXPORT CORRIDOR PLAN**

III EVALUATION ON EXPORT CORRIDORS

IV CONCLUSIONS

I. FOREWORD

I-1. Particulars Regarding Despatch of Survey Team

The government of Federative Republic of Brazil initiated export corridor plan by designating Vitoria, Santos, Paranagua, and Rio Grande as shipping terminals and aims at the completion of most facilities during 1972/1976. Through this plan the bottleneck in the shipment of farm and livestock products will be broken by rehabilitation of the transportation and port facilities. The achievement of target to ship annually eleven million tons of farm products by 1976 is being aimed at.

Brazilian government enlisted the service of Japanese government for the survey of the abovementioned export corridor plan which is indispensable condition for achieving the goal. In compliance with this request, Japanese government decided to conduct a survey in connection with the plan and to despatch survey team for the export corridor plan of the government of Federative Republic of Brazil.

I-2. Objective of Survey

It is the objective of the survey team to conduct the following surveys.

- a. To study the export corridor plan from the aspect of both engineering and economy and to evaluate appropriateness of the plan.
- b. To evaluate appropriateness of scale of the plan, the team will investigate the present state of farming, its production plans, etc., and will study the export plan of agricultural products in relation to the export corridor plan.
- c. To study both from the aspect of engineering and economy the development plan of facilities for shipping port, railroad, road, silo, etc. in relation to the export corridor plan.
- d. To make a survey and investigate the above points and then to extensively appraise the export corridor plan.

I-3. Members of Survey Mission

A survey by the mission was conducted during 25 days from September 4th with overall cooperation of the government of Federative Republic of Brazil and provincial government. The survey mission comprised of the following members.

Head	YOSHIO TAKEUCHI	(Overall responsibility)
Adviser	YUTAKA KUBOTA	
Member	KANJI HIRAYAMA	(Agricultural economy)
	GIICHI YOKOYAMA	(Railroad planning)
	YASUJI SAOTOME	(Cargo handling equipment)
	YOSHITERU AKAMATSU	(Road planning)
	MASAAKI KAMIMURA	(Port planning)
	MASAHARU MAYUMI	(Agricultural development planning)
	MASARU OKUNISHI	(Circulation planning)
	KEIJI HURA	(Coordination)

For conducting a survey, cooperation was received from specialist and counterpart in respective fields of Brazil, from Japanese Embassy, Consulate etc. and at the same time from the visiting professor of Paraiba University, Mr. Kazuhiro Yoshikawa through the courtesy of Brazilian government.

Our gratitude is extended to the officials below-listed who, on behalf on the Brazilian Government, gave us a kind cooperation in the field survey.

Director	PAULO YOKOTA	(Central Bank of Brazil)
Adviser	JOSE DE RIBAMAR MELO	(")
Assistant	ARTHUR L. PINHEIRO GUIMARES	(")
"	KAZUKI SHIOBARA	(")
Adviser	AGOSTINHO VAZ DE MELLO NETO	(Ministry of Agriculture)
"	OSVALD SOUZA GOMES JOB	(Ministry of Industry and Commerce)
Assistant of Director General	CLAUDIO DEMETRIO L. DE ALBUQUERQUE	(D. N. E. F. Ministry of Transportation)
Head of Dept.	ILONI STAREC	(Transport Planning Dept., Ministry of Transportation)
Head of Dept.	SAMUEL GOLTSMAN	(Railway Dept., Ministry of Transportation)
Assistant	HUGHSON PAIVA DE CASTRO	(Planning Dept., Ministry of Transportation)
"	NELSON WALDEMAR LINDERMANN	(Intermodal Analysis Dept., Ministry of Transportation)
Director of Planning and Coordination	JOSE EDUARDO PIMENTEL	(D. N. P. V. N., Ministry of Transportation)
Head of Section	SHIRO MIYASAKA	(Leguminous Plants Section, Institute of Agriculture)
Economist	ROBERTO RODRIGUES CORREA DE ARAUJO	(Agricultural Division, Ministry of General Planning and Coordination)

II. OUTLINE AND DESCRIPTION OF EXPORT CORRIDOR PLAN

II-1. Objective of Export Corridor Plan

Since the new government administration started in 1964, Brazil has recorded outstanding development in the field of economy and social life. In particular, during the past four years high economic growth of actual 9 to 10 % has been kept. Trend toward inflation began to show stabilization and a living cost leveled down to 17 to 18 % rise.

However, progress lag in development between the north and south of Brazil, rich and poor, deficit in trade balance and other difficult problems remain and in order to solve these problems, the present administration made a special provision last year for the first national development plan for 1972 - 1974 and is now making an effort toward for attaining at economic standard of the developed country.

Export corridor plan aims at "empowerment of foreign economic policy by the diversification of agriculture and enlargement of agricultural exports" which is one of the main objectives of national development program and the plan has as its object the ensuring healthy economic growth by effecting steps to improve trade balance.

Currently in export trade of Brazil, greater portion of total export amount is held by agricultural products export and export is still instable due to fluctuation in coffee productions.

So the Brazilian government tried to expand and stabilize the export trade by casting off the export structure dependent on coffee and by diversification in the agricultural products. This is done by newly adding soy-beans, corns, sorghum, orange, meats and processed agricultural products of these crops. The diversification plan is based on the awareness that Brazil has extremely spacious and fertile land and ample labor powers for potentially large agricultural productions. From world agriculture, the diversification plan means dispersions as to the sources of supplies for soy-beans and corn which heretofore depended largely on these products coming mainly from the United States and Canada. Moreover, the underdeveloped countries still suffer serious lack of food and increase in demand for food for mankind is foreseen. There is a long range vision for the new sources of food supplies to meet the needs. Brazil is situated in the southern hemisphere and as the harvesting season differ from the countries in the northern hemisphere and as ample agricultural products can be harvested during the off-crop seasons in the northern hemisphere, much expectation is placed in the aspect of export market as the result of the administration policy to rest on.

II-2. Necessity to develop Infrastructure for Export of Agricultural Products.

To build stable position equal to the United States, Canada, Australia and China as an exporting country of agricultural products, Brazil must

greatly increase power for export competitions in international trade. To become more competitive in export trade, reduction in transportation cost will be a key factor because, in Brazil, agricultural products are produced inland far away from shipping terminals and the country is situated far distant from the importing countries.

However, infrastructure is extremely undeveloped and is contributing as block to export. If it is left as it is, it is certain that infrastructure will become large bottleneck for future expansion of export. The bottleneck must be removed immediately and at the same time rehabilitation on a large scale is necessary.

To explain details:

(a) Storage space is quite inadequate and agricultural products must be exported when harvested. If exporting is not possible, there is no alternative but to leave the harvest uncropped in the fields and the crops often perish in this way. Therefore, rehabilitation of storage facilities such as silo would be needed in order to avail every opportunity for irrespectively of harvest season.

(b) As overland transportation means from production center to shipping terminals, railroad transportation capable of carrying of cargoes in bulk and in large volumes over long distance, is more efficient from economic point of view as compared solely to truck transportation. However, railroads in Brazil are generally limited in extension as compared to roads and as the carriers differ from one area to another, track gages differ from narrow 1.0 meter to wide 1.6 meter. Furthermore, steep gradient, sharp curve and such sharply limit the transportation capabilities. Therefore, it is imperative to introduce now rolling stocks and at the same time to construct new railroads and improve the existing rails for reinforcement of railroad transportation.

(c) The existing shipping terminals are generally small in scale. As it is difficult for large boats to enter and as at the same time handling capacity for cargoes is extremely limited, a difficult situation is faced in introducing large boats to cut down ocean transportation cost. Also, there is lack of sufficient storage facilities at the ports and it has been observed that trains and trucks loaded with agricultural products wait for days before deliveries can be effected.

Therefore, in the future port facilities capable of accomodating entry of large boats and cargo handling and storage facilities to go along with, must be necessarily brought in.

The present plan is based on awareness of the aforementioned infrastructure and the plan is to make agricultural products competitive for export market by providing all necessities for infrastructure and by cutting down transportation cost. At the same time the objective includes not only the providing all necessities for infrastructure but also advancement of agricultural technology and improvement of distribution channels.

As is mentioned before, Brazil is situated in the southern hemisphere and harvest period is different from that in the northern hemisphere. With favorable condition, increase in the export capabilities through providing the necessities for infrastructure is anticipated with great expectation.

II-3. Outline and Description of Export Corridor Plan

According to the plan, target figure of export of agricultural products in 1976 for mid-southern states is considered to be most realistic and calculation placed the figure at about eleven million tons. (The main items are 3 million and 210 thousand tons of soy-beans, 3 million 880 thousand tons of corn, 1 million 25 thousand tons of sorghum, and 1 million 820 thousand tons of soy-bean cakes).

The present plan is drafted for four separate large export corridors and the export target for respective shipping port is as follows:

Export Corridor	Shipping Port	Export Target (1,000 t)	Main Agricultural Products
Minas Gerais, Espírito Santo	Vitoria	850	Corn
São Paulo	Santos	2,880	Corn, Sorghum
Parana	Paranagua	3,500	Soy-bean, Corn, Sorghum, Pellet
Rio Grande do Sul	Rio Grande	2,720	Soy-bean, Corn, Pellet

Note: 1. These are realistic target for 1976 based on export of 11 million 20 thousand tons. Incidentally, figure for optimistic target is 14 million 880 thousand and for pessimistic target, 7 million 630 thousand.

2. These are figures only for the grains and in the amount of 11 million 20 thousand tons are included frozen foods and soy-bean oils.

To achieve these targets in 1976, the present plan provides for removal of bottleneck in infrastructure, construction of 100 - 150 thousand tons capacity intermediate silo at connecting points, construction and improvement of railroads for intermediate transportation, loader for efficiency of ship loading, building of port silo at the port, and port facilities to enable the entry of 50 thousand tons class large boats, etc. among others as specific ends. According to tentative calculation by Brazilian government, a capital of 809 million 520 thousand U.S. dollars will be required to implement the plan and for the first priority 494 million 520 thousands U.S. dollars have been budgeted for the necessities which will be provided by March 1974, and for the second and third priority 315 million U.S. dollars for rehabilitation to be implemented during 1975.

Incidentally, the separate investment plan for the equipment of facilities pertaining to each export corridor is as follows but this plan was drawn up mainly as a necessary reference material to bring in foreign investment and besides the amount here, there are export corridors being built by the use of large amount of domestic capital, federal railroad capital, and provincial government capitals.

Table 1 Investment Plan for Export Corridors

(US\$1,000.00)

	Minas Gerais Espirito Santo	São Paulo	Parana	Rio Grande	Supplementary Projects	Total
Intermediate Silo I	3,500	5,000	5,000	5,000	-	18,500
Railroad I	27,000	32,500	65,000	-	104,900	229,400
II	70,500	37,000	-	65,500	72,500	245,500
Port I	2,000	29,760	32,840	24,720	14,800	104,120
II	30,500	24,000	-	15,000	-	69,500
Modernization of Agriculture I	3,750	3,250	2,500	-	133,000	142,500
Total	137,250	131,510	105,340	110,220	325,200	809,520

Note: I. Shows items of first priorities

II. Shows items of second and third priorities.

II-4. First National Development Plan (PND) and its Relation to Export Corridor Plan

"Export Corridor Plan" is joined with PND policy in the sense that three aspects of agriculture, transportation, and export shape up the PND (see attached literature). In other words, the facilities to realize the PND policy are drawn up in the export corridor plan.

In these three aspects, the relation between PND and the export corridor plan is as follows:

(1) Agricultural aspect

Agricultural development is carried out as follows to encourage competitiveness with the object of achieving annual growth of 7 %.

I Introduction of modernization in the industry and agriculture in mid-southern area so that all staple crops can fulfil international competitions.

II . . . Modernize sales channels for agricultural products in the field of:

- Modernization of main ports at the start and construction of transportation system ("transportation corridor").
- Advancement of funds to the producers in order to expand storage facilities at production center.
- Expansion of storage facilities at connection points, establishment of facilities for food supplies, super market chains in main cities, and advancement of funds to the private industries who has an objective of setting up of series of automated vending machines facilities.

The main plan which the Federative Government will carry out on the basis of abovementioned proceedings and the task on priority basis will be as follows:

- a. Agricultural survey ... Emphasis is placed on agricultural survey in the area where there is a delay in the technical development and the task will include technical assistance to follow.
- b. Regional development ... Modernization through wide use of agricultural inputs such as new fertilizer, agricultural chemicals, improved seeds and so forth in addition to agricultural machinery.
- c. Technical assistance ... Expansion of agricultural technical assistance.
- d. Strengthening of regional infrastructure ... Electrification plans in the rural district.
- e. Development of cattle breeding.
- f. Storage ... Expansion of storage facilities networks at terminal points.
- g. Appropriate financing policy.

(2) Transportation aspect

The present plan is based on the PND "a policy for the expansion, unification and improvement in efficiency for various transportation means, and domestic transportation system composed by Federative Government, individual state, and country".

The policy regarding equipment and unification of transportation organization is studied with consideration taken as to disparities in various transportation means and at the level of federal, individual state, and country, and the plan is drafted to bring in harmony and practicability. The PND decides the policy for economical and modernization plan (transportation corridor) for movement of large volumes of cargoes and for building main national transportation networks between cargo collection regions, and undertakes to implement the plan on priority basis.

"Corridor" especially "export corridor" is linked with the various necessary working plans (PND) for the composition of intra-structures, from silo, warehouses or storage facilities in the producing region to cargo collecting regions or to handling of cargoes at the port and terminal points.

Of special prominence in the PND is "VI - Modernization and Rebuilding of Port Facilities" having purpose of building special terminals, conducting dredging operations, and expansion of port facilities, etc. The port authority (DNPVN) is in charge of the project and investment of a total of 213 million U.S. dollars including port reconstruction expense of 61 million U.S. dollars in the coming years.

First selection of ports (for the project)

For practical investment in port, investment will be concentrated on a limited number of large ports which have big cargo handling capabilities as well as efficient operation as supported by PND. In other words exit points for the "export corridor" will be ports of Vitoria, Santos, Paranagua and Rio Grande.

Another item of special prominence is the carrying out of "transportation corridor" plan linked with "export corridor".

"Transportation corridor" encompasses producing and consuming regions including canals for mass transportation, from shipping terminals to consuming cities of domestic industrial regions. Therefore, the proposed project is a part of general plan necessary for laying down the infrastructures, from silo in producing regions, to regions where cargoes are collected and to shipping terminals, having purpose of removing idle facilities and congestion of cargo movement.

(3) Export aspect

Export policy endeavors and attempts at diversification of export items which means development in two fields upto the level held by coffee. One field is in industrial products and the expectation is 800 million U.S. dollars business by 1974. Another field is in ore and agricultural products so far not grown for export products and by 1974/1975 an export figure of 600 to 700 million U.S. dollars is expected. Through PND plan, an endeavor is made to increase in the export of various items, especially in the natural or processed agricultural goods so far not grown for export. New fields in the export, behind coffee and industrial products will be aimed within the next five years.

The PND plan for agriculture, transportation, and export policy has been outlined as above. Among the policies set forth, essence of the export corridor plan is an attempt at diversification in the agriculture, particularly in the advanced southern regions. The PND at the same time attempts at strengthening the position of agricultural products for export competitiveness and at equipment of infrastructure facilities to reinforce the competitiveness.

(4) Relation with investment plan

According to the PND investment plan for the three-year period from 1972 to 1974, the investment amount in agricultural aspect is about 2,600 million U.S. dollars, in transportation aspect about 3,350 million U.S. dollars. The export corridor plan, whose contents are laying down the infrastructure and agriculture promotion with the investment of 494 million 520 thousand U.S. dollars by 1974, is part of the same investment plan. However, this investment amount for export corridor plan has been computed mainly to obtain coffee fund and loan from foreign countries. There are fields in which construction and equipment are in progress through government, state or federal railroad budgets other than the aforementioned amounts budgeted.

III. EVALUATION ON EXPORT CORRIDORS

III-1. Conception of Export Corridors and Viewpoint for Evaluation

III-1-1 Conception of Export Corridors

- a. Export Corridors should be deemed as "Program" or "Plan" rather than "Project".

The Export Corridors was drafted by the Brazilian Government to consolidate infrastructure, etc. for export of agricultural products and related processed goods. The intrinsic nature of the plan is somewhat different from that of "Project" prevailing in Japan and should therefore be called "Program". In short, it is a plan covering the consolidation of infrastructure for export of agricultural products.

- b. Export Corridors generally understood is only a part of entire plan.

The Export Corridors is a very big plan whose main purposes are to encourage farmers to increase production of soy-beans, corn, sorghum, orange, meat etc., to facilitate collection, storage and inland transportation of the products and to improve harbor facilities to accept giant vessels and further increase loading/unloading capacity for quicker despatch of the goods. Major portion of the plan is covered by the budget of The Brazilian Government, State Government or Federal Railway authorities. "The Export Corridors having been generally understood by the team" is only a part of the entire plan, which will be financed by loan. To be more precise, such basic works as construction of roads and railways, most of the rehabilitation works thereof and completion of harbor facilities are not included in the Export Corridors. The mission was not well informed of this point, which may be attributed to the lack of propaganda by the Brazilian Government at the first stage of planning. It will be better to outline the entire plan here to help understand how and why the request for loan for the Export Corridor Plan is made.

- c. The Brazilian Government has a keen interest in Export Corridors

The plan was worked out by the government itself, who intends to carry out all possible projects to be drafted one after another based on the plan. At the present stage, however, there are still some controversies between the central government (especially Ministries of Finance, Planning, Transportation, Agriculture and Central Bank authorities) and local agencies of the ministries or working agencies of state governments. But this is a matter of course and would be insignificant from general point of view. Necessity for this plan is going to be fully realized by the leaders of state governments and both the central government and state governments are anxious to further promote the plan. The reason is that the obtainment of foreign currency, through the export of agricultural products will be the most important factor for the Brazilian Government to proceed with the current economic policy and prove effective for the development of states.

III-1-2 Evaluation Viewpoint for Export Corridor Plan

- a. Export Corridor Plan is based on the basic idea of current economic policy of the Brazilian Government.

It is, of course, important to evaluate economic factor of each project. But it will be more important to evaluate the economic policy itself on which the plan depends. Repayment of loan etc. is considered to be attainable in the proposed projects to be financed by loan, but it is advised that attention should rather be paid to the present and future economy of Brazil.

