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Fourth LAEBA Annual Meeting
Lima, Peru – June 17, 2008

The Determinants of Transport Costs in Brazil's Agribusiness

José Vicente Caixeta Filho

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LAEBA 2008 Fourth Annual Meeting
Infrastructure for Trade and Integration: Challenges for Latin America and Asia
Tuesday, June 16, 2008

THE DETERMINANTS OF TRANSPORT COSTS IN BRAZIL'S AGRIBUSINESS

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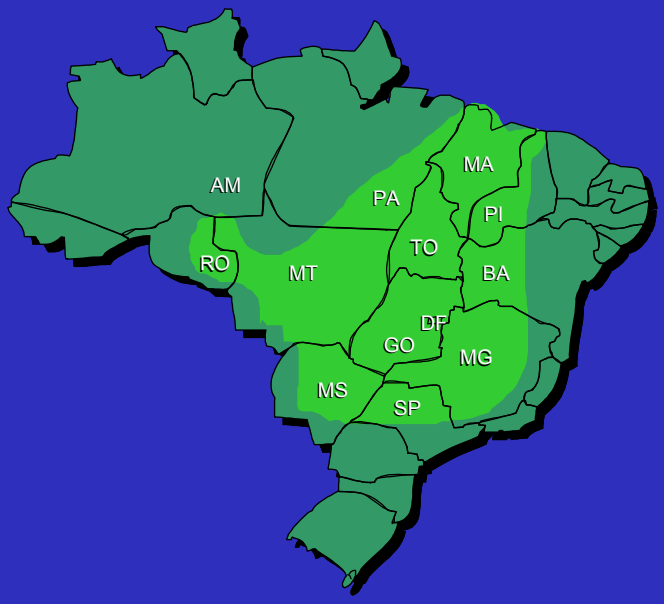
OUTLINE OF THIS PRESENTATION

- introducing the theme
- cargo transportation in Brazil
- main variables affecting agricultural road freights
- logistic expectations of the market

NEW BRAZILIAN AGRICULTURAL FRONTIER...



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In Sapezal, West of Mato Grosso state, corn is planted immediately after the harvest of soybeans. In a typical day of work, each harvesting equipment takes 175 tonnes of soybeans. Altogether, tractors, seedling and harvesting machines that appear in this picture account for more than US$ 7 million. *[Veja, 29/09/2004]*

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CARGO TRANSPORTATION IN BRAZIL

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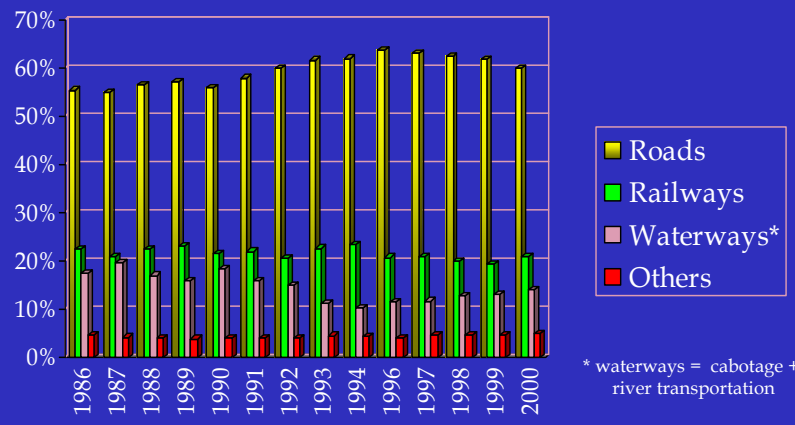
GENERAL CARGO TRANSPORTED, IN TONS-KILOMETER, PER TRANSPORTATION MODE



* waterways = cabotage + river transportation

Source: Brazilian Ministry for Transportation

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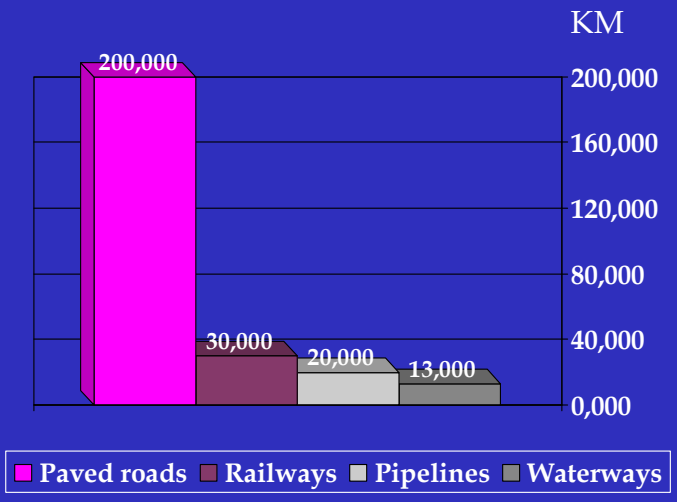
MAGNITUDE (KM) OF THE BRAZILIAN TRANSPORTATION SYSTEM, 2004



Sources: ANTT; Brazilian Ministry for Transportation; ANTAQ; Transpetro

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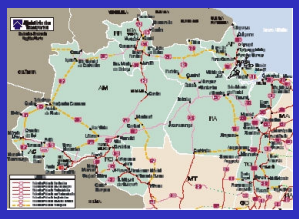
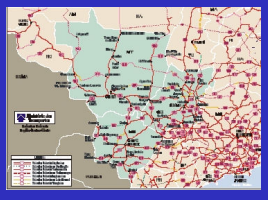
TRANSPORTATION DENSITIES IN SELECTED BRAZILIAN REGIONS, 2000

3.20 km of paved roads per 1000 km² of area



29.03 km of paved roads per 1000 km² of area

12.90 km of paved roads per 1000 km² of area



58.47 km of paved roads per 1000 km² of area

56.07 km of paved roads per 1000 km² of area

Source: Brazilian Ministry for Transportation

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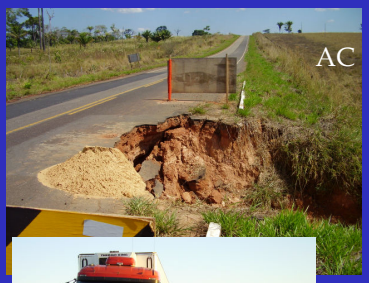
BAD CONDITIONS...



