3.3 ROAD TRAFFIC FLOW MOVEMENT

3.3.1 Tollgate traffics

(1) Outline of tollgate traffic

There are 14 tollgates on the national road in Paraguay, 12 managed directly by MOPC. The two others, which are on National Road Route 7, are managed by private company.

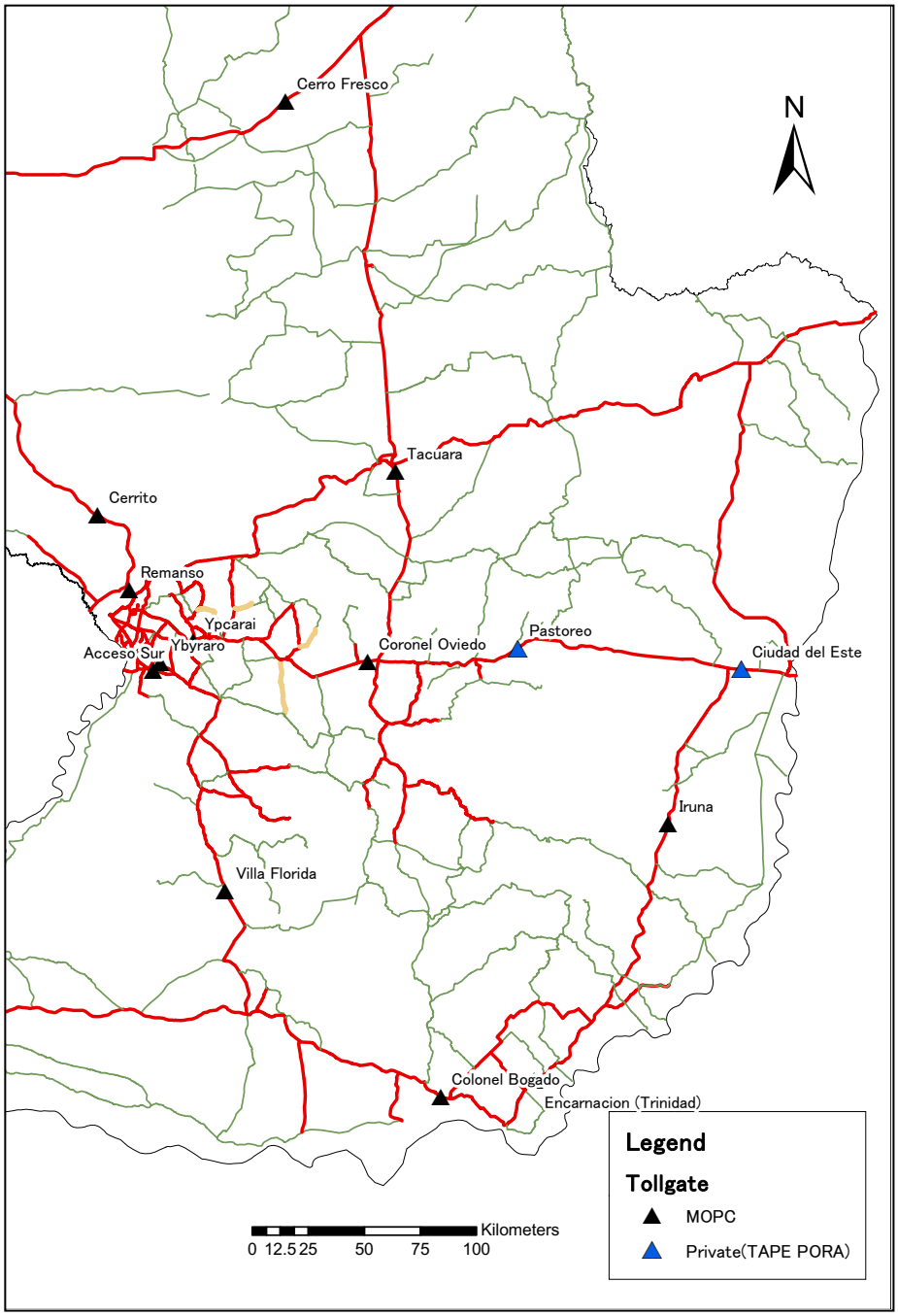


Figure 3.3-1 Location of tollgates

The largest volume of traffic is observed at the Ypacaraí tollgate, with 5,600 vehicles per day in one direction. The second largest volume is observed at the Remanso tollgate with 2,600 vehicles per day in one direction.

Traffic on the National Road Routes No.1, 2 and 7 is heavy, but it is low on others.

Table 3.3-1 Average traffic volume at each tollgate in 2003

(Unit: vehicles/day)

Ypacarai	5,578	Remanso	2,644	Ybyraró	1,277
Coronel Oviedo	2,318	Villa Florida	506	Cerrito	412
Ciudad del Este	509	Encarnación	1,100	Coronel Bogado	610
Tacuara	520	Acceso Sur	791	Cuero Fresco	162

Source: DINATRAN

Heavy traffic in summer (December to January) is seen at Ypacaraí, Coronel Bogado, Tacuara and Acesso Sur tollgates. Heavy traffic is seen in April and May at Coronel Oviedo, Villa Florida, Ciudad del Este and Encarnación tollgates.

There is very little monthly change at the Remanso and Ybyraró tollgates which are located in the Asunción metropolitan area.

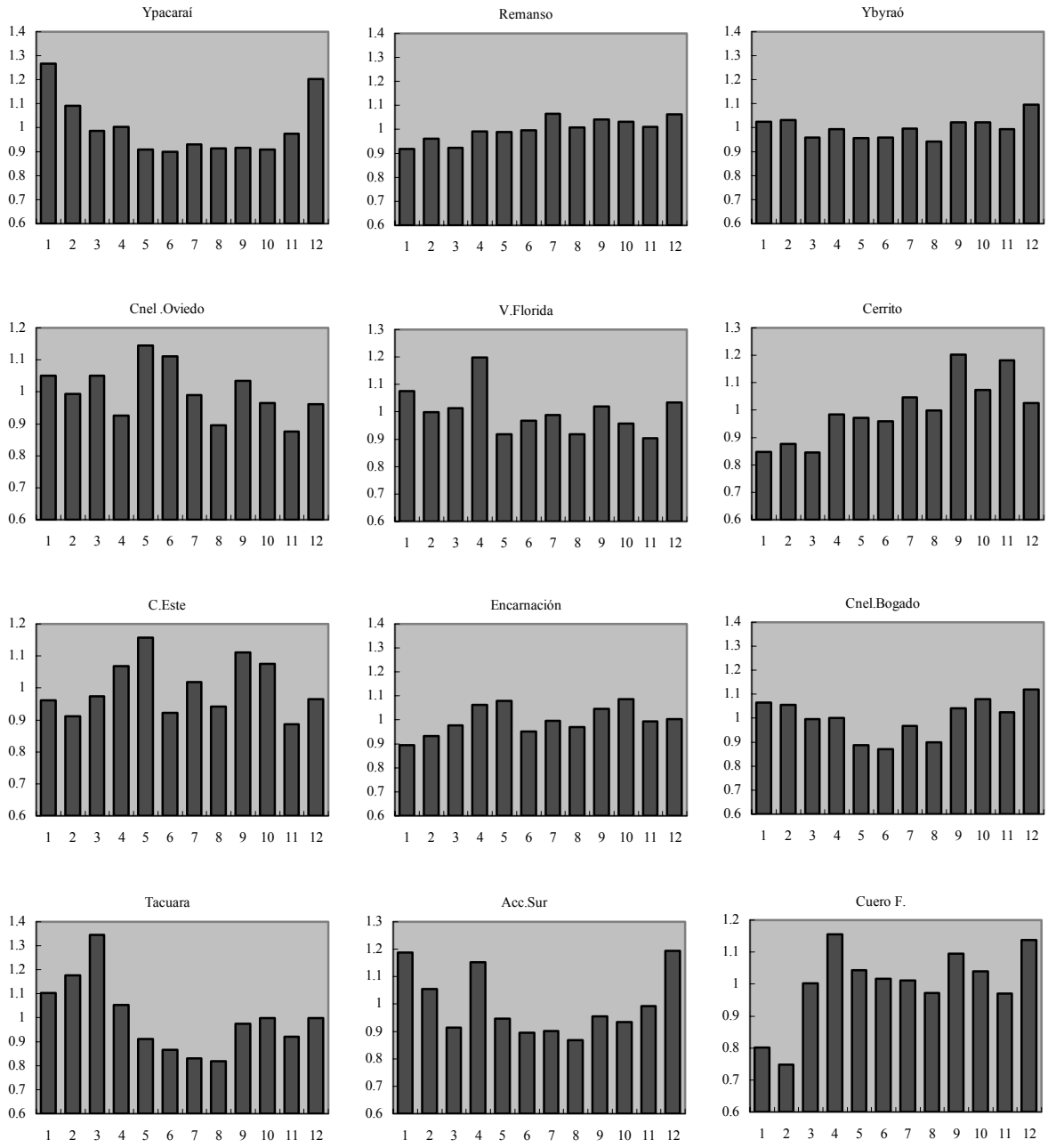


Figure 3.3-2 Monthly fluctuation at each tollgate (Average traffic = 1.0)

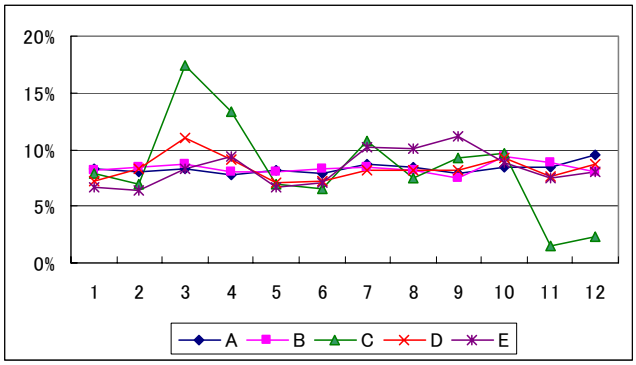
(2) Traffic at the Trinidad and Iruña tollgates

The Trinidad and Iruña tollgates are located on the National Road Route No.6, which runs along the left side of the Parana River coastal road.

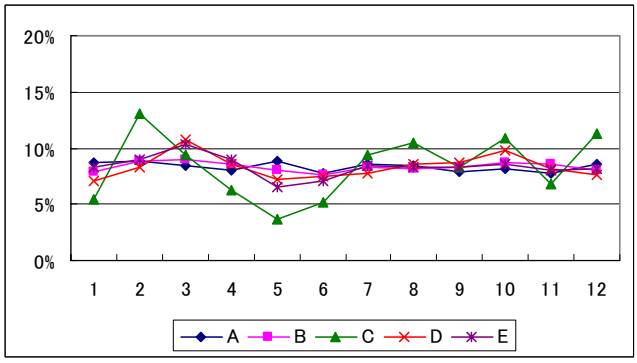
According to the preliminary traffic data in 2005 for these tollgates, 1,080 veh/day headed north were observed at the Trinidad tollgate, and 490 veh/day headed south were observed at the Iruña tollgate.

Among the different types of vehicles, the monthly fluctuation in tractors was especially great. The peak appeared in March at the Trinidad tollgate and in February at the Iruña tollgate.

Trinidad



Iruña



(A: Standard sized car, B: Bus, microbus, 2-axle truck, C: tractor, D: 3-axle truck/bus, E: 4 or more axle truck/bus)

Figure 3.3-3 Monthly fluctuation by type of vehicle

3.3.2 Observed traffic

(1) Outline of Traffic Surveys

A section traffic survey and a roadside OD interview survey were conducted to grasp the present flow of traffic on National Road Route 6,. Also in order to grasp the present traffic volume on the access roads to the port, traffic surveys were conducted at intersections.

- Survey points

Survey points are shown in Figure 3.3-4.

- Survey times

The section traffic survey on the Trinidad tollgate was conducted for 24 hours (From 6 a.m. to 6 a.m. to the next day), and other all surveys were conducted for 14 hours (From 6 a.m. to 8 p.m.)

- Survey method

The traffic volume was counted by vehicle type every hour. Also, the origin, destination and number of passengers were asked for all types of vehicles, and truck drivers were asked what cargo they were carrying.

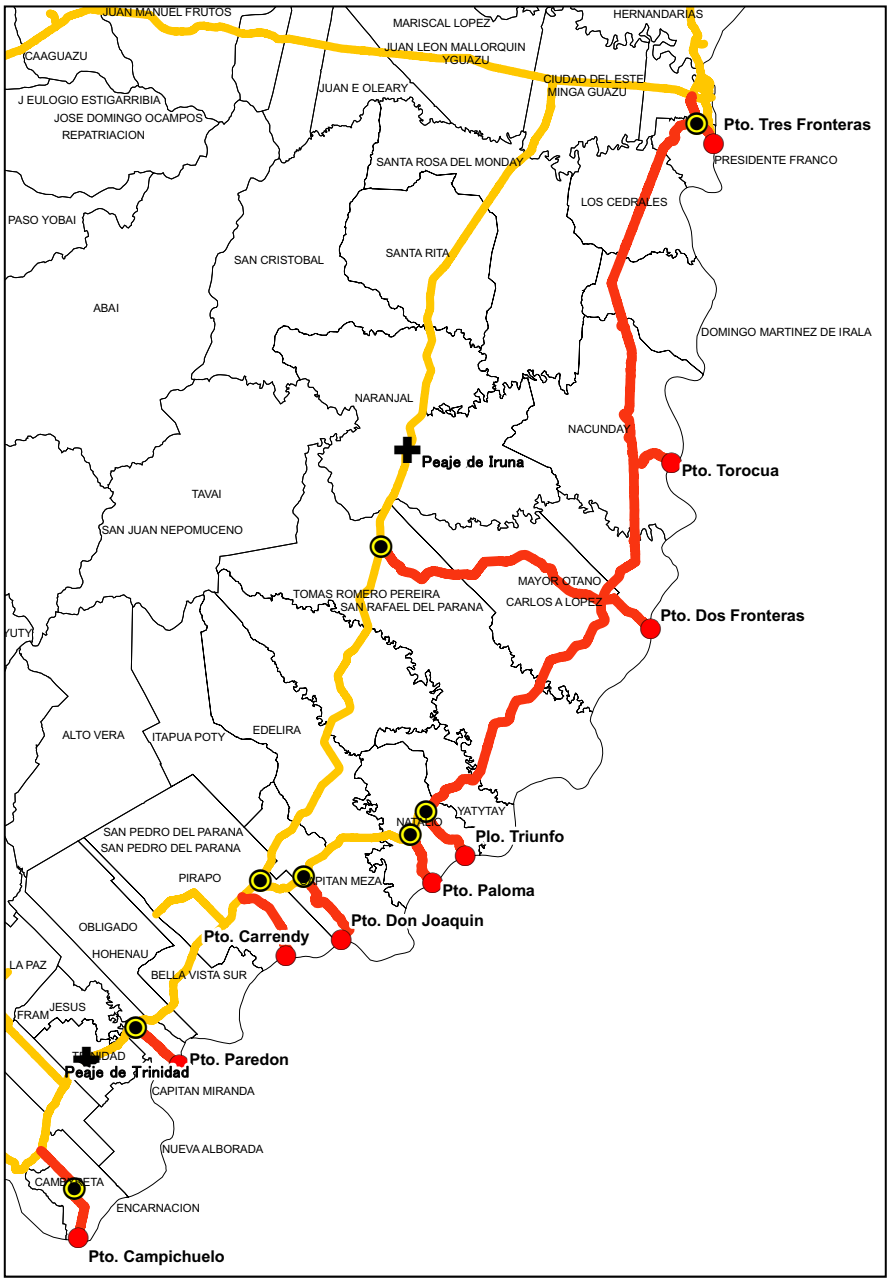


Figure 3.3-4 Survey points

(2) Survey results

1) Section traffic volume

a) Trinidad tollgate

The Trinidad tollgate is located near the Encarnación city on the National Road Route No.6. Observed peak traffic volumes northbound (from Encarnación to Ciudad del Este) were 114 and 112 veh/hour in the morning and afternoon peak periods, with trucks accounting for 18% and 25%, respectively.

Also, southbound traffic (Ciudad del Este to Encarnación) was 98 and 115 veh/hour in morning and afternoon peak periods, and the ratio of trucks was 15% and 12%, respectively.

Northbound and southbound traffic for 14-hour periods was 1,224 and 1,077 veh/14hours,

respectively, and 24-hour traffic was 1,362 and 1,217 veh/day, respectively.

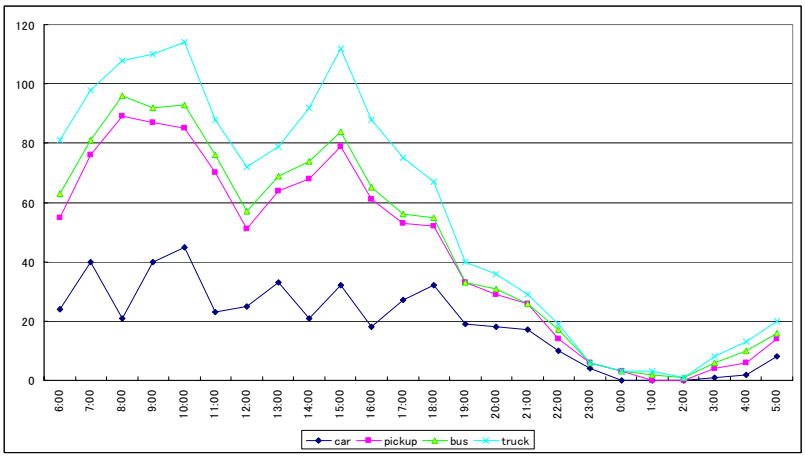
The day-night ratios (24h/14h) were 1.13 and 1.11, which means that most of traffic passed by from 6 a.m. to 8 p.m.

Moreover, the ratio of trucks per day, northbound and southbound was about 18%.

Table 3.3-2 Traffic survey result in Trinidad tollgate

Northbound (Encarnación→C. del Este)								
	Morning peak		Afternoon peak		14-hour traffic		24-hour traffic	
	10:00-11:00		15:00-16:00		6:00-20:00		6:00-6:00	
	veh/h	%	veh/h	%	veh/14h	%	veh/day	%
Passenger car	45	39.5	32	28.5	400	32.7	460	33.8
Pickup, van	40	35.1	47	42.0	523	42.7	565	41.5
Bus	8	7.0	5	4.5	71	5.8	87	6.4
Truck	21	18.4	28	25.0	230	18.8	250	18.4
Total	114	100.0	112	100.0	1,224	100.0	1,362	100.0
Southbound (C. del Este→Encarnación)								
	Morning peak		Afternoon peak		14-hour traffic		24-hour traffic	
	9:00-10:00		17:0018:00		6:00-20:00		6:00-6:00	
	veh/h	%	veh/h	%	veh/14h	%	veh/day	%
Passenger car	29	29.6	50	43.5	377	35.0	417	34.3
Pickup, van	48	49.0	46	40.0	442	41.0	492	40.4
Bus	6	6.1	5	4.3	76	7.1	85	7.0
Truck	15	15.3	14	12.2	182	16.9	223	18.3
Total	98	100.0	115	100.0	1,077	100.0	1,217	100.0

Northbound (Encarnación→C. del Este)



Southbound (C. del Este→Encarnación)

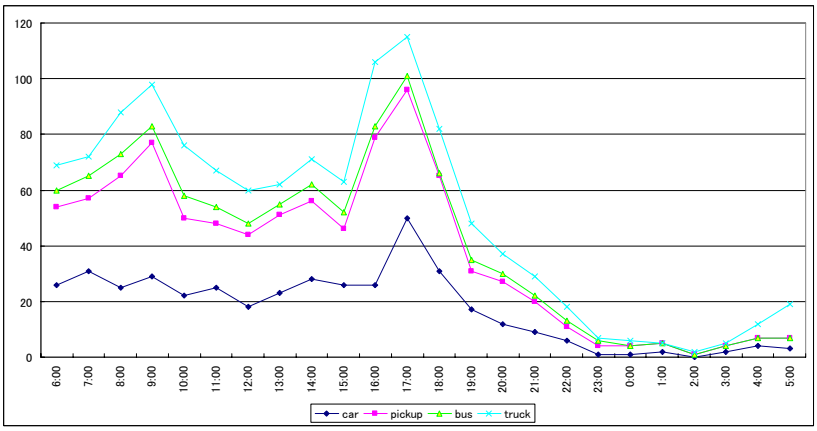


Figure 3.3-5 Hourly traffic volume at Trinidad tollgate

b) Iruña tollgate

The Iruña tollgate is located at the Alto Parana and Itapúa departmental boundary.

Observed northbound peak traffic volumes (from Encarnación to Ciudad del Este) were 45 and 61 veh/hour at morning and afternoon peak, respectively, and the ratio of trucks was 31% and 43%, respectively.

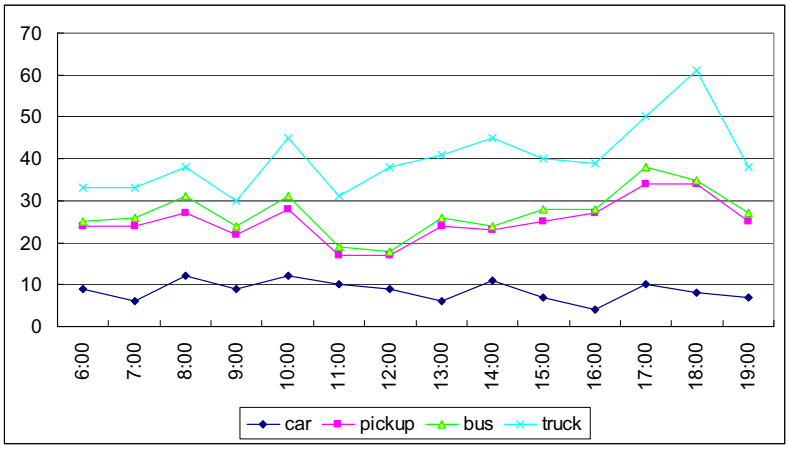
Also, peak traffic volume southbound (Ciudad del Este to Encarnación) was 56 and 50 veh/hour in the morning and afternoon, respectively, and the ratio of trucks was 29% and 34%, respectively.

Traffic for the 14-hour period was 562 and 530 veh/14hours, northbound and southbound, and the ratio of trucks was 32% and 30%, respectively.

Table 3.3-3 Traffic survey results at Iruña tollgate

Northbound (Encarnación→C. del Este)						
	Morning peak		Afternoon peak		14 hours traffic	
	10:00-11:00		18:00-19:00		6:00-20:00	
	veh/h	%	veh/h	%	veh/14h	%
Passenger car	12	26.7	8	13.1	120	21.4
Pickup, van	16	35.5	26	42.6	231	41.1
Bus	3	6.7	1	1.7	29	5.2
Truck	14	31.1	26	42.6	182	32.4
Total	45	100.0	61	100.0	562	100.0
Southbound (C. del Este→Encarnación)						
	Morning peak		Afternoon peak		14 hours traffic	
	9:00-10:00		14:00-15:00		6:00-20:00	
	veh/h	%	veh/h	%	veh/14h	%
Passenger car	9	16.1	11	22.0	126	23.8
Pickup, van	29	51.7	21	42.0	215	40.6
Bus	2	3.6	1	2.0	32	6.0
Truck	16	28.6	17	34.0	157	29.6
Total	56	100.0	50	100.0	530	100.0

Northbound (Encarnación→C. del Este)



C. del Este→Encarnación)

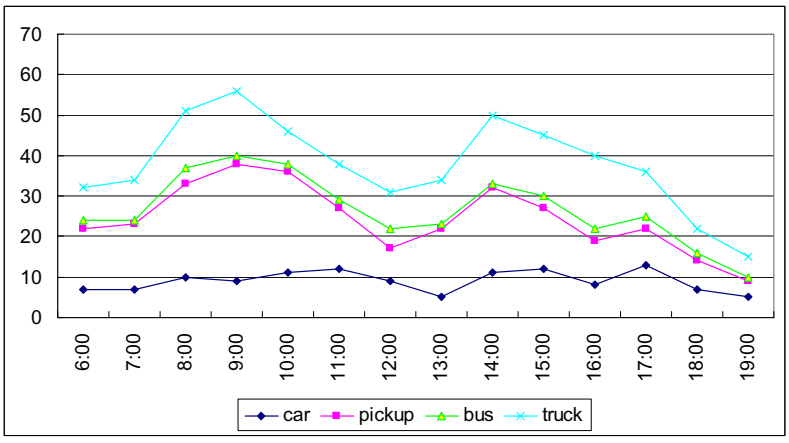


Figure 3.3-6 Hourly traffic volume at Iruña tollgate

2) OD interview survey

An OD interview survey was conducted of drivers passing through the Trinidad and Iruña tollgates. Car type, origin, destination and number of passengers were asked for all types of vehicles. We also asked about the purpose of the trip in the case of private cars and bus passengers and about type of cargo, maximum loading capacity and rate of loading in the case of drivers of freight vehicles.

a) Purposes of trips in passenger cars

The majority of trips were for the purpose of going to work. The next highest percentage was accounted for by "business," "private" and "returning to home."

Table 3.3-4 Purposes of trips in passenger cars

Location / Purpose	Trinidad		Iruna	
	Northbound	Southbound	Northbound	Southbound
To work	53.1%	48.0%	61.2%	68.6%
To school	1.2%	3.6%	0.0%	0.0%
Business	14.0%	15.9%	15.9%	1.8%
Shopping	7.0%	6.2%	2.9%	0.6%
Pickup or send off	2.5%	2.6%	2.4%	0.0%
Private	11.7%	13.9%	13.5%	12.4%
Return to home	10.5%	9.8%	4.1%	16.6%
No. of samples	358	389	170	169

b) Average numbers of passengers

The average number of passengers in private cars was 1.7-2.0 persons/vehicle.

The average number of passengers per bus was 25-26 persons at the Trinidad tollgate and 15-16 persons at the Iruña tollgate.

Table 3.3-5 Average numbers of passengers

(Unit: person/vehicle)

Location / Type	Trinidad		Iruña	
	Northbound	Southbound	Northbound	Southbound
Passenger car	1.9	2.0	2.0	1.7
Bus	25.4	25.6	14.8	15.9

c) Cargo type (top 3)

Fertilizer, seeds, yerba-mate, soybean, electric polls and fuel were mainly transported.