- b. Advice to look into the future of Brazilian economy.

The Brazilian economy has successfully got rid of the traditional inflation in spite of the abrupt economic growth and this success seemingly reveals its unique economic policy to control inflation. Policy of the Government under the present economic plan aims at development of economic community based on the foreign currency obtained by the increase of export and this policy would be reasonable at the present stage. In the opinion, of the mission, majority of Brazilian are diligent and ardent to learn, which are somewhat different from the common view traditionally accepted. It is believed that these points come from the fact that the present government is proceeding with the policy conforming to the present situation of Brazil. Putting together, Brazilian economy will continue to develop also in the coming years, but the team desires to leave the matter in the hands of specialists.

- c. High Evaluation given to Export Corridor Plan.

The Export Corridor Plan by the Brazilian Government should be highly evaluated. It is thought that the Japanese counterparts should take note of the big idea and desire of the Brazilian government without sticking to the mere economic features of each project, and therefore their assistance should not be limited to the financial aspect only.

So as to attain the Export Corridor Plan, it is necessary for the Brazilian Government to take measures for solving a number of problems pertaining to the plan. There are so many problems other than the consolidation of infrastructure such as method of education and guidance of farmers, development of operating organization for export corridor, promotion of agricultural products processing industry and nation-wide industrialization, and Brazil is looking for the investments of greater number of enterprises and introduction of know-hows.

III-2. Comprehensive Evaluation on Export Corridor Plan

III-2-1 Significance of establishment and effect of Export Corridor Plan

In view of the present situation of agriculture including the related facilities, it will be urgently needed for the Brazilian Government to consolidate infrastructure of the relevant area as well as to try to introduce agricultural technology under the Export Corridor Plan so as to facilitate export of agricultural products and associated processed goods which have so far had not enough surplus for export.

The plan aims at ensuring the followings in four corridor areas:-

- Stable increase of agricultural production
- Consolidation of collection and storage facilities for agricultural products.
- Overcoming of bottlenecks for transportation facilities to harbors such as railway, road, canal etc.
- Speeding-up of handling works at harbors.
- Consolidation of harbor facilities to accept giant vessels.
- Consolidation of vehicles and other facilities.

Evaluation of the Mission on the Export Corridor Plan is as summarized below.

- a. High Evaluation is given to the fact that the Brazilian Government decided to build up the Export Corridor Plan.
- b. Target of agricultural production for 1976 will be attainable, and that for export is also considered to be attainable.
- c. Loans of foreign countries shall be refunded by the Brazilian Government on its responsibility and the export earnings by agricultural products are not to be used directly for refund to the loan. However, according to the data compiled by Central Bank, the Brazilian Government is aiming at completing repayment of the loan for about ten years by allocating 12.56% of the export amount agricultural products every year. Therefore, there will be no doubt on insolvency as long as the export target for agricultural products is attained.

These farmers still remain at low intellectual level, so that it is difficult to popularize new techniques and to introduce modern production methods among this backward people. On the other hand, medium and large holding farmers may have potential to develop large plantation under enterprises by using heavy farming machinery, but this is unlikely to occur at present for the sake of inferior profitability with soy-bean. The immediate task is therefore to stimulate the enthusiasm for production among peasant farms, in order to improve the production.

(c)-2 Soy-bean:

This is a product capable to maintain the fertility. In recent years the production is showing rapid increase because of two crops a year with wheat, and is expected to swing upward rapidly in future. The reason is firstly that soy-bean is a product capable to maintain the fertility and not to consume it like corn and is characterized by producing stable yields for a long period. Secondly this crop allows an efficient use of land and has potential of mechanization which can bring a high yield by cultivation combined with wheat. Consequently, the production of soy-bean is likely to become plantation enterprise by middle and large holding farmers, and introduction of improved plant variety and production technology is rapidly extended in order to assure a remarkable growth of production. Oil factories are built in several places, with the future risk of overproduction in the domestic market. Therefore, counter-measure should be studied to promote export of surpluses.

(c)-3 Sorghum:

This is a product apt for cultivation on infertile soil and is used as feeding stuff. Sorghum is not produced on a large scale at present, but its production is anticipated to develop in response to the market demand, because of high commercial value as feeding stuff, relatively strong adaptability to infertile soil and drought and potential of mechanization. Intensive guidance will vastly contribute the mechanized cultivation, now likely to be introduced by middle and large holding farmers on an industrial scale.

(c)-4 Fruit juice:

This product is very prospective due to good quality and low cost. The production of oranges is progressing rapidly in some districts. Brazil has large areas suited to the fruit-culture and a risk variety of fruits. The fruit-culture is deemed difficult to be operated by peasant farms, whose production, if the production technology is mastered and if large size orchards are organized collectively in individual districts with modern mechanization and installations, will increase and will become high rewarding. With the advance of urbanization over the world, the demand for fruit juice ought to increase vastly and prospects are good for Brazilian fruit juice. The export of this product is already provided to the United States as well as other markets and Brazil represents the second largest producer in the world.

(c)-5 Meat:

The beef cattle is produced in large quantities by the native and extensive breeding. It is needless to say that the Brazilian agriculture is established with the basis on the live-stock industry, which relies upon vast

III-2-2 Production and Export of Agricultural Products according to the Export Corridor Plan.

III-2-2-1 Present Status and Future Development of Agricultural Production

(a) Growth of agricultural production

Brazil has shown, in agricultural production, an average growth rate of 6.5 % annually during the last five years from 1969 to 1971, and as for the export products, many of them have attained a tremendous increase in production, particularly soy-bean increased by 50 % and fruit juice by 70 %. It seems clear that such achievement of agricultural production is owing to a favorable change of the domestic and world markets, and also to the public policy of incentives such as establishment of floor prices and support prices system, loan financing and tax exemption. If the contemplated improvement of infrastructure and extension of production guidance are implemented in full, it appears fairly realizable to increase agricultural output to an estimated average rate of 8 to 14 % per annum (realistic estimate 11 %) during the period from 1972 to 1976 as planned by the Export Corridors Plan.

(b) Qualitative change of the Brazilian farming method.

The Brazilian agriculture which was traditionally extensive and primitive with reliance upon the land capability, has yielded profits in the past by exploiting productive soils, and accordingly, there remained a vast waste land of poorly productive soils. Thus, as a whole, yields per unit area was extremely low. Brazil is now taking necessary measures to improve such a deplorable situation and has just entered into a transition phase from the nature-dependent type agriculture to the modern and intensive type for higher yields by import of technology and capital. It is a hard fact that rapid growth of yield per unit area is now being attained through modern cultivation control by mechanization and training of production methods such as land improvement (oxygen control, drainage, irrigation), introduction of high-grade seeds, betterment of fertilization, timely farming, etc. The yields will therefore increase per unit area along with the development of production techniques and farm mechanization. Consequently, the intensive agriculture of Brazil can be expected to make great strides in production capacity, by enlargement of farm size motivated by mechanization.

(c) Peculiarities of export products.

The Export Corridors Plan includes corn, soy-bean, sorghum, fruit juice, meat, etc. as agricultural export products. However, individual product has its particularity in regard to farm labour and production method, and therefore the future production increase will vary from crop to crop.

(c)-1 Corn:

It seems that a rapid increase of corn production is hardly possible due to cultivation now operated by peasant farms. This product is widely produced in many parts of the country, as self supporting product necessary for feeding live-stock, and its current production is maintained mostly by the peasant farms.

natural grassland. However the new technology and capital ought to be introduced so that the live-stock industry will be carried out economically and efficiently by the intensive and effective breeding. The improvement of breed, breeding method and pasturage are also necessary. There are some examples in which the new technology and machinery are already introduced with industrial success in realization of a large scale milk industry and raising of fat beef cattle, thus suggesting vast opportunities for this industry. Meanwhile, modern facilities of meat processing are installed in individual states and are bound to increase. These facilities will play an important role in diversification of livestock industry. When the modern processing facilities and transportation are set up, the meat for export will be provided under stable supply conditions and increasing volume. The problem is how to prevent the foot-and-mouth disease and the like which Brazil is endeavouring to stamp out thoroughly as a national policy.

(d) Regional peculiarities

Regional peculiarities are observed in the agricultural production by individual states.

(d)-1 Minas Gerais State

In Minas Gerais State, the new crop land has been cultivated and further extension is expected in the southwest region (Minas Delta). In the northeast district of Espirito Santo and other localities, development of large plantation enterprises is also expected for soy-bean and sorghum, but the timing and speed of such expansion in regard to cultivation land and field might be behind the remaining states.

(d)-2 São Paulo State

In São Paulo State, it is possible to increase and stabilize the yields of this State by effecting the extension of new technology and the production guidance such as improvement of fertilization and farm lands, well timed farming, etc. of existing crop land, instead of exploiting new lands. Further the increase of yields may be possible by the fertilization and enlargement of cultivation lands in São Paulo State as well as the neighbouring states which are infertile and presently unexploited.

(d)-3 Parana State

Parana State embrace two types of program; to develop the new crop land and also to increase yields of existing crop lands by improving the technology and intensive farming control. Hopely both types should be developed to increase the production.

(d)-4 Rio Grande do Sul State

The production of soy-bean is increasing remarkably in Rio Grande do Sul State. The production method of combination adopted for soy-bean - wheat - pasturage allows to advance highly the utilization of lands and to raise the efficiency of mechanization. Under such circumstances, further

rapid expansion can be anticipated. Meanwhile, the alternative method of combination for waterfield rice plant with soy-bean will enable to assure a high yield and profit. It is noted that this combined method of aquatic rice - soy-bean - pasturage has vast potentialities in this State and will contribute to assuring a stable yield and increasing the farmers income. For this reason, the agricultural production of this State is bound to make rapid progress.

III-2-2-2 Export of Agricultural Products

It is a hard fact that the Brazilian soy-bean, corn, sorghum, fruit juice, meat, etc. are not superior to those of competing countries, in terms of volume and quality.

However, as to soy-bean, corn and sorghum, the Brazil's crop is timed with the off-crop season of the northern hemisphere countries and this provides their advantage in export to be done during the period of high quotation in the world market. Consequently, it is very important to aim at establishment of an export structure enabling to make full use of such advantageous position. For this purpose, it is absolutely necessary to improve the storage capacity of farm products and to build a transport and collecting system from production area to loading port without delay, in order to effect the export efficiently in a short span of time. The Export Corridors Plan has been drawn up to meet this request.

The problem exists in the improvement of quality and the reduction of production cost.

The improvement of quality is possible, because the problem such as improvement of seeds, extension and guidance of new technology are progressively penetrating among the farmers. For instance, soy-bean seeds have been improved from about 17 - 18 to about 21 % in oil content and from 39 to 42 % in protein. It is also indispensable in future to make efforts for unification of plant variety and standarization of products with a view to raising the value of commodity.

The present production cost of the Brazilian soy-bean and corn is relatively low in international levels, but this is supported by the low wages. Such being the case, it is absolutely necessary to increase the production power by mechanization and scaling up so as to assure the profits and also to lift up the standard of living of the farmers. The reduction of cost of production is provided by the increase of yield per unit area and the reduction of expenses. It is a proven fact to cut down the cost of production by both ways of increase of yields and reduction of expenses, if mechanized cultivation is implemented on a large scale combined with new technology and modern farming methods.

Tentative study may be made, according to the research materials on São Paulo State, to calculate the cost of production of soy-bean and corn obtainable by the production method using animal power and mechanical power respectively.

As the agricultural production power varies according to the scale of enterprise and to the technical level, it is needless to say that the yield and the cost of production are not the same. The yield per hectare is about 1.5 ton and 1.2 ton for corn and soy-bean respectively in case of production method by animal power which is still customary in Brazil, while 2.8 to 3.0 tons and 2 to 2.5 tons obtainable for corn and soy-bean respectively in case of modern and mechanized method. However, we have to state that, at the present stage of technical level and production scale, the production expenses are higher in case of mechanized method than by animal power. However, by the calculation of production charges for corn and soy-bean based on the same research data, the charges for corn should be \$30 per ton in case of animal power against \$20 per ton in case of mechanization, and those for soy-bean \$52 against \$46 respectively. In case of soy-bean particularly, the combined production by complement of soy-bean and wheat or waterfield rice plant can be adopted and the production method using heavy machinery can be operated economically and efficiently. Consequently, the expenses of equipments will be reduced and the yield will increase considerably by the rationalization of fertilization and the well timed cultivation control. It is deemed hardly difficult to reduce the production charges down to around \$30 to 35 per ton, by improving the productivity of labour and land following the increase of agricultural production power which is obtainable by the realization of plantation enterprises using heavy machinery.

The problem is how to introduce and establish the rational and large scale mechanization among the farmers. It should be necessary to take measures intensively for the loan financing by the government bodies in connection with the introduction of machinery, for the farmers' organizations on regional and collective basis, for the system aimed to extend new technology and for the cooperative activities. Needless to say that serious consideration should be taken in order to cut down the expenses incurred on the marketing channels such as storage charges, transport fees, etc.

Fruit juice and meat are produced in large quantities owing to favorable climate and vast land resources. Their production cost is lower compared with the international level, and offers vast potential for export.

The variation of export volume is inevitably subject to change of the world market, trend of domestic consumption, etc., but the export quantity should be assured by the quality improvement and stabilization of the export products and the lowering of production cost, since these factors are nothing but the basis of competition. If the circumstances may require, a strong financial policy may be useful, but it is deemed possible to achieve the export target of about 11,000 thousand tons planned for 1976, covering soy-bean, corn, sorghum, meat, fruit juice, etc.

Through its field investigation, the mission obtained the figures of yield of agricultural products which are expected to achieve by individual State, as mentioned in the table of estimated production and export by State and by product (Table 8). These figures are, as a matter of course, in excess of those estimated by the Federative Government. This reflects the positive attitude of the State Authorities toward agricultural production and its export, but the mission observed that the export quantities estimated by the Federative Government are fairly reasonable and justified at this stage.

Taking into consideration the above factors, the mission made use of the total export quantity submitted by the Federative Government for 1976 as reasonable figures for the basis of its investigation.

In conclusion, it may be added that special attention should be paid to the following points, in order to build up in the Brazilian agriculture the production and export of these agricultural products for a continuous and stable expansion.

- (1) Intensification of the guidance relative to a right choice of cultivation and land.

As it is apprehended that the farmers may rush into expansion of crop land without careful planning (for instance, coffee crop and damage by late frost), it is absolutely necessary to execute the guidance concerning agricultural production by informing the farmers of soil and weather conditions, market situation and by making and distributing the maps of right products by district from the natural and economical viewpoints, also to promote the guidance positively concerning management on the basis of "a right product on a right land", through public policies, such as financial measures, taxation system, support price system, etc.

- (2) Intensive aids for production supplies

In order to supply and to allow the farmers to procure, at low prices and without price fluctuation, seeds, fertilizers, pesticides, farming machinery, and storage installations which are indispensable for production increase and quality improvement, it is advisable to put into practice the intensive financial aids as well as extension and training of new technology. (Particularly, intensive financial aids and technical guidance are required for the farmers to procure the farming machinery.)

- (3) Introduction of new techniques for production increase and quality improvement.

It is to be desired to introduce various new techniques such as improvement of seed, efficiency progress of fertilization and weeding, soil improvement, etc. Besides the intensive extension and guidance regarding selection of high-grade seeds, and technology, similar encouragement is needed in connection with well timed cultivation (sowing time, fertilization time, weeding time, harvest time) and collection by means of mechanization as well as development and installation of drying and storage facilities.

- (4) Reinforcement and expansion of research organizations and extension services.

In close liaison with the public organizations, financial institutions and industries related to agriculture (for instance, farming machinery industry and with their assistance, it is imperative to establish experiment and research facilities and to organize extension system, with a view to increasing the agricultural production and reinforcing the extension service.

(5) Encouragement and reinforcement of agricultural cooperatives

The reform policy concerning management structure, with a view to encourage the development of operations by small farmers and to stimulate their enthusiasm, should be studied fundamentally from the aspects of land-ownership and utilization of machinery capital. The basis of reinforcing and stabilizing the agricultural production is to increase the production power of small farmers' operations by means of establishment of cooperative organization.

(6) Modernization and integration of the facilities for collection, storage, processing, and marketing of agricultural products.

With a view to sell the agricultural products as merchandise on favorable conditions, it is necessary to collect the products of standardized quality, to store and process them in order to keep their quality and to effect transport to the consuming places. Consequently, special efforts should be made so as to realize the modernization and integration of the facilities for collection, storage, processing, marketing of the agricultural products.

(7) As basic problem to solve the abovementioned tasks, the first point to be made is the raising up of intellectual and capability level of the farmers in connection with management and production and the reinforcement of economic thinking (enthusiasm regarding the agricultural enterprise). In order to promote the implantation of new technology in the production, the point is to take up positively the farming education which forms the basis of absorption of new technology (crusade against illiteracy, acquirement of basic scientific knowledge, etc.), the establishment of productive cooperations, the improvement of living standards in rural areas and the development of cultural institutions.

III-2-3 Ideal infrastructure and way for improvement

Most of the products cropped in four export corridor areas shall be transported to the ports in respective area. The port for loading will be decided subject to geographical conditions and transportation facilities available and suitable for respective product.

It is estimated that soy-bean is the most prospective products for export and total export amount of soy-bean including refuses will amount to approx. 9 million tons. Another estimate indicates that export of corn and sorghum will amount to 5 million tons being half of total export amount of agricultural products of 10 million tons.

The difference of opinion between the two estimates comes from the fundamental difference of consolidation policy for infrastructure of transportation between the two. Soy-beans are produced many in southern part and very few in the north, while production of corn and sorghum is concentrated in northern part. Therefore, when making much of soy-beans, higher priority should be given to the consolidation of Rio Grande do Sul and Parana Export Corridors than the other two. But when stress is put on corn, four

Export Corridors should be given almost same degree of priority.

a. Premise for study of infrastructure

Although thorough investigation was impossible by the mission during limited period, the mission estimated export target of each Export Corridor as follows based on the estimation of production of each state as mentioned below.-

Table 2 Export Target of each Export Corridor

		(1,000 t)		
Export Corridor	Port for Loading	Products	Export Amount	Transport Capacity
Minas Gerais/ Espirito Santo	Vitoria	Cereals	850	1,000
		Frozen goods	-	100
Sao Paulo	Santos	Cereals	2,878	3,200
		Frozen goods	-	280
Parana	Paranagua	Cereals	3,500	3,500
		Frozen goods	-	-
Rio Grande de Sul	Rio Grande	Cereals	2,719	3,000
		Frozen goods	-	150

The period when production and export of agricultural products will be centered is about 6 months for soy-bean, 5 months for corn and 7 months for pellet respectively. Out of the period, each one month at the first and the last show slight decline of export and therefore it will be reasonable to consider that the average period for production and export is 5 months.