Source: CNT

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EXAMPLES OF ROAD ROUTES TRAVELED IN BRAZIL, PER PRODUCT

Product	Origin	Destination	Distance (km)
soybean	Campo Novo (RS)	Porto Velho (RO)	3,283
corn	Nova Mutum (MT)	Maraú (RS)	2,037
sugar	Barra do Bugres (MT)	Santos (SP)	1,801
rice	Bagé (RS)	Ilhéus (BA)	3,017
beef	Itaporã (MS)	Recife (PE)	3,595
cotton	Diamantino (MT)	Natal (RN)	3,616
fertilizer	Paranaguá (PR)	Nova Olímpia (MT)	2,013

Source: Sifreca

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TRAFFIC JAMS DURING SEASON TIMES...

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Sifreca

Information System for Freights

(http://sifreca.esalq.usp.br)

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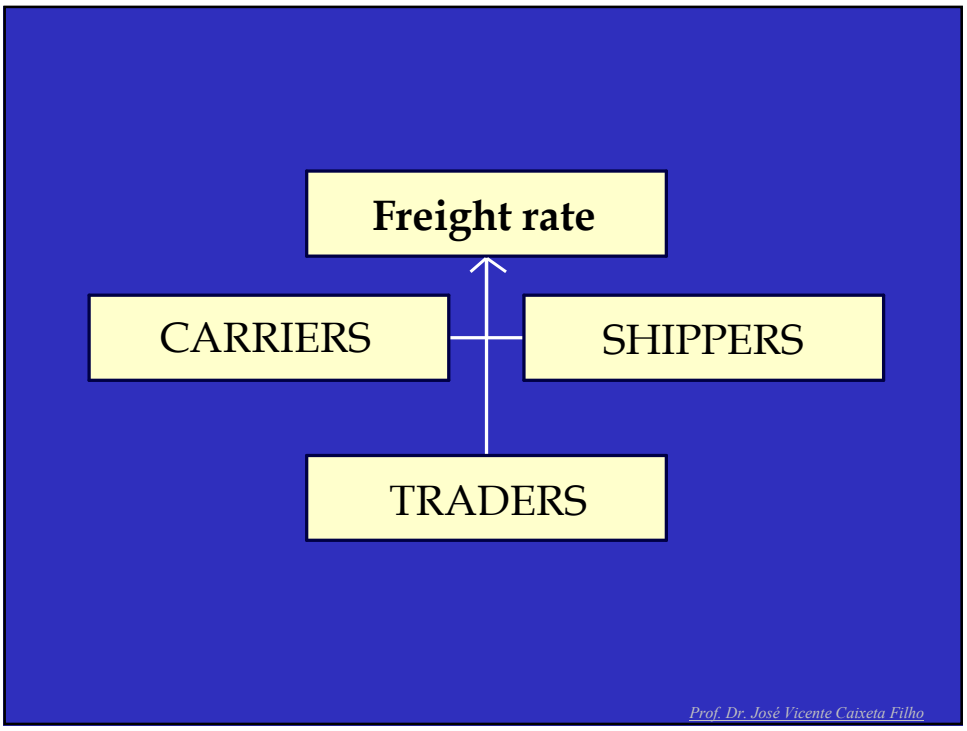


PECULIARITIES OF AGRICULTURAL CARGOES

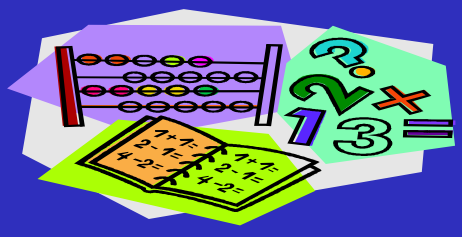
- perishability *x* high risks (due to biologic and weather conditions, for instance)
- seasonality of the production (and consumption, in some cases)
- long distances separating production and consumption sites
- low value added
- very high competitive markets

MAIN FACTORS INFLUENCING AGRICULTURAL ROAD FREIGHTS

- distance to be traveled
- type of cargo/load to be hauled
- seasonality of the demand for transportation
- regional peculiarities (at the origin and/or at the destination of the freight)
- possibility of back-hauling operation
- operational costs (e.g., type of vehicle to be utilized)
- competition and/or integration with other transportation modes
- quality of the pavement
- tolls and scales along the roads
- delivery time