Table 3.3-6 Top three types of cargo

Location	Trinidad		Iruna	
	Northbound	Southbound	Northbound	Southbound
1	Fertilizer	Yerba-mate	Soybean	Electric polls
2	Electric polls	Fertilizer	Seeds	Seeds
3	Food	Fuel	Fuel	Fertilizer

d) OD traffic flow

・ Setting of expansion rate

Because the OD interview survey results were sampled data, it was necessary to expand this to all numbers. Therefore, the expansion rates by each hour and vehicle type were set by using traffic count result.

Result summary is shown as follows.

Table 3.3-7 Expansion rate

Survey point		Number of samples	Traffics (14 hours)	Expansion rate
Trinidad	Northbound	553	1,224	2.21
	Southbound	552	1,077	1.95
Iruña	Northbound	280	562	2.01
	Southbound	295	530	1.80

・ Setting expansion rate for daily traffic

The OD interview survey was conducted for 14 hours, and the traffic volume survey was conducted for 24 hours at the Trinidad tollgate. Therefore, to expand the interview sample data of 14 hours to 24 hour data, the expansion rates by vehicle type were set. This expansion rate was applied to the samples at the Iruña tollgate.

Table 3.3-8 Expansion rate to daily traffic

Survey point		Traffic (24 hours)	Traffic (14 hours)	Expansion rate
Trinidad	Northbound	1,362	1,224	1.11
	Southbound	1,217	1,077	1.19

・ Composition of OD Tables

Two expanded OD tables, which were multiplied by two expansion rates to OD interview data on the Trinidad and the Iruña tollgates, were synthesized to one OD table, excluding the traffic that passed each tollgate, because that traffic was counted at each OD table.

・ Result of the OD interview survey

The synthesized OD table shows the daily traffic passing the Trinidad and/or Iruña tollgate, and most of middle- and long-distance traffic in this survey area was covered except for the short-distance traffic between two tollgates.

The OD desire lines of all modes are shown in Figure 3.3-7, and the OD desire lines of trucks are shown in Figure 3.3-8.

Highest traffic volume for all modes for each OD pair was between Encarnación and Honerau in Itapúa department. The next highest was between Encarnación and Vella Vista.

Traffic between Encarnación and Ciudad del Este was about 180 veh/day for all modes, but truck traffic was the highest of all OD traffic at 40 veh/day.

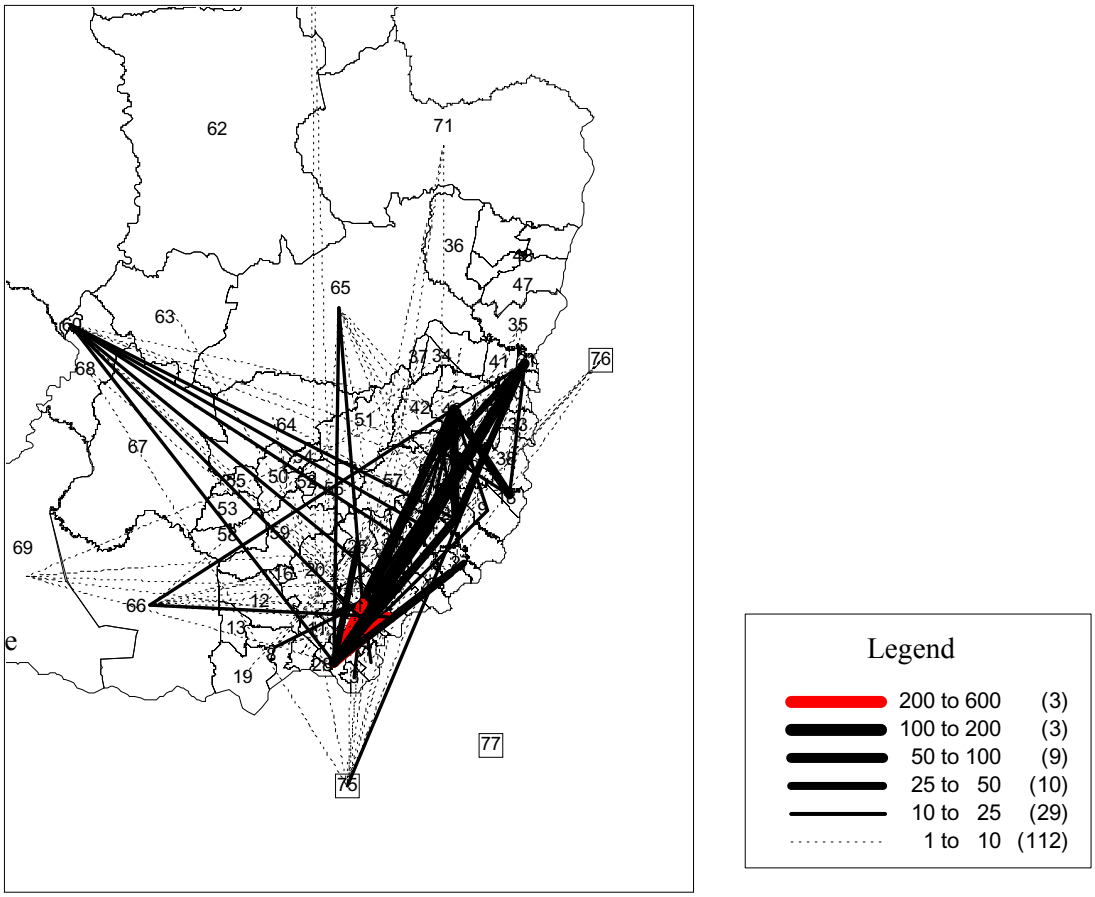


Figure 3.3-7 OD desire lines (All Modes)

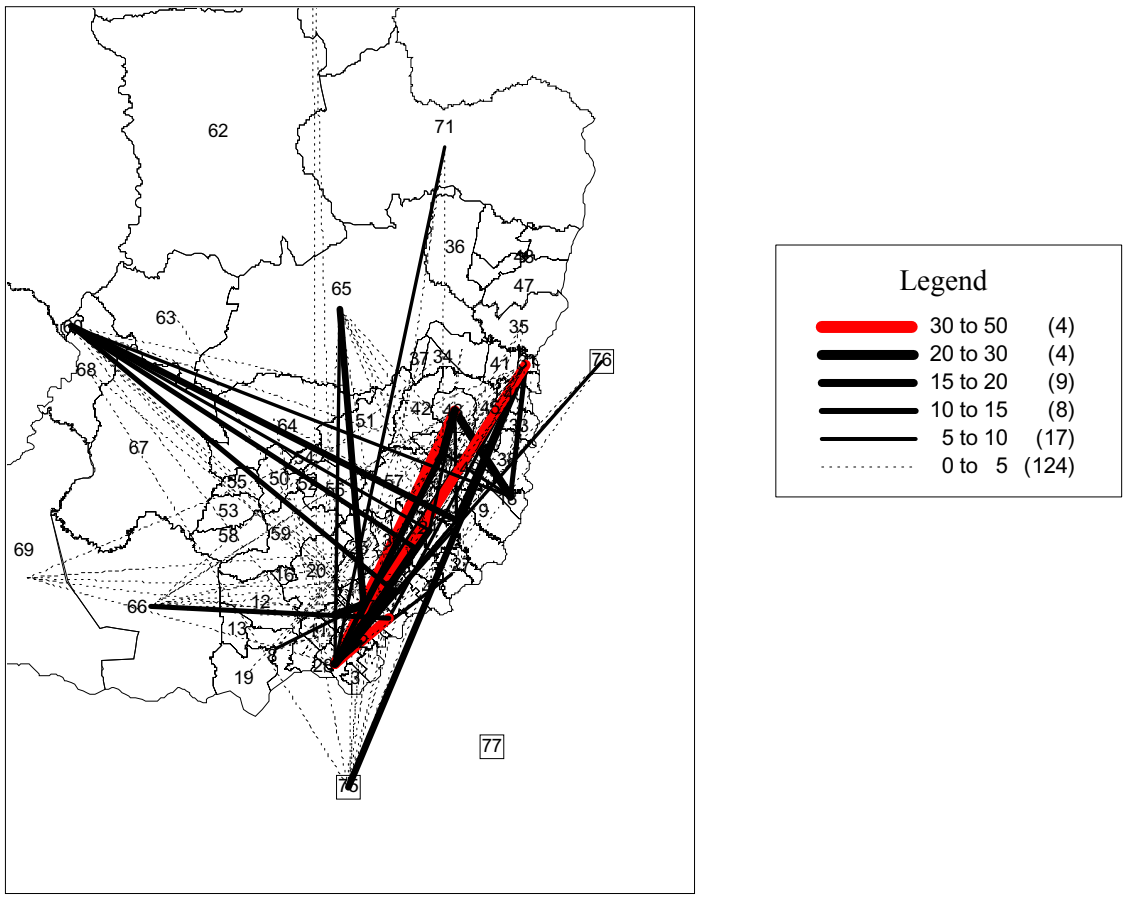


Figure 3.3-8 OD desire lines (Trucks)

3) Intersection count survey

To grasp the current traffic volume at the roads studied, an intersection count survey was conducted at six intersection points where access roads to the six active ports and main roads cross.

a) Tres Fronteras port access road × Paraná River Coastal Road

Observed traffic on the access road was 2,000 veh/14hours. Traffic connecting with the central area of Ciudad del Este was 35% of the total, and the other 65% was traffic connecting to Parana river coastal roads. The ratio of trucks on the access road was 16%, and the ratio of trucks connecting to the central area of Ciudad del Este was high at 30%.

b) Dos Fronteras port access road ×National Road Route No.6

Observed traffic on the National Road Route No.6 was about 1,100 veh/14hours, and the ratio of trucks was about 32%. Traffic on the Dos Fronteras port access road was 350 veh/14hours, and the ratio of trucks was 34%.

The rate of traffic between the north side of the national road and the access road was slightly higher at 53%.

c) Triunfo port access road and Paloma port access road × National Road Route No.6

Traffic on the Paraná River coastal road was 930, 820 and 650 veh/14h at the south side connecting to the Paloma port access road, the part between the Paloma and the Triunfo port access roads and the north side connecting with the Triunfo port access road. The ratio of trucks was about 27%. On the other hand, the traffic volume on the Triunfo and Paloma access roads was small, at 200 and 110 veh/14h, respectively. The ratio of trucks was 34% and 49%, respectively.

d) Don Joaquin port access road and National Road Route No.6 × Paraná River Coastal Road

The traffic on the Don Joaquin port access road was 640 veh/14h, with many of the 280 veh/14h of traffic travelling from/to the north side of Paraná River Coastal Road. The ratio of trucks was 24%.

About 40% of the traffic passing on the south side of National Road Route 6 used the Parana River coastal road, which accounted for 35% of the truck traffic.

e) Paredon port access road × National Road Route 6

The traffic on National Road Route 6 was about 2,300 veh/14h, and the ratio of trucks was about 20%. The traffic on the Paredon port access road was 330 veh/14h, trucks accounting for 10%.

f) Campichuero port access road × access road to the downtown Encarnacion

The traffic on the access road was about 270 veh/14h, and the ratio of trucks was about 12%. This traffic branched off to downtown Encarnacion and to National Road Route 6. The latter road had a high ratio of trucks at about 27%.

3.4 INTERVIEW SURVEY OF COOPERATIVES, CARRIERS AND PORTS

3.4.1 Outline of the survey

Interview surveys were conducted to grasp the flow of goods.

At first, interviewers visited and passed out the questionnaire sheets to the 8 ports located along the Parana River, to 10 major transport carriers, and to 10 major farmer's cooperatives. Then interviewers visited again and collected the questionnaire sheets, and asked some questions at same time.

Table 3.4-1 shows lists of the interviews and the respondents.

Table 3.4-1 Succeeded interview lists

Interviewees	No. of interviews	Name of interviewees
Ports	7 Ports	Tres Fronteras: OTS S.A. Torocua: TOTEM S.A. Dos Fronteras: OTS S.A. Triunfo: Cargill Agropecuaria S.A.C.I. Paloma: Cargill Agropecuaria S.A.C.I. Don Joaquin: Trans Agro S.A. Paredon: Gical S.A.
Companies	7 Carriers	Cargill Agropecuaria S.A.C.I. ADM Paraguay S.A.E.C.A. Agrorama S.A. Coop. Colonias Unidas Agro Silo Santa Catarina S.A. Agrofertil S.A. Shirosawa Company S.A.C.I.
Cooperatives	10 Farmer's Cooperatives	Alto Parana Yguazu, Union Kurparty, Copronar, Raul Pena, Pindo Itapua La Paz, Pirapo, Unida, Integracion Naranjito Caazapa Yegros

3.4.2 Results of the survey

(1) Ports

- The products handled are mainly soybeans and soy products. Corn and wheat are also handled.
- Main destinations for export are Nueva Palmmira and Rosario ports, Argentina.
- The port where a large amount of cargo is handled is Tres Fronteras port. About 700,000 tons a year are shipped.
- The handling commissions are about three dollars per ton.
- The main problem each port faces is that the access road to the port is unpaved and cannot be passed on rainy days. They recognize that this project will contribute to regional development.

(2) Carriers

- All carriers handle soybeans, wheat, corn and soy products.
- Colonias Unidas handles about 7.6 million tons a year, and Cargil Agropercuaria and ADM Paraguay each handle about 1.2 to 1.5 million tons a year.
- Some carriers plan to increase the number of silos.
- The main problem each port faces is that the access road to the port is unpaved and cannot be passed on rainy days. They recognize that this project will reduce transport costs and boost exports.

(3) Cooperatives

- Colonias Unidas has over 50 years of history. Pirapo and Yguazu have over 40 years of history.
- The top cooperative is Colonias Unidas, which has 3,200 members. Other cooperatives have 100 to 500 members.
- Some cooperatives have plans to increase the number of silos and to construct a grain processing plant.
- The main problem for each cooperative is the high cost of transport, which is caused by the poorly maintained roads that can't be passed on rainy days.

4. STRUCTURE OF EXPORT AND IMPORT IN PARAGUAY

4.1 THE TREND OF IMPORT AND EXPORT IN PARAGUAY

The value of imports and exports of Paraguay showed a decrease in 1997, which remained stable from 1999 to 2002. Although it started to show a tendency to increase again, with the economic recovery in 2003, it had not as yet reached the level of 1990.

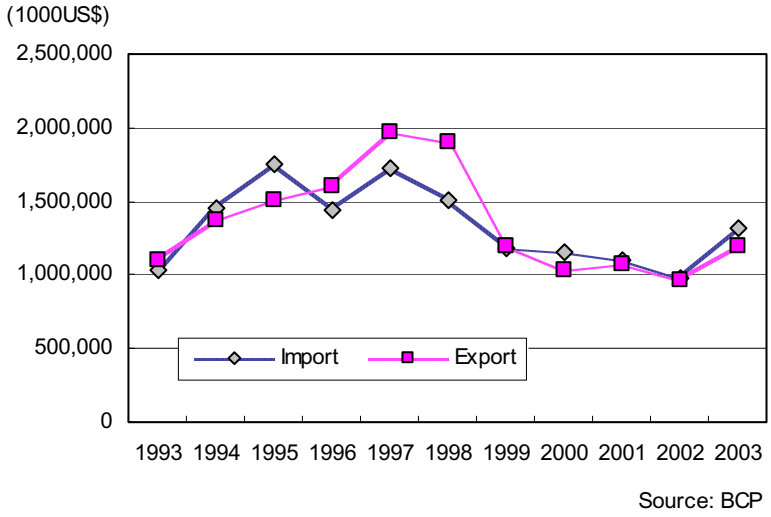
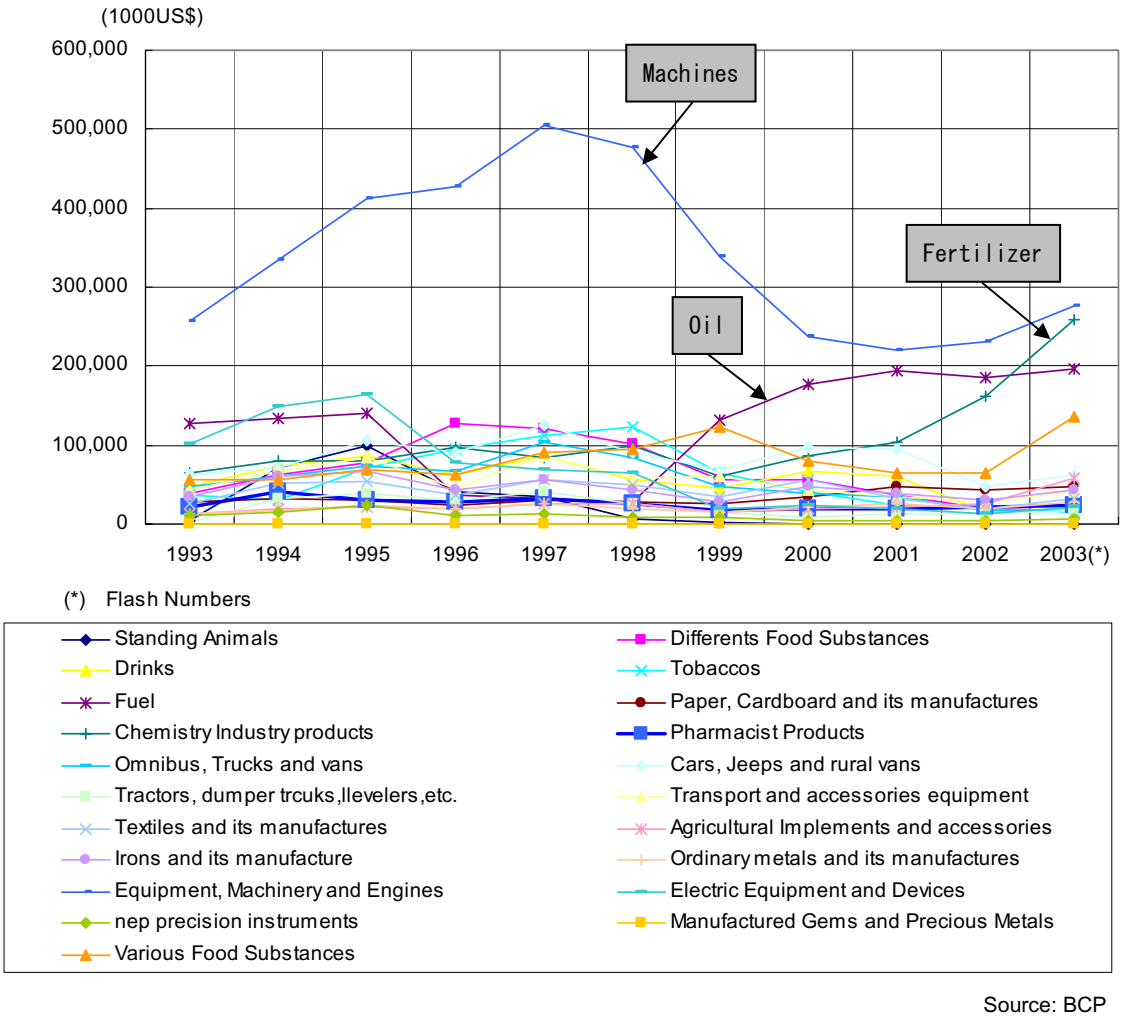


Figure 4.1-1 Transition of Value of Imports and Exports (in 1982 Constant Price)

The imports of;machinery, fertilizers, oil and so on increased, with these three goods accounting for about 60%of the whole. The ratio of machinery gradually decreased though still accounted for about 30%of the temporary whole. The growth of the ratio of fertilizer has grown in recent years.



Source: BCP

Figure 4.1-2 Transition of Amount of Import by Main Article

The exports;the ratio of oil seeds such as soybean rose, and accounted for 32%of the whole in 2003. The ratio of cotton which, before, shared the leading role of export with soybean decreased every year from 12.9%in 1993 to 7.6%o 2003.

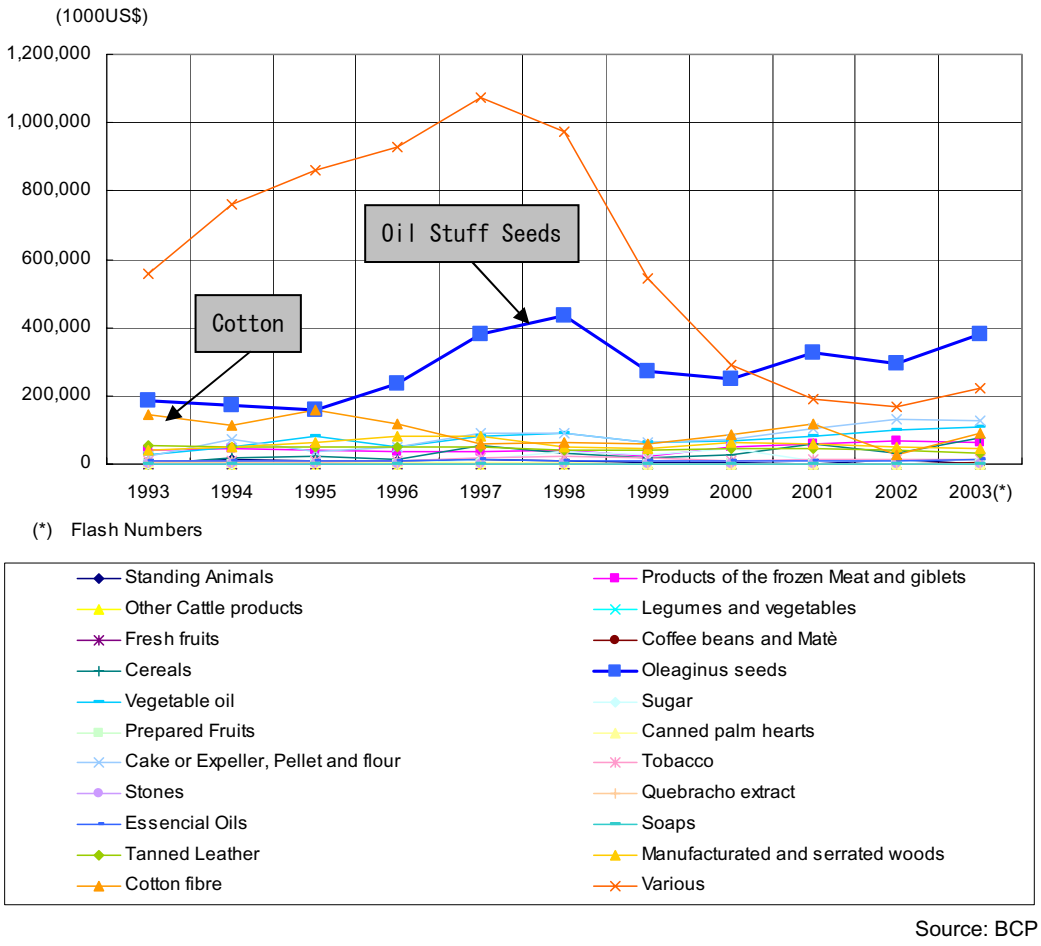


Figure 4.1-3 Transition of Export by Main Article

On the other hand, the quantity of total export of Paraguay in 1997 was about 4.4 million tons on weight basis. The main export products were agricultural goods such as soybean, wood, wheat, and corn. Moreover, the export quantity of, especially soybean, increased greatly, and has shown that the importance of soybean has risen. The tonnage of total export in 2004 increased by 5.6 million, though the quantity of the main export items did not change. On the other hand, an increase in fertilizer made up the entire amount of the import.

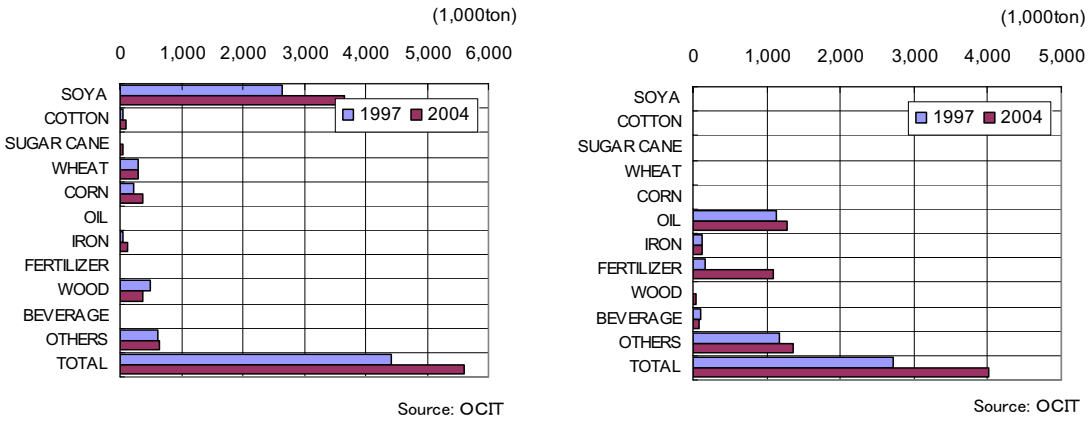


Figure 4.1-4 Transition of Amount of Export and Import by Article

In addition, river transportation tended to increase, reflecting an increase in the amount of export of soybean, as a transportation mode. It is assumed that this tendency will continue in the future as long as the export structure in Paraguay is not greatly changed, and the ratio of river transportation increases, the resulting appropriate maintenance of harbors and access roads will become necessary. On the other hand, the use of river and road transportation, for export, will be at almost the same rate as that for import (Refer to Figure 4.1-5).