Judging from the above, it is estimated that monthly and daily amount of handling of agricultural products for each Export Corridor as shown in Table 3-3.

As a result, it is estimated that the goods for loading at Vitoria and Santos will be transported mainly by railways, those at Paranagua will be 2/3 by road and those at Rio Grande will be 1/4 by road and 1/4 by water respectively. (see Table 4)

The estimate is made on the assumption that well improved and rehabilitated railways will be utilized to the full extent of its capacity and those which can not be covered by railways will be transported via road. Of course, due consideration is given on selectivity on various transportation facilities conforming to respective product. Water transportation is also taken into consideration especially.

Table 3 Amount of Cargo Movement

Name of Port	Movement Amount (1,000 tons)		
	Per Year (A)	Per Month (B=A/5)	Per Day (C=B/30)
Vitoria	850	170	6
Santos	2,878	576	19
Paranagua	3,500	700	23
Rio Grande	2,719	544	18

Table 4 Amount of Goods Transported from Producing Region to Ports

Name of Port	(1,000 tons)					
	Railway		Road		Water Transport	
	Monthly	Daily	Monthly	Daily	Monthly	Daily
Vitoria	170	6	-	-	-	-
Santos	576	19	-	-	-	-
Paranagua	233	8	467	16	-	-
Rio Grande	272	9	136	5	136	5

b. Storage facilities at producing region

So as to ensure efficient production and distribution of cereals for export, it is required to establish intermediate silos for collection, drying, selection and storage of the products.

Advantages of the intermediate silo are as follows:-

- Can ensure more efficient collection of products.
- Can unify quality of products by drying and selection.
- Can avoid deterioration of quality of products during storage.
- Can reduce cost by handling products in bulk

However, silo should be built after minute studies on managerial aspect as turnover rate of the goods will be lowered as compared with that of the warehouse for storage of bagged products which accepts wider variation of products than silos. It is absolutely necessary to make systematic collection and delivery of goods for efficient management of silos. Construction and management of the intermediate silos under the Export Corridor Plan will be performed by warehouse companies invested by both State and Federal Government, and due consideration should be taken to ensure systematic co-operations with the system for collection and delivery.

As for the capacity of silos to be constructed in each state under the Export Corridor Plan, it is not yet clear how many silos are required in each state except the State of São Paulo for which necessary data has been fully furnished. Therefore, further study will be necessary on the required quantity of silos for other states.

In conclusion, the intermediate silos should be constructed in accordance with the situation of each area taking due consideration of the managerial aspect.

c. Transportation facilities from producing regions to ports.

c-1 Railway

c-1-1 Present condition of railways

Railways in Brazil were mainly managed by foreign companies before the World War II, but drastically nationalized after the war. At present, railways in Brazil consists of government-owned Federal Railway Company (RFFSA), São Paulo State Railway Company (FPSA) managed by the State of São Paulo, Vale do Rio Doce Company (Semi-governmental corporation; 80 % of the capital is invested by the government.) and several small-scaled private railways.

Track gauge is 1.0 m or 1.6 m which share almost 90 % (Please refer to Table 11) and railway of different track gauges are only seen at local lines. Railway line of 1.6 m track gauge shares only 1.0 % or more of total railway line, but the gauge is applied to the trunk lines in the State of São Paulo such as the Federal Railways' trunk line connecting the two biggest cities, São Paulo and Rio de Janeiro and another trunk line Belo Horizonte to Rio de Janeiro.

The fact that main railway line has two different track gauges is one of the heaviest restrictions for building up railway network of entire Brazil, and transshipment facilities at the connecting points between the railways of different track gauge are the main bottleneck in railway transportation.

With the development of automobile transportation and accumulative shortage of investment on railway industry, volume of passenger transport by the railways is decreasing year by year except for that of commuter traffic around the big cities, while freight traffic records a steady increase and shares a major portion of the services by the Brazilian Railways. (Please refer to Figure 7)

As shown in Table 12, most of the freight cargo is shared by such raw materials as iron ore, cement and coal; agricultural products such as wheat, coffee, sugar etc. share only a small portion. The most remarkable example of freight traffic is the transport of iron ore on railway line of Vale do Rio Doce Company. The railway is the single track (partly double) connecting Itabira and Tubarao port (north of Vitoria port) and is transporting iron ore of 30 million tons per year by 7 roundtrips per day.

The train formed of 160 hopper cars of 72 tons loading capacity is hauled by 4 diesel locomotives of 3,600 HP each. The terminal station Tubaro is equipped with highly automated unloading facilities as well as automatic loading facilities.

The railway company is proceeding with the modernization works such as double-tracking and adoption of CTC system to ensure iron ore transport of 60 million tons in the latter half of 1970s. The company's iron ore transport is almost at the highest level and it is noticed that the Export Corridor Plan have been worked out after the model of the iron ore transport system by the company.

Figures 8 to 11 show volume of railway transport of main cargoes in each district of Federal Railway, which indicate peculiarities of each district. Figure 12 shows conditions of freight movement among different districts in the Federal Railway. According to the figure, transport of cargoes among the districts is small.

Brazilian Government is trying to improve railway system under the National Development Program and puts stress on completion of railway networks running through the mainland connecting north and south as the present network is directed for ports only. There still are many lines left unimproved from the beginning of construction and these lines have many steep gradients and sharp curves which constitute main obstacles for railway transport. Therefore, necessary rehabilitation works are being implemented gradually.

Total length of double-track line is approx. 600 km as shown in Table 11, and electrified section is approx. 2,000 km centering around the State of São Paulo. Non-electrified section is going to be dieselized and steam locomotives are gradually replaced. (Please refer to Table 13 and 15)

Management of Federal Railway is unsuccessful as shown in Table 14 and yearly deficits are compensated by the nation and expenses for rehabilitation work and construction of new lines are also covered by the nation. To improve management condition, the Federal Railway is proceeding with removal of deficit lines. (During two year period from 1970 to 1971, deficit lines extending over 540 km were discontinued in revenue service.) On the other hand, employees reduction by 30,000 was carried out during the past 10 years. The Federal Railway intends to balance the account at the time of termination of the 5 year plan under implementation.

Federal Railway Bureau of The Ministry of Transport (DNEF) undertakes supervision and support on Federal Railway etc. Influence of the Bureau over the Federal Railway is comparatively bigger than the one with which Japanese Ministry of Transportation's supervising Japanese National Railways (JNR), and all construction programs including disuse of superannuated cars are carried out subject to assessment by DNEF.

The full-governmental Federal Railway Company consists of 4 district departments and 14 administrative departments and its organization is almost same as that of JNR.

The company was established by merging several railway companies of foreign capital; the personnel management is made on a nation-wide scale.

c-1-2 Outline of Export Corridor Plan and estimation

The shortage of investment by railway enterprise for many years, has resulted in the situation of dependence on transportation by truck over long distance with many goods which should usually be covered by railway transportation. So as to solve the above problem, Brazilian government is going to promote, as one of national development plans, improvement of existing railway for the purpose of increasing transportation capacity, and construction of new railway lines and purchase of new rolling stock. Therefore, this export corridor plan covers consolidation of such railway lines as considered to be necessary for transport of agricultural products for export.

The Export Corridor Plan aims at improving main railway lines, which have now a bad condition of 2.5 - 3.5 % max. gradient and approx. 100 meter minimum curve, upto the condition of 1.0 - 1.5 % maximum gradient and over 300 meter min. curve in order to increase transportation capacity by two or three times as well as ensure speed-up. Furthermore, in some areas between stations, train control system of C. T. C. etc. will be introduced and the construction of railway lines will be reinforced for nationalization of train operating control and to avoid accident. Construction of new railway lines will be mainly concentrated on short-cut lines so as to shorten the distance of railway transportation to get an advantage in competition with truck transportation. This railway equipment plan is considered to be reasonable in judgement of estimated volume of transport in the future.

The Export Corridor Plan has main purpose of transporting large quantities of domestic agricultural products to seaports by railways and the most desirable transportation system is to build base station for loading agricultural products at intervals of about 100 km along railway line in hinterland and then for charging onto train at short interval from base station to seaport so as to enhance efficiency of train operation. In such case, it would be necessary to equip silo for collecting goods (capacity is about 1.5 to 2.0 times as much as the railway's daily transport) at base station and also to provide equipment for loading in suitable manner for transportation capacity. In addition, it is to be taken into consideration to couple to trains for shuttle motion operation in accordance with the scale of base station for carrying goods to seaports by the train shuttle motion running over long distance.

As the result of calculation of quantity of railway rolling stock based on Export Corridor Plan, necessary quantity of rolling stock for exporting agricultural products over 11 million ton in total, shows that 260 locomotives with 1,500 HP class as standard and 3,000 hopper cars with 40 t loading capacity as standard will be required. However, the above figures is to be understood for reference purpose only because these are the ones as estimated on the basis of much unknown factor.

Generally, railways in Brazil has been developed for only transporting primary products made in domestic areas to seaport. This Export Corridor Plan, it is understood, will be the most responsive measures for distribution of goods in Brazil.

However, this Export Corridor Plan shows that route for transportation is slightly different from existing route and quantity of transportation has much increased than before because the plan has been made for the purpose of developing areas in individual province.

General observation is made on the Export Corridor Plan as follows.

1) The Export Corridor Plan for Minas Gerais, Espirito Santo states is primarily drafted for transporting agricultural products of Minas delta area to Vitoria port. The railway line, under management of Vale Do Rio Doce company, which runs from Vitoria port in the west in Minas Gerais state, has a good railway equipment because it has been developed for transportation of large quantity of iron ore. Therefore, it is observed that the transportation of agricultural products of Minas delta by this railway seems to be the best policy to raise efficiency of investment on improvement of existing line and also to alleviate congestion of narrow Santos port. On the other hand, as Santos port is nearer in distance to Minas delta area and the transportation route of this plan is administered by three enterprises, São Paulo States Railway, Federal Railway and Vale Do Rio Doce Co., transportation freightage in comparison with Santos port is considered to become more expensive. Therefore, it is requested to consider supporting freight (the one set by the political point of view) by Government in order to effect this plan.

2) The Export Corridor Plan for São Paulo

Santos port is prosperous and has been developed with hinter-land of São Paulo state. It is therefore observed that this plan is suitable without any consideration revision. However, area between São Paulo and Santos is highly industrialized area in Brazil and is foreseeable to become more and more industrialized in the near future which will result in the increase in quantity of goods for Santos port and railway connecting thereto. In addition, as agricultural products around Minas Gerais State and Parana State may be forecasted to flow into Santos port and railway connecting thereto caused by over-loading. And furthermore, the Export Corridor Plan must be checked to revise more carefully for one of Brazil Government Development Plans and especially the ways to develop area between São Paulo and Santos.

3) The Export Corridor Plan on Parana State

Though the State is of the most hopeful on agricultural products on this Export Corridor Plan and also has a excellent Paranagua port for export, achievability is apprehended of quantity target of export due to the shortage of quantity of railway transportation. The improvement of railway between Curitiba and Paranagua is now being studied, though it must be effected as soon as possible by making good plan.

At the same time, the construction of new railway line between Apucarana and Ponta Grossa must be proceeded with to connect well between northern part of Parana state and Paranagua port..

4) The Export Corridor Plan on Rio Grande do Sul.

The agricultural products of western part of Rio Grande do Sul state is suitable for using railway and the north-eastern part with using canal and Patos lagoon is a suitable base for deviding volume of transportation.

c-2 Road

The transportation facilities in Brazil and in transportation of goods as well, depend on road from old times due to the shortage for investment of railway and equipment for port.

As indicated in Table 16, the quantity of 42.6 billion t-km at 60.5% within 70.4 billion t-km of the quantity of transportation of goods in 1960, the quantity of transportation has increased to 176.5 billion t-km, at 2.5 times as compared with the quantity in 1960, on the other hand, the figures of transportation by truck shows over 70 % which still indicates large share of transportation by truck, in addition, in view of increasing quantity of transportation by railway of iron ore etc. of mineral source, degree of dependence on agricultural products and general goods by using road is extremely high.

Concerning transportation of passenger as compared with Japan, it is well that how the road in Brazil plays an important role in transportation. (Table 17) Under the circumstances, although road plays an important role for means of transportation, the equipment of road does not give any effect to improve.

The roads in Brazil are composed of the Federal highway, the Base road, which connects between areas and between cities, and composed of State road and municipal road to supplement Federal highway. One of them, even in the most important road on National highway, the road is paved only 24,000 km of a total extension of 52,000 km and pavement ratio is only 47%.

The equipment of road as important means of transportation has been more improved year by year, which can not keep up with the speedy economic growth of Brazil, and accordingly new roads are under construction.

Extension of road for equipment in the Federal highway has been effected 5,500 km for 6 years (9,400 km in 1961 to 14,900 km in 1967), and has been more added 8,800 km for 3 years by extension of 23,700 km in 1970. In addition, 3 years plan by the Federative Republic of Brazil is showing to extend equipment of road to 38,400 km from 1972 to 1974 from now on.

The financial resources for equipment of road with Brazil Government are mainly covered by petroleum tax and car registration tax and general financial resources. However, there are some roads covered by loan from the World Bank and Banco Nacional de Desenvolvimento Economico, which are effected by control of the Federation and state, country and city. (Table 18,19)

The executive organizations in the Federation on enterprise of road are organized by the National Highway Department of the Ministry of Transportation and 20 Federal Highway District in number each local states, which control the construction of the Federal highway and the administration of maintenance for them.

Nowadays there are only two toll roads, BR-116 Via Dutra between Rio de Janeiro and Sao Paulo, and BR-50 Via Anchieta between Sao Paulo and Santos, and income of the toll road, which only keeps maintenance for repairing road, can not bear refund for construction of road and then the refund for loan on construction of road is supported by part of total financial resources. Although the national area is very large and road density is small, the traffic density is the main base in the Federal highway, which covers 2,000 to 3,000 vehicles/day and they are increasing in number very much in the city. The kinds of vehicles are, generally composed of 30 to 40 % shared by passenger-cars and buses and the rest by trucks of which big cars with three axles are in a big share of 30 to 40 % in total.

As stated above, partial field survey of the mission for short time shows that the plans of equipment for road in Brazil are as follows.

1) It is proposed that new road be considered in the near future as toll roads for support of financial resources in the case of constructing new road in compliance with demand of traffic between cities and areas around big cities.

2) In cities where traffic is dense, it would be necessary to break down traffic in order to avoid concentration on central area of the city and then to construct out-skirt ring road of the city to make traffic under passing detour.

3) In gradient road, especially on two-lane undivided road, it is a favourable matter of making capacity of traffic for many big cars of Brazil to equip climbing lane for upgrade so as not to give other traffics low efficiency due to slowdown of speed caused by big vehicles.

In view of the roads having connection with the Export Corridor Plan, the traffic is not so crowded that it may accept increasing amount of agricultural products in future and moreover the roads are wide enough to accept further expansion. However, the road density on the side of place of production for collecting agricultural products from vast farming area, is high and especially such tendency can be recognized in the northern part of Minas Gerais state and Rio Grande do Sul state.

So as to make use of the vast land fully and to equip road efficiently, it would bring good result that the arterial highway shall connect the nearest distance between the place for collecting agricultural products and traffic base station and seaport etc. and additionally the road for supplement shall rather connect the nearest distance to this arterial highway than the traffic base. Partial loss time can be covered by level up of service such as increase of design speed of arterial highway.

In Sao Paulo city and the neighborhood and Porto Alegre city etc., as trouble is experienced with traffic jam caused by cars and trucks which concentrate on the center of the city, it would be necessary to build new road in compliance with traffic demand and ring road to make traffic detour.

The expenditure on Brazil DNER in 1971 including construction and management expenditure, is 4,546 million Cr. \$ (about 2,300 hundred million Yen) of which the national treasury funds and the self-funds on road are included. As compared with 7,600 hundred million Yen of the national expenditure for road concerned in Japan in 1971, and also from the point of view of country area and condition of equipment for road, Brazil Government may need to plan further expansion of the financial resources on equipment for road.

c-3 Canal

The central part of the Atlantic Ocean coastal zone in Brazil is obstructed by the coastal mountain-chain, which the water scarcely pours into the Atlantic side to use good facilities for water transportation. No ample transportation has been operated navigation interior by means of river and lake so that the amount of shipment of products indicates only 526 thousand t. However, in Rio Grande do Sul state, Jaqui river and Taquari river are connected with Lagos Dos Patos at Porto Alegre, which will be made possible to sail ship over 1,000 DWT in case of completion of four gates in 1973 effected by the Federative Government in this area. It has been made possible to transport over long distance much quantity of agricultural products at low freight cost if transportation terminal around Cachoeira do Sul and Estrela is installed to connect road and railway. It is observed that the capacity of the above would become 200 t. per one year and more additional ships would make possible to transport much quantity of products. Furthermore, equipment of railway and road to connect to those terminals would make possible to perform a reasonable transportation for agricultural products to Rio Grande seaport.

d. Harbor facilities

d-1 Outline and description

The halves of Brazil border on South Atlantic Ocean and the length of seashore line reaches about 8,000 km. These seaports are located between 20' degrees of south latitude and 32' degrees to keep sea around there calm to be about 2 m height at maximum on sea run.

Inside within these seaports is extremely calm because those are made skillfully use of the lay of the land as natured. In fact Vitoria, Santos and Paranagua port are made use of seaboard respectively between a big island and a continent and Rio Grande port is utilizing Lagos Dos Patos harbor, which gives also a good effect to expand seaport by use of nature.

In Vitoria port and Santos port, which have no enough space for expansion for the coming future, the former depends on Tubaron, out of seaport to construct the base of import petroleum to San Sebastian port. However, as Paranagua port and Rio Grande port have enough space to expand. The mission observed that Rio Grande port would be eligible for the propose site for building on a large scale of seafront industrial area in the near future.

The following list indicates quantity of goods handled by each seaport.

Table 5 Quantity of Goods Handled by Each Port
(Unit: 1,000 t.)