Source: Correa Jr. and Caixeta Filho, 2003

FREIGHTS
x
DISTANCES



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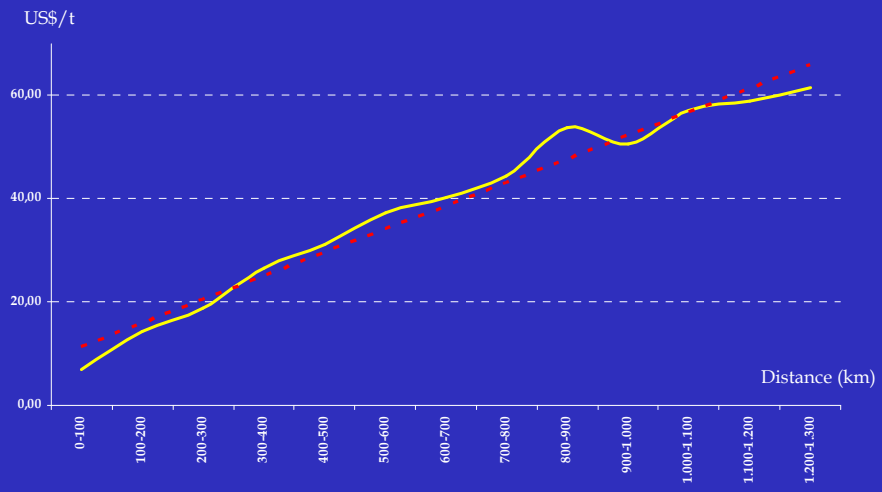
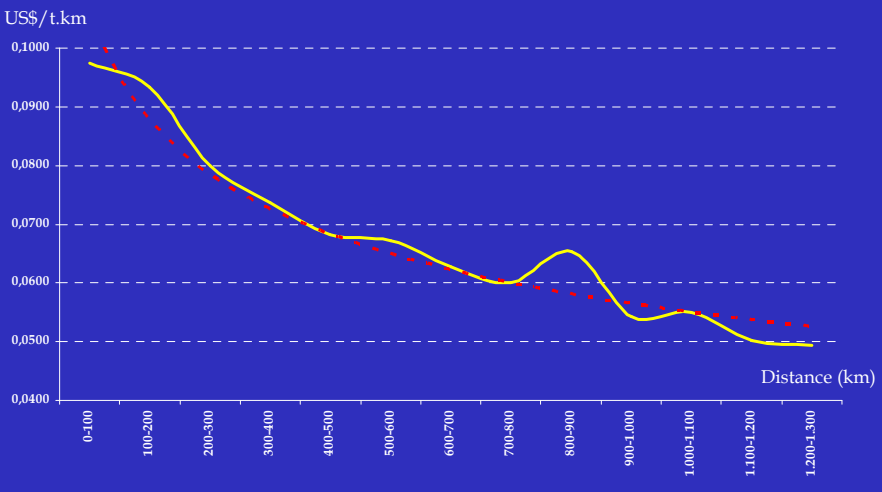
MEAN VALUES OF ROAD FREIGHTS (US$/T) FOR SOYBEANS, APR-2008



Soure:

Prof. Dr. José Vicente Caixeta Filho

MEAN VALUES OF ROAD FREIGHTS (US$/T.KM) FOR SOYBEANS, APR-2008



Source:

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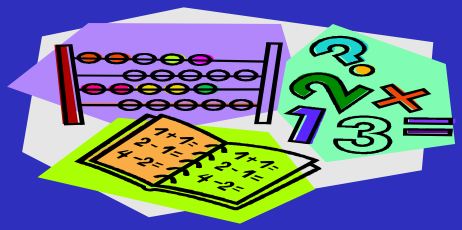
FREIGHTS

x

TYPE OF COMMODITY



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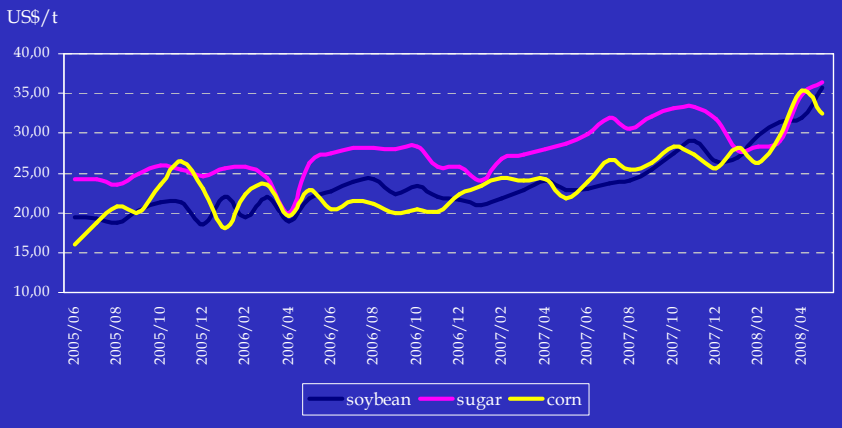
MEAN VALUES OF ROAD FREIGHTS (US$/T), JUN-2005 TO MAY-2008



Source: Sifreca

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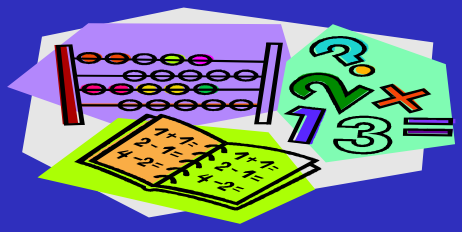
FREIGHTS
x
DISTANCES and
TYPE OF COMMODITY



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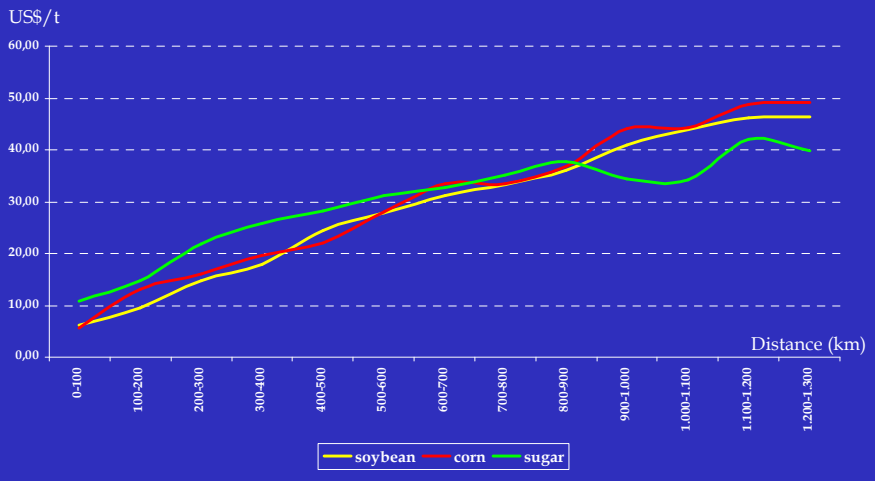
MEAN VALUES OF ROAD FREIGHTS (US$/T) FOR BULK GRAINS, JUN-2005 TO MAY-2008