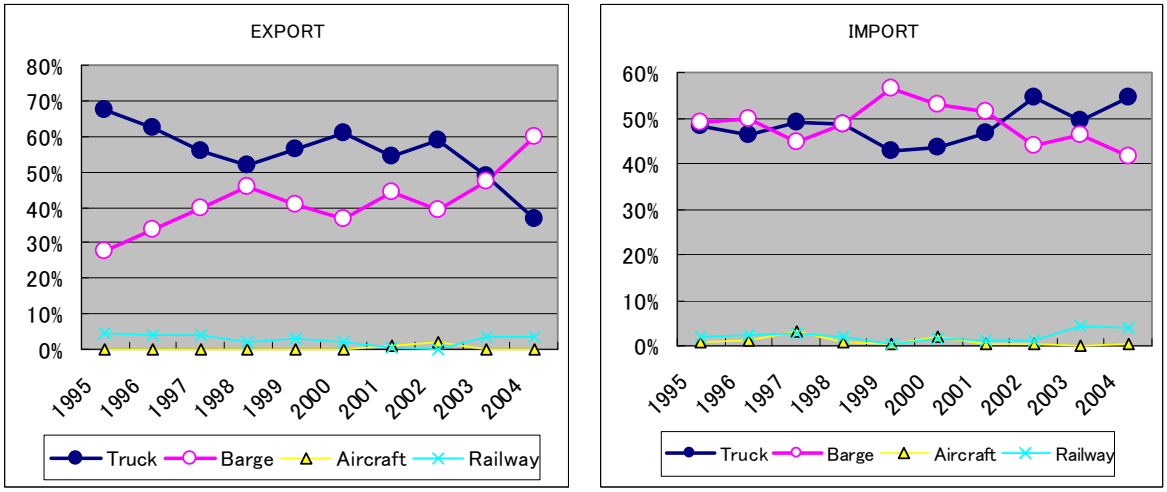


Figure 4.1-5 Change in Transportation in Imports and Exports

Figure 4.1-6 shows the change of the origin for imports and the destination for exports in Paraguay. The amount of exports to Brazil, Argentina and Europe decreased, and exports to Uruguay and other Latin American regions increased. The reason for the decrease of exports to Brazil is that entrance of genetically-modified soybeans was temporarily prohibited and export through the Paranágua port was decreased. Alteranatively, export through the Nueva Palmia port in Uruguay was increased. The amount of exports to Argentina decreased and exports to the CAN region (Comunida Andia; Chile, Ecuador, Peru, and Venezuela, etc.) increased substancially.

On the other hand, the imports from Brazil and Argentina increased with the ratio of 61% in 1995 to 78% in 2004, and shows that the intraregi onal trade within MERCOSUR become active.

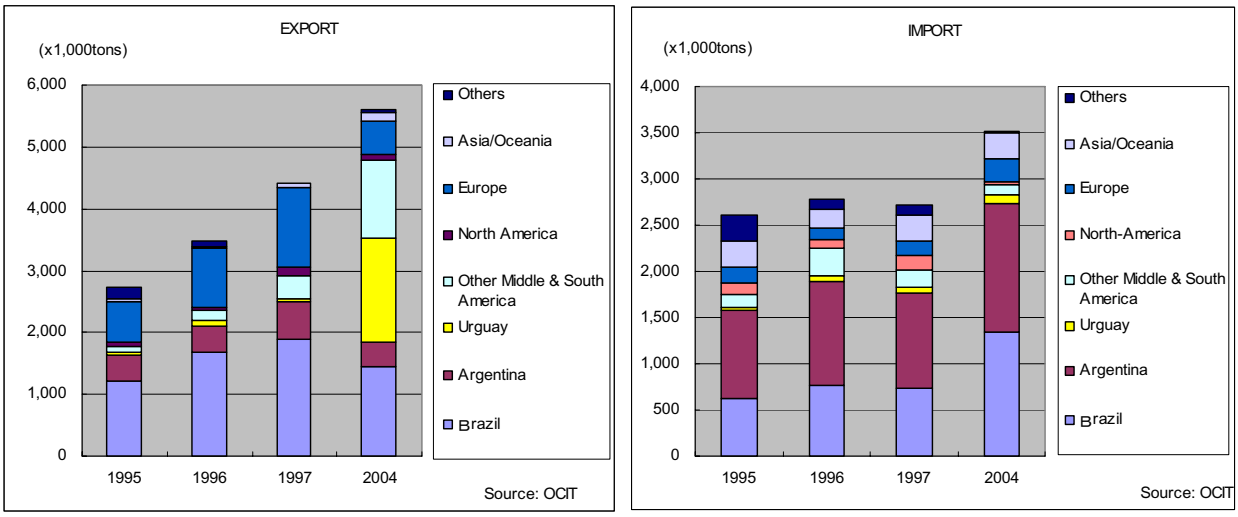


Figure 4.1-6 Change of the Origin for Imports and Destination for Exports in Paraguay

The route and the transportation used in imports and exports are shown in Figure 4.1-7. In exports, the amount to Argentina on the Paraguay River and the Paraná River accounts for about 60% of the amount of all exports. This indicates the importance of river transportation in exports. However, the Paraguay River is used more than Paraná River at present. For land transportation, the quantity to Brazil through Ciudad del Este accounts for approximately 20% of the entire amount. In imports, the amount carried by using the Paraguay River from Argentina increased by 44% of the whole of the amount, in addition; land transportation to Asunció n and Ciudad del Este from Argentina and Brazil also increased. The total amount of these two accounts for about 40% of the total of all imports.

An enormous discrepancy can be seen in the form of the river transportation in exports and imports. The use of Paraguay River has increased overwhelmingly in imports, while both rivers are used almost equally for exports. This is because equipment, such as piers needed for imports is not provided to harbors on the Paraná River banks. The improvement of ports that have the import equipment on the Paraná River banks is expected to resolve the imbalance of the import and export quantities by efficient port use.

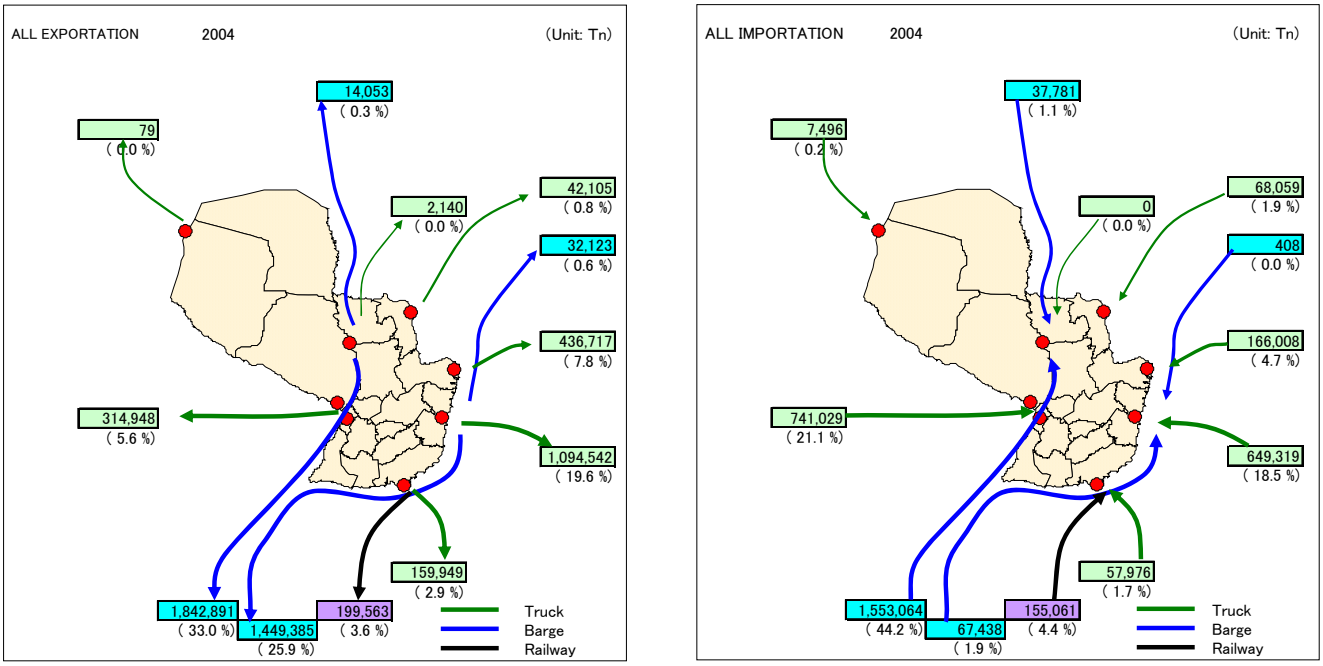


Figure 4.1-7 Amount of Imports and Exports by Route and Transportation (2004)

4.2 IMPORT AND EXPORT CHARACTERISTICS BY GOODS

4.2.1 Soybean (Export)

In the export of soybean, the proportion of river transportation is high. It accounts for about 73% of the total. The quantity transported on the Paraná River slightly exceeds that on the Paraguay River. For truck transportation, soybean exported to Brazil from Ciudad del Este and Salto del Guaira has increased. Moreover, the amount transported by the train service from Encarnación to Argentina is about 3.5% of the total amount (Refer to Figure 4.2-1).

Figure 4.2-2 shows the amount of production and export of soybean by department.

It is thought that the amounts of production and of export are almost equal in the Alto Paraná department and the Itapúa department. Soybean is produced in and exported from both departments. On the other hand, production exceeds the amount of export in other departments. It is assumed that the exportation is done after tranporting to the Central Department.

The tonnage from February to May, which is the harvest period of the soybean, increased and the tonnage in August and September also increased slightly because of the export of the stored soybeans (Refer to Figure 4.2-3).

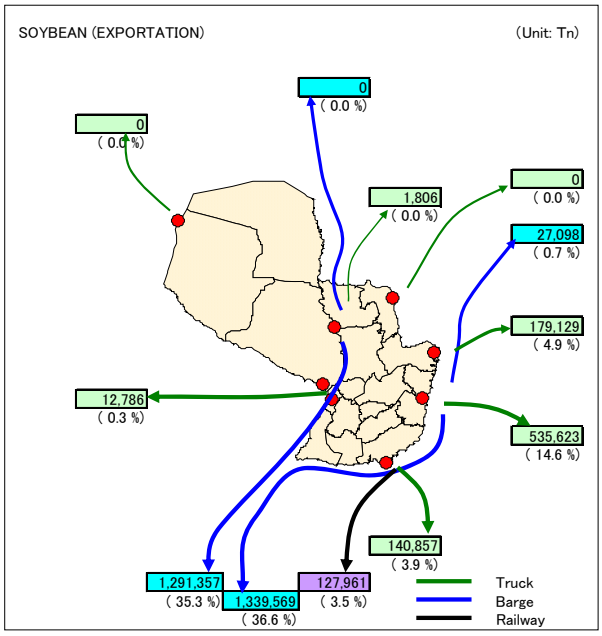


Figure 4.2-1 Route and Transportation of Export (Soybean)

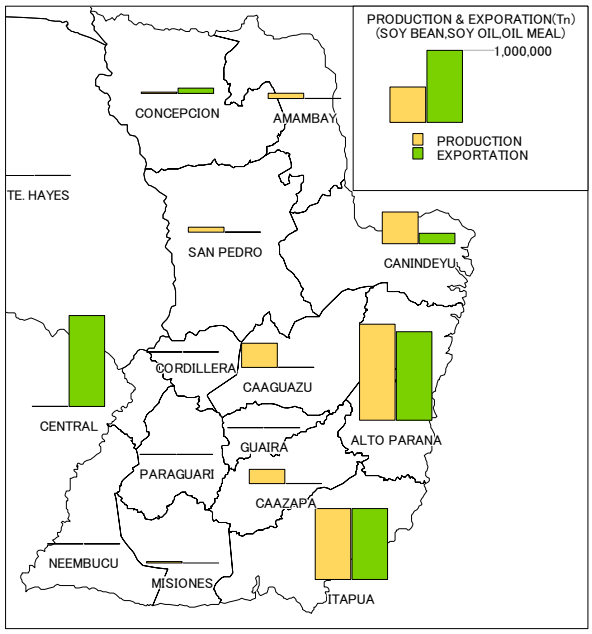


Figure 4.2-2 Production and point of Export (Soybean)

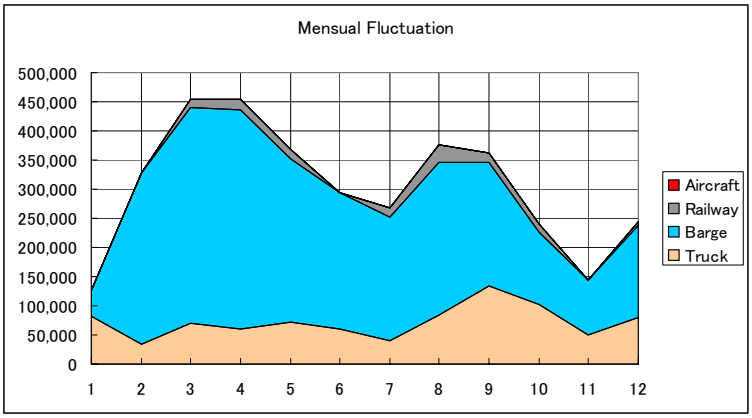


Figure 4.2-3 Transportation and Amount of Export by Month (Soybean)

4.2.2 Corn (Export)

80%of the total exports of corn is to Brazil. The amount exported through Ciudad del Este and Salto del Guaira to Brazil increased overwhelmingly by land transportation (Refer to Figure 4.2-4). In August and September exports are increased dramatically by month (Refer to Figure 4.1-5).

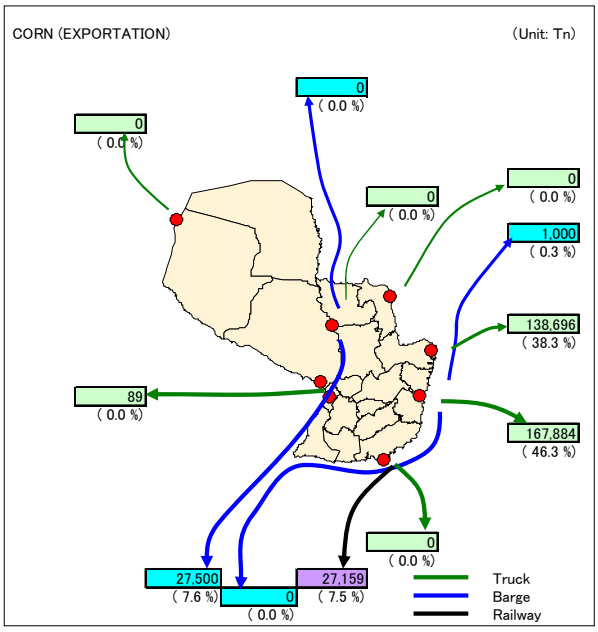


Figure 4.2-4 Route and Transportation of Export (Corn)

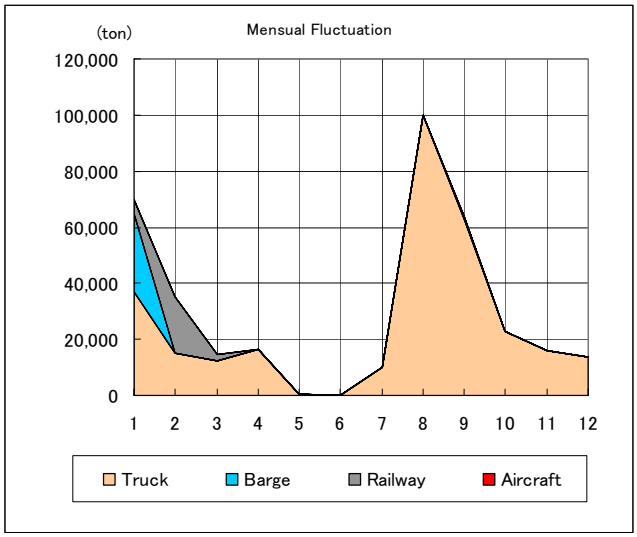


Figure 4.2-5 Transportation and Amount of Export by Month (Corn)

4.2.3 Wheat (Export)

The majority of wheat exports is by river;with the use of the Paraná River being double that of the Paraguay River. The exports from October to January increased because this period is the off-season for harvesting of soybean.

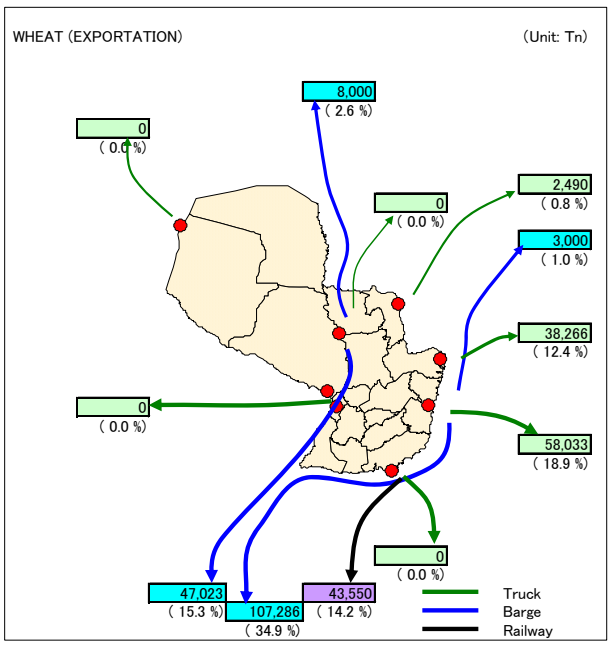


Figure 4.2-6 Route and Transportation of Export (Wheat)

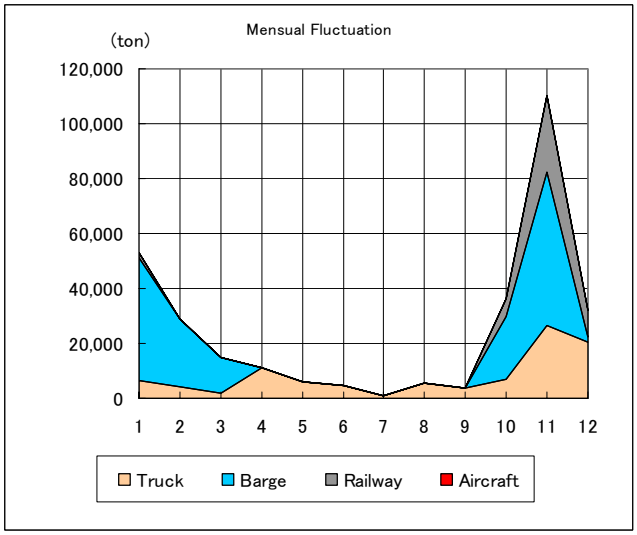


Figure 4.2-7 Transportation and Amount of Export by Month (Wheat)

4.2.4 Oil (Import)

Almost all the oil to Paraguay is imported from Argentina. The quantity unloaded at the San Antonio port, on the Paraguay River, which has an oil refinery, is large. However, it is said that 80% or more of the imported oil is refined, and therefore an increase of oil imports via the Paraná River is expected.

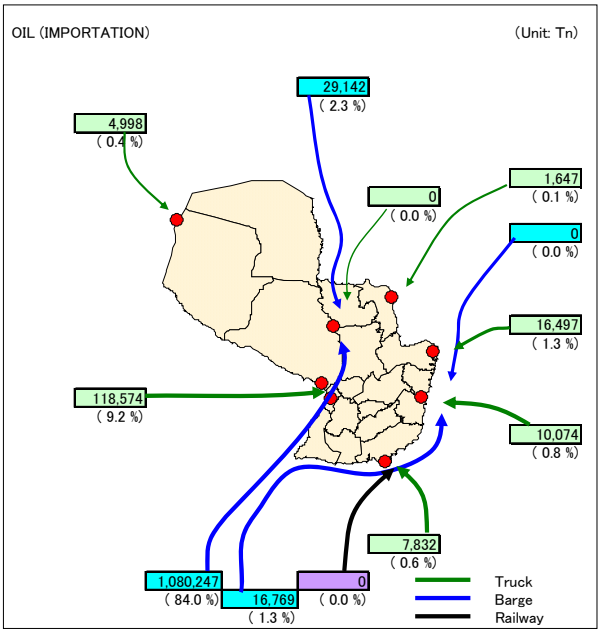


Figure 4.2-8 Route and Transportation of Import (Petroleum)

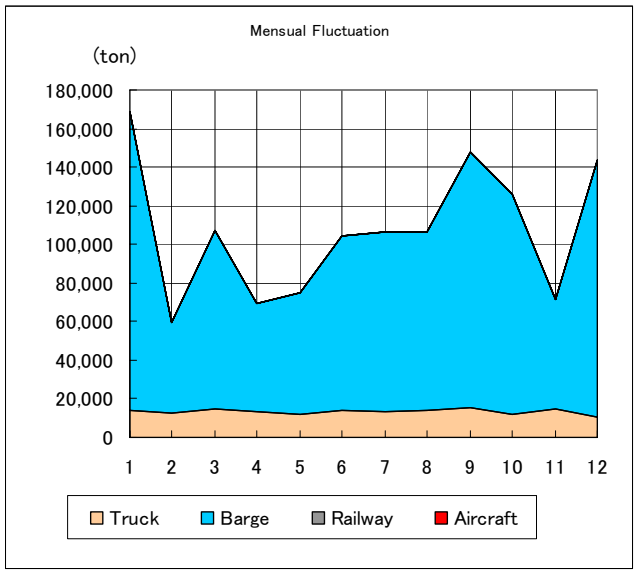


Figure 4.2-9 Transportation and Amount of Import by Month (Petroleum)

4.2.5 Fertilizer

The amount of fertilizer imported has increased rapidly recently, and the imports from Brazil accounts for about 90% of the whole. Therefore, the amount transported by land from Ciudad del Este and Salto del Guaira has increased. By month, the amount from July to October increased because of the crop time of soybean.

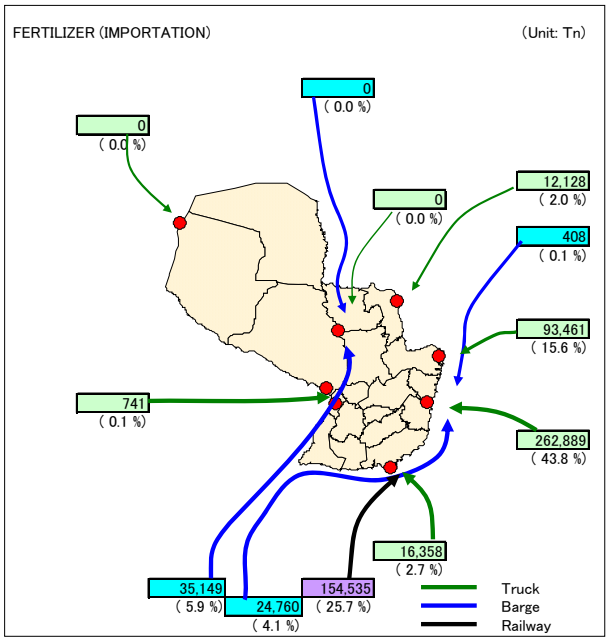


Figure 4.2-10 Route and Transportation of Import (Fertilizer)

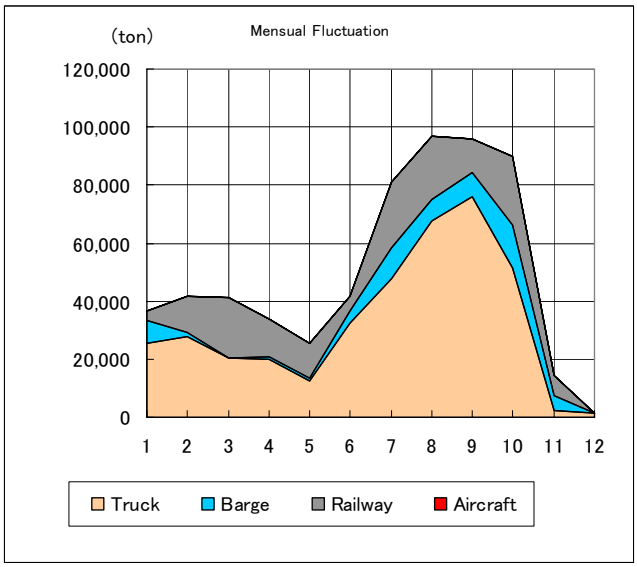


Figure 4.2-11 Transportation and Amount of Import by Month (Fertilizer)

4.3 GRAIN EXPORT SHIPPING COST

There is little difference in the shipping cost per ton in road transportation and river transportation. The land transportation cost to ports accounted for 16-18% of the whole, however;cost decreases can be expected by the access road improvement. As for the transportation expense of Paraguay River and the Paraná River, it is assumed that using the Paraná River will become cheaper than the Paraguay River through the improvement of the access road to the ports, however;there is no difference under the present situation.

Table 3.3-1 Grain Export Shipping Cost

(At the time of September, 2004)

ITEMS OF COST	C.D.E. Paranaguá *By Road*	San Antonio (*) Nva. Palmira *By River*	La Paloma (*) Rosario *By River*	Encarnación (*) Nva. Palmira *By River*	Encarnación (*) Rio Grande *By Railway*
Ocean Port Cost	5.20	4.00	4.00	4.00	4.25
Local Port Cost		3.50	3.50	3.50	2.50
Road Freight	25.00				
River Freight		13.00	18.00	17.00	
Railway Freight					18.00
Road Freight to Local Port (*)		11.00	6.00	5.00	5.00
Transporting Commission	2.50				
Dispatch and Others (Transshipment)	1.00				1.10
Quality Control PY	0.10	0.25	0.25	0.25	0.25
Parking Fee PYBR	0.80				
Others (License)	0.20				
Waste	0.30	2.00	2.00	2.00	3.00
TOTAL US$	**35.10**	**33.75**	**33.75**	**31.75**	**34.10**

(*) Road freight to local ports is considered a charge to the nearest port from its zone except Asunción.
(*) Road freight to San Antonio is considered from Ciudad del Este.

Source:CAPECO

5. SYSTEM OF ROAD AND PORT MANAGEMENT

5.1 ROAD

(1) Management Division

The Paraguayan roads are divided into three categories: the national roads, the departmental roads, and the rural roads as follows.

- National Roads: the roads that connect department to department, the railway, and the port facilities. 12 routes are recognized as national roads now.
- Departmental Roads: the Roads that connect district to district within departments.
- Rural Roads: other regional roads

MOPC Road Bureau (Dirección de Vialidad) manages the national roads and also occasionally assists with the construction of these roads. It is also in control of maintenance and management of the departmental roads and the rural roads. Despite the fact that, the organizations within the departments originally do the maintenance management of the roads, the MOPC Road Bureau substantially executes this control and management. Therefore, MOPC does substantial control of maintenance of about 15,000km of these national roads, departmental roads, and principal rural roads. The paved extent of these roads is 4,000km (about 14%), and the remainder are unpaved roads.

Table 5.1-1 Road Extension by Jurisdiction

	Paved	Paved (Rock)	Unpaved	Total
National Road	3,076	12	6,459	9,547
Departmental Road	468	238	4,844	5,550
Sub total	3,544	250	11,303	15,097
Ratio (%)	23.5	1.6	74.9	100.0
Rural Road	21	69	14,038	14129
Total	3,643	277	25,239	29,226
Ratio (%)	12.5	1.2	86.3	100.0

Source: MOPC

12 routes are recognized as national roads in Paraguay now. However the connecting roads between the departmental capitals, and the access roads to the principal port facilities are not recognized as national roads, and a problem related to the maintenance and/or the management of these roads occurs. MOPC specifically examined these missing links with a view to the necessity of new national roads, and to the development of a new road network. In accordance with this, all sections of the present route No.2 and No.7 are assumed to be route No.2, and the Paraná River coastal road is newly specified as route No.7.