Year	Vitoria		Santos	Paranagua	Rio Grande
	Vitoria	Tubarão			
1969	3,567	15,870	12,756	2,149	2,638
1970	3,660	22,069	11,745	2,740	2,635
1971	3,069	26,879	13,524	2,759	3,136
1972 (estimation)	-	-	-	-	-

As indicated above, it is understood that Santos handles the most quantity and other ports handle the quantity of 3 million to 4 million tons except for Tubaron in Vitoria for exclusive port of loading iron ore.

These port are administrated by state respectively, port located, except for Santos managed by private enterprise and the improvement of installation for these four ports is supplied by funds by the Federal Government.

The subsequent paper is intended to introduce the general port conditions of Brazil, to help acquire a knowledge on the port arrangement program included in the Export Corridor Plan.

1) Port administration

The ports in Brazil are administered by Ministerio Dos Transportes (Ministry of Transportation), Departamento Nacional De Portos E Vias Navegaveis (National Department for Ports and Navigation Routes).

A national port system is organized of 25 organized ports, 10 unorganized ports, and a number of terminals and piers. In addition to these ports, 5 ports and special terminals are now under construction, and 8 river ports are now being surveyed.

The organized ports are administered by the following bodies.

Government-administered:	DNPVN	8 ports
	Public corporation . . .	1 port (Rio de Janeiro port)
Government-conceded:	Provincial government	9 ports
(Concessão)	Private enterprises . . .	3 ports
Government-intervened enterprises & special	enterprises	2 ports

a) Organized ports

Manaus, Belem, Mucripe, Natal, Cabedelo, Recife, Maceio, Aracaju, Salvador, Ilheus, Vitoria, Niteroi, Rio de Janeiro, Angra dos Reis, S. Sebastião, Santos, Paranagua, Antonina, S. Francisco do Sul, Itajai, Imbituba, Laguna, Porto Alegre, Pelotas e Rio Grande.

b) Unorganized ports

São Luis, Tutoia, Luis Garcia, Parnaiba, Camocim, Aracati, Cabo Frio, Florianopolis, S. Borja e Corumba.

c) Existing principal terminals or piers

Santana (Icomi); Terminal de Carmopolis - Tecarmo; Terminal de Madre de Deus - Temadre; Terminal da Baía de Guanabara - Tegua; Terminal Almirante Barroso - Tebar; Terminal Almirante Soares Dutra; em Tramandai (Petrobras); Tubarão (Cia. Vale do Rio Doce); E. Guimarães; Cais Paul (Usiminas); Terminal Marítimo da Cosipa, Terminal da Ultrafertil e Terminal da Dow Productos Químicos (em Santos); STBG; Metalnave; Guaxindiba; Cordeiros; Salceiro; e grande numero de outros, inclusive os pertencentes as companhias distribuidoras de gasolina, como a Esso, Shell, Texaco, Atlantic etc.

d) Ports under construction

Itaqui, Santarem, Imperatriz, Itaituba e Altamira.

e) Terminals under construction

Sal em Areia Branca, Acucareiro em Recife, Acucareiro em Maceio, Minerio em Campinho (BA), Cacaueiro em Malhado (Ilheus), containers do Rio de Janeiro, Fertilizantes de Conceicaozinha em Santos, Cereais de Paranagua e Derivados de Petroleo de Paranagua.

f) Ports now being surveyed

Cais de Capuaba em Vitoria, Foz do Iguacu, P. Velho, Humaita, Boca do Acre, Caceres, Corumba, Ladario e Rio Grande (ampliação do Porto).

The ports are presently administered by the above various bodies. DNPVN, however, is planning to unite an administration system into mono-administration by the special enterprise.

The following are the activities which DNPVN is in charge of:

- Direct administration for 8 ports
- Supervision for other ports administration
- Construction of port facilities
- Planning and surveying for ports
- Issuance of permit for privately-run terminal

2) Cargoes handled in ports

A cargo handling volume in ports of Brazil attained 91,000,000 tons as at 1971. A port cargo handling volume is on a tendency to increase on the sound basis, reflecting a high economic growth of the nation. A growth ratio recorded 5.8 % for 1968 - 69, 12.4 % for 1969 - 70, and 12.4 % for 1970 - 71. The means of transportation employed in Brazil for foreign trade in 1972 are as listed below (Presumed statistics).

Table 6 Means of Transportation in Brazil (Estimated 1972)

Means of transportation	Cargo (ton-kilo basis)	Passenger (passenger-kilo basis)
Road	71.0 %	94.4 %
Railway	18.0	3.5
Ocean transportation	10.9	0.1
Aircraft	0.1	1.5

Remarks: Figures presumed for road transportation.

Export volume attained US\$2,900,000,000 and import volume US\$3,250,000,000, with a total volume of US\$6,150,000,000. Listed below are cargo movement volumes in ports of Brazil during 4 years from 1968 to 1971. (see Table 20)

3) Financial position

The financial position with DNPVN in 1971 is as follows:

Revenues

Domestic fund	(Federal budget, National port fund: FPN, Port improvement fund: FMP etc.)	Cruzeiro 531,000,000 (or about Japanese Yen 27,000,000,000)
Other funds	(Economic Development Bank: BNDE etc.)	Cruzeiro 19,000,000 (or about Japanese Yen 1,000,000,000)
Foreign financing	(American Development Bank: IDB)	Cruzeiro 4,500,000 (or about Japanese Yen 200,000,000)
Total:		Cruzeiro 554,500,000 (or Japanese Yen 28,200,000,000)

Expenditures

Investment	Cruzeiro 324,000,000 (or Japanese Yen 16,000,000,000)
Other expenditures	Cruzeiro 69,000,000 (or Japanese Yen 3,500,000,000)
Total:	Cruzeiro 393,000,000 (or Japanese Yen 19,500,000,000)

The port improvement fund, one of the financial resources for improvement works of port facilities, is to be established by port improvement tax (TMP) to be levied according to a National Plan for Establishment of Port Improvement Fund as put into effect in 1961. This tax is levied on the basis of CIF value of the cargoes being moved in the ports.

Foreign trade:	Export	Duty-free
	Import	2 %

Domestic trade: 0.2 % for both import and export

The port improvement tax is to be allocated to the funds for port renovation, of which 40 % is allocated for the port renovation in which the tax was collected and remaining 60 % is to be once collected to DNPVN for pooling and thereafter distributed to each port for the port renovation purposes.

The port facilities such as navigation channel, anchorage wharf, pier area, port transportation route, cargo handling equipment, warehouse, storage facilities, silo, are maintained and arranged by the use of federal funds, with no partial fund participation from the port administrating bodies or related municipal authorities.

In case where port arrangement work needs fund in big amount or requires immediate implementation, there will be the case that the foreign credit may be allocated to the financial resources that is needed. Such foreign finance is to be credited to the federative government for port renovation fund, of which principals and interest are to be redeemed out of the port improvement fund. In the event of the fund being short, the money out of other funds such as general account is to be allocated for redemption.

Furthermore, charges or taxes are to be levied on all port activities such as the use of cargo handling equipment, silo storage facilities in Brazil, with the revenues thus collected being allocated to port administration. No other funds than these revenues are available for the port administration activities. A rate of charges or taxes being levied on the port activities are to be determined for the revenues to suffice the fund needed for the port administration activities. The rate is reviewed every two years and is apt to gradually decrease in such ports as where the facilities are efficiently utilized and port is administered rationally. Since a rate is reviewed for each of port, a difference will tend to develop between the ports.

Therefore, the point to be taken into account in exploring feasibility for the facilities in Brazil, is whether the facilities will be efficiently utilized with favourable influence on the entire economy, and rather than whether the revenues being secured by utilizing the facilities will suffice the fund to be needed for constructing and administering the facilities. It is expected by the Government of Brazil that the Export Corridor Plan be evaluated on a large-scale basis on the point of view that whether the facilities on the Project will be effective for the export of agricultural products amounting to target 11,000,000 tons on the Project and whether investment for the whole facilities will be well rewarded by the revenues to be brought about by the export of agricultural products. It is expected that the Project be not evaluated on the basis of feasibility as explored or profitability on each of the facilities.

4) Port project

Every port has 10, 5, 3 and 1 year plan. The 10 years plan is being framed up by the administration body of each of the ports, as guide lines for the port renovation. While, DNPVN has a consultant framed up 5 years plan and submits it to the Vessel Deliberative Council for review and comment, and thereafter to the Minister of Transportation for authorization. The 3-years plan is to be decided on the basis of the integrated decision of the government, after having been reviewed with deliberation by the Ministry of Transportation, Ministry of Finance and Ministry of Planning and Coordination. The 1-year plan is decided with deliberation into the relative budget.

d-2 Improvement of port facilities

The abovementioned four ports serving the outlets of the Export Corridor are individually equipped with mooring berths of substantial length, all of which are of the conventional type with the average water depth of less than -10 meters. Thus, the present loading capacity of grains averages about 2,000 tons per day in each port.

This is a dreary fact when compared with the daily grain handling capacity of 10,000 tons in each port of the Gulf Coast, U. S. A.

Aiming at bulk export of grains, the Export Corridor Plan contemplates rapidly improving such substandard capacity of port facilities; modern and efficient handling system such as large ships, large-size shiploaders, large-capacity silos with the mating unloaders will be established and operated effectively in each port. The Brazilian Government, with this object in view, are investing a huge amount in renovating the access navigation channels which will serve the key basis for establishing such handling system, for scheduled completion by May 1973 as described below:

Table 7 Access Navigation Channels

Port	Water depth of Navigation channel	Status
Vitoria	-13 m	Completed
Santos	-13 to -14 m	To be completed by May 1973
Paranagua	-12 m	" "
Rio Grande	-13 to -14 m	" "

Remarks: The water depth as tabulated is indicated on the basis of L. L. W. L. being adopted for port construction work. Since water depth is indicated by M. L. W. L. in chart, this will need the addition of 70 to 80 cm. as the time when it is used as the water depth of chart.

After June 1973 and onward, these ports are scheduled to have such access navigation channels as to permit entry of large grain carriers of 40,000 to 60,000 D/W. However, these access navigation channels are left unprotected by the absence of diversion banks and established directly in the open sea, with likelihood of being silted up by littoral drift and sediment load. Among others, the port of Rio Grande appears to need the dredges for upkeep of channels and also the long-range measure for expanding the existing diversion banks, with detailed study and planning.

Establishment of large-capacity silos and refrigeration terminals with reliance upon external financial aid is visualized with the key basis of access navigation channels being implemented with the Federal investment.

Although having no direct bearing upon the Export Corridor Plan, it may be worthy to make some observations about effective use of coastal transportation for national development.

The surrounding South Atlantic being in calm waves, it is recommended to expand the coastal transport on a large scale which will serve as an inexpensive bulk transport of cargo, thus offsetting the present drawback of expensive long-haul inland transport.

Furthermore, the coastal shipping will make possible establishment of the industrial areas attached to the ports, by way of importing the raw material within and outside Brazil and also transporting the manufactured goods. The best suited location for such industrial area appears to be Rio Grande, which will need further careful study because of the apparent soft terrain.

d-3 Improvement of cargo handling system

The grain handling system of ports are presently in a poor state, despite the fragmental improvements done in recent years. A majority of warehouses are of one-story while the shiploaders being fixed to warehouse cannot be varied to the hatch location ships. There are a few of modern grain warehouses and the general cargo warehouses are being utilized for grain.

Although cargo handling in warehouses is by use of conveyor belts, this is devoid of continuity due to inadequacy of loading hoppers. Further, due to the inadequate handling of incoming cargo and limited storing capacity as well as low efficiency of unsacking ship loading, there takes place sometimes congestion of freight cars and trucks in the harvest season.

The refrigerated warehouses are scarce and of limited capacity, due to inadequacy of handling volume. Accordingly the port side refrigerated warehouses are not visualized and the cargo are frequently hauled by truck from the plantation to warehouses for shipment. Waiting for docking of ships, the refrigerated wagons are forced to stand still in substitution for refrigerated warehouses.

In order to implement the Export Corridor Plan, emphasis is placed upon the need of inexpensive and rapid handling of bulk export cargo (agri-

cultural products). This will require developing the large capacity and high speed handling system, as well as establishing the high efficiency weighing centre, thus the handling of incoming goods will be improved to make with the ship loading capacity with least congestion of incoming wagons and trucks.

With a view to improving the outlet of warehouses, it appears that vertical type silos are preferred instead of horizontal type, with protection of dust-proofness and anti-explosion for bulk and rapid handling of grain. Further, in order to ensure the smooth inlet of warehouses and silos, the capacity and layout of these facilities will need a careful study thereby minimizing the idling of wagons and trucks.

Whereas with a view to a smooth movement of meat inside the refrigerated warehouses, a useful start of container pallets may be desired. And at a later stage, a new type of meat handling system such as refrigerated containers will need due consideration as an effective tool of transport from the meat processing factory to container ships via the commodity-wise terminals.

d-4 Handling capacity of berthing facilities

In the general, the export period of farm products in this country is six months for soy-beans, five months for maize, seven months for pellet. The opening and final harvesting months showing reduced export volume, it may be fairly correct to take into account the average five months of export period when estimating the port capacity.

The port handling capacity is related to land transport system, port handling facilities, navigation channels, berthing facilities and etc., which in turn will be determined by "Queuing Theory" with relation to average days of interval between incoming ships and also relative to days of handling with the available capacity of handling system. In the general, number of incoming ships is shown by Poisson distribution, which days of cargo handling is more or less determined by carrying capacity of incoming ships. The commodity-wise berths are generally to show Erlang distribution. Although these figures are more correctly determined by actual statistics, it may be appropriate at this early stage of basic planning to have due account of the two extremes of Erlang distribution constituting the exponential distribution and unit distribution, namely the fixed days of handling service, and thus to make a study by mixing the two distributions.

Supposing the case of one berth, and combining Poisson arrival, exponential distribution, as well as cargo handling and the fixed cargo handling service, attempt is made to locate the relation between days of waiting and availability (average days of handling service versus average days of interval between incoming ships), under probability of extraordinary berth waiting being 5 % and 10 %. Thus it will be seen that the berth waiting is likely to increase abruptly in the neighbourhood of 0.4 to 0.5 availability.

It is therefore recommended that the availability is established within such range, thus affording the maximum utilization of large-capacity handling equipment and also the least possibility of berth waiting. Furthermore, such

extraordinary berth waiting is likely to operate the handling equipment to full capacity, and small-capacity silos to cause congestion of incoming goods, thus reducing the availability and handling volume of berth.

Optimum capacity of silos is relating to the order of berth waiting. Inexpensive and steady export of bulk cargo is possible by reducing such berth waiting. Supposing the availability of 0.4 to 0.5 and also assuming the steady flow of incoming goods into silos as well as the handling of incoming goods being half of shipping volume, it will be seen that the optimum capacity of silos is more than 1.5 times of shipping volume.

These observations being made from the viewpoint of ship loading, it may be also necessary to take into account the in-flow of cargo hauled by truck and wagons into silos; Extraordinary interval of incoming ships is likely to take place, thus causing congestion in silos of incoming cargo and also the abnormal idling of wagons and trucks in port area.

It is therefore estimated at this preliminary planning stage that the availability is 0.4, the optimum capacity of silo is more than 1.5 times of shipping volume, while the handling volume of berth is determined by days of cargo handling as well as handling capacity.

OPTIMUM CAPACITY OF SHIPLOADER

Shiploader capacity being shown by rated capacity, the operating capacity is to be varied by different grain, warehouse layout, ship classification, number of shiploaders, conveyor design and etc., while the daily and annual capacity of loader is subject to actual working hours and of annual handling laydays.

In order to evaluate the handling capacity of existing and contemplated shiploaders, assumption is made as follows:

Type of grain	Soy-bean, maize	Index of 1.0
Conveyor efficiency	Out-flow of silos	0.8
	Out-flow of warehouse .	0.7
Number of shiploader per each ship	One loader	0.9
	More than two loaders .	1.0
Efficiency of working hours		0.7
Working hours per day		20
Monthly working days		20 (holidays and rainy days allowed for)

REFRIGERATED WAREHOUSE

The annual handling volume of refrigerated warehouse is often contemplated by assuming the daily in-flow and out-flow being about 3 % each of the annual handling, thus causing the annual turnover of about 10, if handling in warehouse is done by forklifts. Meanwhile the annual turnover will be reduced to 5 or 6 if manual handling by cargo carts is insisted upon. Further, floor bearing of ordinary warehouse is 400 kg/m², while the available floor space is 55 to 60 % if the forklifts are employed extensively. With these figures in mind, it is possible to estimate the optimum capacity of refriger-

ated warehouse in relation to the requisite handling volume, while the optimum handling system is decided upon by assuming the maximum handling volume per day. The present plan is to visualize availability of refrigerated carrier, which in turn necessitates the maximum handling volume per day to be about 10 % of warehouse storing capacity, with the result that shipping is by bulk handling of containerized cargo as well as refrigerated containers along with provision of large-capacity forklifts and commodity-wise crane and etc.

HANDLING CAPACITY OF BERTH

The handling capacity of berth is subject to navigation channels, state of berth and handling system. In order to evaluate the handling capacity of existing and contemplated berth facilities, assumption is made as follows:

1) Berth availability

Increase in berth availability is to augment the handling volume, with the eventual idling of ships, which reduced availability is to decrease the handling volume with the result of expensive idling of berth facilities. In view of the above, and also the grain carriers being more or less standardized, it is estimated that availability of grain terminal is about 40 %.

2) Optimum capacity of handling equipment

With a view to complete the loading of 50,000 DW ship within 3 to 4 days, it is contemplated that two units of shiploader to be installed in each port will be able to handle 2,000 to 3,000 tons/hour according to varying volume handled. Meanwhile the existing facilities having capacity of less than 5,000 tons/day, and because of their apparent inadequacy, it is appropriate to exclude these facilities when evaluating the optimum capacity.

3) Handling capacity of silos

Assuming the availability of berth being about 40 % with a steady flow of handling and also with least congestion of incoming goods into silos, it is estimated to have the optimum silo capacity being about 1.5 times of shipping volume, by way of "Queuing Theory". Meanwhile the handling of in-coming goods into silos is assumed as more than half of shipping volume.