Source: Sifreca

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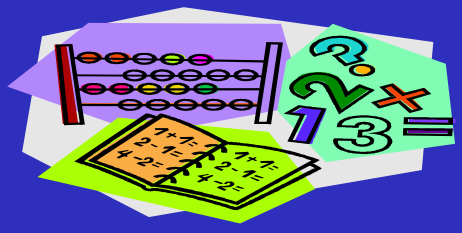
FREIGHTS
x
SEASONALITY OF THE DEMAND FOR TRANSPORTATION



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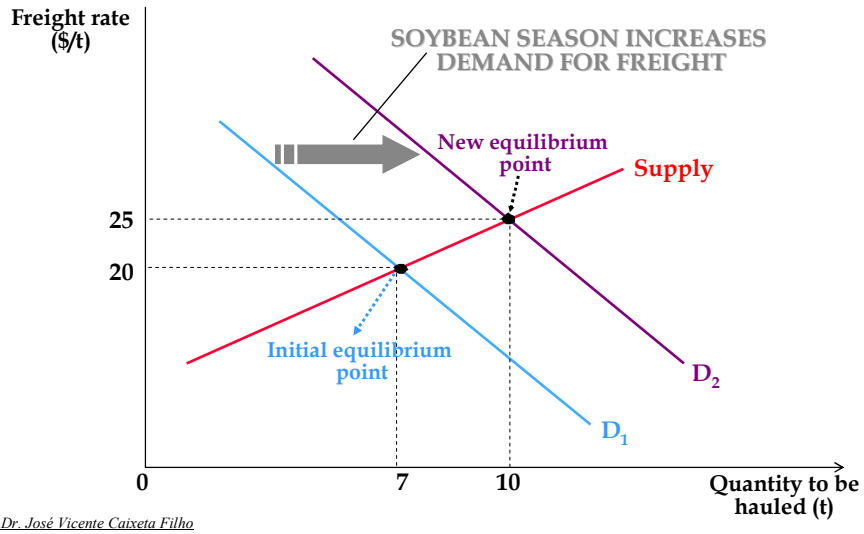
INCREASING THE DEMAND FOR FREIGHT...



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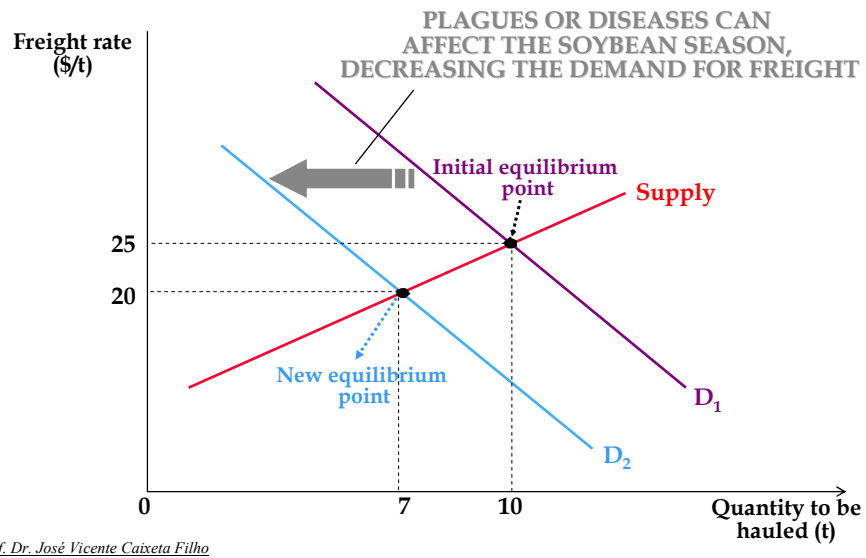
DECREASING THE DEMAND FOR FREIGHT...



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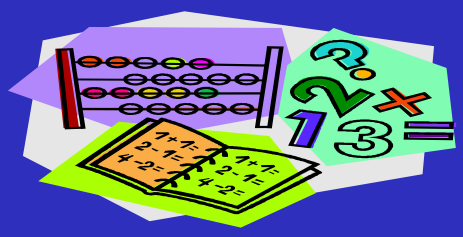
FREIGHTS
x
REGIONAL PECULIARITIES



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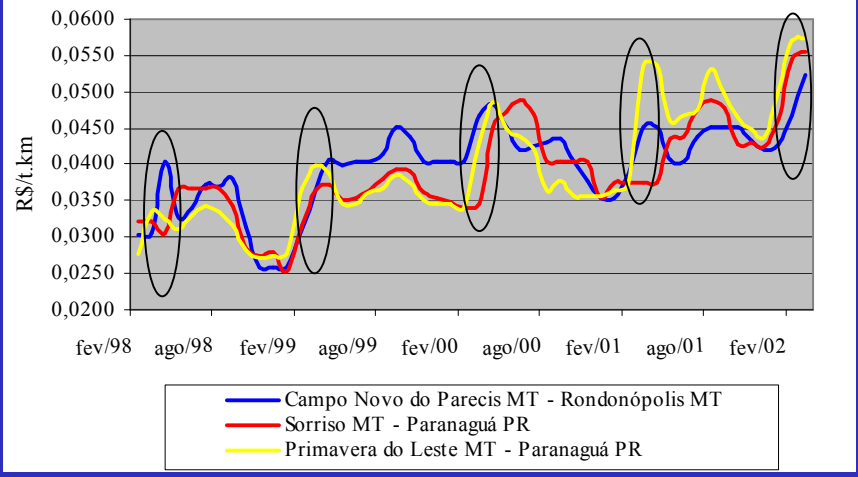
SOYBEAN ROAD FREIGHTS FROM DIFFERENT ORIGINATIONS AT THE CENTER-WEST REGION, 1998-2002