Current

Prospective Plan

Figure 5.1-1 Plan of National Road Network

(2) Toll Way System

On the national roads in Paraguay, toll is paid by the user, on the benefit principle. There are 14 toll collection points, and MOPC collects the money directly at 12 points. As for the two remaining places, the toll collection is executed by concession contract of a private organization. Moreover, toll collection is permitted on the departmental roads and the rural roads.

The charge collected at the twelve toll gates, that MOPC manages, is delivered directly, without any money being received by MOPC, to the general finances of the Ministry of Finance. The toll collection is done only on one side of the road. Below; the charge categories are shown in Table 5.1-2.

Table 5.1-2 Toll Way Fee System (MOPC Direct Control Section)

Model Division	Charge(Gs)
Standard Car	5,000
Bus, Minibus, and Two Axle Freight	7,000
Vehicle with Tractor	7,000
Freight and Bus (Three Axle)	8,000
Freight and Bus (More Than Four Axle)	15,000

(3) Concession Method

The improvement work, the control of maintenance, and the toll collection on the national road; route No.7 are executed by the Concession method. The period of the commission of 25 years is to be set, and to be repaid by the traffic toll.

Table 5.1-3 Toll Way Fee System (Concession Section)

Model Division	East Side Toll Gate (Gs)	West Side Toll Gate (Gs)
Standard Car	7,000	8,000
Pulling Standard Car	11,000	12,000
Bus and Freight (Two Axle)	12,000	13,000
Bus and Freight (Three Axle)	23,000	26,000
Bus and Freight (Four Axle)	25,000	28,000
Bus and Freight (More Than Four Axle)	28,000	32,000

(4) Budget of Road Bureau

Funding sources for roads are domestic resources and loans from international organizations. Domestic resources are composed of fiscal resources, specified fiscal resources, a government bond and selling of electricity by hydro-power. Gas tax and the toll road collection by MOPC is dealt with as annual revenue in the country, and not used directly for the road maintenance. The road budget changes greatly by year and the budget is a provisional budget. In addition, the execution thereof changes greatly according to the financial conditions.

Table 5.1-4 Road Bureau Budget

(Unit: 1000 US$)

Year	2000	2001	2002	2003	2004
Budget Planning	145,062	200,619	140,064	167,114	182,202
Amount of Budget Execution	110,390	83,819	72,191	62,771	111,212
Cost of Construction (Domestic)	34,900	33,239	2,576	11,613	41,936
Cost of Construction (Foreign Aid)	62,591	36,300	62,826	45,888	64,496
Administrative and Maintenance Expense	12,899	14,280	6,789	5,270	4,779
Execution Rate (%)	76%	42%	52%	38%	61%

Source: MOPC

5.2 PORTS

The National Administration of Navigation and Ports (ANNP:Administración Nacional de Navigación y Puertos) under the jurisdiction of MOPC execute the control and maintenance of ports and waterways. However, ports have been authorized businesses in the private sector since 1994, and privatization has advanced. Private ports which obtained the authorization of Ports and Harbors Bureau of MOPC, have done business since August, 2001, and have been setting the facility maintenance standards of private ports.

The Paraná River and The Paraguay River are international rivers. However, there is a section which Paraguay maintains independently; this is between Asunción and Valle Mi. The other sections are under the cooperative management with an adjacent country or adjacent country management. About 680km; a section from the Iguacu River on the Paraná River to the divergence with the Paraguay River is an international river along the border with Argentina. However Argentina carries out the control of maintenance of the whole section. In addition, Argentina carries out the control of maintenance to a 1240km section from Buenos Aires on the Paraguay River. On the other hand, the control of maintenance by the collaborative activity of Paraguay and Argentina is executed for the section from Asunción to Pilar (340km), on the Paraguay River

6. RELATING POLICY, PLAN, AND SYSTEM, ETC.

6.1 POLICY AND RELATED PROJECTS

(1) Social Economic Strategy Plan

Paraguay joined MERCOSUR in 1995, advanced the deregulation of trade, for example, the abolition of tariffs, and it targeted the productivity improvement of agriculture in, doing away with the agricultural dependence constitution, promotion of an industrial diversification, the competitive edge in the strengthening of the export industry, and the promotion of the small-scale firm, etc. However, the export items with a competitive comparison was limited to one part of the agricultural product, namely cotton or soybeans. As a result, it was under export pressures from Brazil and Argentina with exports such as cheaply processed agricultural products and industrial production goods, and was also exposed to a reduction in developing the economic base through the decline of competitiveness of the agricultural sector and other industries with a monoculture lacking a competitive edge and weak job opportunities. With such a background, the Government of Paraguay requested the cooperation through the policy that upheld support for the strengthening of economic competitiveness and the export expansion to the Government of Japan. Thereafter the Study on the Economic Development of the Republic of Paraguay (EDEP) was executed in October, 1998.

The government of Paraguay settled on the "Social Economic Strategy Plan (PEES)" aiming at the achievement of the action plan proposed by the economic development investigation, and propagated it as Executive Order. This plan is composed of four bases ("Competitive edge and investment", "Poverty reduction", "Reform of the nation", and "Macroeconomic stabilization."). As for the "Competitive edge and investment" axis, it roughly includes the action plan of the economic development study. Both the "Reform of the nation" axis and the "Macroeconomic stabilization" axis consists of a series of actions on the part of the government to support the "Competitive edge and investment" axes and the measures for distribution of the effect of job creation, etc., produced as a result of the promotion of the "Competitive edge and investment" axis to the society impartially, have together brought about the "Poverty reduction" axis.

This plan is a development plan which stands in mid/long-term view as the first in Paraguay, and it is important to definitly execute this. It is assumed that the system of decision making, the budget demand, the execution of the program, and adjusting the plan for each ministry will be done through the monitor of the project agency and the Ministry of Finance. The international cooperation (bilateral or multilateral) of the execution capital of this plan is scheduled to be requested explicidly, and the cooperation from countries such as Japan, Spain, and Italy is materializing as the implementation finance.

(2) South American Regional Infrastructure Integration Action Plan (IIRSA=Iniciativa para la Integración dela Infraestructura Regional Suramericana)

Details: In the 1st South American summit in 2000, President Caldorzo from Brazil (chairman) advocated the infrastructure integration of each country in the region as a pillar of cooperation in the South America region. It was adopted as "South American Regional Infrastructure Integration Action Plan (IIRSA)".

Purpose: A competitive edge improvement and the promotion of economic social development of the South American countries' economy, etc. are aimed at through the infrastructure integration and the modernization of 12 countries in the region.

Content: It is assumed that the maintenance of the infrastructure in the region of traffic, transportation, the communication, and energy in three fields is indispensable for the formation and promotion of integration of the South American economic bloc.

a) Development of infrastructure and hub (base) in three above-mentioned fields
b) Modernization of system and restriction concerning various infrastructures
c) Improvement of the local populace's standards of living and securing of job opportunities.

Decision of the ten year plan (at first) centering on the above mentioned contents, sets ten "Axis" (Refer to Figure 6.1-1) as the main maintenance region. And it aims at achievement of the infrastructure integration connecting South America

Attending Countries: South America; 12 countries (Brazil, Argentina, Paraguay, Uruguay, Chile, Colombia, Ecuador, Peru, Bolivia, Venezuela, Guyana, and Suriname)

Organization:

a) CDE (Comité de Dirección Ejecutiva = Executive Board) (Ministerial level)
b) GTEs (Grupos Técnicos Ejecutivos = Technology Execution Group) (Bureau Director level)
c) CCT (Comité de Coordinación Técnica = Technology Adjustment Committee) (External Aid Organization)

Participation organization to CCT:

a) Banco Interamericano de Desarrollo (BID = Inter-American Development Bank)
b) Corporación Andina de Fomento (CAF)
c) Fondo Financiero para el Desarrollo dela Cuenca del Plata (FONPLATA = La Plata River Valley Development Fund)

The current state: In the 6th ministerial-level Executive Committee in 2004, "Agenda concerning the mutual agreement of execution of the matter for years 2005-2010" (Refer to Figure 6.1-2) that consists of 31 projects (about four billion dollars in the investment total) is

approved. The financing decision for the road construction of the extension of 1200km that connected Brazil with Peru was signed as a concrete project by the head of the two countries at the end of the year. A severe austerity is forced on many of the attending countries. Therefore the funding related to an individual project becomes an important problem including calling in the private investment from various foreign countries. 25% of funding is private capital, 25% is governmental capital, and the remainder, 50% is semi-governmental capital.

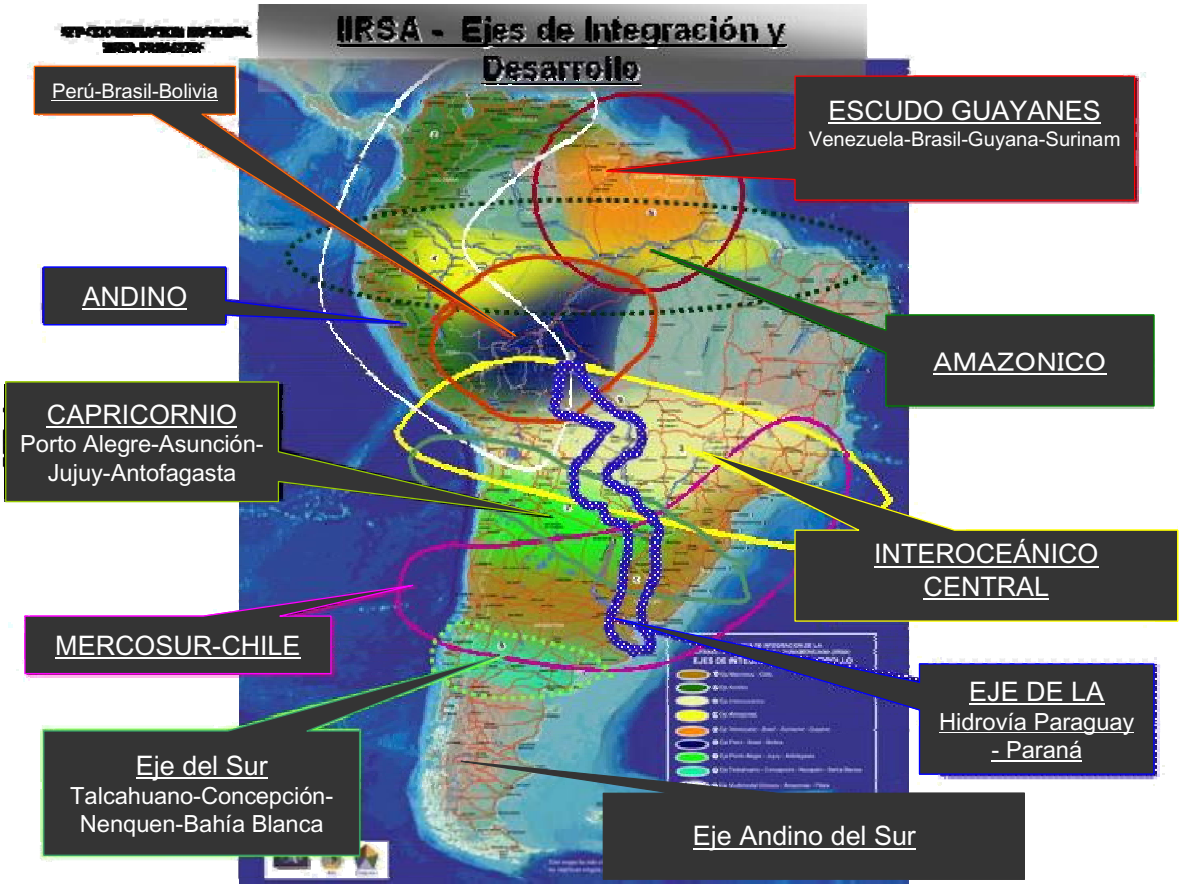


Figure 6.1-1 Ten Development Axes in IIRSA

1. Amazon Axis
   Colombia, Ecuador, Peru, and Brazil
2. Andes Axis
   Bolivia, Peru, Colombia, Ecuador, and Venezuela
3. Escudo Guayanes Axis
   Venezuela, Brazil, Guiana, and Suriname
4. Peru-Brazil- Bolivian Axis
5. Central Axis between Both Oceans (Interoceánico)
   Peru, Chile, Bolivia, Paraguay, and Brazil
6. Capricorn Axis
   Ti, Argentina, Paraguay, and Brazil
7. Southern Axis
   Chile and Argentina
8. MERCOSUR-Chile Axis
   MERCOSUR (Brazil, Argentina, and Uruguay) and Chile
9. Paraguay - Paraná River Axis
   Report axis by water transportation that uses Paraguay River and Parana River
10. South Andes Axis
    Chile and Argentina

Figure 6.1-2 Agenda Concerning Mutual Agreement of Execution of Matter for Year 2005-2010

That is, Paraguay is related to the three development axes of Central Axis between Both Oceans, Capricorn Axis, and Paraguay - Paraná River Axis. And it is expected to do the development maintenance of the infrastructure related to transportation by multimodal and of the water

transportation using the rivers, especially in Paraguay

The project of IIRSA that relates to this study is as follows.

1) Capricorn Axis Development

It is the east and west axis along the tropic of Capricorn and the second Amista bridge construction plan crossing the Paraná River is advocated as one of the 31 priority projects. The project is the road construction with concession where Foz do Iguacu in Brazil and Ciudad del Este in Paraguay are connected, and the route map including alternatives is examined (Refer to Figure 6.1-3). Moreover, the interest to Paraguay is low even though Argentina is proposing a bridge, where Puerto Iguazú adjacent to Ciudad del Este, connects as a northern part development, as a two country project.

2) Development of Paraguay - Paraná River Axis

This axis is the north south axis that runs through the center of three axes of Central Axis between Both Oceans, Capricorn Axis, and MERCOSUR-Chile Axis that crosses South America. The issues of this axis are aimed mainly at development of the water transportation facilities to La Plata and a Paraguayan water system that flows to the north south and the road development connection to the port facilities. A related project is proposed, including the improvement of the access roads to exporting ports along the Paraná River and the connecting road, these are the target of this study.

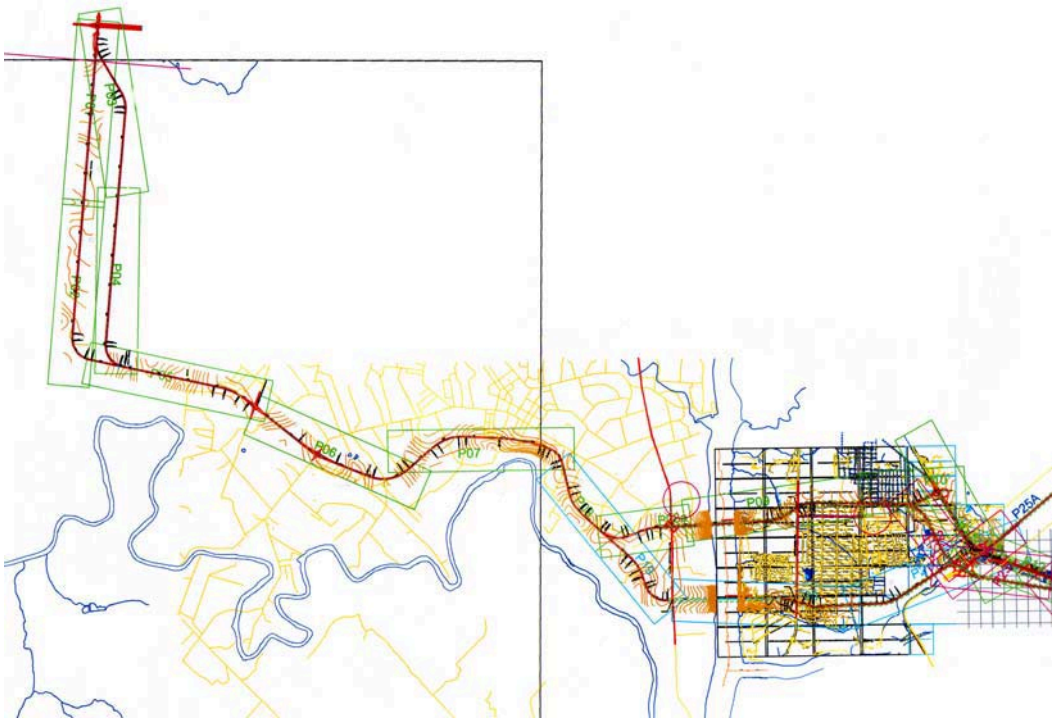


Figure 6.1-3 Second Amista Bridge Construction Plan

6.2 MAIN PROJECTS

(1) Road Improvement Plan by International Aid Agency

The project planned with a debt from the international aid agency is as follows.

Table 6.2-1 Road Construction Program by International Aid Agency

Aid Agency		Content of Plan
BID-CAF	Program	Chaco regional trunk road maintenance
BID	Study	Road sign maintenance investigation
		N8 expressway construction program investigation
		Paraguayan river access expressway construction program investigation
		N7-N10 road maintenance report
		Investigation related to other roads
	Program	N8 road construction plan
		Paraguayan river access road maintenance (Rasario port)
		N7-N10 report road construction plan
CAF-OPEP	Project	Paraguayan river access road maintenance (San Pedro)
		Maintenance of road related to N10
CAF	Project	N10 and related road maintenance
BM	Study	Road network maintenance management plan
FONPLATA	Project	Pilar port maintenance
		Paraguay river access road maintenance (Concepción)

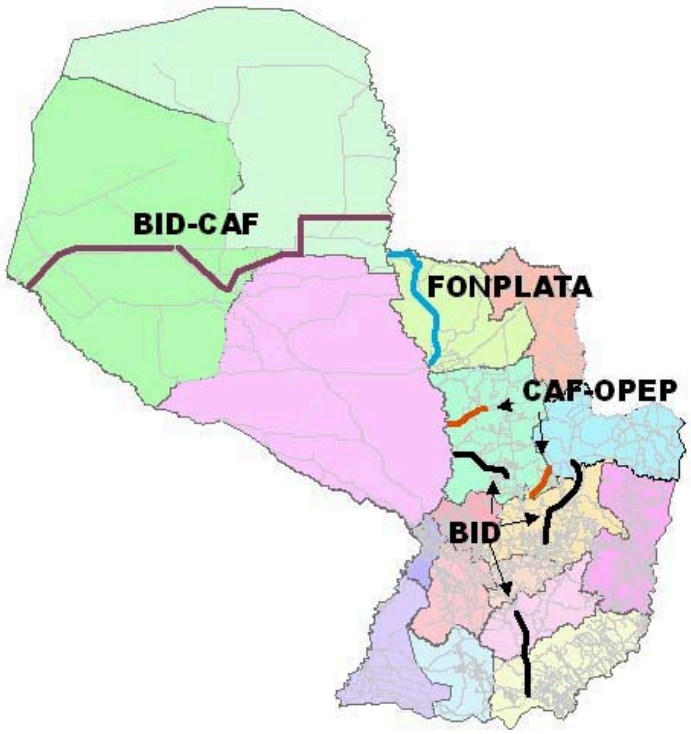


Figure 6.2-1 Road Construction Program by International Aid Agency

(2) Related Projects

1) Yacyreta Dam

The submergence compensation is late as the dam construction has been completed. The water level of the dam has adjusted to 76m and hydro-power is produced now. Submergence compensation, the submergence prevention embankment, and construction of excavation in the river are still scheduled to be undertaken for three years. The deriving of power generation at a water level of 83m of the dam will be done in 2008.

2) Corpus Dam Construction Plan

There is a construction plan of the Corpus dam between Yacyreta dam and Itaipú dam in the Paraná River. The interest to Paraguay is low although it is an international dam with Argentina. Paraguay is not interested in power-generation activities for selling electricity to Argentina any more since Paraguay already sells 99% the Paraguayan share of the power generation of Yacyreta dam. The dam will become a Concession if Paraguay executes the dam, and the government plans not to take part immediately.

3) New Port Construction for Submergence Compensation of Encarnación Port

The construction of a new port with a pier of 200m in total for containers and a grain terminal is planned in Arojo Quiteria in the area of Encarnación. The capital allowance has not been made yet, and it is desirable to start construction in about three years. It is thought that recent port management of ANNP is private by Concession management, and that this new port will not be an exception.

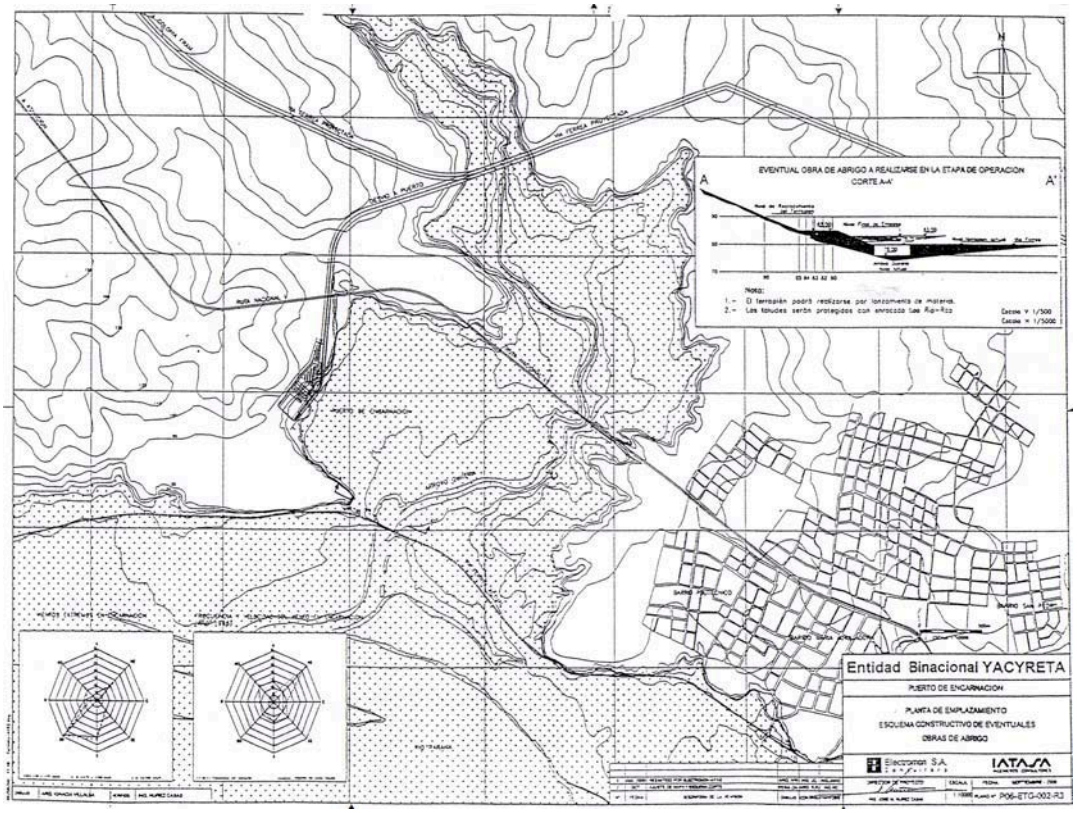


Figure 6.2-2 Encarnación New Port Construction Plan

7. CURRENT PROBLEMS

(1) General

Paraguay's democracy was restored in 1989 when its institutions took the first steps to build a new nation. However, the country's structural and institutional reforms lagged behind, which caused the nation to lack the ability to adjust to worldwide changes in relation to economy. As a result, the Paraguayan economy is sluggish, producing an unstable social economy that has triggered a number of social problems, such as a rise in the unemployment rate, etc. Due to its flat geographical characteristics and the favorable amount of rainfall during the year, Paraguay's agriculture, forestry and livestock industry have reached historical heights, thus becoming people's main means of making a living. However, we cannot but say that there is little potential for economic growth due to poor infrastructure investment in terms of the whole country, together with generally inefficient farming by most of the people who work the land, despite the fact that there has been progress in relation to the expansion of cultivated area and an increase of productivity by mechanization.

Paraguay's improved productivity was asserted by trading improvements with the neighboring countries, and by actively participating in Mercado Común del Sur (Mercosur). Paraguay, which is a landlocked country, exports using river transportation (60%) through the Parana River and the Paraguay River, road traffic to neighboring countries (37%), and rail traffic. Air shipment (3%) is the means of transportation for overseas trade. Most transportation relies on river and road traffic. However, the maintenance of the transport infrastructure is poor and the roads that connect production bases to export gates are unpaved. Heavy vehicles, such as trucks, are subject to damage while traveling on these unpaved roads due to potholes and the like. These bad conditions force vehicles to reduce speed, cause damage to the machines, and make driving especially difficult after rainfall. Moreover, there are lots of private ports located on the Parana River bank, and most of them are exclusively used for grain export. Most of these ports are small scale and take advantage of the geographical features of their location, though each port is located near the corresponding producing district. Also, a lot of access roads from trunk roads to export ports are not connected with all-weather roads, which sometimes becomes a problem when the delivery work gets held up.

The route shown in Figure 7-1 is currently used as an export corridor to another country from Paraguay.

Table 7-1 shows the current conditions and the problem of each export corridor.

In order to adjust to the neighbouring countries while considering the importance of each export corridor, it is necessary to improve the convenicence of each corridor in order to carry out transportation from Paraguay smoothly. Considering a future increase of the amount of exports along the river, especially an increase in embarkation from the Paraná River, it can be said that improving route 3 as an export corridor should be considered a priority of the highest importance. This is the target project of this study.