4) Yardstick of evaluating the port facilities

The contemplated berth should have the depth of water being -13 m, with the capacity of 1,000,000 ton per each berth to be realized within five months. This will in turn determine the ship loading capacity as 2,000 to 3,000 ton/hour. As a result of the above, it is possible to complete the loading of 50,000 DWT ship within 3 to 4 days. Meanwhile the desired capacity of silo is about 80,000 tons. Further, handling capacity of refrigerated warehouse should be contemplated by assuming the annual turnovers of about 10 and also the floor bearing of 400 kg/m³. Meanwhile the daily capacity of handling equipment may be worked out by assuming 10 % of warehouse capacity.

d-5 Improvement of port in individual Export Corridors

1) Minas Gerais/Espirito Santo (Vitoria port)

In view of the export target of 100,000 tons meat and 850,000 tons grain, it is contemplated to establish additional berth in Capuaba district of Vitoria port, with the water depth of -12 meters and berth length of 530 meters. Further the refrigerated terminal of 5,000 ton capacity and silos of 30,000 ton each are scheduled to be established in neighbourhood of this berth.

As for refrigerated terminal, the scale and capacity being currently contemplated appears to suffice for years to come, with due consideration to possibility of future expansion.

Meanwhile the planned capacity of berth and silos should be reviewed for possible future expansion. Furthermore the priority of berth is to be altered to 1 instead of 2.

Vitoria port has so spacious hinterland of the Northern Corridor region; expansion of Vitoria port is imminent due to the expected saturation of Santos port. The best suited location for such expansion might be Alibiri in proximity of Capuaba area.

2) São Paulo (Santos port)

With the export target of 280,000 tons meat and 2,900,000 tons grain, it is contemplated to establish refrigerated warehouses of 30,000 capacity and also new handling equipment for grain warehouse which is now under construction, as well as to construct silos of 100,000 ton capacity and renovate general cargo warehouses.

The present capacity of refrigerated terminal appears be satisfactory. As for grain silos and warehouses, with addition of 100,000 ton capacity silos which are under contemplation with the IBRD loan on the left-side harbour, the present capacity of these facilities appears to suffice. Furthermore the improvement of general cargo warehouses should be excluded from the present planning, in view of least urgency.

3) Parana (Paranagua port)

With the export target of 3,500,000 tons grain, it is contemplated to establish 70,000 ton capacity warehouses and also 100,000 ton capacity silos. The present capacity of grain silos and warehouses amounts to 190,000 tons after allowing for the private facilities of 20,000 tons. The inadequacy of such facilities is imminent in years to come, while the grain berth with water depth of -12 meters and with berth length of 500 meters appears to be inadequate in the foreseeable future.

4) Rio Grande do Sul (Rio Grande port)

With the export target of 150,000 tons meat and 2,700,000 tons grain it is contemplated to establish refrigerated terminal of 10,000 tons and 60,000 ton capacity silos in the new harbour area as well as 10,000 ton capacity silos in the super port area.

As for the capacity of refrigerated warehouses, the existing facilities will be inadequate in the order of 10,000 tons, and as such the overall review might be necessary by taking into account new facilities under construction. As for the capacity of grain silos and warehouses, these facilities will be augmented with new facilities of 220,000 tons in Cotorijui (Existing 110,000 tons and planned 110,000 tons) and also addition of 60,000 ton capacity silo under construction in the new port area, thus providing the total capacity of 440,000 tons.

The overall review should be made about adequacy of such facilities by taking into account the domestic shipping of corn and rice etc., being handled in this port. Furthermore the navigation channel with the water depth of -14 meters should be maintained with necessary steps.

III-2-4 Evaluation of Individual Corridor Plans

In addition to evaluation of individual facilities, the following is a summarized report of evaluation.

III-2-4-1 Export Corridor of Minas Gerais/Espirito Santo

The main crop for export is maize, which will need intensive undertakings on the side of Federal and state governments.

The existing railroad network more or less in linkage of South-to-North, for transporting the products to Santos port, while the export corridor plan will enable the smooth movement of goods in east-to-west with the eventual industrialization and economic development of hinterland.

Vitoria port is already in adequate capacity while the new port being constructed in Capuaba district appears to be short of space. With the current improvement of road network, further study might be necessary about a new port construction in Alibiri district which should serve as the outlet for hinterland. Furthermore as for the provision of intermediary silos, basic problems such as their function and management etc., should be studied carefully.

III-2-4-2 Export Corridor of São Paulo

São Paulo state is the most densely populated and industrialized. Santos port is one of the base equipped with hinterland of not only São Paulo but also Parana and Minas Gerais etc.

In view of the expected increase in transport volume, it will be of urgent necessity to improve the 1,000 mm gauge railroad especially the section of Canpinas to Santos. The road network being in the first class condition, it will be of urgent need to construct the loop highway in São Paulo region due to the present traffic congestion. Furthermore the toll highway such as the section of São Paulo to Canpinas is recommended to be constructed by all means.

Santos port appears to have increased flow of cargo due to future industrialization of hinterland. While the capacity being currently contemp-

lated appears to suffice for years to come, it might be necessary to review the need of renovating general cargo warehouses. In view of the imminent containerization, further study should be made about introduction of new transport system by transporting meat in refrigerated containers from hinterland to port container yard. Furthermore as for intermediary silos, while the current investigation and information are excellent, it might be necessary to make further study about operational plans etc.

III-2-4-3 Export Corridor of Parana

In view of the future expansion of farm products, Paranagua port should be renovated for such export. However the railroad network is presently in the most backward state and will need intensive renovation urgently. Above all, the section of Curitiba to Paranagua being of the key importance to future development of Parana port, this section should be renovated most urgently.

Cargo transport beyond the railway capability will have to depend on road network. Study appears to be necessary to construct the ring highway in cities such as Curitiba and Londrina. Further the Mid-West region appeared to need development of road.

Paranagua port being renovated rapidly, inadequacy of handling capacity is imminent in stages when the export farm products are brought in as currently planned.

While the intermediary silos will need further study, it is observed that this issue should be reviewed along with the necessity of establishing agro-industry in cities such as Curitiba, rather than locating such facilities in hinterland.

III-2-4-4 Export corridor of Rio Grande do Sul.

In view of the most advanced state of agriculture and stockbreeding, and because of rather plain terrain, the inland waterways should be developed by means of coasted vessels in Lagos Dos Patos Bay and the annexing rivers, for onward transport to Rio Grande port. As a second crop of corn, production of soy-beans is likely to develop rapidly, which livestock breeding will be encouraged intensively.

The railroad connecting the hinterland with Rio Grande and Porto Alegre, cargo is likely to increase in Rio Grande due to its need to be renovated with the top-most priority. The road network being in the most backward condition among these five states, and with prominent inadequacy in western region, it will be of urgent need to construct the road from western region to Rio Grande port. Further in view of the present traffic congestion of Porto Alegre, the ring highway should be constructed urgently.

Meanwhile agricultural silos and other equipments are established in COTRIJUI annexing the superport of Rio Grande. While silos and other facilities will be established intensively, it is observed that development of such cooperatives will play a decisive role in future expansion of agriculture in

this country. However by taking into account the capacity of silos, it appears that the scale and capacity of Rio Grande port being currently contemplated is rather excessive.

III-2-4-5 Coordination of Individual Export Corridor Plans

This report is prepared with adoption of target figures shown by the Central Bank. However emphasis on soy-beans and maize production will need further study such as inter-state coordination of overall implications. While Minas Gerais state is in pursuit of maize production, Rio Grande do Sul state is augmenting soy-bean production rapidly.

From the viewpoint of export marketing, emphasis appears to be placed in development of Rio Grande do Sul state. However the future development of Minas Gerais will explore possibility of soy-bean production and intensive stockbreeding along with industrilization. As such, priority of development among individual export corridors will need careful study about economic implications such as the peculiarities of individual regions.

It is observed that the superport area of Rio Grande is the best suited location for establishing industrial complex, provided that necessary steps will be taken in order to maintain the navigation channel with the water depth of -14 meters.

While the mission endorses the present plan of canalization in this region, it might be more worthwhile to develop this region by coastal transport which should connect the canal- side terminal - Porto Alegre - Pelotas - Rio Grande port and further with Santos and Rio de Janeiro port.

As for the intermediary silos, further study might be necessary about operational plans and other problems by taking into account the success of COTRIJUI and etc.

IV. CONCLUSIONS

The Export Corridor Plan is deemed as the concept rather than operational plan, and will serve as the guideline of economic policy by Brazilian Government. Increased production of agriculture and increased export by way of renovating infrastructure are long over-due and should be promoted intensively by Brazilian Government.

As regards agriculture, the mission observed that the target production and export volume will be made possible by the future technical guidance and other operational plans to be made by Brazilian government. The problem is however competitiveness of such farm products in future world market. Such competitiveness being subject to fluctuating situation of importing countries and also competition by U. S. A. and China etc., the future of these products is obscure. However taking example of soy-bean, this country is in advantage as described below:

(1) Harvesting of soy-bean in Brazil is in the off-crop season of the northern hemisphere countries such as U.S.A., thus the export period is favourable.

(2) Quality of Brazilian soy-bean is rather inferior to that of U. S. A., and appears to be competitive in the Japanese market because of its lower price by US\$5.00 than the American equivalent.

While in 1972 Japanese firm imported a trial order of Brazilian soy-bean at US\$135.00 per ton, the imported price of American Soy-bean was US\$140.00 per ton.

Brazilian government is in pursuit of quality improvement of soy-bean, while the mission observed that the current price can be reduced by about US\$10.00 per ton by way of mechanization and improving fertilizers and others.

(3) It is possible to reduce loading days and permit docking of larger ships by way of improving port facilities, in order to favourably compare with ports in the Gulf coast. Improvement of railroad will make possible the inbulk transport thus offsetting the current long-haul road transport.

(4) Freightage and handling expenses are mostly decided from the political viewpoint, and can be varied from the viewpoint of export competitiveness if need may arise.

(5) The Central Bank forecasts that the future of soy-bean export is promising.

It appears that the above-described observations apply to other farm products with least exceptions.

As regards the export marketing of farm products, the Brazilian government is entrusting the British consultant with such investigations. Nevertheless, implementation of this plan will need a lot of intensiveness and enthusiasm on the side of Brazilian government by way of improving infrastructure as well as improved technology and guidance to farmers and freightage policy etc.

The mission wishes that Japanese Government and private enterprises will not only extend financial aid to individual projects, but also will assist to the full of their capability in such laborious efforts being made by this country.

Table 8 Estimated Production and Export by State and by Crop (1976)

(1,000 tons)

State	Estimate	Soybean	Corn	Sorghum	Bean cake	Total
Minas Gerais	F.Gov:prod.	61	3,709	46	6	3,822
Espirito Santo	" :exp.	23	779	43	5	<u>850</u>
	State:prod.	125	3,600	44	-	
	" :exp.	128	1,180	35	-	1,343 *
São Paulo	F.Gov:prod.	713	5,101	874	501	7,189
	" :exp.	271	1,384	812	411	<u>2,878</u>
	State:prod.	800	4,500	1,000	400	
	" :exp.	300	2,000	-	400	2,700
Parana	F.Gov:prod.	2,807	5,543	430	696	9,476
	" :exp.	1,347	1,204	395	554	<u>3,500</u>
	State:prod.	2,800	4,982	-	1,300	
	" :exp.	1,200	2,336	-	1,300	4,836
Rio Grande do Sul	F.Gov:prod.	4,919	2,919	-	1,038	8,876
	" :exp.	1,569	300	-	850	<u>2,719</u>
	State:prod.	4,234	-	-	1,007	
	" :exp.	1,800	-	-	1,007	2,808
	F.Gov:prod.	8,500	17,272	1,350	2,241	29,363
Total	" :exp.	3,210	3,667	1,250	1,820	<u>9,947</u>
	State:exp.					11,689
Total	F.Gov:prod.	8,500	18,500	1,350	2,240	30,590
Brazil	State:exp.	3,210	3,880	1,250	1,820	<u>10,160</u>

* Only in case of Minas State, processed Mandioca product and others are included in the total of 1,573 thousand tons.

Table 9 Land Utilization in Areas Covered by Export Corridor Plan

Unit: 1,000 ha, 1967.)

State (Corridor Area)	Cultivated Land (1)	Grazing Land (2)	Forest Land (3)	Uncultivated Land (4)	Total		Total Land Area (1)-(5)
					Cultivable Land (1)-(4)	Uncultivable Land (5)	
Minas Gerais	4,640	26,144	2,363	5,901	39,048	4,275	43,323
Espirito Santo	891	1,305	607	304	3,107	275	3,382
Goiás	1,397	15,971	1,609	14,047	33,024	3,282	36,306
Sub-total	6,928	43,420	4,579	20,252	75,179	7,832	83,011
São Paulo	4,995	9,869	1,911	2,324	19,099	1,477	20,576
Mato Grosso	883	20,122	3,181	20,594	44,780	3,435	48,215
Sub-total	5,878	29,991	5,092	22,918	63,879	4,912	68,791
Parana	4,412	4,074	2,384	5,276	16,147	1,066	17,213
Santa Catarina	1,332	2,588	1,228	1,873	6,970	623	7,593
Sub-total	5,744	6,612	3,612	7,149	23,117	1,689	24,806
Rio Grande do Sul	4,354	14,333	1,348	2,584	22,619	1,330	23,949
Sub-total	4,354	14,333	1,348	2,584	22,619	1,330	23,949
Total	22,904	94,356	14,631	52,903	184,794	15,763	200,557

Table 10 Agricultural Production by Corridor Area Estimated by Federative Republic Government

(1,000 tons)

Item & Year Corridor Area	Year	Soybeans	Maize	Sorghum	Bean Cakes	Orange Juice	Beef	Soybean Oil	Castor Oil
Minas Gerais/ Espírito Santo	1972	24	3,050	4	6	-	319	1	-
	1973	31	3,204	8	6	-	344	1	-
	1974	36	3,364	15	6	-	365	1	-
	1975	47	3,532	26	6	-	387	1	-
	1976	61	3,709	46	6	-	410	1	-
	1972	277	4,197	92	244	100	791	50	75
São Paulo	1973	360	4,407	162	290	120	854	60	83
	1974	421	4,627	285	348	140	901	72	91
	1975	548	4,858	499	418	170	956	84	100
	1976	713	5,101	874	501	210	1,014	100	110
	1972	1,086	4,560	45	320	-	154	74	20
Parana	1973	1,412	4,789	80	404	-	166	89	22
	1974	1,653	5,028	140	486	-	176	107	24
	1975	2,148	5,279	245	581	-	186	132	26
	1976	2,807	5,543	430	696	-	198	157	29
	1972	1,900	2,400	-	500	-	222	115	-
	1973	2,470	2,520	-	600	-	240	140	-
Rio Grande do Sul	1974	2,890	2,646	-	720	-	254	170	-
	1975	3,757	2,778	-	865	-	270	204	-
	1976	4,919	2,019	-	1,038	-	286	242	-
	1972	3,287	14,207	141	1,070	100	1,486	240	95
	1973	4,273	14,920	250	1,300	120	1,604	290	105
	1974	5,000	15,665	440	1,580	140	1,696	350	115
	1975	6,500	16,447	770	1,870	170	1,800	420	126
	1976	8,500	17,270	1,350	2,240	210	1,908	500	139
	1972	3,300	15,250	141	1,070	100	1,800	240	200
	1973	4,273	16,000	250	1,300	120	1,960	290	220
Total Brazil (B)	1974	5,000	16,800	440	1,560	140	2,070	350	240
	1975	6,500	17,640	770	1,870	170	2,200	420	260
	1976	8,500	18,500	1,350	2,240	210	2,330	500	290
	1972	100	93	100	100	100	62	100	47
Ratio of Total Corridors Area to Total Brazil (A/B)	1973	100	93	100	100	100	82	100	48
	1974	100	93	100	100	100	82	100	48
	1975	100	93	100	100	100	82	100	48
	1976	100	93	100	100	100	82	100	48

Table 11 Extension of Railway Lines by Gauge, 1971

Unit: Km

Railways	Gauge (m)					Total	Total Length of Double-trucked Section	Total Length of Electrified Section
	1.60	1.435	1.00	0.76	0.60			
Federal Railways	1.691	0	22.830	202	0	24.723	471	1.110
Northeastern District	0	0	7,148	0	0	7.148	29	179
Central District	1.518	0	7,122	202	0	8.842	311	822
Mid-Southern District	173	0	1.607	0	0	1.780	122	109
Southern District	0	0	6.953	0	0	6.953	9	0
São Paulo State Railway	1.701	0	3.596	0	0	5.297	130	860
Sorocabana Line	0	0	2.017	0	0	2.017		
Paulista Line	1.701	0	0	0	0	1.701		
Mogiana Line	0	0	1.579	0	0	1.579		
Other Railway Lines	0	194	1.328	0	29	1.551		
Vitoria-Minas Railway	0	0	782	0	0	782		
Amapa Railway	0	194	0	0	0	194		
Campos do Jordão Railway	0	0	47	0	0	47		
Votorantim Railway	0	0	15	0	0	15		
Pevus-Pirapora Railway	0	0	0	0	29	29		
Medira-Mamore Railway	0	0	366	0	0	366		
Tocantins Railway	0	0	118	0	0	118		
Total	3.392	194	27.754	202	29	31.571	601	1,970

Remarks: The 3,174 km length of railway lines to be constructed under the government's transportation improvement plan is included.