Source: Sifreca

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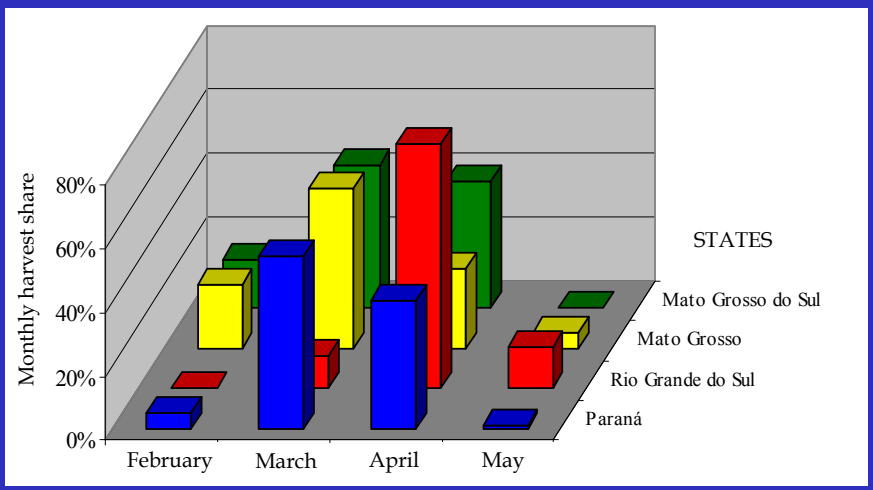
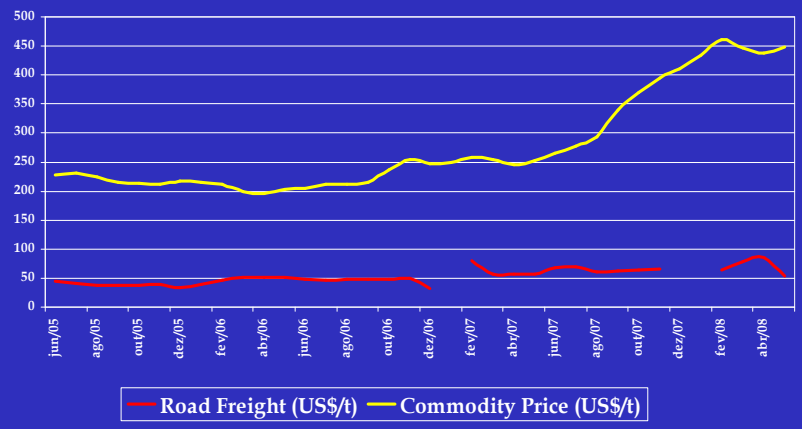
PATTERN OF HARVEST CALENDAR FOR SOYBEANS, PER BRAZILIAN STATE



Source: CONAB

BEHAVIOR OF THE BRAZILIAN SOYBEAN MARKET, TAKING THE EXAMPLE OF THE FLOWS FROM THE CENTER-WEST REGION TO THE PORT OF PARANAGUÁ (PR), 2005-2008



Source: Sifreca

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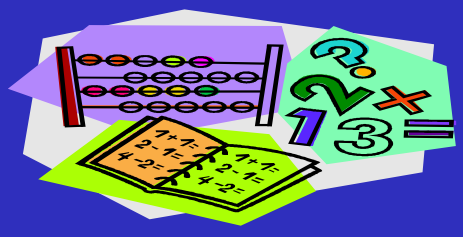
FREIGHTS

x

BACK-HAULING



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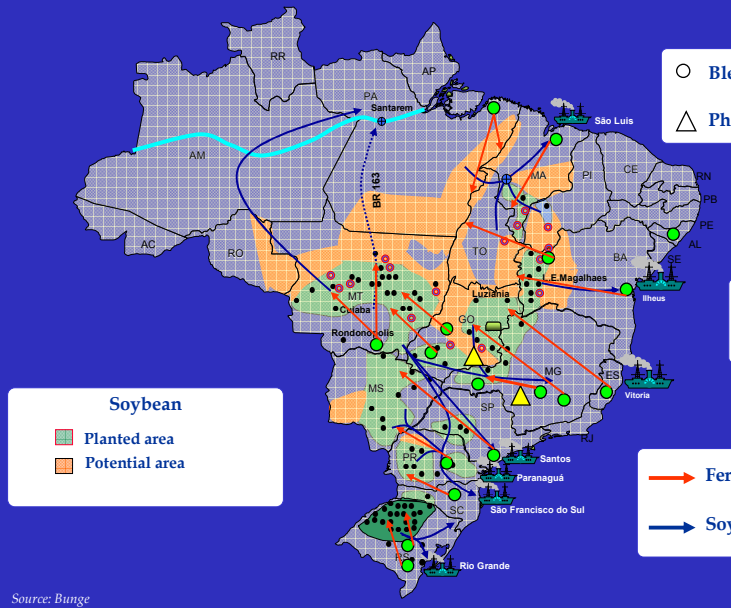
BACK-HAULING OPERATIONS INVOLVING FERTILIZERS AND SOYBEANS