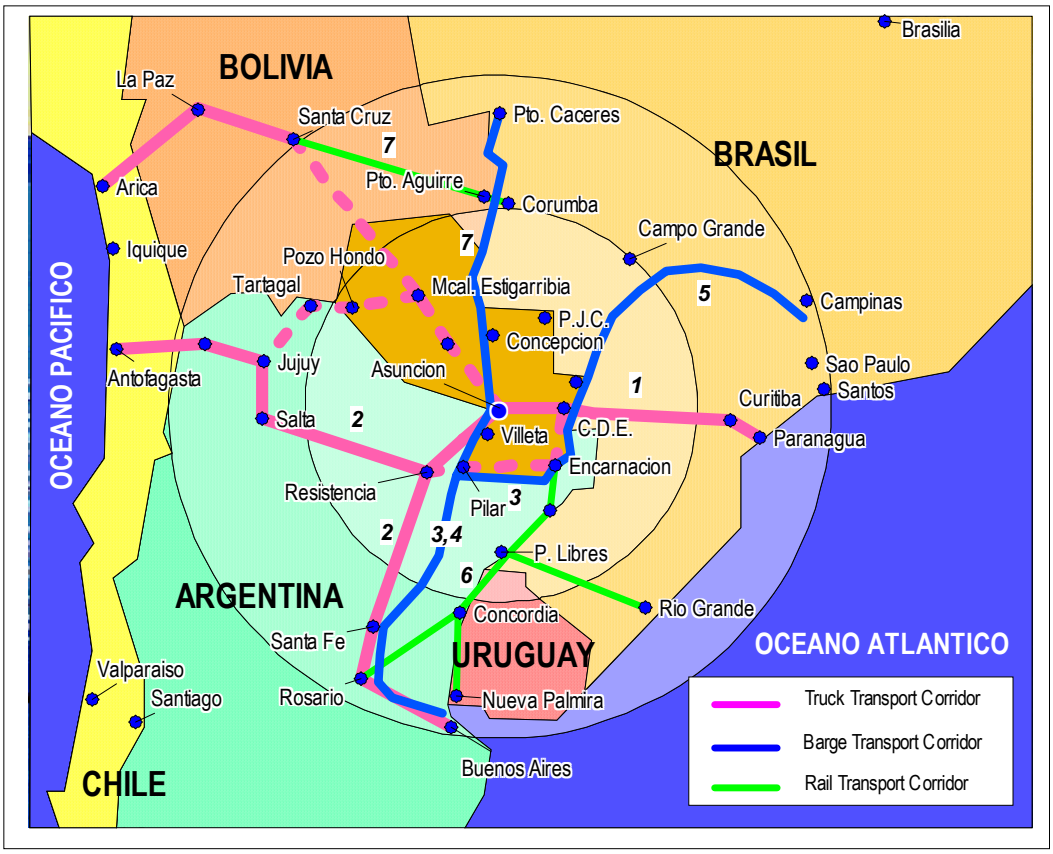


Figure 7-1 Paraguay's Main Export Corridor

Table 7-1 Main Export Corridor and Outline of Paraguay

	Route	Mode	Problem
1	Ciudad del Este - Paranagua	Truck	It is an important route for the soybean exported from Paraguay to Brazil. It is possible that its importance will increase by maintaining the second Amista bridge though there is a capacity limitation of the Amista bridge with the Brazilian border under the present situation.
2	Asunción - Antofagasta	Truck	It enters Argentina from Paraguay, crossing the Andes, and takes the route to the Antofagasta port. Because it is a long distance, and the state of the road in the Andes section is not excellent, either, it becomes too expensive, or it is not used excluding big freights of the fare load power. Moreover, the maintenance of the route from Mcal. Estigarribia to Jujui or Santa Cruz is expected as an alternative route because it is the only land route to the Pacific Ocean side.
3	Ciudad del Este - (Paraná River ., Paraguay River) - Buenos Aires	Barge	It is an important route similar to route 1 and the soybean export though it is a route to the Rosario port or the Nueva Palmira port in Argentina that uses the Paraguay River and the Parana River. Route 3 is especially important because it connects two large soybean production points such as the Itapúa department and the Alto Parana department.
4	Asuncion - (Paraguay River) - Buenos Aires	Barge	
5	Ciudad del Este - (Paraná River., Tiete River) – Campinas	Barge/Truck	It is a route to Campinas which uses the Parana River and the Tiete River, and it is carried from Campinas to Sao Paulo or the Santos port by truck. It has been taken into consideration as an alternative route, a1though there is a disadvantage: a big ship cannot pass because the width of the river narrows upstream of the Itaipú Dam.
6	Encarnación - P.Libres - Rio Grande, Nueva Palmira, Rosario	Railway	This route enters an Argentinean railway from Encarnacion, goes south, connects with a Brazilian railway or a Uruguayan railway, and ends in Rio Grande, Nueva Palmira or Rosario. However, it is necessary to carry out a freight transshipment to an Argentinean railway or to a Brazilian railway because the track gage is different when going to Rio Grande. Moreover, it is necessary to transship the freight because it has to go about 40km by an Uruguayan railway to this side of the Nueva Palmira port.
7	Asunción - (Paraguay River) - Corumba - Santa Cruz	Barge/Railway	Because the transshipment of freight is generated in Corumba and Santa Cruz, it is limited to special freight such as highly priced commodities even if the transportation cost is high. Recently, though, the route that comes off from Arica, Chile on the Pacific Ocean has been taken into consideration.

(2) Road Related Problems

1) Roads Closed by Rainfall

The departmental and rural roads in the study area are often closed to traffic after heavy rainfall, and cars often cannot drive on these roads for quite some time. The number of rainfall days in the study area are about 6-9 days/month except in July and August, which means that there can be no traffic on the roads for at least these rainy days.

2) Decline of Producer Prices Caused by Undeveloped Roads

Deals are made taking into consideration the spot-sale price calculated from the international market price (forward pricing) though exports such as grain depend on the contract with the exporter. And grain purchase contractors transport it from accumulation areas or from production areas to the transportation port on their own account or through a contract with the carrier. All of these transportation costs fall substantially on production farmers, and the spot-sale price is decided by substracting the transportation cost from the shipping value. Because the transportation risk of potential transport delays due to rainfall and increase of vehicle operation cost is added to the transportation cost, the proportion of transportation cost on the final price of production goods - especially from an undeveloped area of the export corridor - is high, and the producer price lowers and leads to a decline in the willingness to produce.

(3) Problems Related to Ports

Ports in Paraguay are distributed along the Paraná River and the Paraguay River, but their size is limited because they are constructed ashore along the rivers. Also, the loading ability of each port is 3500-4000 ton/day. Moreover, yearly contracts are entered into with some major trading companies. Therefore, general users are hardly able to use these ports though there are a lot of private ports.

Producers secure sales contracts for risk reduction in relation to the market price before growing about 60% of the production. Therefore, the structure allows the other 40% to be sold off, adjusted by the current supply-demand situation. However, as mentioned above, port facilities are monopolized by some big traders who can use them at all times, and even if medium-small farmers come during advanced time of clearance, they often cannot sell off. As a result, very often medium-small farmers are forced to make deals with excessive risks.

(4) Poverty

The latest data on poverty in Paraguay come from a survey executed in August-December, 2004 in association with IDB (Inter-American Development Bank). According to the results of the survey, necessary food cost of 410,189 Gs per family (4.7 people). is set as the extreme poverty line and necessary living cost of 643,539 Gs per family is set as the poverty line. 41% of the population is below the poverty line and half of those are below the extreme poverty line on the national average. In the Itapúa Department, the extreme poverty rate reaches 24% of the whole; higher than the national average. However, this poverty rate is near the national average. On the other hand, the poverty and the extreme poverty rate of the Alto Paraná Department are becoming smaller than those of the national averages.

Table 7-2 Poverty Situation in Paraguay

Residential Area	Total Population	Poverty Population	Poverty Rate %	Extreme Poverty Population	Extreme Poverty Rate %
Paraguay Total	5,701,675		41.4		20.1
Asunción	509,190		24.8		8.2
Urban Area (Central)	1,331,170	655,783	49.3	191,097	14.4
Urban Area (Others)	1,401,143	454,009	32.4	185,009	13.2
Rural Area	2,406,172	986,869	40.1	560,933	22.8
Alto Paraná	**556,002**		**29.1**		**15.0**
Itapúa	**451,247**		**41.1**		**24.1**

Reference : Pragauay Pobreza y Deigualdad de Ingresos a Nivel Distrial (2004), DGEEC

Moreover, the poverty rate distribution by district in the study area is shown in Figure 7-2.

The poverty rate by district greatly varies between 15 to 50% along the planned route. The poverty rate in the Itapúa Department is higher than the poverty rate in the Alto Paraná Department, and the poverty rate of the countryside is higher along the Paraná River.

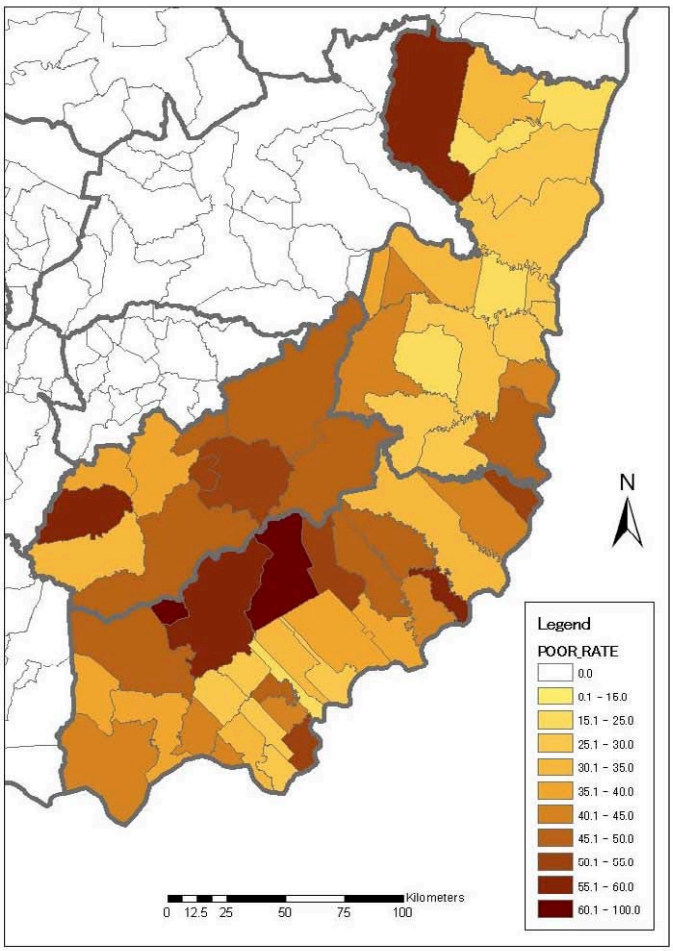


Figure 7-2 Poverty Situation by District

Ⅱ BASIC PLANNING

8. DEVELOPMENT STRATEGY OF THE EXPORT CORRIDOR

8.1 NEEDED FUNCTIONS AND ROLES OF THE EXPORT CORRIDOR

Development of the access road and feeder roads leading to the major ports in the Study area is not only important to support export and economic development in Paraguay, but is also significant for the promotion of the regional development along the road corridor. That is to say, while the former has the function of being the "distribution corridor", the latter has the role and expectation of being the "development corridor". Furthermore, Paraguay is one of the South American countries with an under developed infrastructure; therefore, it is especially essential, as a landlocked country, to develop a well established transportation infrastructure in order to promote exportation.

The insufficiency in transportation infrastructure within the MERCOSUR framework in South America may cause a decrease in competitive exportation for Paraguay. Under this situation,

there is a risk of a critical obstruction in exportation and its diversification. Hence, it is important to possess a wide viewpoint of development under the MERCOSUR framework in order to plan the transportation infrastructure in Paraguay.

Thus, the functions required of the export corridor could be summarized to the following three development strategies.

1) Development as export corridor
2) Development as regional service roads
3) Development as a component of the international/regional network in South America

8.2 DEVELOPMENTS STRATEGY BY FUNCTION

(1) Development as Export Corridor

The most needed function of the export corridor is the stable, smooth and efficient exportation of grains represented by soybean and wheat produced in the Study area. To make this possible, there are three indicative strategies to be taken into account.

- Development of a stable transportation route between production center - depot/silo - ports
- Acquisition of land route to Brazil and Argentina
- Efficiency of transport by proper coordination and modal sharing

1) Development of stable land transport

When precipitation is severe in the Study area, provincial roads and local roads, for the reason of road management, often close and virtually no vehicles can pass along these roads. The heavy rainfall days

in the Study area are 6-9days/month, excluding July and August, and vehicles cannot use these roads on those days. Rainfall hinders grain transport while increasing transportation cost. Therefore, there is a need of an all-weather paved road, as well as reinforcement in the maintenance system of such a road to make it possible for large grain transport carriers to use these roads, all year round

2) Acquisition of land routes to the neighboring countries

It is estimated to export approximately 50% of the overall Paraguayan grain from the Alto Paraná province and the Itapúa province in the year 2015. Within the transportation means, 58% relies on river transport, 35% on road, and the remaining on railroad (Table 8.2-1). Therefore, it is not only necessary to pre-consider access by river transport to the main port, but also to consider maintenance of roads that makes smooth exportation possible by truck transport in the Brazil (Paranágua) and Argentina (Buenos Aires) direction. Especially, as exports increase, there might be a possibility of causing bottlenecks in both, Brazilian and Argentinean sections and as it has been proposed in the South American Regional Infrastructure Integration Action Plan (IIRSA), construction of a new Second Amistad bridge and improvement of the Encarnación-Posadas bridge should come together with the development of the export corridor of this Study that links the producing center to the shipping center.

Concretely, coordinating these existing projects, the export corridor shall be planned to obtain a proper connectivity and play a role as international road.

Table 8.2-1 Estimated Future Grain Export Volume from the Study Area in 2015

(ton/year)

Custom	Transport	Destination	SOYBEAN	OIL	MEAL	WHEAT	CORN	TOTAL
Alto Paraná	Truck	Paranagua	395,909	79,928	602,559	67,134	261,481	1,407,011
	Barge	Buenos Aires	297,275	204,470	791,063	-	-	1,292,808
	Barge	Campinas	34,395	-	21,193	4,099	1,560	61,247
Itapua	Truck	Buenos Aires	218,758	-	-	-	-	218,758
	Barge	Buenos Aires	1,160,037	12,066	98,843	116,487	-	1,387,433
	Railway	Rio Gurande	-	-	-	6,238	9,405	15,643
	Railway	Buenos Aires	208,748	-	-	29,809	32,767	271,324
Alto Paraná + Itapua	Barge		1,457,312	216,536	889,906	116,487	-	2,680,241
	Truck		614,667	79,928	602,559	67,134	261,481	1,625,769
	Railway		208,748	-	-	36,047	42,172	286,967
	Total		2,280,727	296,464	1,492,465	219,668	303,653	4,592,977

3) Efficiency in Transport

Many private small-scale ports are located along the Paraná River, and most of these ports are used exclusively for grain exports. Whether private or publicly owned, these ports should be opened to public use, however, in reality, large businesses arrange annual contracts with these ports and general public users do not have access to these ports.

The possibility of a shortage in port facilities at the peak time of grain shipment exists. Hence, it is conceived that large trading companies make advance booking, and closed traffic period caused by poor maintenance of the road spurs further shortage in port facilities. Therefore, increase in port

capacities, especially, those open for public use shall be strived for while further improvement in port management efficiency shall be aimed at by improving reciprocal port communication that attains proper sharing of port facilities.

(2) Development as Regional Service Road

Despite low traffic, a road is necessary from a regional development standpoint. Itapúa, which is within the Study area, has a high poverty rate and it is an area where regional development is necessary. Indeed, the export corridor primarily functions as a "distribution corridor" in delivering products such as grains smoothly and precisely to the destination while also functioning as a "development corridor" for alleviation of regional disparities from a development standpoint. This is precisely why, it is indispensable to secure the function as export corridor while locating the route planned close to the city; in addition environmental countermeasures are also required within the city area.

(3) Development as International Road Network in South America

As mentioned previously, Paraguay is a landlocked country, thus, it is indispensable to form a network that will support exportation to outside the country. Further, it is also necessary to develop a transport infrastructure that will connect to an international network in South America

As for river transport, the South American Regional Infrastructure Integration Action Plan (IIRSA) proposes the development of the road along the Paraná River and road access to the main port as this Study target, in order to form a river transport network system by utilizing two international rivers, Paraguay and Paraná. On the other hand, as to land transport, the level of road development in Paraguay is extremely low compared to the neighboring countries and is in need of improvement. In land transport, in order for Paraguay to connect to the wide-range South American network, it is desirable to establish a mutual network that links the border points while improving accessibility to the major international borders.

In the IIRSA framework, it is desired for Paraguay to strengthen an axis of the portion of the road system that links the two oceans, the Pacific and the Atlantic; by developing a wide-range East-West road system in the northern (Chaco) and the central (Asunción-Ciudad del Este) regions of Paraguay.

In IIRSA, it is proposed to develop a service of paved road between Brazil and Bolivia in the Chaco region as the northern network. In the central region, it is planned to improve the existing bridge (Encarnación - Posadas) and construct new bridges (Second Amistad Bridge, New Pilar Bridge) on the Brazilian and Argentinean borders in order to solve the capacity shortage of bridges. In order to make effective use of these bridges, a road link between the Second Amistad Bridge and New Pilar Bridge is essential; and the project of this Study is highly significant as a part of the international network along the Paraná River.

Table 8.2-2 Comparison of the Level of Road Improvement

Country	Road Network in Km		% Road Pavement	Km of Paved Road	
	Total	on Pavement		c/1000hab.	c/1000km2
Argentina	231,019	69,537	30.10	1.878	18,500
Bolivia	53,259	2,968	5.57	0.036	2,700
Brazil	1,658,677	154,257	9.30	0.904	1,800
Paraguay	25,901	3,056	11.80	0.556	7,500
Uruguay	8,679	6,631	76.40	1.987	37,600
Total	1,977,535	236,449	11.96	1.072	16,860

Source：Direcciones Nacionales Viales - 2004

Figure 8.2-1 Development Plan of International Highway Network proposed in IIRSA
(Only related to Paraguay)

9. FUTURE TRANSPORTATION DEMAND FORECAST

9.1 SETTING A SOCIOECONOMIC FRAMEWORK

9.1.1 Population

The country population is forecasted to reach 5.5 millions in 2000, 6.98 millions in 2010, and 8.57 millions in 2020, approximately, from 4.22 million people in 1990. In other words, the growth rate is forecasted to show a slight decrease in the future, from a ten-year 1.30 growth rate (2000/1990) to 1.27 (2010/2000) to 1.23 (2020/2010). The populations of the Alto Parana Department (1.66 times) and Central Department (1.33 times) are expected to show a great increase in ten yeas (2010/2000). Please refer to Figure 9.1-1.

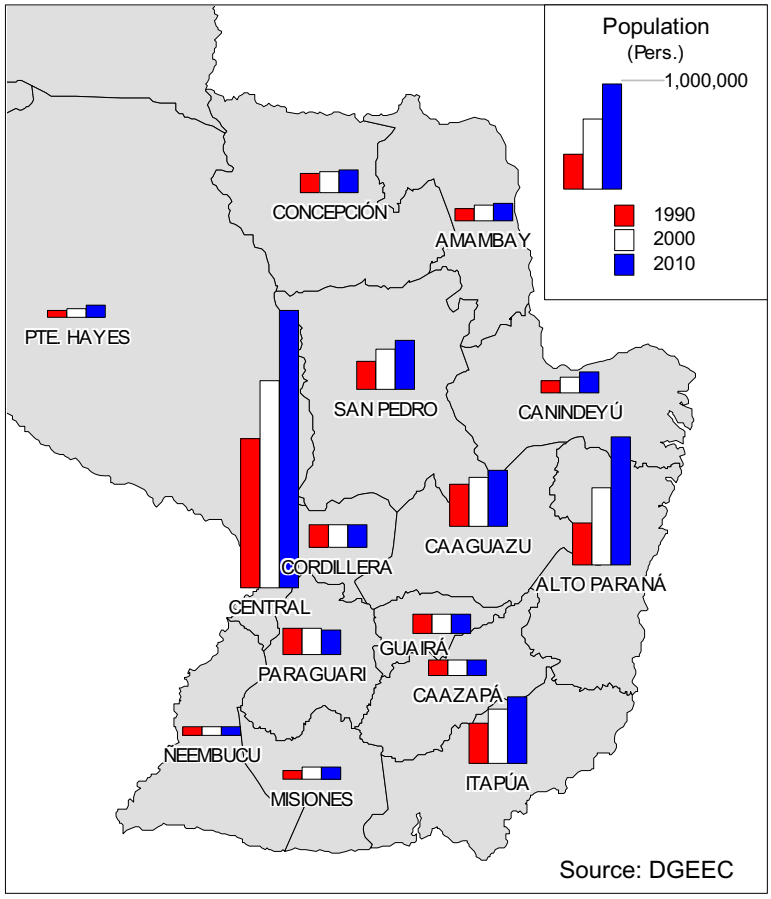


Figure 9.1-1 Population Estimation per Department

Table 9.1-1 Population Estimation per Department

	1990	1995	2000	2005	2010	2015	2020	2025
CONCEPCION	168,685	181,030	191,911	201,121	208,350	224,432	237,128	249,308
SAN PEDRO	270,442	314,446	361,786	411,619	462,441	518,634	573,897	628,369
CORDILLERA	212,743	215,394	215,516	213,173	208,514	214,047	215,279	215,848
GUAIRA	167,671	172,413	175,121	175,811	174,572	181,831	185,586	188,820
CAAGUAZU	393,030	428,718	461,937	491,740	517,156	562,899	601,127	638,159
CAAZAPA	134,016	139,791	143,889	146,412	147,376	155,335	160,465	165,181
ITAPUA	374,788	431,376	490,969	552,908	615,929	687,780	757,531	826,179
MISIONES	93,140	97,273	100,385	102,387	103,326	109,080	112,896	116,425
PARAGUARI	243,261	247,589	247,175	242,355	233,736	240,233	240,347	239,698
ALTO PARANA	391,982	530,812	705,137	917,609	1,170,650	1,352,918	1,568,112	1,782,351
CENTRAL	1,374,027	1,618,400	1,895,275	2,200,617	2,530,267	2,847,781	3,177,273	3,502,831
ÑEEMBUCU	82,326	85,948	88,285	89,021	88,183	93,006	95,545	97,826
AMAMBAY	104,162	120,606	136,910	152,366	166,583	186,756	204,937	222,808
CANINDEYU	105,073	124,978	145,841	166,837	187,214	211,974	235,538	258,794
PRESIDENTE HAYES	63,351	73,235	83,193	92,583	101,075	113,341	124,350	135,170
ALTO PARAGUAY	11,786	13,277	14,669	15,843	16,725	18,556	20,041	21,490
BOQUERON	28,249	33,190	38,451	43,545	48,224	54,488	60,269	65,966
TOTAL	4,218,732	4,828,476	5,496,450	6,215,947	6,980,321	7,773,091	8,570,322	9,355,222

Source: DGEEC

9.1.2 Economic Growth Rate

The Study on Economic Developemtn in Paraguay (SEDP), suggests building a structure that would enable the 6% annual growth rate to last and increase in relation to the economic growth rqate in Paraguay during the Action Plan period (2001 – 2006). However, it is a considerably high goal, taking into account the results averaging 2.3 – 2.9% during the last 3 years.

Figure 9.1-2 is a straight GDP line according to the industrial recurrence, using data from 1993 – 2004. Assuming only the 1.0% growth rate as annual rate is not correct, since we may expect the economic growth rate projected to 2020 to be provisorily estimated using this tendency from 2005 as goal growth (refer to Table 9.1-2).

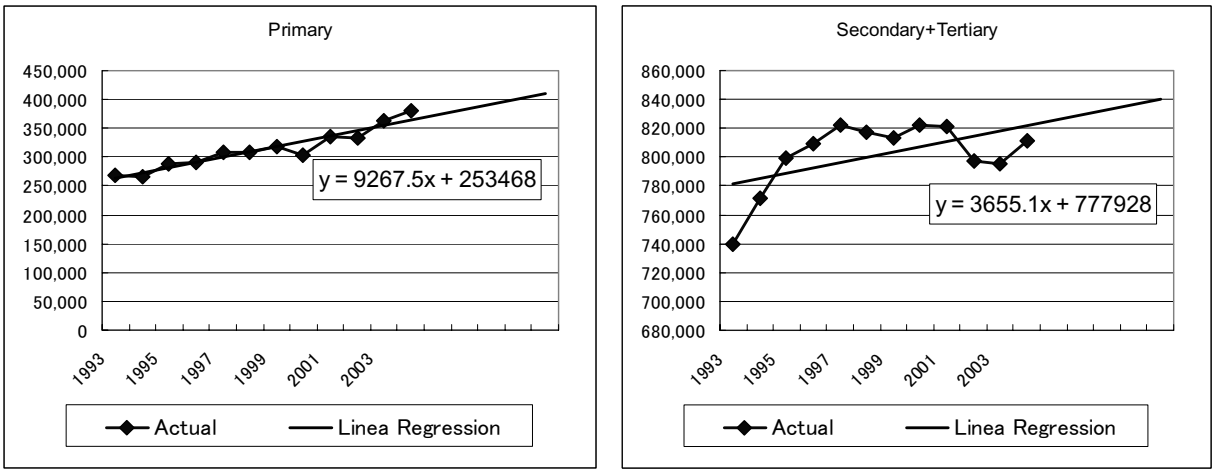


Figure 9.1-2 Evolution of the Economic Growth Rate

Table 9.1-2 Economic Growth Rate Forecast

	Average Annual Growth Rate (%)		
	Primary	Secondary and Terciary	TOTAL
2000 - 2005	4.25	0.07	1.26
2005 - 2010	2.36	0.44	1.05
2010 - 2015	2.11	0.43	1.00
2015 - 2020	1.91	0.42	0.95

Table 9.1-3 shows the economic growth rate per industry. Productivity is forecasted not according to GDP but in relation to tendencies by using the method of advantage in relation to future population per industry. The average growth rate forecasted from 2004 to 2010 is 3.76%, from 2010 to 2015 is 3.29%, and from 2015 to 2020 is 2.94%.