Table 12 Cargo-wise Transport Volume of Federal Railways 1971

Kinds of Cargo	Transport Tonnage (ton)	Transport Volume (ton-km)
Iron ore	6,839,656	3,547,755,775
Cement	1,562,150	798,320,953
Wheat	1,425,543	751,004,949
Gasoline	1,286,949	5,556,810,711
Lime	1,322,674	454,031,543
Timber	904,536	446,982,860
Fuel Oil	1,111,364	391,111,158
Coffee	1,221,191	350,289,153
Pig Iron	839,938	331,621,574
Coal	3,321,468	324,799,679
Diesel Oil	1,022,616	310,393,230
Grass	528,629	285,481,468
Sugar	896,781	235,676,625
Others	7,942,671	2,643,351,826
Total	30,226,166	11,427,631,504

Table 13 Transport Volume of Federal Railways

Item	Year	1969	1970	1971
Number of Engines		1,330	1,258	1,278
Steam Locomotive		355	274	241
Diesel Locomotive		909	917	974
Electric Locomotive		66	67	63
Number of Passenger Coaches		2,908	2,844	2,682
Passenger Coach		2,021	1,958	1,856
Sleeping Coach		169	167	155
Dining Carriage		113	112	101
Postal and Luggage Car		331	326	301
Others		274	281	269
Number of Goods Waggon		31,882	30,951	30,948
Open Waggon		8,407	7,932	7,738
Covered Waggon		14,247	13,873	14,004
Steel Waggon		3,836	3,762	3,622
Animal Carriage		2,105	1,991	1,857
Others		3,287	3,393	3,727
Number of Trains		822,319	811,450	730,106
Train-km (Thousand Train-km)		68,508	68,174	66,680
Number of Passenges (Thousand person)		303,442	282,622	261,219
Passenger Transportation Volume (Million man-km)		9,497	8,704	7,765
Tonnage of Cargoes (Thousand ton)		42,115	41,795	40,577
Railway Transportation (")		32,141	33,075	30,589
Luggage and Parcels (")		102	91	77
Animals (")		419	340	286
Cargoes (")		31,620	32,644	30,226
Pipeline Transportation(")		9,943	8,661	9,927
Truck Transportation (")		31	59	61
Cargo Transport Volume (Million ton-km)		12,003	12,593	11,999
Railway Transportation (")		11,570	12,232	11,581
Luggages and Parcels (")		21	20	16
Animals (")		211	156	137
Cargoes (")		11,338	12,056	11,428
Pipeline Transportation(")		427	352	408
Truck Transportation (")		6	9	10
Number of Workes (Person)		126,196	124,833	121,492
Income (Million Cr\$)		664.6	830.9	963.0
Operational Income (")		525.4	664.4	759.4
Non-operational Income(")		139.2	166.5	203.6
Expenditure (")		1,092.5	1,310.8	1,595.5
Operational Expenditure (")		962.0	1,147.4	1,411.9
Non-Operational Expenditure		130.5	163.4	183.6

Table 14 Annual Income and Expenditure of Federal Railways, 1971

Unit: Thousand Cr\$

Income		Expenditure	
Income from Railway Operation	759,278	Disbursement for Railway Operation	1,384,756
Transport Income	719,108	Personnel Cost	810,625
Passenger Income	138,921	Cost of equipment and Materials	316,017
Cargo Income	525,917	Other disbursements	258,114
Miscellaneous Income	54,270		
Other Income	40,170		

Table 15 Locomotives and Coaches Owned by São Paulo State Railways

Unit: Number

Item	Year	1968	1969	1970
	Locomotive		433	445
Steam locomotive		49	45	16
Diesel locomotive		259	273	337
Electric locomotive		125	127	165
Goods Waggon		15,746	15,626	15,159
Open waggon		2,612	3,538	3,578
Covered waggon		9,998	9,570	9,253
Steel waggon		1,094	431	394
Animal carriage		1,376	1,357	1,160
Others		666	730	774
Cargo Transport Tonnage (Thousand ton)		11,500	11,397	11,206
Cargo Transport Volume (Million ton-km)		3,319	3,165	3,160

Table 16 Changes of Quantity of Transportation

		(100 million ton. km)											
Description \ Year		1960		1962		1964		1966		1968		1970	
Brazil	Road	426	60.5%	520	61.4%	645	67.5%	829	68.9%	1,075	71.5%	1,245	70.5%
	Railway	132	18.7	145	15.1	160	16.7	190	16.0	215	14.3	303	17.2
	Ships for domestic use	145	20.6	181	21.4	148	15.5	177	14.9	212	14.1	216	12.2
	Airway	1	0.2	1	0.1	2	0.3	2	0.2	2	0.1	1	0.1
	Total	704	100	847	100	955	100	1,189	100	1,504	100	1,765	100
Japan	Road	208	15.1	324	20.7	472	25.6	649	31.0	1,015	37.6	1,359	39.8
	Railway	554	40.2	572	36.6	599	32.5	559	26.7	600	22.2	634	18.5
	Ships for domestic use	616	44.7	668	42.7	771	41.9	887	42.3	1,088	40.2	1,425	41.7
	Airway	-	-	-	-	-	-	-	-	-	-	-	-
	Total	1,377	100	1,564	100	1,842	100	2,095	100	2,703	100	3,418	100

Table 17 Changes of Passenger Quantity of Transportation

		(100 million ton. km)											
Description \ Year		1960		1962		1964		1966		1968		1970	
Brazil	Road	234	69.8%	294	73.7%	390	79.3%	524	86.2%	705	89.1%	1,086	93.5%
	Railway	75	22.4	79	19.8	81	16.4	65	10.7	61	7.7	54	4.6
	Ships for domestic use	3	0.9	4	1.0	4	0.8	2	0.3	5	0.6	1	0.1
	Airway	23	6.9	22	5.5	17	3.5	17	2.8	20	2.6	21	1.8
	Total	335	100	399	100	492	100	608	100	791	100	1,162	100
Japan	Road	555	22.8	740	25.5	1,079	30.3	1,385	34.4	1,989	41.3	2,842	48.5
	Railway	1,844	75.8	2,110	72.8	2,418	68.0	2,586	64.1	2,744	56.9	2,886	49.3
	Ships for domestic use	27	1.1	30	1.1	31	0.9	31	0.8	35	0.7	37	0.6
	Airway	7	0.3	18	0.6	27	0.8	29	0.7	51	1.1	94	1.6
	Total	2,433	100	2,898	100	3,555	100	4,031	100	4,819	100	5,858	100

Table 18 Consolidation of Roads by State (1970)

Items	Population (thousand person)	Area (Km ²)	Population Density (person/km ²)	Number of Vehicles (Number)	Population per Vehicle (person/ vehicle)	Density of Federal & State Roads (m/km ²)	Density of Paved Federal & State Roads (m/km ²)
Total Japan	103,720	369,662	280.6	18,188,680	5.7	418	223
Minas Gerais	11,645	587,172	19.9	267,861	43.5	43	13
Espirito Santo	1,618	45,597	35.5	31,538	51.3	104	17
Sao Paulo	17,959	247,898	72.6	1,017,826	17.7	84	59
Parana	6,998	199,554	35.0	205,954	34.0	54	16
Rio Grande do Sul	6,775	282,184	24.9	296,748	22.7	47	11
Sub-total	44,975	1,362,405	33.0	1,819,927	24.7	55	22
Other States	49,534	7,149,560	6.9	950,144	52.1	14	3
Total Brazil	94,509	8,511,965	11.1	2,770,071	34.2	21	6

Note: For road density comparison with Japan, national and prefectural highways were taken.

Table 19 Existing State of Roads (1970)

Unit : km, %

State	Federal Highways			State Roads			Sub-total			Municipal Roads			Total		
	Total	Unpaved Roads	(Pavement Ratio) Paved Roads	Total	Unpaved Roads	(Pavement Ratio) Paved Roads	Total	Unpaved Roads	(Pavement Ratio) Paved Roads	Total	Unpaved Roads	(Pavement Ratio) Paved Roads	Total	Unpaved Roads	(Pavement Ratio) Paved Roads
Japan	33,360	5,368	(84) 27,992	122,324	67,152	(45) 55,172	154,974	72,520	(53) 82,454	867,962	763,793	(12) 104,169	1,022,936	836,312	(18) 186,624
Minas Gerais	7,242	2,324	(68) 4,918	17,894	15,078	(16) 2,816	25,136	17,402	(31) 7,734	128,943	128,804	(0.1) 139	154,079	146,206	(5) 7,873
Espirito Santo	1,106	410	(63) 696	3,668	3,541	(3) 127	4,774	3,951	(17) 823	13,267	13,429	(0.1) 18	18,041	17,200	(10) 841
São Paulo	5,198	678	(87) 4,520	15,627	5,377	(66) 10,250	20,825	6,055	(30) 14,770	134,100	133,540	(0.4) 560	154,925	139,595	(3) 15,330
Parana	2,508	545	(78) 1,963	8,402	7,074	(16) 1,328	10,910	7,619	(23) 3,291	91,470	91,427	(0) 43	102,380	99,046	(2) 3,334
Rio Grande do Sul	3,098	1,314	(58) 1,784	10,282	9,037	(12) 1,245	13,380	10,351	(12) 3,029	122,574	122,462	(0) 112	135,954	132,813	(3) 3,141
Sub-total	19,152	5,271	(72.4) 13,881	55,873	40,107	(28) 15,766	75,025	45,378	(40) 29,647	490,354	489,482	(0.2) 872	565,379	534,860	(5) 30,519
Other States	32,388	22,123	(31.7) 10,265	69,461	61,799	(11) 7,662	101,849	83,922	(18) 17,927	372,551	371,734	(0.2) 1,689	474,400	455,656	(4) 18,744
Total Brazil	51,540	27,394	(47) 24,146	125,334	101,906	(19) 23,428	176,874	129,300	(27) 47,574	862,905	861,216	(0.2) 1,689	1,039,779	990,516	(5) 49,263

Table 20 Cargo Movement Volume in Ports of Brazil

Ports	Cargo movement in tons				Increase (+) or decrease (-)		
	1968	1969	1970	1971(a)	1969/68	1970/69	1971/70
Manaus	663,649	807,065	973,536	1,457,269	+ 21.6	+ 20.6	+ 49.7
Belém	993,368	1,066,533	1,191,516	1,701,336	+ 7.4	+ 11.7	+ 42.8
Mucuripe	985,511	926,099	944,820	929,256	- 6.0	+ 2.0	- 1.6
Natal	166,652	146,647	147,656	172,161	- 12.0	+ 0.7	+ 16.6
Cabedelo	253,177	274,787	234,036	240,614	+ 8.5	- 14.8	+ 2.8
Recife	1,906,680	2,285,737	2,678,229	2,357,880	+ 19.9	+ 17.2	- 11.9
Maceió	589,244	653,851	828,451	791,894	+ 11.0	+ 26.7	- 4.4
Aracaju (incl. Tecarmo)	1,104,385	1,508,633	1,584,464	1,599,401	+ 36.6	+ 5.0	+ 0.9
Salvador	536,899	659,343	552,249	638,712	+ 22.8	- 16.2	+ 15.6
Ihéus	180,423	240,275	287,142	350,966	+ 33.2	+ 19.5	+ 22.2
Vitória (incl. Tubarão)	14,162,999	19,375,553	25,740,606	29,975,698	+ 36.8	+ 32.8	+ 16.6
Rio de Janeiro (incl. Teguá)	19,613,528	20,744,397	22,454,260	23,112,427	+ 5.8	+ 8.2	+ 2.9
Niterói	105,106	177,868	167,583	356,424	+ 69.2	- 5.8	+112.7
Angra dos Reis	179,546	222,273	549,037	470,591	+ 23.8	+147.0	- 14.2
Santos	16,562,226	12,756,017	11,746,992	13,562,736	- 22.9	- 7.9	+ 15.5
Paranaguá	2,099,956	2,149,308	2,447,780	3,426,492	+ 2.3	+ 13.9	+ 40.0
São Francisco do Sul	189,548	125,544	139,821	161,008	- 33.8	+ 11.4	+ 15.2
Itajai	493,792	494,033	552,972	605,852	-	+ 11.9	+ 9.6
Imbituba	847,411	938,005	905,167	998,624	+ 10.7	- 3.5	+ 10.3
Rio Grande	2,599,507	2,638,084	2,635,356	3,293,625	+ 1.5	- 1.1	+ 25.0
Pelotas	69,511	306,372	328,181	402,180	+340.7	+ 7.1	+ 22.5
Porto Alegre	3,620,778	3,346,097	3,663,108	4,189,740	- 7.6	+ 9.5	+ 14.3
Total (b)	67,923,996	71,842,521	80,752,962	90,794,886	+ 5.8	+ 12.4	+ 12.4

Remarks: (a) The data relative to 1971 are estimated, and are still depending on a final computation.

(b) Tonnage of movement in private terminals of Santana (in Icomi), Temadre and Tebar (in Petrobras), Cosipa and Ultrafertil, is not included.

Fig. 1 Network of Railway Lines in Brazil

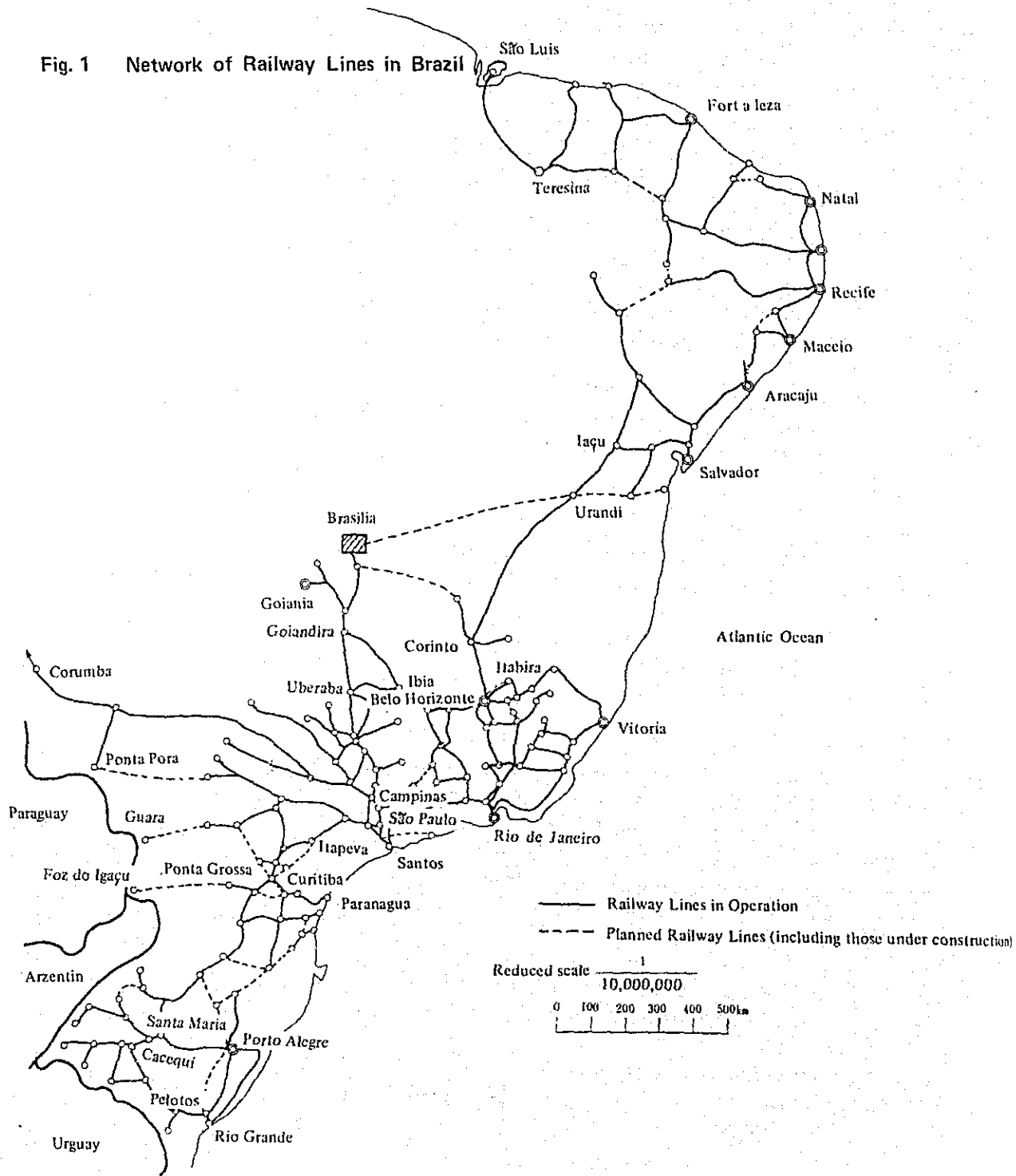
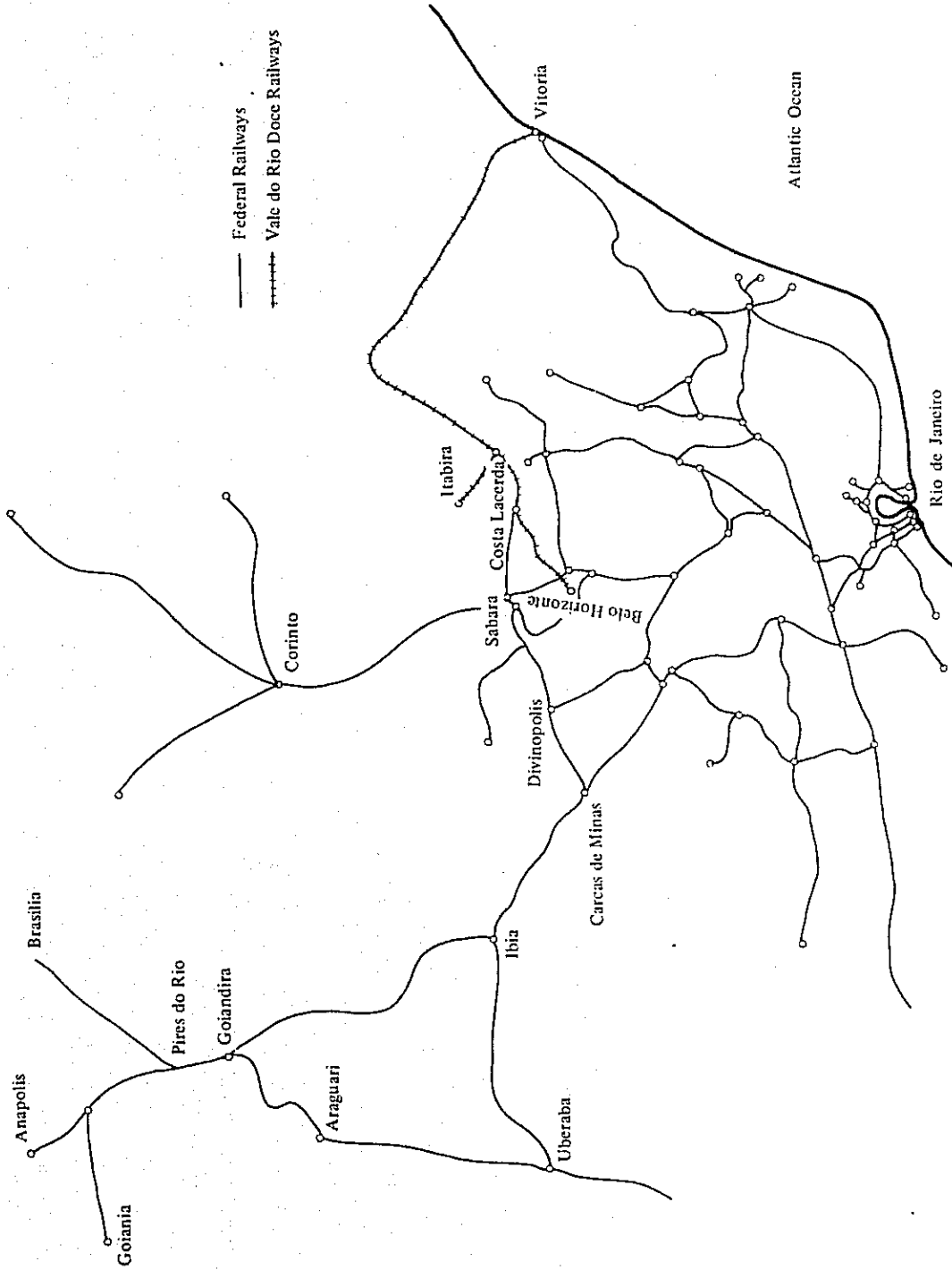