- Blending factories
- Phosphate mines
- Existing silos
- New silos

Soybean
- Planted area
- Potential area

- Fertilizer flow
- Soybean flow

Source: Bunge

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MEAN VALUES OF ROAD FREIGHTS (R$/T.KM), AVERAGE DISTANCE OF 1,500 KM, JAN-2006 TO MAY-2008

Source: Sifreca

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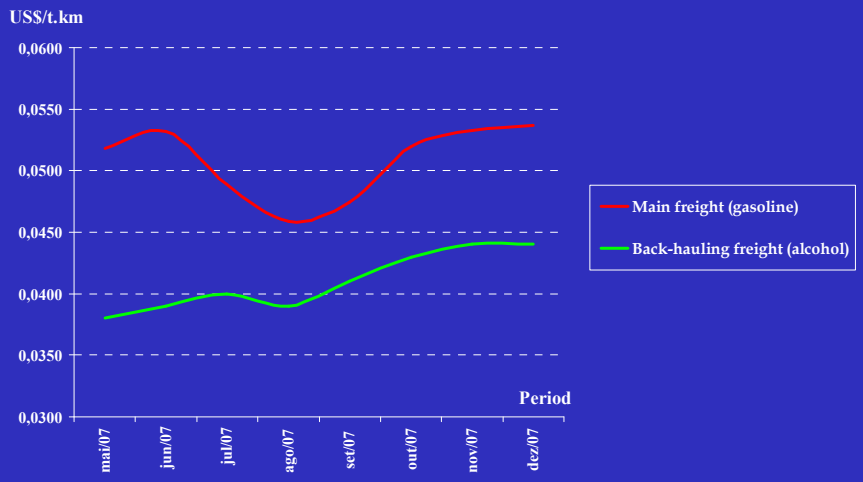
MEAN VALUES OF ROAD FREIGHTS (US$/T.KM) FOR FUELS BETWEEN PAULÍNIA (SP) AND CUIABÁ (MT), 1,508 KM, MAY TO DECEMBER 2007



Source: Sifreca

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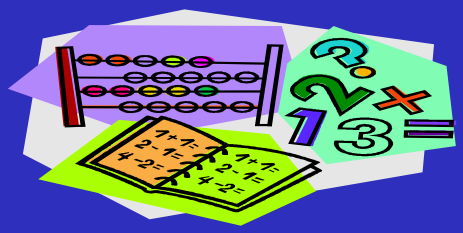
FREIGHTS

x

TYPE OF VEHICLE



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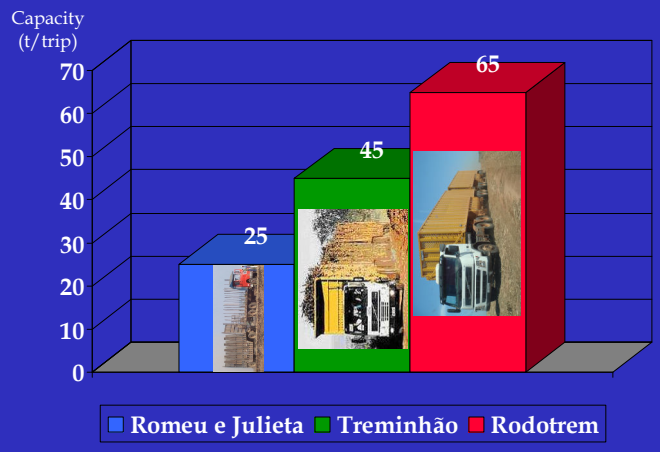
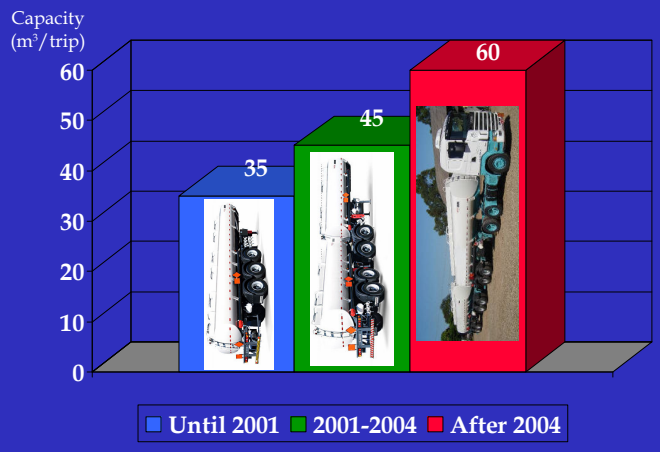
EVOLUTION OF THE TRANSPORTATION CAPACITIES FOR SUGAR-CANE TRUCKS



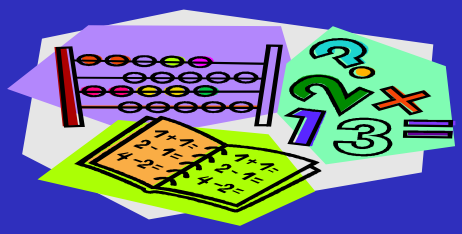
Source: Silva (2006)

EVOLUTION OF THE TRANSPORTATION CAPACITIES FOR ETHANOL TRUCKS



Source: Copersucar

FREIGHTS
x
TRANSPORTATION MODE



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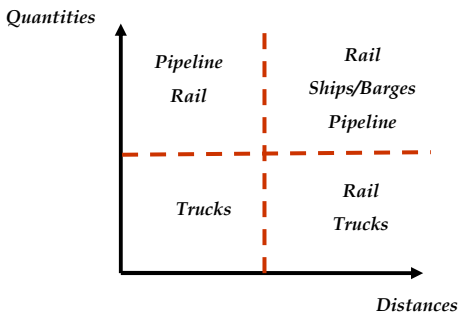
ESALQ-LOG