Table 9.1-3 GDP Forecast per Sector

(in million Guaranies at 1982 price)

Year	Gross Domestic Product			GDP per Capita		Annual Growth Rate(%)		
	Primary	Secondary & Tertiary	Total	G./capita	Rate to Previous Yr	Primary	Secondary & Tertiary	Total
1990	254,889	670,825	925,714	219,690	-	-	-	-
1991	253,792	696,416	950,208	219,236	1.00	-0.43	3.81	2.65
1992	254,013	713,299	967,312	217,237	0.99	0.09	2.42	1.80
1993	268,201	739,176	1,007,377	220,208	1.01	5.59	3.63	4.14
1994	266,608	771,939	1,038,547	220,974	1.00	-0.59	4.43	3.09
1995	288,089	799,320	1,087,409	225,207	1.02	8.06	3.55	4.70
1996	291,745	809,414	1,101,159	222,221	0.99	1.27	1.26	1.26
1997	307,202	822,480	1,129,682	222,145	1.00	5.30	1.61	2.59
1998	307,863	817,076	1,124,939	215,554	0.97	0.22	-0.66	-0.42
1999	317,596	812,794	1,130,390	211,057	0.98	3.16	-0.52	0.48
2000	303,730	822,686	1,126,416	204,935	0.97	-4.37	1.22	-0.35
2001	335,622	821,385	1,157,007	205,385	1.00	10.50	-0.16	2.72
2002	332,493	797,697	1,130,190	195,749	0.95	-0.93	-2.88	-2.32
2003	363,991	795,024	1,159,015	195,863	1.00	9.47	-0.34	2.55
2004	381,342	811,246	1,192,588	196,638	1.00	4.77	2.04	2.90
2005	386,982	851,721	1,238,703	199,278	1.01	1.48	4.99	3.87
2006	392,623	890,068	1,282,691	201,623	1.01	1.46	4.50	3.55
2007	398,263	929,653	1,327,917	203,947	1.01	1.44	4.45	3.53
2008	409,180	970,517	1,379,697	207,041	1.02	2.74	4.40	3.90
2009	420,310	1,012,699	1,433,009	210,110	1.01	2.72	4.35	3.86
2010	431,652	1,056,242	1,487,894	213,156	1.01	2.70	4.30	3.83
2011	439,918	1,097,592	1,537,509	215,575	1.01	1.91	3.91	3.33
2012	448,257	1,140,168	1,588,425	217,974	1.01	1.90	3.88	3.31
2013	456,668	1,184,006	1,640,674	220,351	1.01	1.88	3.84	3.29
2014	465,145	1,229,145	1,694,290	222,709	1.01	1.86	3.81	3.27
2015	473,685	1,275,622	1,749,308	225,047	1.01	1.84	3.78	3.25
2016	481,462	1,319,898	1,801,361	227,262	1.01	1.64	3.47	2.98
2017	489,269	1,365,388	1,854,657	229,461	1.01	1.62	3.45	2.96
2018	497,100	1,412,125	1,909,225	231,644	1.01	1.60	3.42	2.94
2019	504,952	1,460,141	1,965,093	233,812	1.01	1.58	3.40	2.93
2020	512,818	1,509,473	2,022,291	235,964	1.01	1.56	3.38	2.91

Annual Average Growth Rate(%)	
2000 - 2004	1.44
2004 - 2010	3.76
2010 - 2015	3.29
2015 - 2020	2.94

9.2 PRODUCT FLOW FORECAST

9.2.1 Production Forecast of the Main Agricultural Products

In this section, we will provide a soybean, wheat and corn forecast, since these are the main products of the Study Area. This forecast has been prepared based on a method that takes into account the planted acreage with a future trend analysis, and then the cultivation acreage is multiplied by the average yielding per area (production volume per area unit).

(1) Soybean

A soybean production forecast was made taking into account the value estimated by CAPECO and by the Ministry of Agriculture and Farming (MAF) besides the value estimated by the JICA Study Team.

The estimation method of every organization is the following:

- CAPECO: the cultivated acreage is forecasted from the previous tendencies of the Department towards the year 2010. The 2.8 t/hectare average yielding per area was multiplied by this cultivated extension and the production was calculated.
- MAF: the tendency on cultivated acreage and average yielding per area of all the country is forecasted, and these numbers are multiplied by the calculated production.
- Study Team: the yielding is the result of the forecasted cultivated acreage according to previous tendencies in the corresponding department, multiplying the average by the average yielding per area (2,693 t/hec).

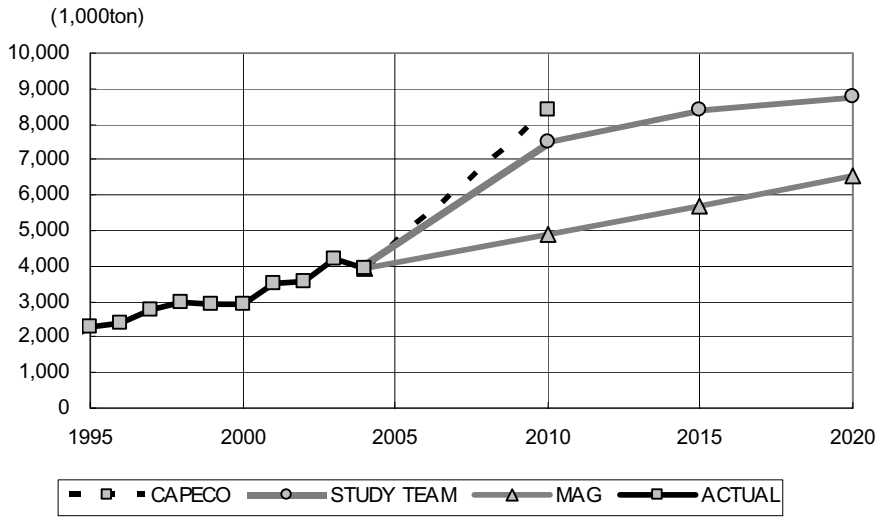


Figure 9.2-1 Soybean Production Forecast

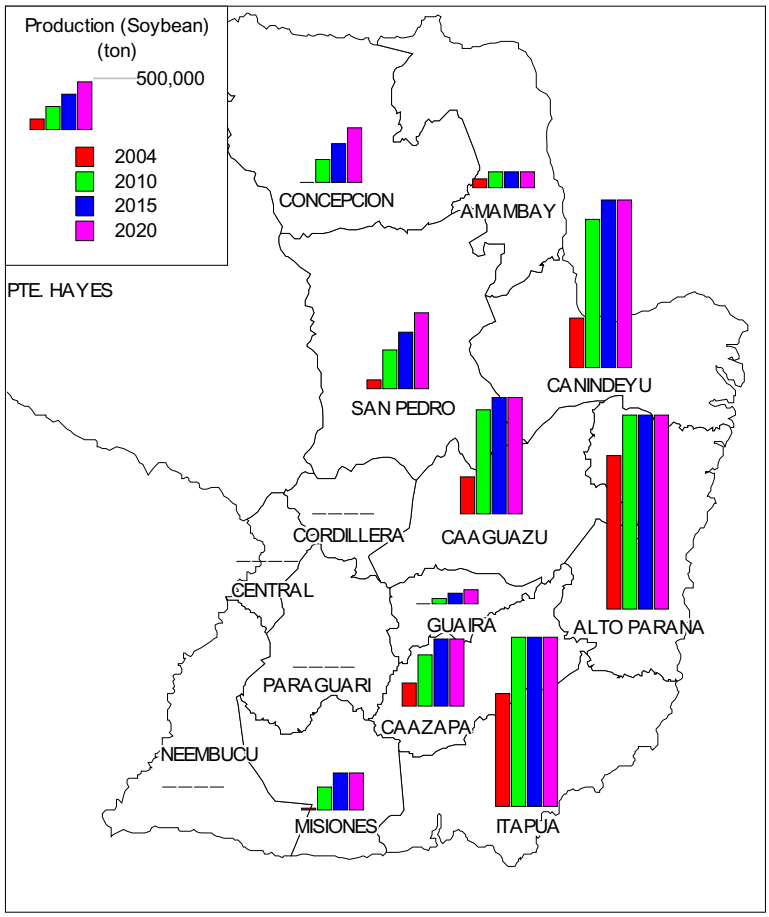


Figure 9.2-2 Soybean Production Forecast per Department

(2) Wheat

Wheat cultivated area is approximately 30% of the soybean cultivated area (refer to Figure 9.2-3), despite the fact that wheat is the second crop in order of importance after soybean.

Therefore, it is assumed that 30% of the forecasted soybean cultivation area would be equal to wheat cultivated area, by multiplying the average by the average yielding per area (1,686 t/hectare), hence forecasting future production.

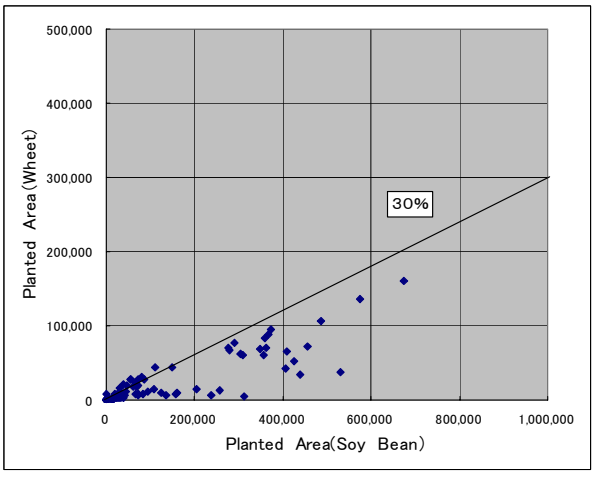


Figure 9.2-3 Soybean and Wheat Cultivated Area Ratio

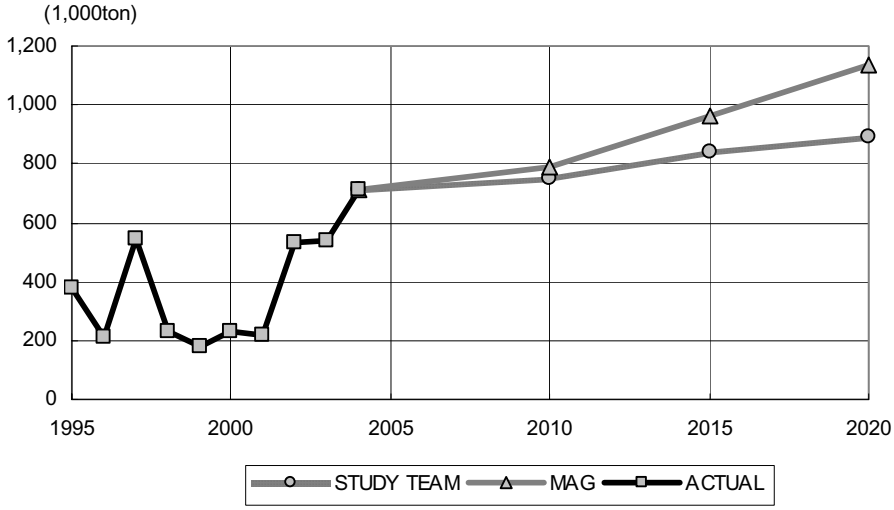


Figure 9.2-4 Wheat Production Forecast

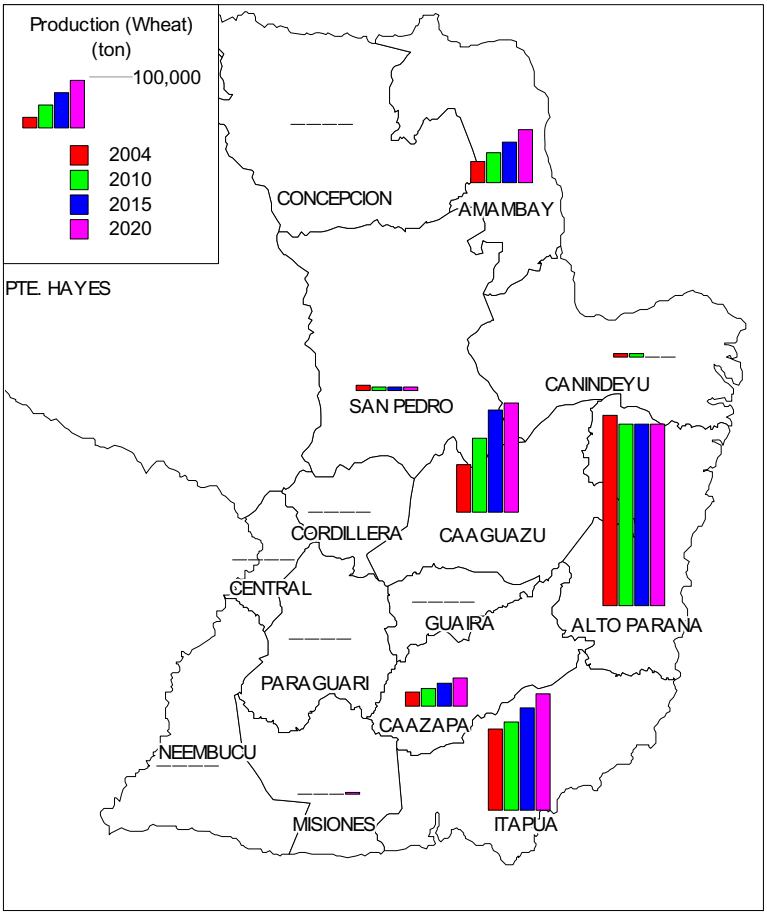


Figure 9.2-5 Wheat Production Forecast per Department

(3) Corn

Corn cultivated area was forecasted from the previous tendency per department, by multiplying the average by the average yielding per area (2,363 t/hectare), hence calculating future production.

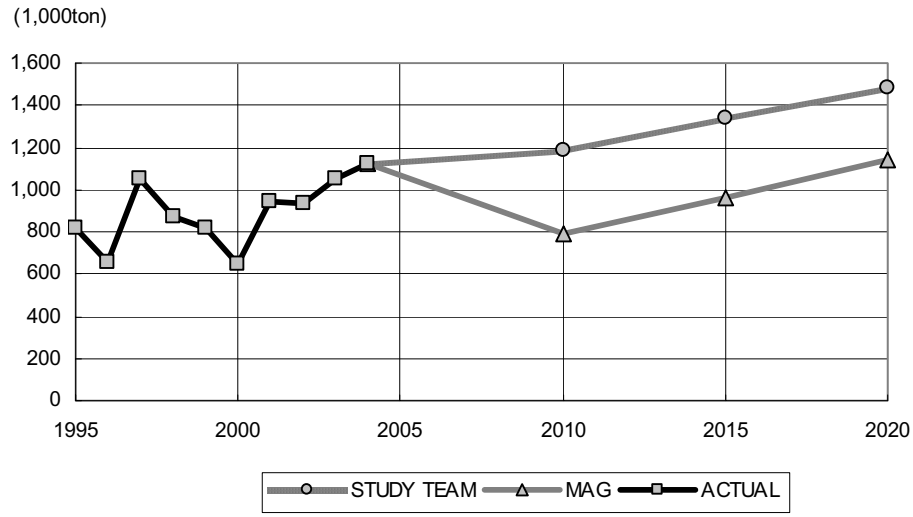


Figure 9.2-6 Corn Production Forecast

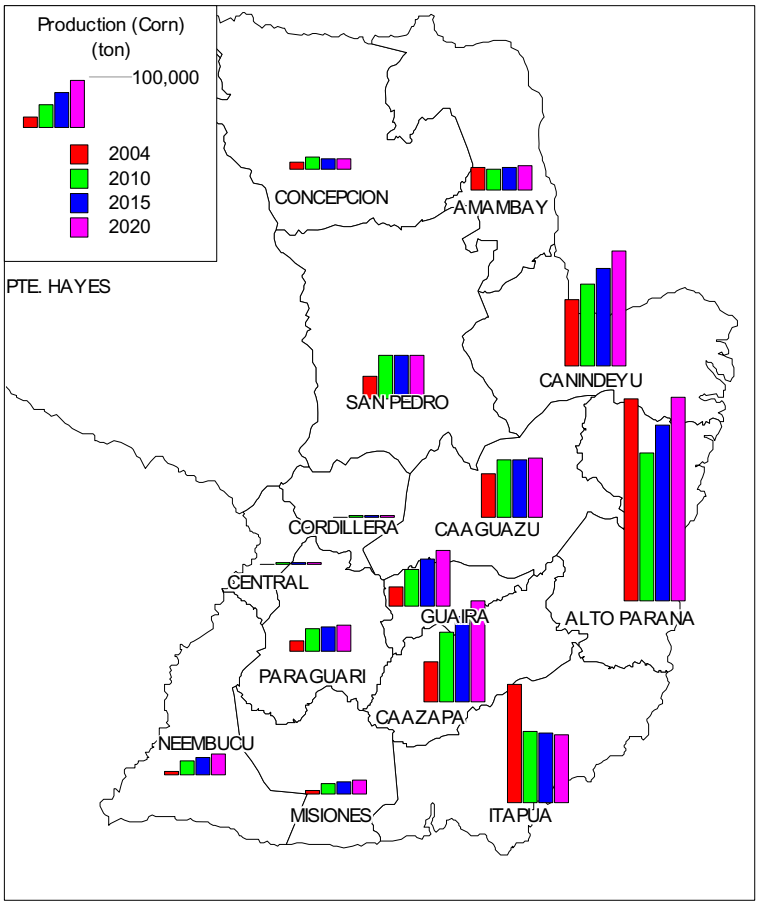


Figure 9.2-7 Corn Production Forecast per Department

9.2.2 Possible Flow Volume Forecast

(1) Export Volume and Internal Consumption Volume Forecast

It is necessary to classify production into three items: national consumption, exports, and imports, in order to forecast the future flow volume. These items were calculated by following these methods:

- National consumption: multiplying future population by previous consumption per person
- Exports volume: (production) surplus – (national consumption)
- Imports volume: (national consumption) deficit – (production)

1) Soybean and related products

Soybean load flow is classified into soybean, soybean oil, and soybean derivatives, as shown by Figure 9.2-8. Soybean exports account for around 60% of production, and the rest is produced mainly as soybean oil and derivatives in squeezer oil factories.

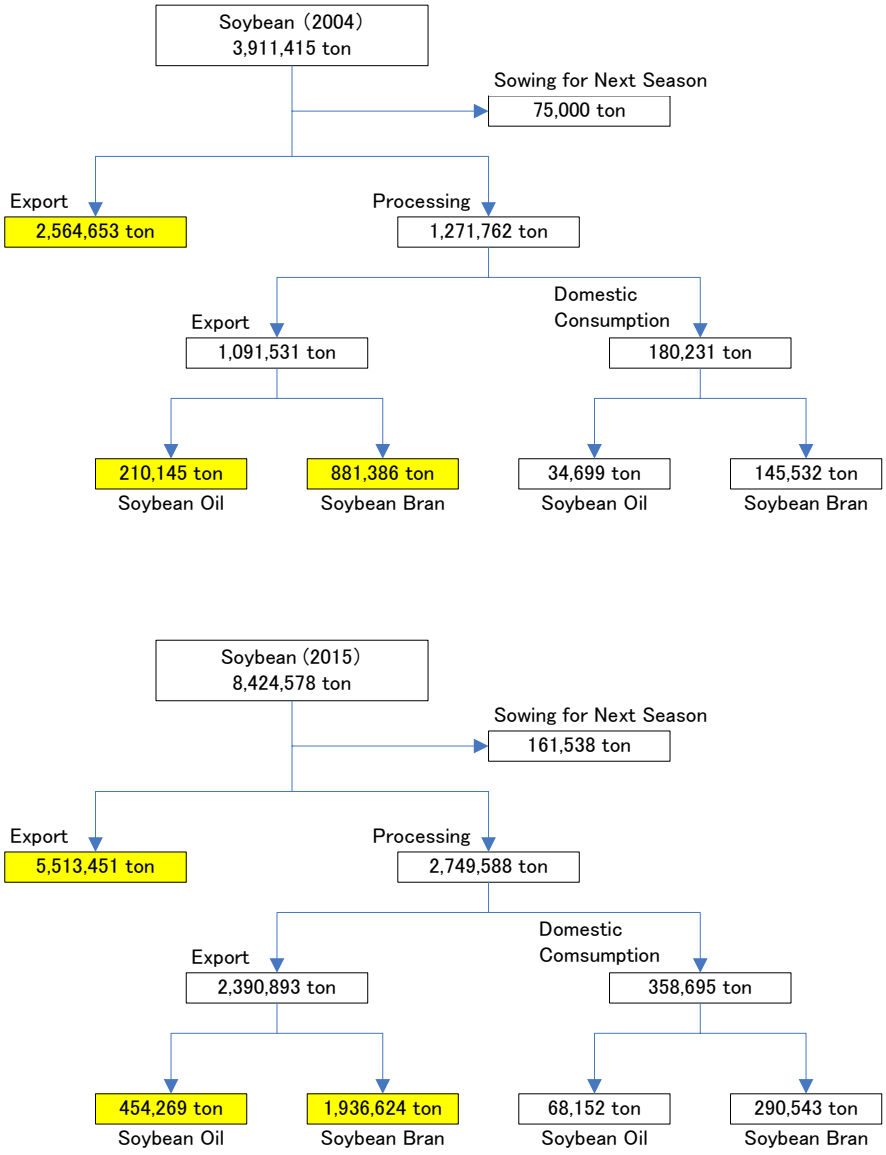


Figure 9.2-8 Soybean-Related Distribution Tendency

2) Wheat

Around 40% of the production of wheat is for export, and the rest is transformed into flour, mainly in flour mills for national consumption. Besides, part of this production is also used for export. However, since national consumption is expected to increase in the future, most of the flour produced will be consumed nationally. Flour consumption per person is 0.05 tons per year.

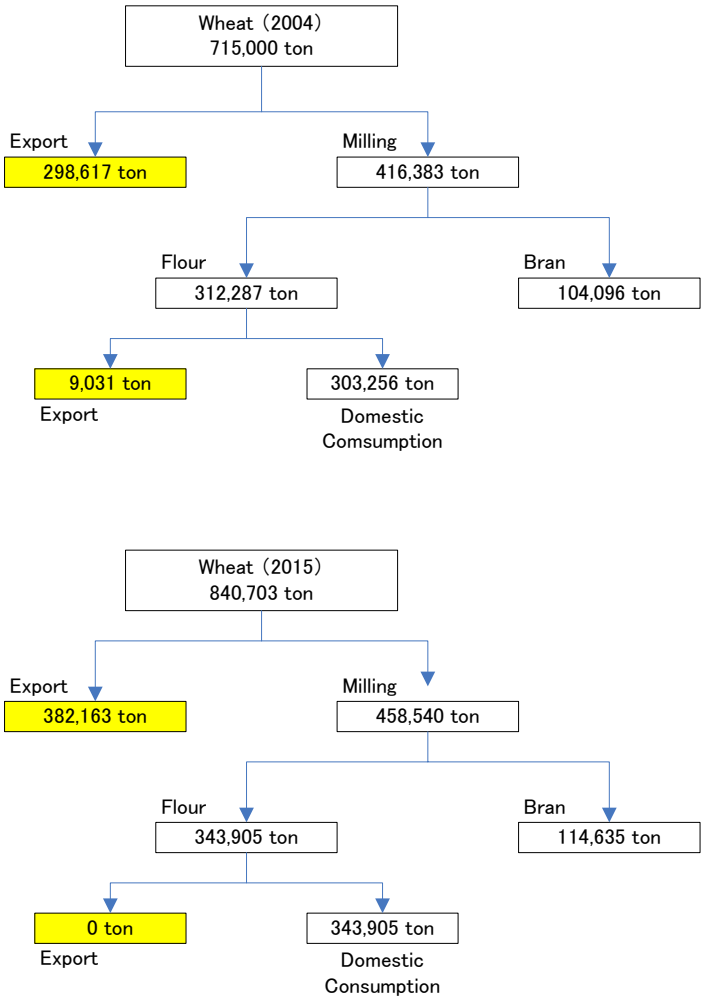


Figure 9.2-9 Wheat-Related Distribution Tendency

3) Corn

Around 70% of corn is consumed nationally, and only a part is imported. Per capita consumption is 0.119 tons per year. The production is expected to increase in the future so that it can meet the national demand completely.

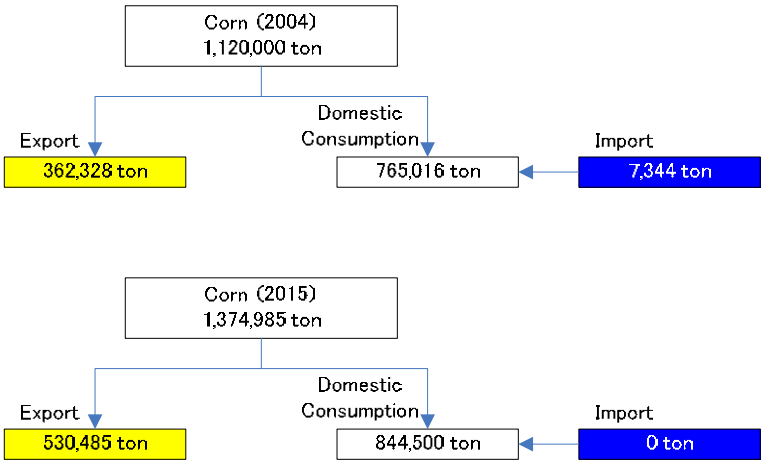


Figure 9.2-10 Corn-Related Distribution Tendency

(2) OD Traffic Volume Forecast per Product

OD transportation volume is estimated in relation to the origin and destination of the main agricultural and agroindustrial products. The traffic distribution patterns come from the Study on Economic Development of Paraguay (SEDP).

Figure 9.2-11 to Figure 9.2-13 show the estimation of the roads to be used per agricultural product.

1) Soybean and related product

The volume of exports through the Paraguay River is expected to grow as production new lands gradually shift from the west side shores of the Parana River. The use of the Parana River for exports is expected to double from its current use, approximately. Likewise, the amount of soybean exports is expected to increase, too.