Fig. 2 Network of Railway Lines in Central Brazil
(Minas Gerais State and Espírito Santo State)



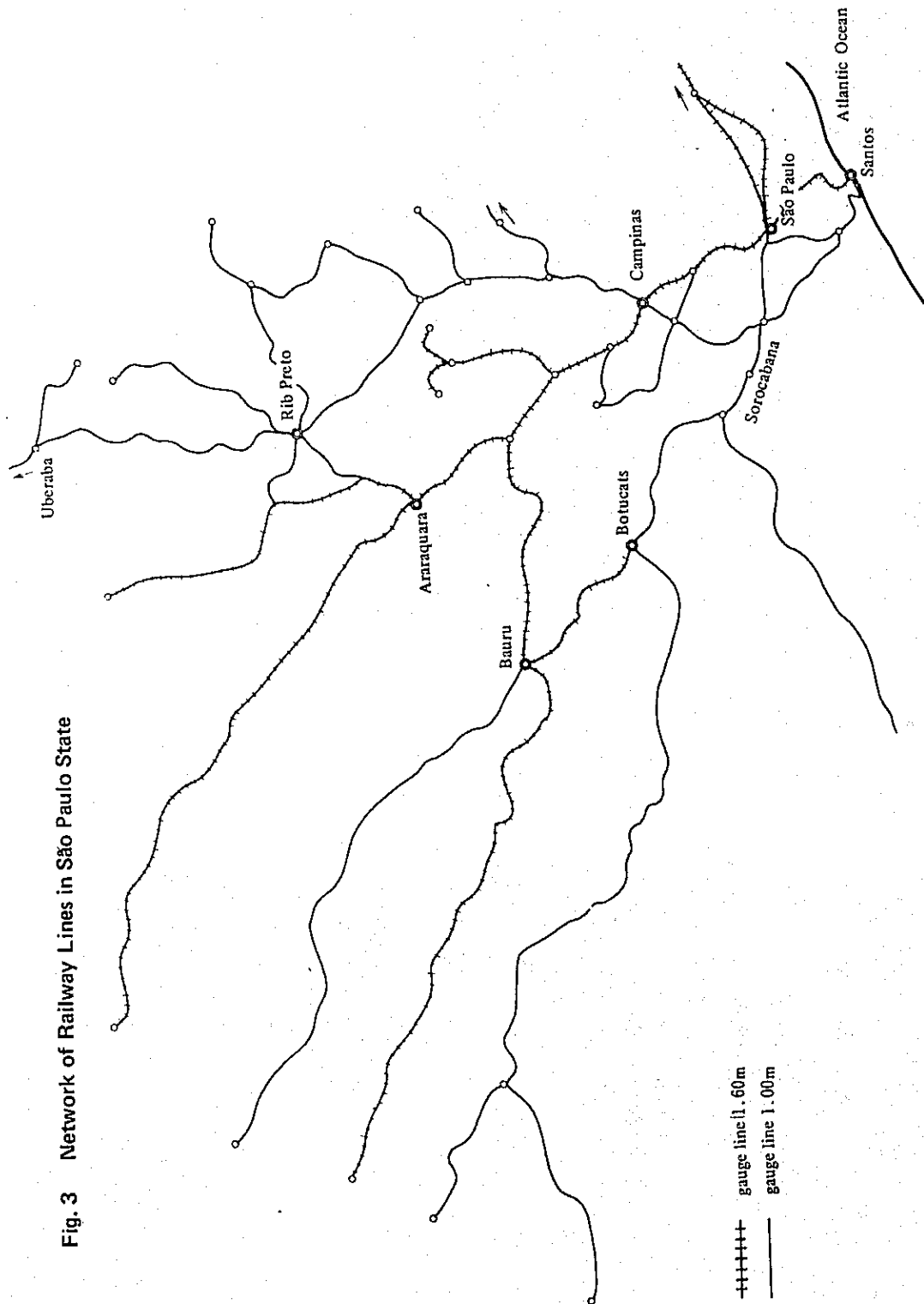


Fig. 3 Network of Railway Lines in São Paulo State

Fig. 4 Railway Lines Linking São Paulo and Santos Port

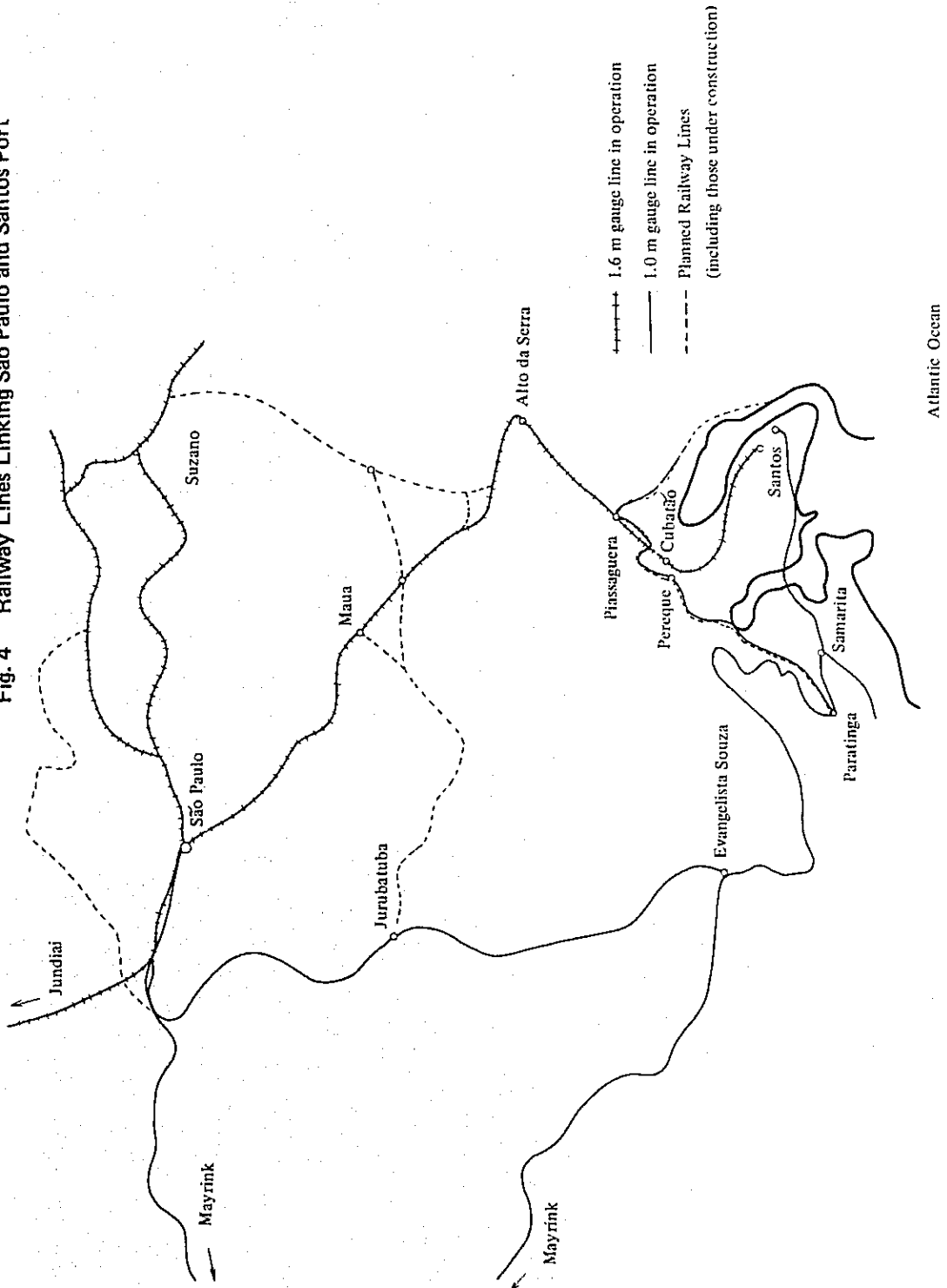
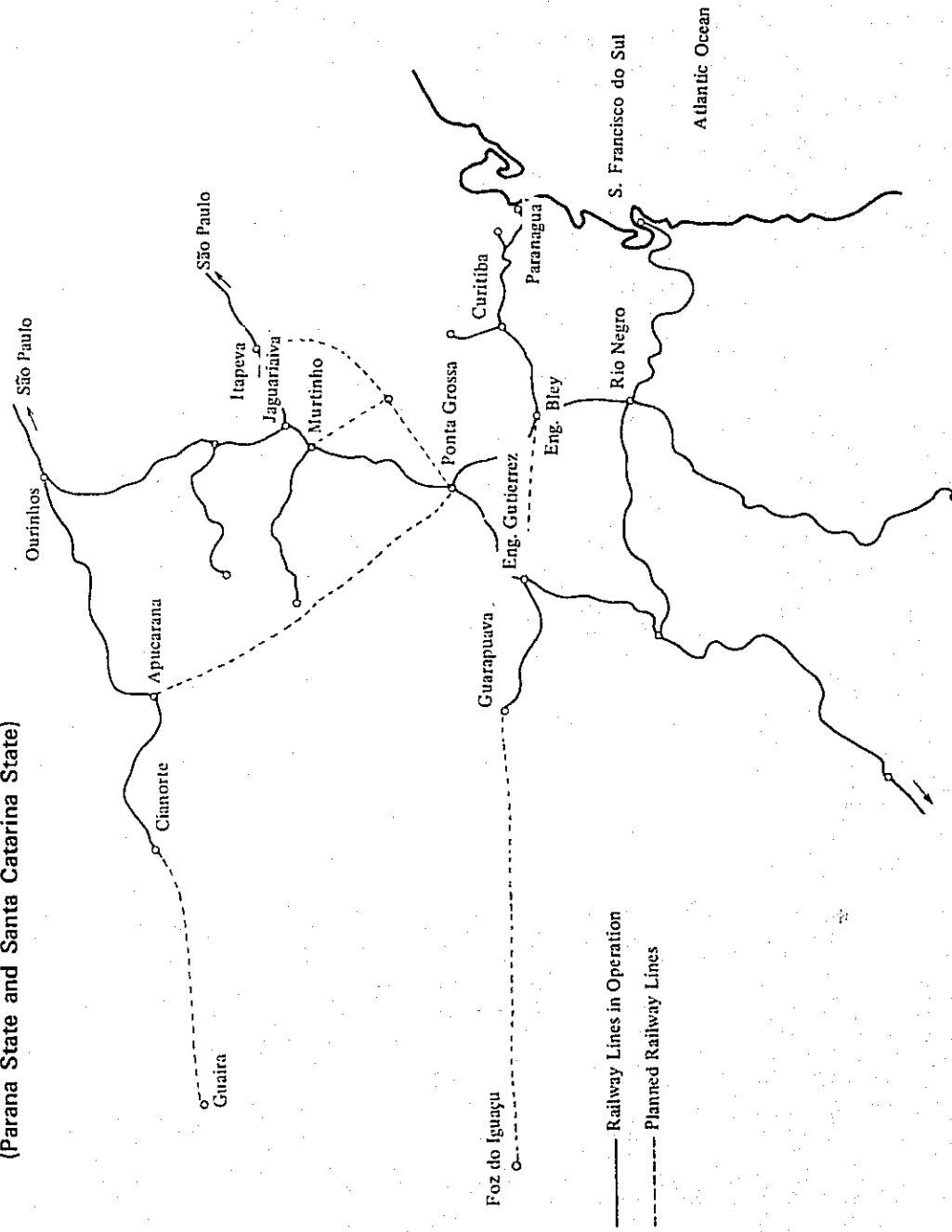


Fig. 5 Network of Railway Lines in Southern Brazil
(Parana State and Santa Catarina State)



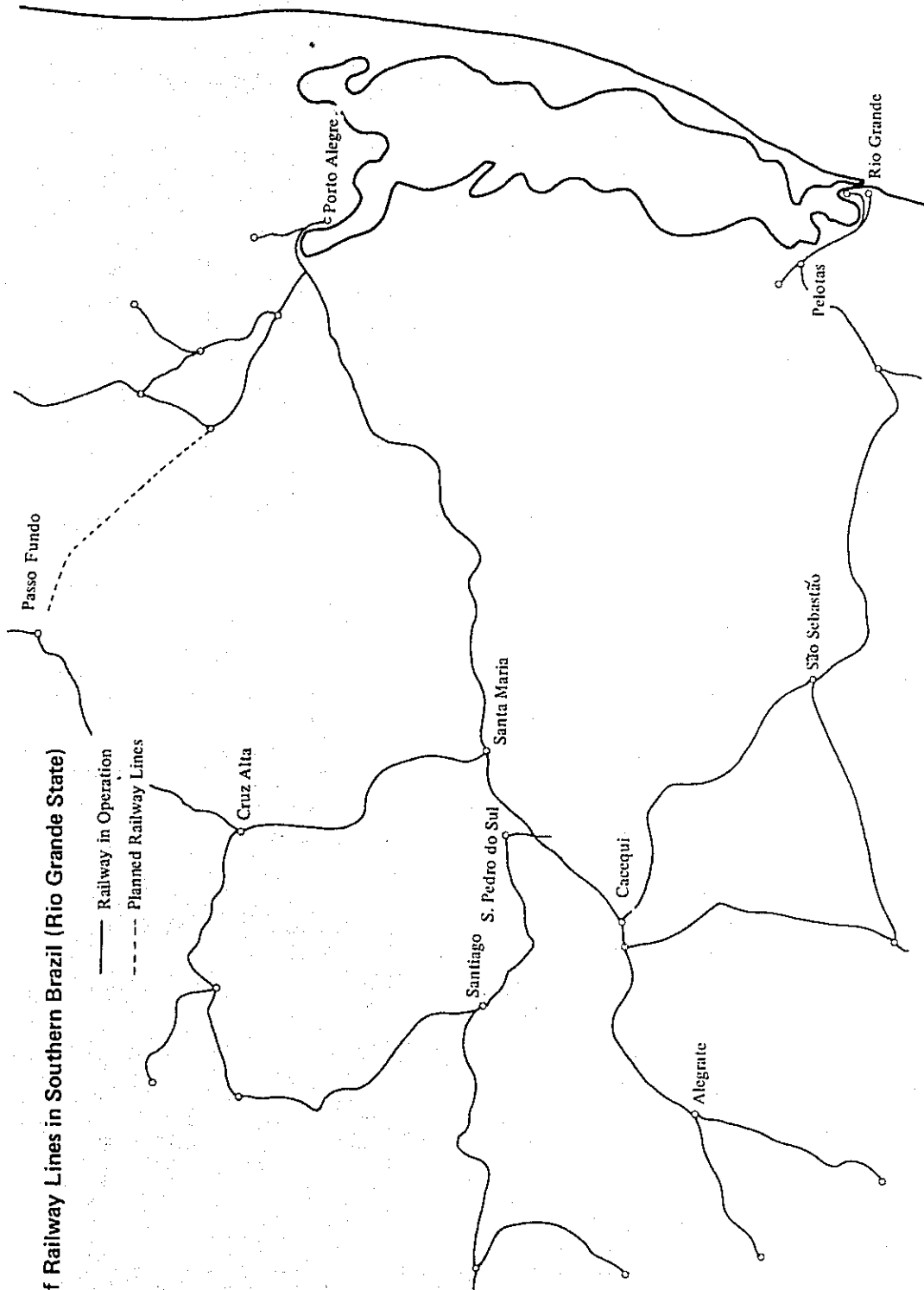


Fig. 6 Network of Railway Lines in Southern Brazil (Rio Grande State)