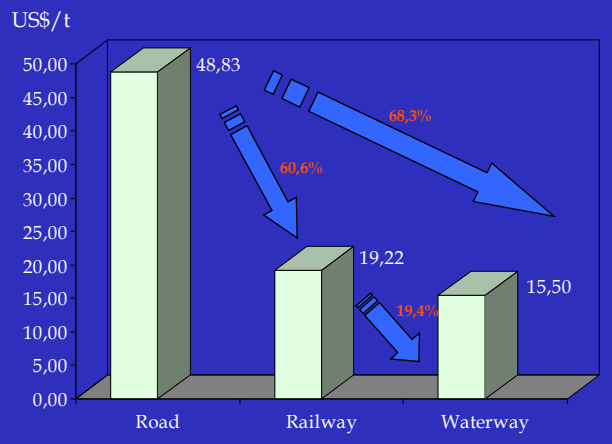
WHICH IS THE MOST ADEQUATE TRANSPORTATION MODE?

Transportation Mode Competitiveness



Source: Figueiredo (2006)

MEAN VALUES OF FREIGHTS (US$/T) FOR SOYBEANS, 1,000-1,500 KM, JUN-2005 TO MAI-2008



Source: Sifreca

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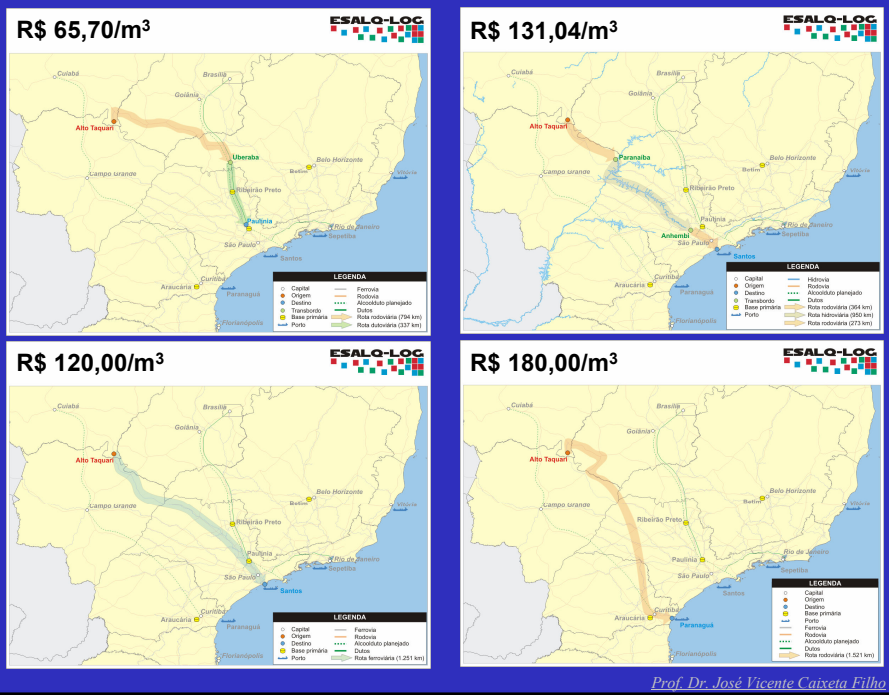

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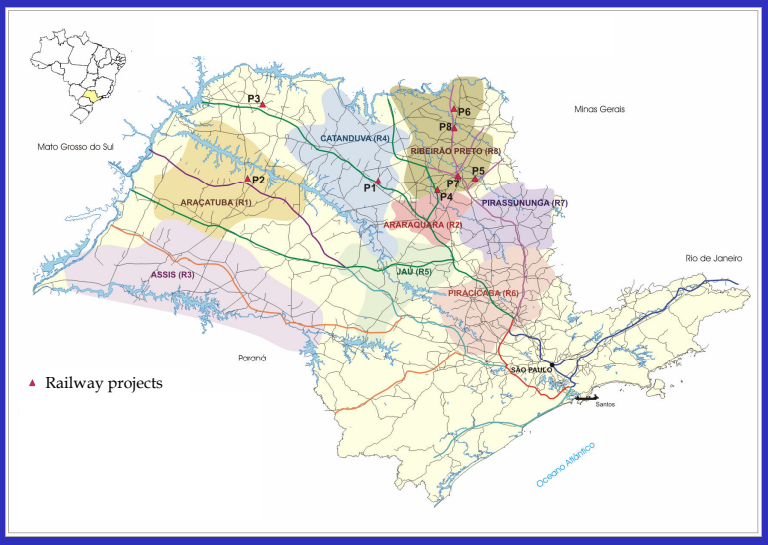
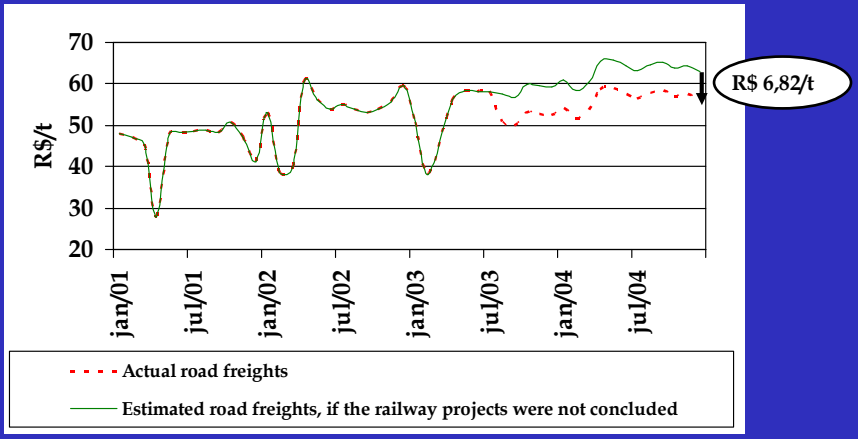
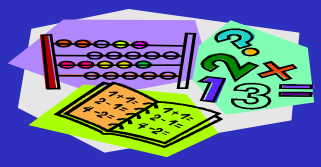


For the state of São Paulo, comprising sugar flows directed towards the port of Santos (road distances varying between 154 and 750 km), the mean road freight value obtained under the period for such analysis was R$ 51,05/t

In the case of a series of railway projects were not concluded, an additional increase of R$ 6,82/t (13% in relative terms) would be expected in the corresponding road freights for sugar.