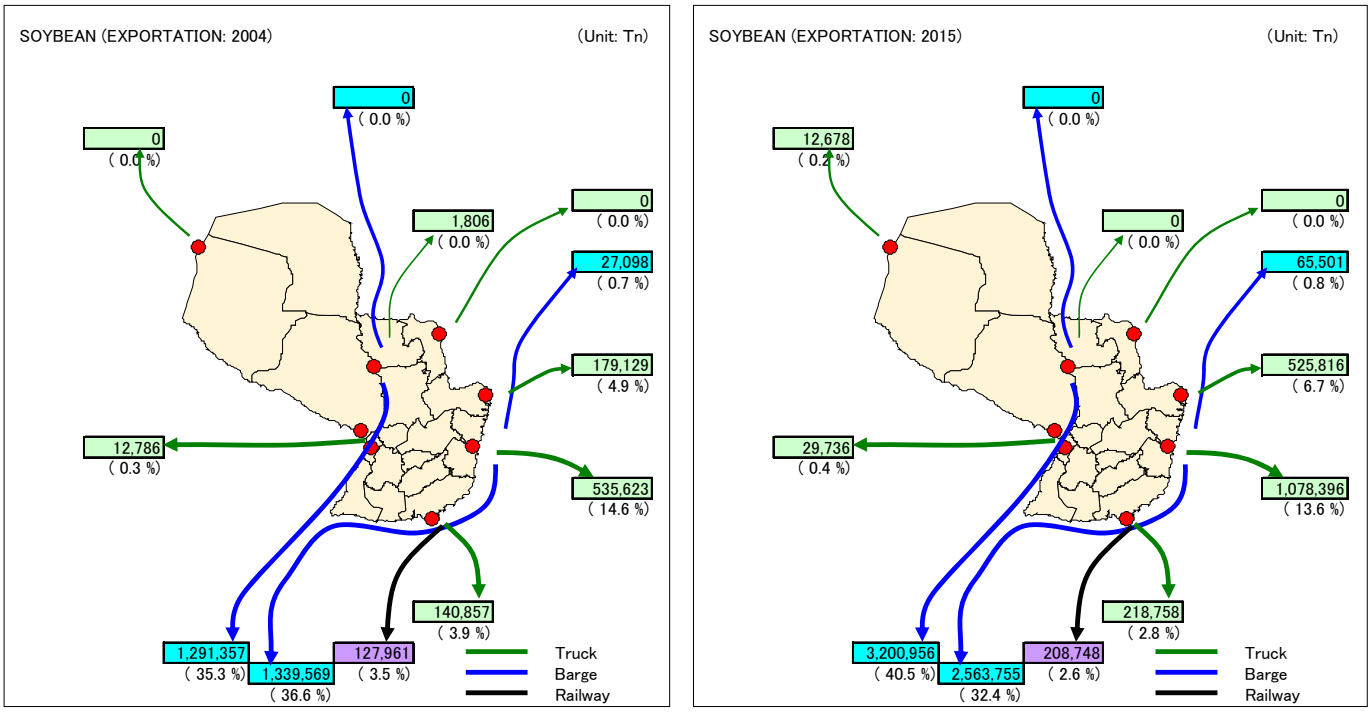


Figure 9.2-11 Road Change for Soybean and Related Product Exports

2) Wheat

As the national consumption of wheat increases, future exports will not increase much. The use of the Paraguay River for exports is expected to increase as soybean production land shifts towards the west side.

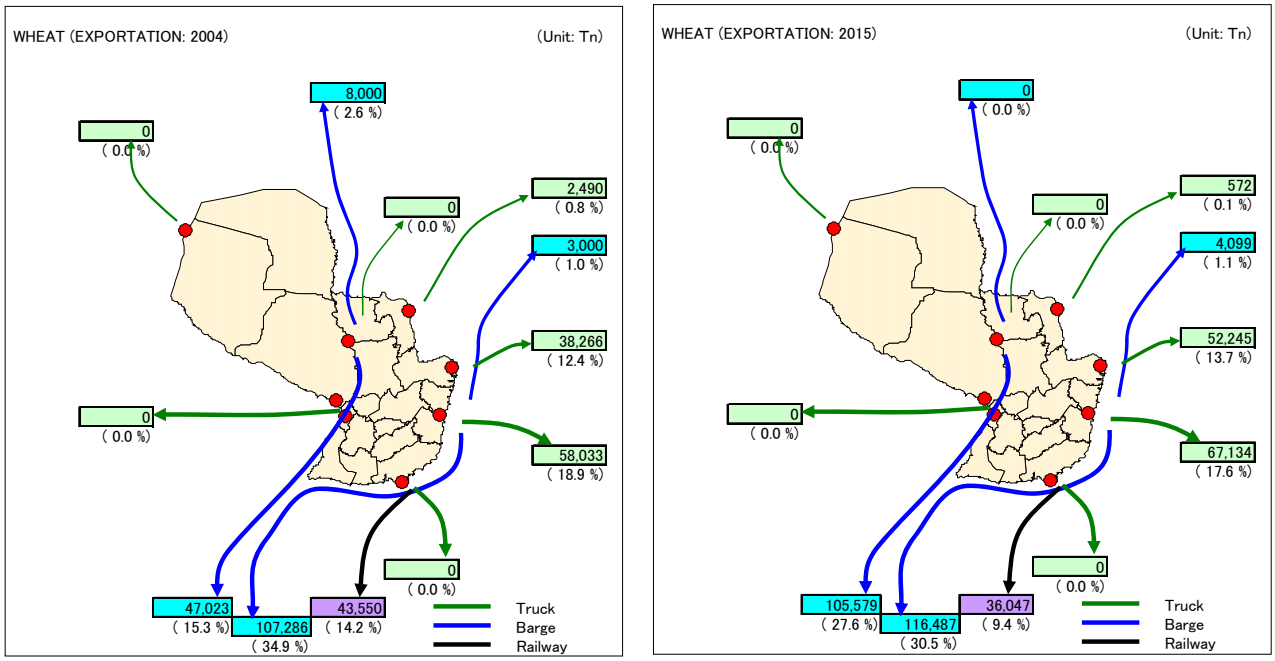


Figure 9.2-12 Road Change for Wheat Exports

3) Corn

Since the highest amount of corn exports goes to Brazil, the Parana River is not used. Its use is not expected to increase in the future.

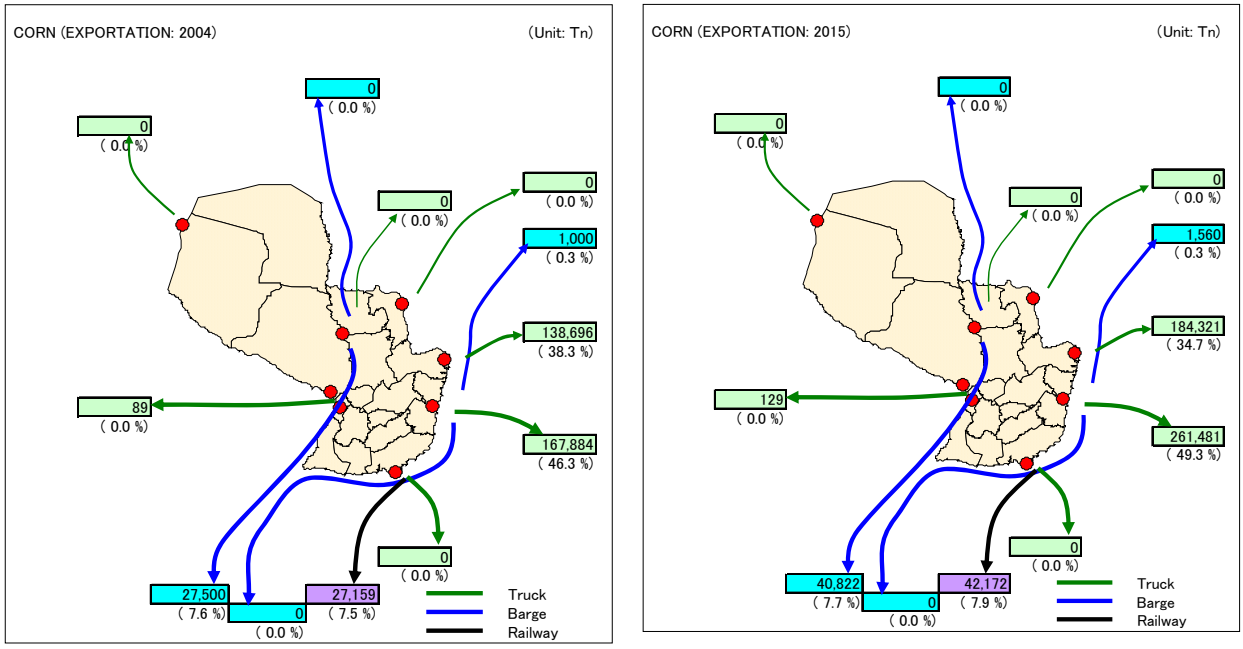


Figure 9.2-13 Road Change for Corn Exports

(3) Monthly Fluctuation Quotient

It is necessary to set a peak month in terms of traffic concentration and a fluctuation quotient to show seasonal fluctuations in relation to grain production and exports. The monthly fluctuation related to exports of soybean and related products, wheat and corn is shown in Figure 9.2-14.

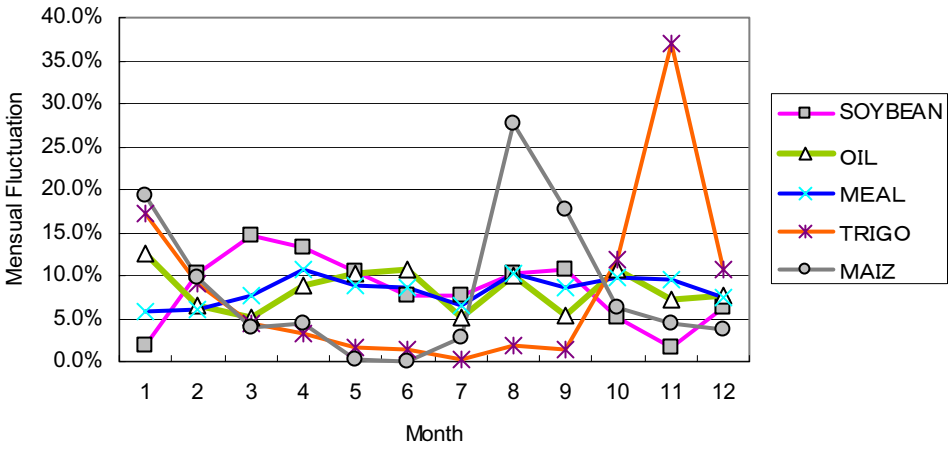


Figure 9.2-14 Monthly Export Fluctuation

(Soybean)

Soybean exports are high from February to May, crop season, and represent 50% of the total volume. Road traffic is expected to be heavy during those four months, presenting great movement of soybean transportation towards export ports (silo) in order to meet the demand. On the other hand, road traffic of soybean oil and soybean derivatives generates a monthly fluctuation on export amount due to the fact that soybean oil and soybean derivatives are exported from the corresponding factory.

(Wheat and Corn)

The concentration rate during the peak month is assumed to be high, and the product gathered is transported directly to ports. Hence, traffic is generated according to the monthly fluctuation of the volume of exports.

Table 9.2-1 Fluctuation Quotient per Month and per Grain

Grain	Fluctuation Quotient per Month	Notes
Soybean	30.2% (March) 27,4% (April)	
Soybean oil	5.1% (March) 8.8% (April)	
Soybean derivatives	7.7% (March) 10.7% (April)	
Wheat	36.9% (November)	
Corn	27.6% (August)	

(4) Future Freight Transportation Forecast

The amount of grain exported from the Alto Parana Department and the Itapua Department and the traffic of freight vehicles is estimated from the estimative work mentioned above and shown in Table 9.2-2.

The volume of grain exported from the Alto Parana Department and the Itapua Department is approximately 50% of the country's total amount. The traffic of full load vehicles is around 38,000 units / month during the peak month (March) out of 230,000 per year, approximately, when the monthly fluctuation is taken into account.

Assuming the export freight that used to use the rivers (23,800 vehicles / month) will now use the study road, and that 50% of the total volume of railroad and truck freight will use the study road (7,200 vehicles / month), that will make a total of 31,000 vehicles circulating by the study road to transport grain per month. If we translate this number into 22 days a month, this would mean 1,400 vehicles / day, and in case we have only 15 days for transportation, the final number is 2,100 vehicles per day.

Table 9.2-2 Traffic on the Objective Roads

Transportation mode	Freight volume (ton/ year)	Freight transportation amount (ton/month)	Peak time freight (veh/month)	Traffic on Objective Roads			
				availability	veh/month	veh/day	veh/day
River	2,741,500	130,300	23,800	100%	23,800	1,080	1,590
Car	1,625,800	85,200	11,400	50%	5,700	260	380
Railroad	287,000	15,600	3,000	50%	1,500	70	100
Total	4,654,300	231,100	38,200		31,000	1,410	2,070
Note		March is the peak month.				22 d/month	15 d /month

Table 9.2-3 Freight Transportation Future Traffic Forecast

(ton/year)

Custom	Transport	Destination	SOYBEAN	OIL	MEAL	WHEAT	CORN	TOTAL
Central	River	Buenos Aires	2,169,822	157,160	404,047	97,751	40,822	2,869,602
Alto Paraná	Truck	Paranagua	395,909	79,928	602,559	67,134	261,481	1,407,011
	River	Buenos Aires	297,275	204,470	791,063	-	-	1,292,808
	River	Campinas	34,395	-	21,193	4,099	1,560	61,247
Itapua	Truck	Buenos Aires	218,758	-	-	-	-	218,758
	River	Buenos Aires	1,160,037	12,066	98,843	116,487	-	1,387,433
	Railway	Rio Gurande	-	-	-	6,238	9,405	15,643
	Railway	Buenos Aires	208,748	-	-	29,809	32,767	271,324
Amambay	Truck	Campo Grande	-	-	-	572	-	572
Canindeyú	Truck	Sao Paulo	524,722	-	1,094	52,245	184,321	762,382
	River	Campinas	9,912	-	-	-	-	9,912
Pte.Hayes	Truck	Buenos Aires	-	645	56	-	-	701
	Truck	Antofagasta	11,267	-	17,769	-	129	29,165
Concepción	River	Buenos Aires	469,928	-	-	7,828	-	477,756
	River	Pte.Caceres	-	-	-	-	-	-
Ñeembucu	River	Buenos Aires	-	-	-	-	-	-
Boqueron	Truck	Arica(SantaCruz)	-	-	-	-	-	-
	Truck	Antofagasta	12,678	-	-	-	-	12,678
TOTAL			5,513,451	454,269	1,936,624	382,163	530,485	8,816,992
Alto Paraná + Itapua	River		1,491,707	216,536	911,099	120,586	1,560	2,741,488
	Truck		614,667	79,928	602,559	67,134	261,481	1,625,769
	Railway		208,748	-	-	36,047	42,172	286,967
	Total		2,315,122	296,464	1,513,658	223,767	305,213	4,654,224

(veh/year)

Custom	Transport	Destination	SOYBEAN	OIL	MEAL	WHEAT	CORN	TOTAL
Central	River	Buenos Aires	94,341	13,667	16,162	8,146	3,402	135,718
Alto Paraná	Truck	Paranagua	17,214	6,951	24,103	5,595	21,791	75,654
	River	Buenos Aires	12,925	17,780	31,643	-	-	62,348
	River	Campinas	1,496	-	848	342	130	2,816
Itapua	Truck	Buenos Aires	9,512	-	-	-	-	9,512
	River	Buenos Aires	50,437	1,050	3,954	9,708	-	65,149
	Railway	Rio Gurande	-	-	-	520	784	1,304
	Railway	Buenos Aires	9,076	-	-	2,485	2,731	14,292
Amambay	Truck	Campo Grande	-	-	-	48	-	48
Canindeyú	Truck	Sao Paulo	22,814	-	44	4,354	15,361	42,573
	River	Campinas	431	-	-	-	-	431
Pte.Hayes	Truck	Buenos Aires	-	57	3	-	-	60
	Truck	Antofagasta	490	-	711	-	11	1,212
Concepción	River	Buenos Aires	20,432	-	-	653	-	21,085
	River	Pte.Caceres	-	-	-	-	-	-
Ñeembucu	River	Buenos Aires	-	-	-	-	-	-
Boqueron	Truck	Arica(SantaCruz)	-	-	-	-	-	-
	Truck	Antofagasta	552	-	-	-	-	552
TOTAL			239,720	39,505	77,468	31,851	44,210	432,754
Alto Paraná + Itapua	River		64,858	18,830	36,445	10,050	130	130,313
	Truck		26,726	6,951	24,103	5,595	21,791	85,166
	Railway		9,076	-	-	3,005	3,515	15,596
	Total		100,660	25,781	60,548	18,650	25,436	231,075
LOADING	(ton/veh)		23.0	11.5	25.0	12.0	12.0	

MARCH (veh/month)

Custom	Transport	Destination	SOYBEAN	OIL	MEAL	WHEAT	CORN	TOTAL
Central	River	Buenos Aires	28,491	698	1,245	359	140	30,933
Alto Paraná	Truck	Paranagua	5,199	355	1,856	247	894	8,551
	River	Buenos Aires	3,904	907	2,437	-	-	7,248
	River	Campinas	452	-	66	16	6	540
Itapua	Truck	Buenos Aires	2,873	-	-	-	-	2,873
	River	Buenos Aires	15,232	54	305	428	-	16,019
	Railway	Rio Gurande	-	-	-	23	33	56
	Railway	Buenos Aires	2,741	-	-	110	112	2,963
Amambay	Truck	Campo Grande	-	-	-	3	-	3
Canindeyú	Truck	Sao Paulo	6,890	-	4	192	630	7,716
	River	Campinas	131	-	-	-	-	131
Pte.Hayes	Truck	Buenos Aires	-	3	1	-	-	4
	Truck	Antofagasta	148	-	55	-	1	204
Concepción	River	Buenos Aires	6,171	-	-	29	-	6,200
	River	Pte.Caceres	-	-	-	-	-	-
Ñeembucu	River	Buenos Aires	-	-	-	-	-	-
Boqueron	Truck	Arica(SantaCruz)	-	-	-	-	-	-
	Truck	Antofagasta	167	-	-	-	-	167
TOTAL			72,399	2,017	5,969	1,407	1,816	83,608
Alto Paraná + Itapua	River		19,588	961	2,808	444	6	23,807
	Truck		8,072	355	1,856	247	894	11,424
	Railway		2,741	-	-	133	145	3,019
	Total		30,401	1,316	4,664	824	1,045	38,250
Peak Factor （%）			30.2	5.1	7.7	4.4	4.1	

APRIL (veh/month)

Custom	Transport	Destination	SOYBEAN	OIL	MEAL	WHEAT	CORN	TOTAL
Central	River	Buenos Aires	25,850	1,203	1,730	277	154	29,214
Alto Paraná	Truck	Paranagua	4,717	612	2,580	191	981	9,081
	River	Buenos Aires	3,542	1,565	3,386	-	-	8,493
	River	Campinas	410	-	91	12	6	519
Itapua	Truck	Buenos Aires	2,607	-	-	-	-	2,607
	River	Buenos Aires	13,820	93	424	331	-	14,668
	Railway	Rio Gurande	-	-	-	18	36	54
	Railway	Buenos Aires	2,487	-	-	85	123	2,695
Amambay	Truck	Campo Grande	-	-	-	2	-	2
Canindeyú	Truck	Sao Paulo	6,252	-	5	149	692	7,098
	River	Campinas	119	-	-	-	-	119
Pte.Hayes	Truck	Buenos Aires	-	6	1	-	-	7
	Truck	Antofagasta	135	-	77	-	1	213
Concepción	River	Buenos Aires	5,599	-	-	23	-	5,622
	River	Pte.Caceres	-	-	-	-	-	-
Ñeembucu	River	Buenos Aires	-	-	-	-	-	-
Boqueron	Truck	Arica(SantaCruz)	-	-	-	-	-	-
	Truck	Antofagasta	152	-	-	-	-	152
TOTAL			65,690	3,479	8,294	1,088	1,993	80,544
Alto Paraná + Itapua	River		17,772	1,658	3,901	343	6	23,680
	Truck		7,324	612	2,580	191	981	11,688
	Railway		2,487	-	-	103	159	2,749
	Total		27,583	2,270	6,481	637	1,146	38,117
Peak Factor （%）			27.4	8.8	10.7	3.4	4.5	

9.3 FUTURE TRANSPORTATION DEMAND FORECAST

9.3.1 General

In the previous chapter, we made an estimation of future net freight transportation related to grain export per Department. Here, we make a forecast of the future traffic volumes per road section, for the time the road along the Parana River and the river port access roads are developed. The Objective year is 2015.

The next three traffic types will be calculated and added:

- Grain export related freight truck traffic
- Utility traffic of the residents along the road
- Long distance traffic detoured from National Road Route 6.

9.3.2 Forecast Method and Results

(1) Forecast of Grain Export Related Freight Transport

In the previous chapter, we have studied the customs for grain exports based on the existing patterns. However, if we manage to decrease transportation costs by improving road infrastructures, we may be able to present a variation in the grain export road. In relation to this, the forecasted OD transportation volume per freight in the previous chapter was estimated from the transportation volume per section, preparing a traffic distribution model per section, taking transportation cost as a parameter. The basic criterion for the distribution model is the following:

- In relation to the Itapua and Alto Parana departments, the estimation was made by comparing the freight transportation generation volume per district and the agricultural area ratio per district (reference: Table 9.3-1)

- The transportation volume per mode (land, river, and railroad) is used just as it is.

- Grain exports are distributed annually due to seasonal variations.

- Concerning land transportation cost, was calculated using vehicle operation cost (PYG/Km) per type of vehicle, as prepared by DINATRAN (National Transport Direction). The average vehicle operation cost was estimated based on the Semi-Large Truck and Large Truck ratio (80.9: 19.1) from detailed information on number of future transport necessary to export the main export agricultural products which are soybean, pellet (freight average volume 23 – 25 tons) and soybean oil, wheat, corn, (freight average volume 11.5 – 12.0 tons).

Table 9.3-1 Freight Transportation / Grain Exports per Zone Ratio

(Generated Volume) (vehicle/day)

Department	Zone	Area (hec)	Agricultural Land Percentage (%)	Agricultural Land Area (hec)	Traffic Volume	Department	Zone	Area (hec)	Agricultural Land Percentage (%)	Agricultural Land Area (hec)	Traffic Volume
ITAPÚA	1	322	90	290	37	ALTO PARANÁ	31	149	20	30	2
	2	298	80	238	30		32	123	90	110	7
	3	190	80	152	19		33	334	90	301	19
	4	440	80	352	45		34	266	80	213	14
	5	219	90	197	25		35	1,519	90	1367	87
	6	232	50	116	15		36	1,964	90	1768	113
	7	313	20	63	8		37	226	90	203	13
	8	660	20	132	17		38	865	60	519	33
	9	826	50	413	52		39	762	80	610	39
	10	383	80	307	39		40	406	90	365	23
	11	327	90	294	37		41	486	90	437	28
	12	1,341	20	268	34		42	1,028	80	822	52
	13	448	20	90	11		43	651	80	521	33
	14	198	80	159	20		44	753	80	602	38
	15	144	80	115	15		45	1,000	80	800	51
	16	131	80	104	13		46	881	90	793	51
	17	414	80	331	42		47	1,174	90	1057	67
	18	263	80	210	27		48	1,047	70	733	47
	19	1,319	10	132	17		49	528	70	370	24
	20	1,486	40	594	75	Sub-Total		14,162		11621	741
	21	1,453	50	727	92	Total		29,828		19,439	1,730
	22	176	50	88	11						
	23	636	70	445	56						
	24	607	50	304	38						
	25	900	10	90	11						
	26	239	90	215	27						
	27	226	80	181	23						
	28	112	80	90	11						
	29	841	90	757	96						
	30	524	70	367	46						
Sub-Total		15,666		7,819	989						

Table 9.3-2 Vehicle Operation Cost

	Paved Road	Cobbled Road	Dust Road	Dust Sub-road
Semi-large trucks	4504.12	5650.86	6324.47	6842.02
Large trucks	5849.00	7688.19	8554.06	9282.89
Set value	4760.99	6039.99	6750.32	7308.23

Note: A set value is a numerical value to divide the vehicle operation cost of two models of the above-mentioned in proportion in a ratio of 80.9:19.1.

- Concerning river transportation, shipment costs (0.3 USD / ton) was taken into account, along with port unloading cost. Figure 9.3-1 (Comparative Table of Freight Cost in Several Paraguayan Ports until Nueva Palmira Port) shows the relation between freight cost and the distance on the

Paraguay River and on the Parana River, the unitary Parana River freight price is higher than that of the Paraguay River due to the river running speed.

- The transportation volume per section was added making an estimation of the road from another the export place. In case of using a port, since there was the chance to use several ports, the estimated freight transportation volume for each port was made based on the inverse proportion to the square of the transportation cost, selecting the 3 first ports with the lowest transportation cost.

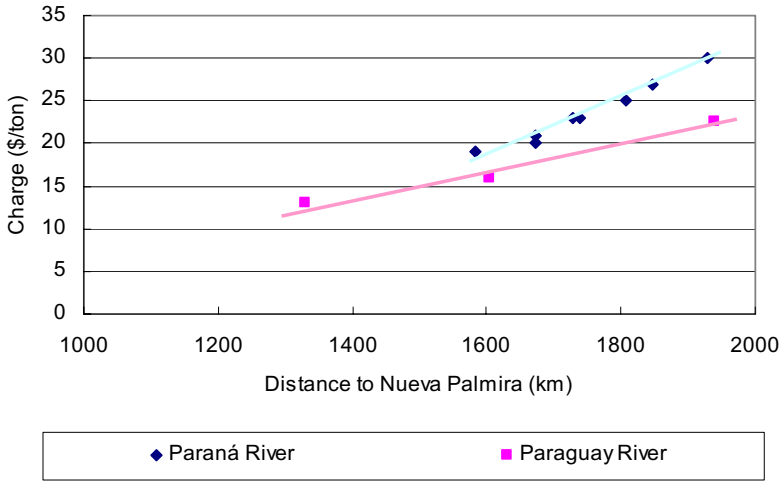


Figure 9.3-1 Comparative Chart of Freight Cost on Paraguay River and on Parana River

Table 9.3-3 River Freight Cost on Paraguay River and on Parana River

Parana River			Paraguay River		
Port	Distance to Nueva Palmira Port (km)	Fee (USD/ton)	Port	Distance to Nueva Palmira Port (km)	Fee (USD/ton)
Trociuk	1,583	19	Pilar	1,329	13
Paredón	1,672	20	San Antonio	1,604	16
Don Joaquín	1,697	21	Concepción	1,940	22.5
La Paloma	1,729	23			
Triunfo	1,740	23			
Dos Fronteras	1,807	25			
Torocuá	1,848	27			
Tres Fronteras	1,928	30			

Figure 9.3-2 shows the result of the estimation. It presents a transportation volume increase in most of the sections due to an increase in the transportation that will use the ports in operation on the Parana River once the corresponding roads that correspond to the Parana River Coastal Road and the extension of National Road Route 15 (please refer to Table 9.3-3). The section that shows the highest traffic volume is the Mayor Otaño – Ciudad del Este section with 75,300 to 114,400 vehicle / year, followed by the Natalio – Mayor Otaño section with 35,900 to 54,200 vehicle / year, and the extension

of National Road Route 15 with less volume, 22,000 to 39,200 vehicle / year. However, the improvement of the road equalizes port facility use, and efficiency for the entire ports increases.