— Railway in Operation
 - - - Planned Railway Lines

Fig. 7 Cargo and Passenger Transportation Volume, Federal Railways

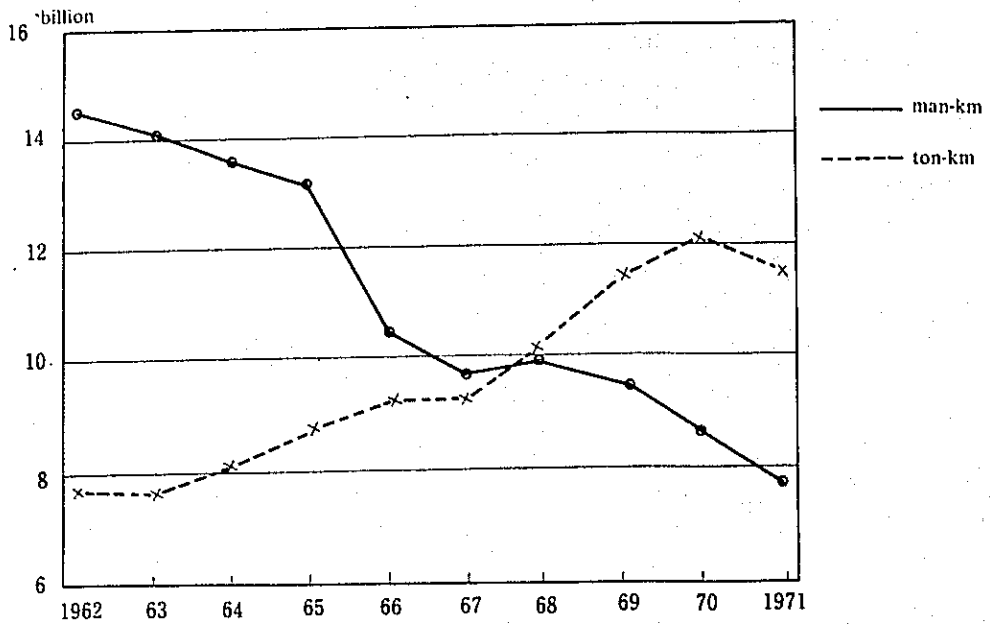


Fig. 8 Major Items of Railway Cargoes

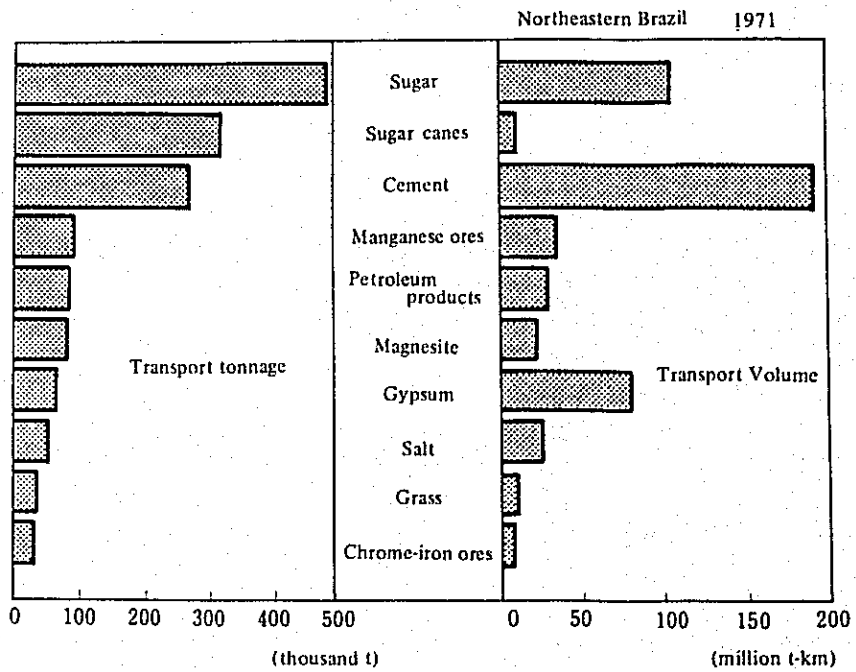


Fig. 9 Major Items of Railway Cargoes

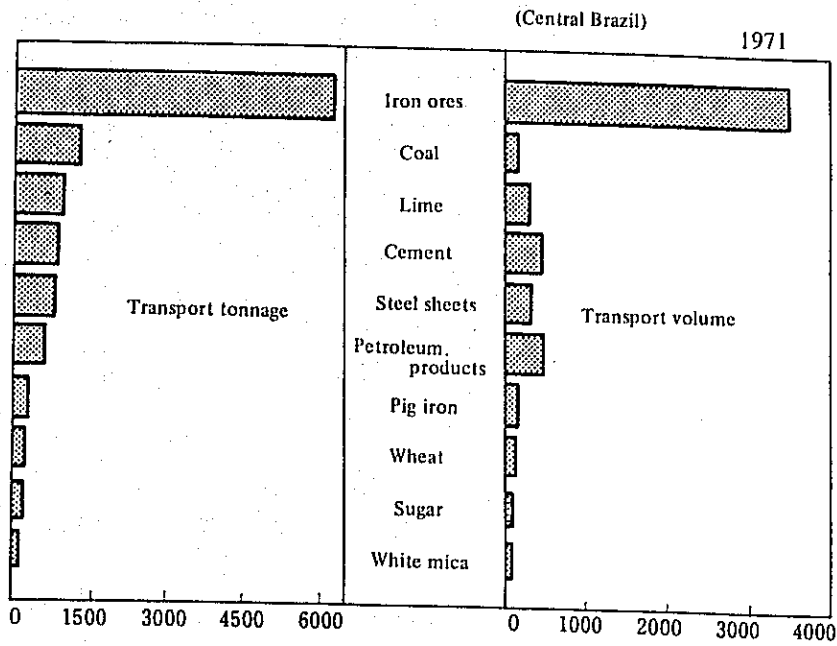


Fig. 10 Major Items of Railway Cargoes

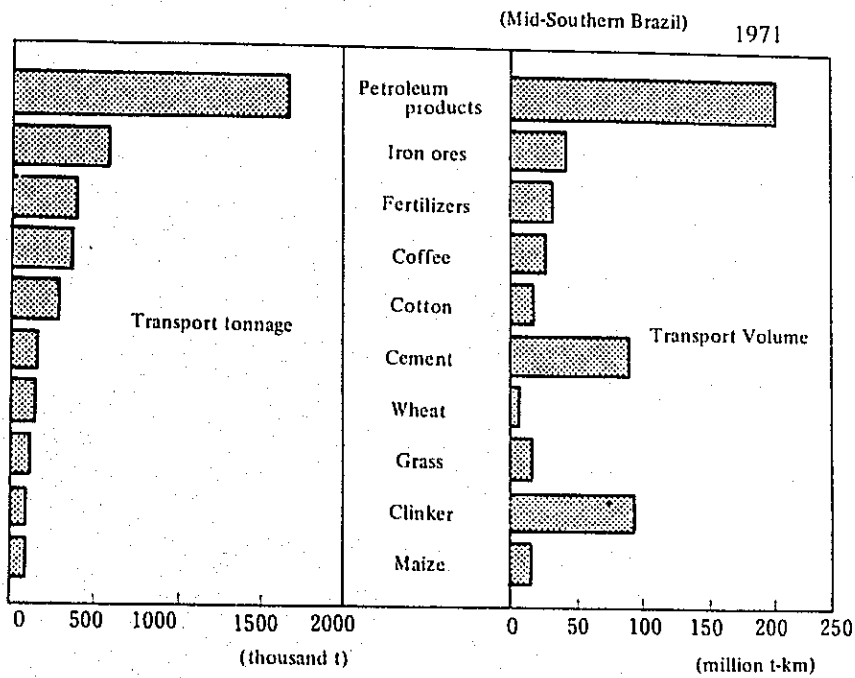


Fig. 11 Major Items of Railway Cargoes

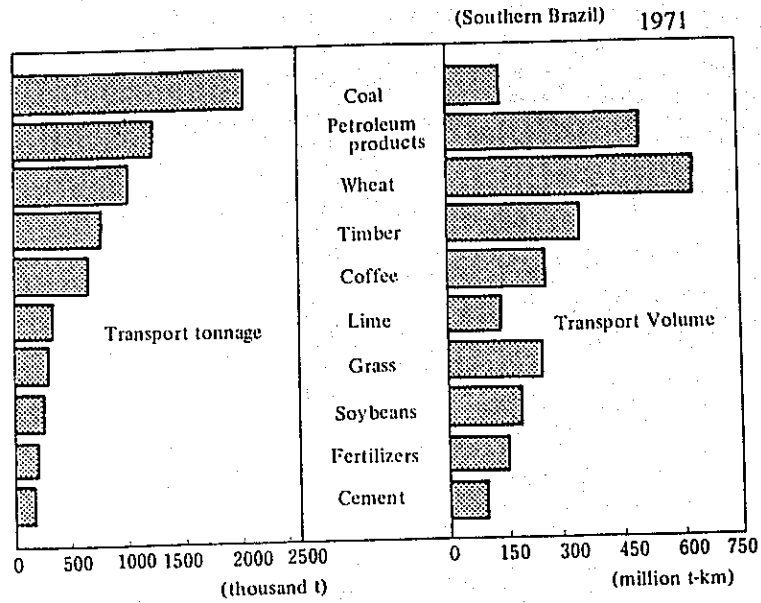


Fig. 12 Cargo Movement between Local Management Districts of Federal Railways

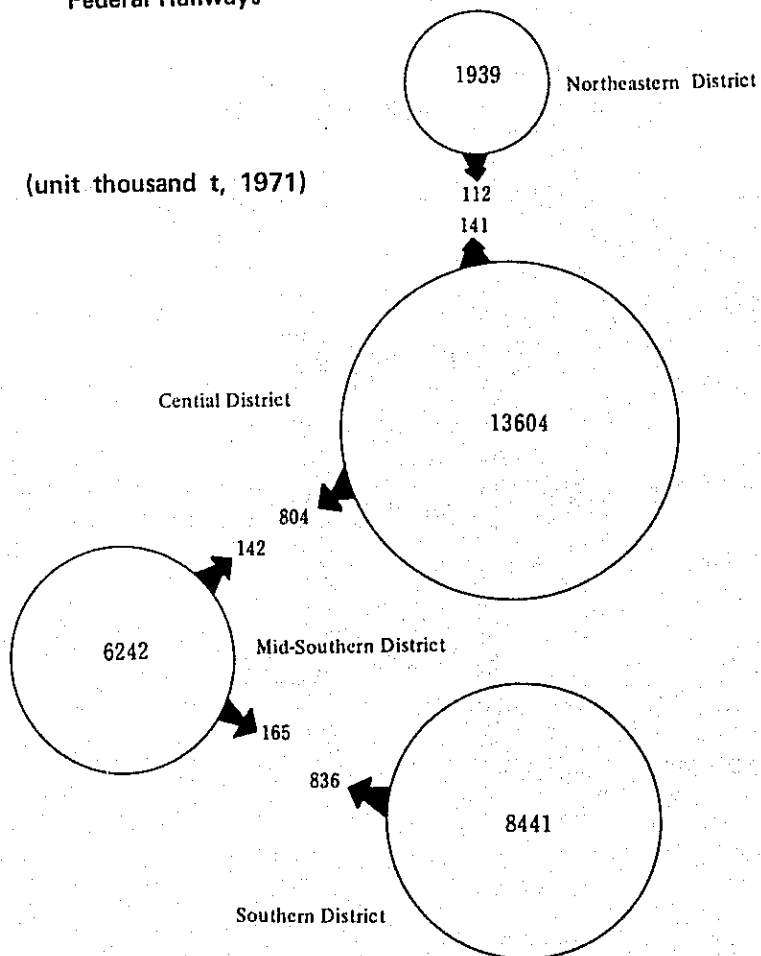


Fig. 13 Dead Weight Tonnage and Length Overall
(Register of Shipping in Japan, 1972)

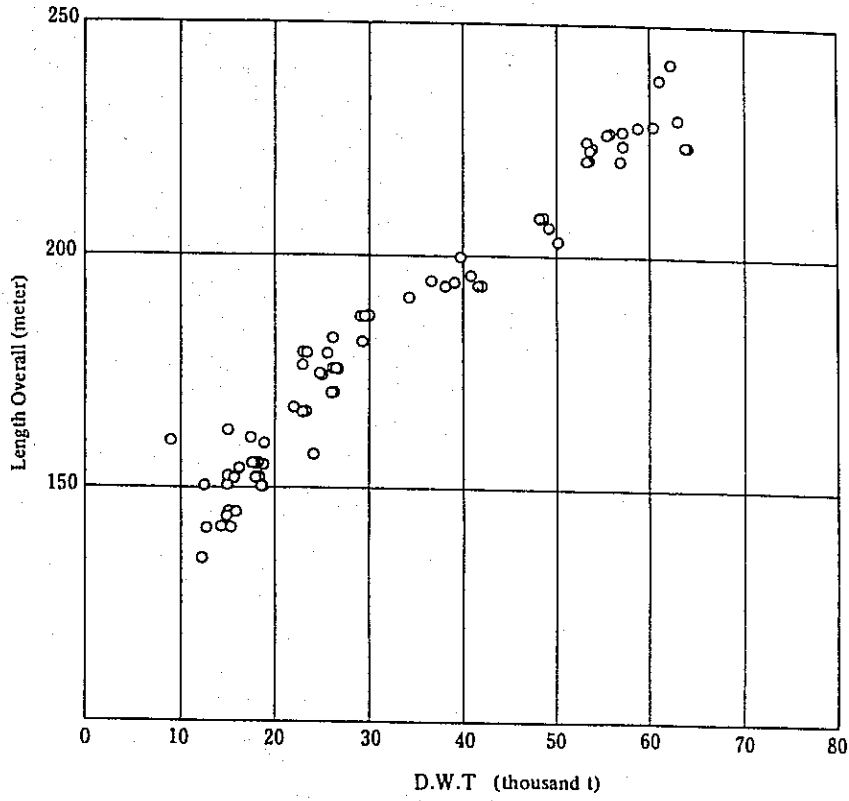
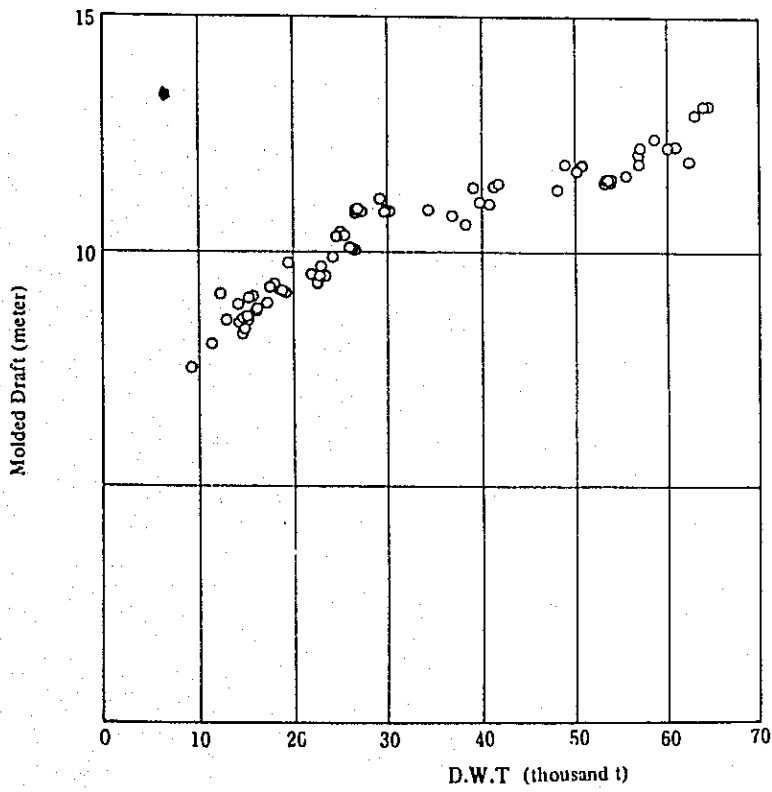


Fig. 14 Dead Weight Tonnage and Molded Draft
(Register of Shipping in Japan, 1972)



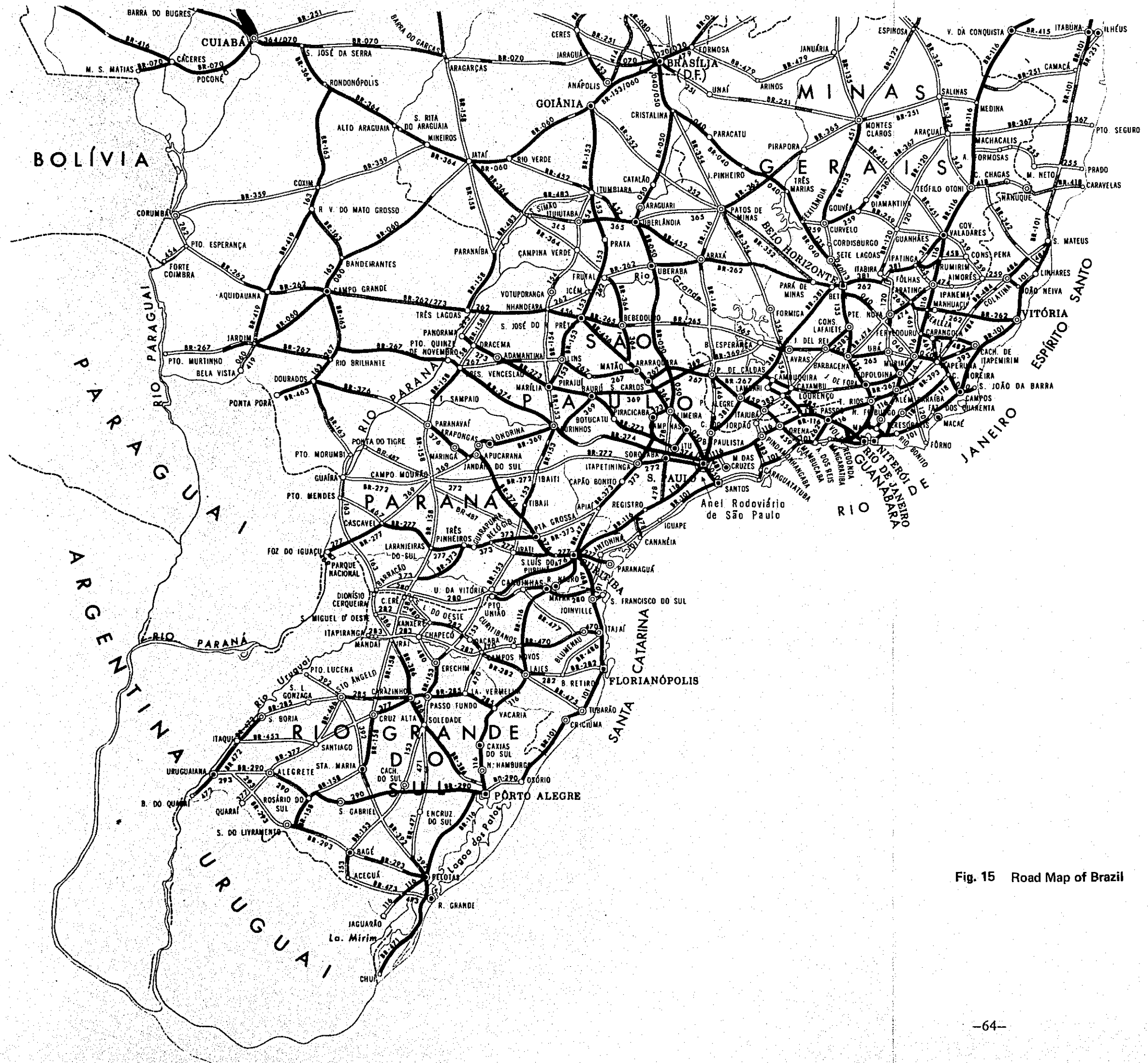


Fig. 15 Road Map of Brazil