Table 9.3-4 Parana River Use Ratio Increase with the Improvement of the Export Corridor

	Without Export Corridor	With Export Corridor
Paraguay River Use	155,540 veh. (54.7%)	145,330 veh. (51.1%)
Parana River Use	128,760 veh. (45.3%)	138,970 veh. (48.9%)
Total	284,300 veh. (100.0%)	284,300 veh. (100.0%)

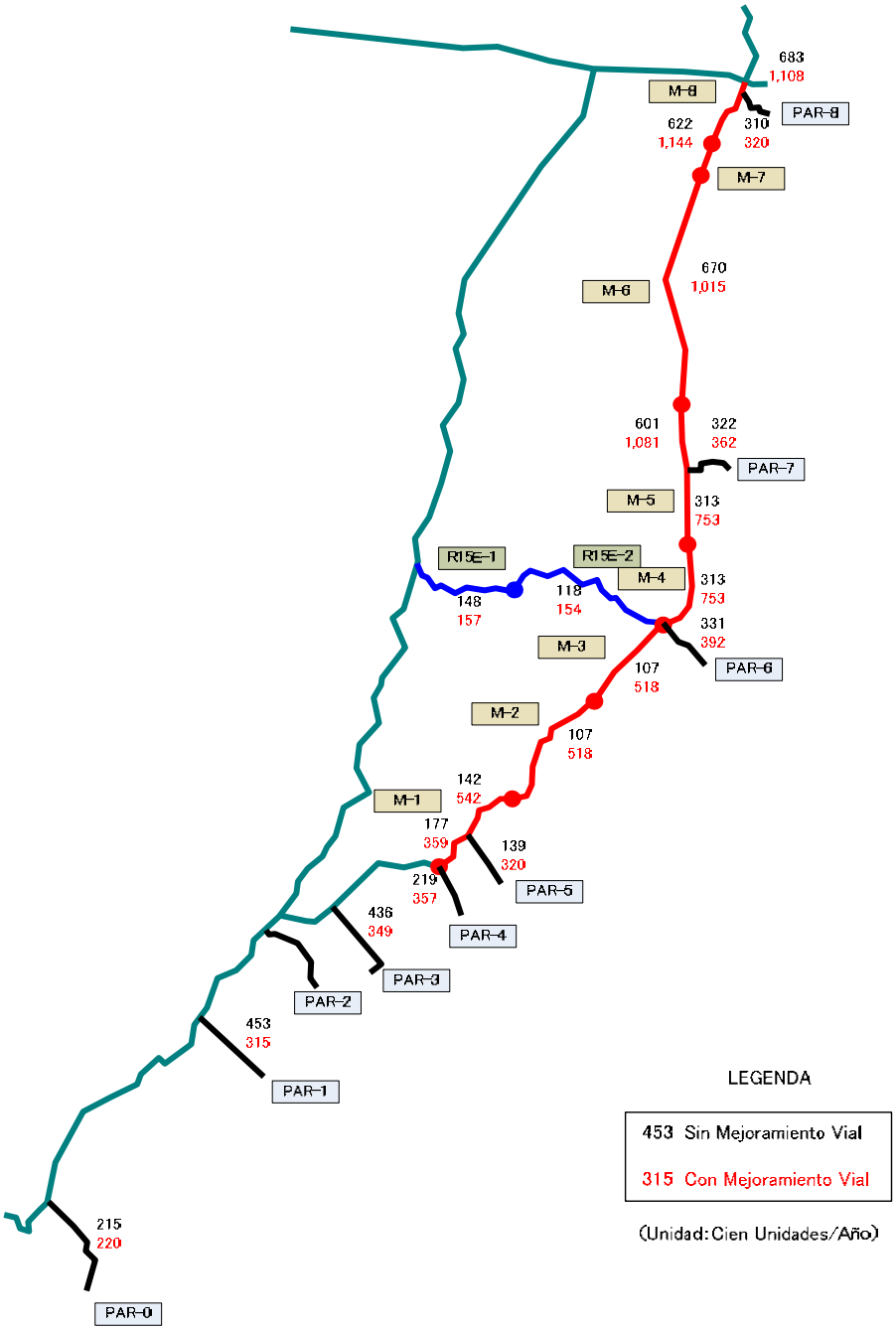


Figure 9.3-2 Freight Transport Volume Distribution for Grain Exports

(2) Traffic Forecast for Resident along the Roads

According to the Traffic Study Report, the traffic observed on the Parana River Coastal Road and the extension of National Road Route 15 is shown is Table 9.3-5. The actual 24h traffic volume was calculated by multiplying the traffic volume by the day/night ratio (24 hours / 14 hours) observed in the Trinidad toll gate. Besides, we also looked for an average transformation quotient from the observation data corresponding to the year 2005 on National Road Route 6. We also took into consideration that this last information includes the average traffic volume considered.

Table 9.3-5 Traffic Forecast for Residents along the Roadside
(Paraná River Coastal Road and Extension of National Road Route 15)

(1) Natalio-Pdte.Franco

	Car	Bus	Truck	Total
(A) Observed traffic volume (vehicle/14h)	449-686	20-37	174-280	646-932
(B) Day / night ratio (24h/14h)	1.11	1.17	1.15	-
(C) Current traffic volume (veh/day) (section average) (A*B)	626	30	254	910
(D) Conversion rate to annual average volume	1.002	0.891	0.891	-
(E) Increase rate (2015-2005)	1.39	1.39	1.39	-
(F) Future traffic volume (vehicle/day) (section average) (C*D*E)	870	40	310	1,220

(2) Presidente .Franco – National Road Route 7

	Car	Bus	Truck	Total
(A) Observed traffic volume (vehicle/14h)	1,323-1,680	235-630	258-350	1,908-2,568
(B) Day / night ratio (24h/14h)	1,11	1,17	1,15	-
(C) Current traffic volume (veh/day) (section average) (A*B)	1,667	506	350	2,523
(D) Conversion rate to annual average volume	1.002	0.891	0.891	-
(E) Increase rate (2015-2005)	1.39	1.39	1.39	-
(F) Future traffic volume (vehicle/day) (section average) (C*D*E)	2,320	630	430	3,380

(3) Extended Section of National Road Route 15

	Car	Bus	Truck	Total
(A) Observed traffic volume (vehicle/14h)	225	10	114	349
(B) Day / night ratio (24h/14h)	1.11	1.17	1.15	-
(C) Current traffic volume (veh/day) (section average) (A*B)	250	12	131	393
(D) Conversion rate to annual average volume	1.002	0.891	0.891	-
(E) Increase rate (2015-2005)	1.39	1.39	1.39	-
(F) Future traffic volume (vehicle/day) (section average) (C*D*E)	350	20	160	530

Also, port access roads were also estimated based on the results of the traffic volume of the Study. Table 9.3-7 shows the results of the estimation calculations.

Table 9.3-6 Working Day Annual Average Traffic Calculation Ratio

	Annual Average Traffic	Average Traffic – February (Annual average estimation ratio)	Average Traffic – October (Annual average estimation ratio)
Cars	935.1	961.9 (0.972)	932.8 (1.002)
Buses and Trucks	147.2	158.5 (0.929)	165.3 (0.891)

Note: Prepared based on data from the Trinidad toll gate, 2005.

Table 9.3-7 Traffic Forecast

Port	Cars	Buses	Trucks	Total	Note
Campichuelo	310	50	50	410	Current Traffic Study, February
Paredón	440	20	50	510	Current Traffic Study, October
Don Joaquín	790	10	170	970	Ditto
Paloma	90	0	70	160	Ditto
Triunfo	190	10	100	300	Ditto
Tres Fronteras	1,900	610	450	3,050	Ditto
Caarendy	90	0	50	140	We have used the smallest traffic volume of other sections, because we do not have the current traffic volume available for these sections.
Dos Fronteras	90	0	50	140	
Torocua	90	0	50	140	

(3) Forecast of Inter-Departmental Traffic Detoured from National Road Route 6

1) Traffic Volume Estimation on National Road Route 6

There are three detoured traffic patterns from National Road Route 6 to the project road, as shows by Figure 9.3-3. Table 9.3-8 shows the current OD volumes taken from this current study, in three traffic patterns that circulate on National Road Route 6.

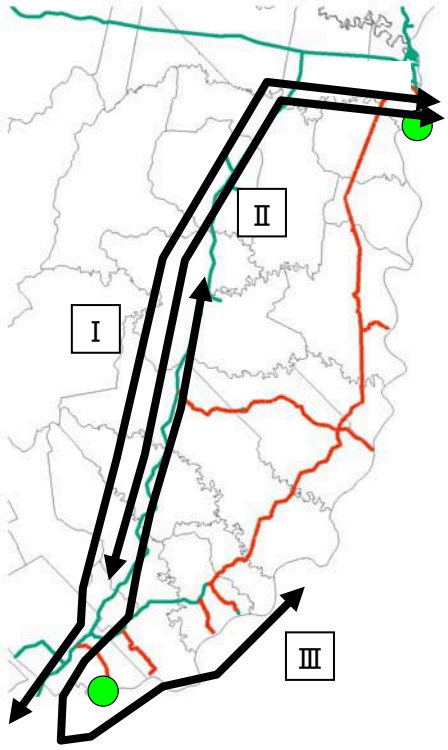


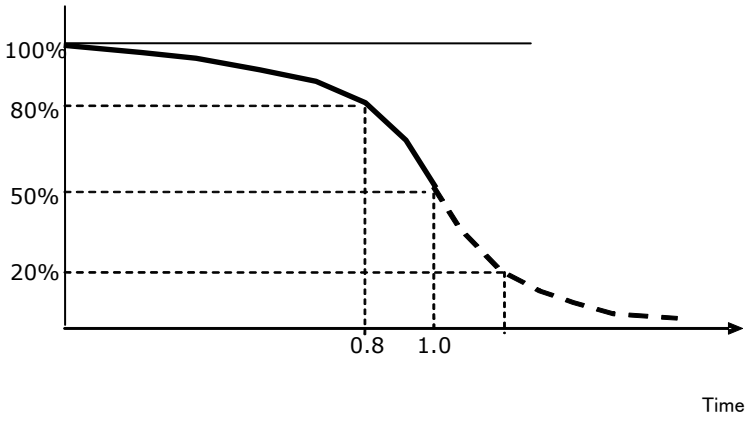
Table 9.3-8 Traffic on National Road Route 6

(vehicle／14h)

Circulation pattern	Car	Bus	Truck	Total
I	208	52	144	404
II	235	5	113	353
III	38	1	61	100

2) Detour Rate Organization

Due to the existing speed differences between National Road Route 6 and the Coastal Road along the Parana River, case this latter increases speed, it includes the traffic detoured from National Road Route 6. In case there is a 20% time shortening in comparison to National Road Route 6, we have set the conversion curves shown in Figure 9.3-3 assuming an 80% detour from the total. Table 9.3-9 shows the speed set to obtain the necessary time. .



$$P = 1 - \frac{1}{1 + 1000 \exp\left(-6.9 \times \frac{Tp}{T6}\right)}$$

Where,

P: Detour Ratio (%)

Tp: Necessary time for project road

T6: necessary time from National Road Route 6.

Figure 9.3-3 Detour Ratio Curve

Table 9.3-9 Circulation Speed per Road Type

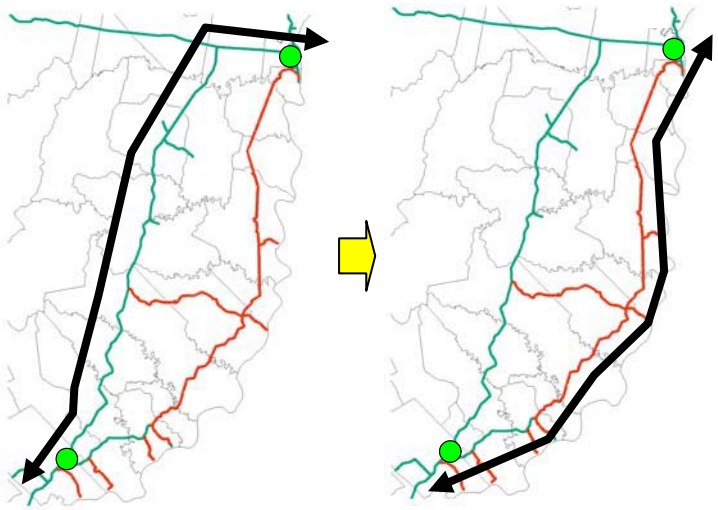
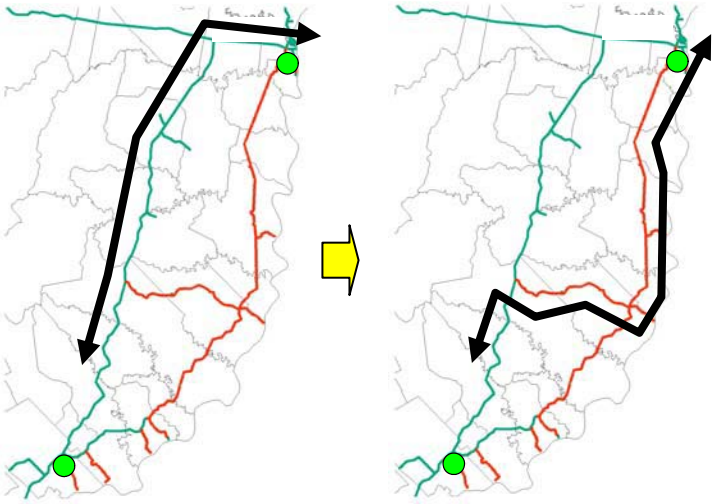
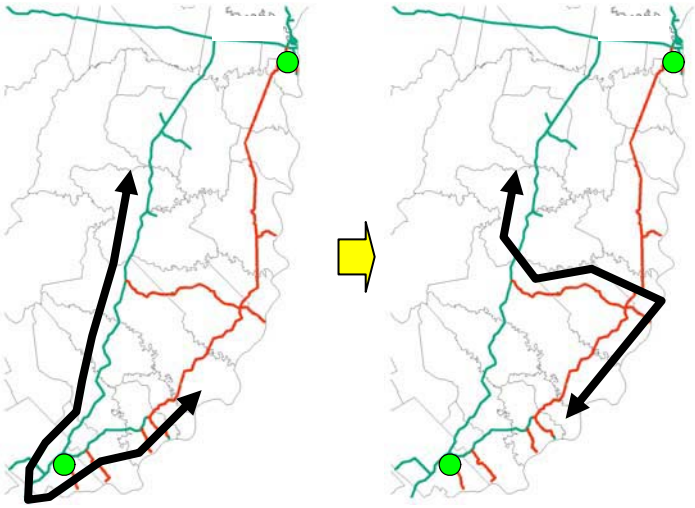
(Unit: km/h)

	Paved road	Unpaved road (including cobbled road)
Main road long Parana River	80	-
Other roads	64	32
Access roads and sub-roads	50	25

3) Future Traffic Volume Estimation

The future volume of daily detoured traffic shall be estimated by multiplying the day-night ratio by the future growth rate of the estimated detoured traffic volume. For the day-night ratio (24h / 14h) we will apply the data we got from the Trinidad toll gate, and the future growth rate is assumed to be the same as the population growth rate per department (1.39, same as previous item). The estimated detoured traffic volume is shown in Table 9.3-10. The total detour volume of National Road Route 6 was 400 vehicles per day.

Table 9.3-10 Summary of the Traffic Volume Detoured from National Road Route 6

	Detour pattern	Traffic Volume of Detoured Area	Detoured Traffic Volume
I		**2005 (veh./day)** Car 208 Bus 52 Truck 144 Total 404	**2005 (veh./day)** Car 80 Bus 31 Truck 43 Total 154 *Detour Indexo 38.1% **2015 (veh./day)** Car 110 Bus 40 Truck 50 Total 200
II		**2005 (veh./day)** Car 235 Bus 5 Truck 113 Total 353	**2005 (veh./day)** Car 90 Bus 5 Truck 35 Total 130 *Detour Index: 36.8% **2015 (veh./day)** Car 130 Bus 10 Truck 40 Total 180
III		**2005 (veh./day)** Car 38 Bus 1 Truck 61 Total 100	**2005 (veh./day)** Car 4 Bus 1 Truck 9 Total 14 *Detour Indexo 14.0% **2015 (veh./día)** Car 10 Bus 0 Truck 10 Total 20

(4) Total Future Traffic Volume

Adding (1) – (3) will equal the daily average traffic volume.

1) Traffic of Freight Trucks for Grain Exports

As shown in the annual volume of freight transportation, the average traffic volume per working day has been determined, divided by 254 days which are the working days of the year, excluding Saturdays, Sundays and holidays.

Como se muestra en el volumen anual de transporte de carga, se ha determinado el volumen de tráfico promedio por días hábiles, divido 254 días que son los días del año, sin incluir los sábados, domingos y feriados.

2) Resident Traffic alongside the Road

For the traffic of residents from the road sides, we considered 51.8% of freight trucks, taking into account its similarity with export freight transportation mentioned in the previous item. A 50% of the real vehicle ratio is estimated based on the proportion of agricultural products for export among the articles dispatched from freight transportation at the Iruña Toll Gate, and taking into account 48.2% of the total (100% - 24.1% x 2 = 51.8%) of movement related to exports and imports.

3) Detoured Regional Traffic from National RoadRoute 6

Just like Resident Traffic, we have the basic data from the Traffic Study carried out in October and February from the traffic volume data of the Trinidad Toll Gate in 2005. It was used to estimate the annual average traffic volume proportion on working days and the average working day traffic volume in February and October. We also calculated the annual average traffic volume on working days and multiplied it by the monitoring result. Besides, due to the coincidence of freight truck traffic volume for exports and imports, we have adopted the same 51.8% reference criteria for freight trucks.

4) Detoured Regional Traffic from National Road Route 6

The result of the study shows that the traffic volume on the Parana River Coastal Road is 1,410 – 4,080 units per day. From Natalio towards the north there is a higher volume. Also, the traffic volume that corresponds to the extension of National Road Route 15 is 690 – 700 units per day. With the formation of a road net between National Road Route 6 and the Parana River Coastal Road the volume of traffic will double in relation to the current volume. Likewise, the volume that corresponds to the port access roads is 210 – 2,960 daily units, PAR-8 which corresponds to downtown Ciudad del Este presents a higher amount. However, the other accesses go from 210 – 1,010 daily units.

Table 9.3-11 Future Traffic Volume Estimation (2015)

Without Caarendy

Section	Traffic of export freight trucks	Traffic of residents in the zone				Detoured traffic				Total			
		car	bus	truck	subtotal	car	bus	truck	subtotal	car	bus	truck	total
M-1(1)	140	870	40	160	1.070	130	40	40	210	1.000	80	340	1.420
M-1(2)	210	870	40	160	1.070	130	40	40	210	1.000	80	340	1.490
M-2	200	870	40	160	1.070	130	40	40	210	1.000	80	340	1.480
M-3	200	870	40	160	1.070	130	40	40	210	1.000	80	340	1.480
M-4	310	870	40	160	1.070	260	50	60	370	1.130	90	530	1.750
M-5(1)	300	870	40	160	1.070	260	50	60	370	1.130	90	520	1.740
M-5(2)	430	870	40	160	1.070	260	50	60	370	1.130	90	650	1.870
M-6	400	870	40	160	1.070	260	50	60	370	1.130	90	620	1.840
M-7	450	870	40	160	1.070	260	50	60	370	1.130	90	630	1.890
M-8(1)	450	2.320	630	220	3.170	260	50	60	370	2.580	680	730	3.990
M-8(2)	540	2.320	630	220	3.170	260	50	60	370	2.580	680	820	4.080
R15E-1	60	350	20	80	450	150	10	30	190	500	30	170	700
R15E-2	60	350	20	80	450	150	10	30	190	500	30	170	700
PAR-0	90	310	50	30	390	0	0	0	0	310	50	120	480
PAR-1	120	440	20	30	490	0	0	0	0	440	20	150	610
PAR-2	0	90	0	30	120	0	0	0	0	90	0	30	120
PAR-3	140	790	10	90	890	0	0	0	0	790	10	230	1.030
PAR-4	140	90	0	40	130	0	0	0	0	90	0	180	270
PAR-5	130	190	10	50	250	0	0	0	0	190	10	180	380
PAR-6	150	90	0	30	120	0	0	0	0	90	0	180	270
PAR-7	140	90	0	30	120	0	0	0	0	90	0	170	260
PAR-8	130	1.990	610	230	2.830	0	0	0	0	1.990	610	360	2.960

With Caarendy

Section	Traffic of export freight trucks	Traffic of residents in the zone				Detoured traffic				Total			
		car	bus	truck	Subtotal	car	bus	truck	Subtotal	car	bus	truck	Total
M-1(1)	130	870	40	160	1.070	130	40	40	210	1.000	80	330	1.410
M-1(2)	210	870	40	160	1.070	130	40	40	210	1.000	80	410	1.490
M-2	200	870	40	160	1.070	130	40	40	210	1.000	80	400	1.480
M-3	200	870	40	160	1.070	130	40	40	210	1.000	80	400	1.480
M-4	300	870	40	160	1.070	260	50	60	370	1.130	90	520	1.740
M-5(1)	290	870	40	160	1.070	260	50	60	370	1.130	90	510	1.730
M-5(2)	430	870	40	160	1.070	260	50	60	370	1.130	90	650	1.870
M-6	400	870	40	160	1.070	260	50	60	370	1.130	90	620	1.840
M-7	450	870	40	160	1.070	260	50	60	370	1.130	90	670	1.890
M-8(1)	450	2.320	630	220	3.170	260	50	60	370	2.580	680	730	3.990
M-8(2)	540	2.320	630	220	3.170	260	50	60	370	2.580	680	820	4.080
R15E-1	50	350	20	80	450	150	10	30	190	500	30	160	690
R15E-2	60	350	20	80	450	150	10	30	190	500	30	170	700
PAR-0	70	310	50	30	390	0	0	0	0	310	50	100	460
PAR-1	110	440	20	30	490	0	0	0	0	440	20	140	600
PAR-2	90	90	0	30	120	0	0	0	0	90	0	120	210
PAR-3	120	790	10	90	890	0	0	0	0	790	10	210	1.010
PAR-4	130	90	0	40	130	0	0	0	0	90	0	170	260
PAR-5	120	190	10	50	250	0	0	0	0	190	10	170	370
PAR-6	150	90	0	30	120	0	0	0	0	90	0	180	270
PAR-7	140	90	0	30	120	0	0	0	0	90	0	170	260
PAR-8	130	1.990	610	230	2.830	0	0	0	0	1.990	610	360	2.960

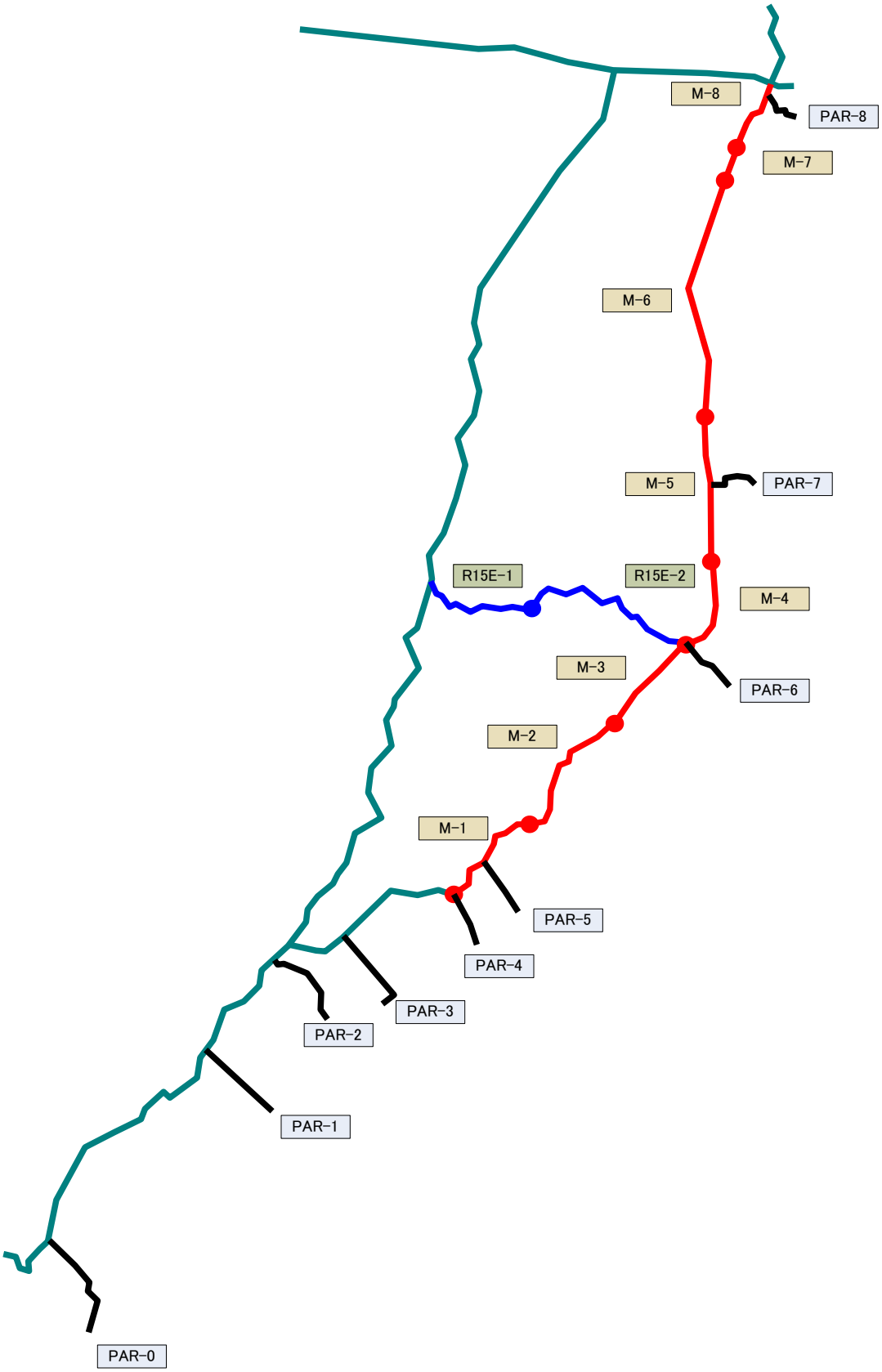


Figure 9.3-4 Road Section for Traffic Volume Forecast