FREIGHTS
x
DISTANCES and
TYPE OF COMMODITY and
PERIOD OF TIME and
CONDITION OF THE ROAD and
NUMBER OF TOLLS and BACK-HAULING OPERATIONS etc.



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$$FREIGHT_{ij} = \beta_1 + \beta_2 DISTANCE_{ij} + \beta_3 ROAD_{ij} + \beta 4 TOLL_{ij} + \beta_5 BACK_{ij} + \varepsilon$$

where:

$FREIGHT_{ij}$ = freight rate, in R$/t, for the transportation of soybeans from *i* to *j*;

$DISTANCE_{ij}$ = distance in km between *i* and *j*;

$ROAD_{ij}$ = quality of the pavement between *i* and *j* (binary variable: 1 for good roads and zero for the others);

$TOLL_{ij}$ = number of toll points between *i* and *j*;

$BACK_{ij}$ = possibility og getting a back-hauling operation at the destination *j* (binary variable: 1 for flows to the ports of Santos, Paranaguá and Guarujá and zero for the other destinations);

β_k = coefficients to be estimated, being k = 1, …, 5;

ε = error of the estimative.

Source: Correa Jr. and Caixeta Filho, 2003

Main results for the road freights of soybeans during season periods (January to May) of the years 1998 to 2000, originated in the states of Goiás (GO), Mato Grosso (MT) and Paraná (PR)

Variable/ "t" test	GO 1998	GO 1999	GO 2000	MT 1998	MT 1999	MT 2000	PR 1998	PR 1999	PR 2000
Intercept	6,107 (9,800)*	5,798 (10,440)*	7,635 (10,599)*	9,429 (4,332)*	13,662 (7,652)*	11,325 (7,661)*	1,716 (1,991)	3,708 (2,952)*	3,120 (8,849)*
DISTANCE	0,040 (21,401)*	0,040 (22,724)*	0,035 (19,410)*	0.039 (22,226)*	0,036 (22,401)*	0,034 (22,506)*	0,054 (45,315)*	0,054 (66,650)*	0,046 (29,092)*
ROAD	-3,068 (-2,946)*	0,780 (0,663)	-1,929 (-1,382)	-1,827 (-1,579)	-0,258 (-0,197)	2,377 (1,478)	4,882 (3,872)*	1,963 (1,288)	2,347 (3,397)*
TOLL	1,008 (2,776)*	1,425 (2,803)*	1,165 (3,258)*	0,938 (2,509)*	1,596 (2,751)*	1,817 (2,238)*	-1,175 (-2,221)**	-0,349 (-1,077)	-0,229 (-0,660)
BACK	-4.959 (-1,842)	-4,312 (-0,982)	-2,670 (-1,024)	2,131 (0,539)	1,682 (0,548)	0,711 (0,125)	-0,602 (-2,250)	2,847 (1,985)**	3,510 (2,417)*
F	616,6	467,1	218,5	413,589	473,0	312,5	342,7	628,1	243,0
R^2	0,9610	0,9125	0,8964	0,9008	0,8763	0,9144	0,9737	0,9824	0,9025
Durbin-Watson	1,139	1,786	1,606	1,951	1,655	1,842	1,766	2,512	1,528
Nº obs.	105	184	106	187	272	122	42	50	110

* level of significance = 1%
** level of significance = 5%

Source: Correa Jr. and Caixeta Filho, 2003

MAIN IMPACT TO BE EXPECTED FROM A "GOOD" LOGISTICS:

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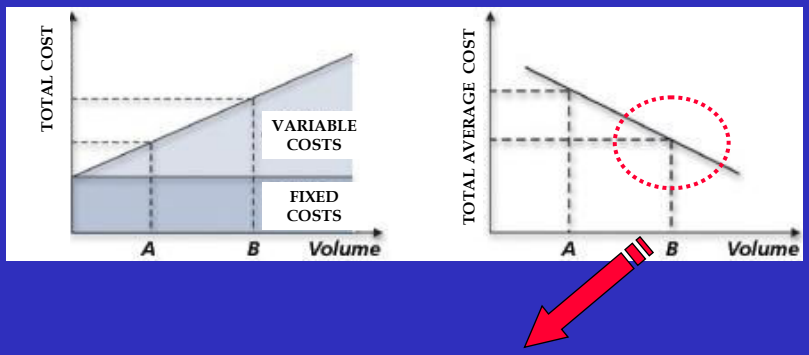
VERY COMMON STRATEGY ASSOCIATED TO A "GOOD" LOGISTICS:



dillution of the value of fixed costs…

Source: Lean Institute Brasil

"SHORCUTS" THAT CAN FACILITATE THE DILLUTION OF FIXED COSTS:

- economies of scale;
- efficiency of the process / low idleness;
- organization;
- integration among activities/players/stakeholders.

RECENT STRUCTURAL CHANGES

- privatization of a number of highways;
- concession of Federal Railway network;
- expansion of the navigability of several water basins;
- modernization of the national port system.

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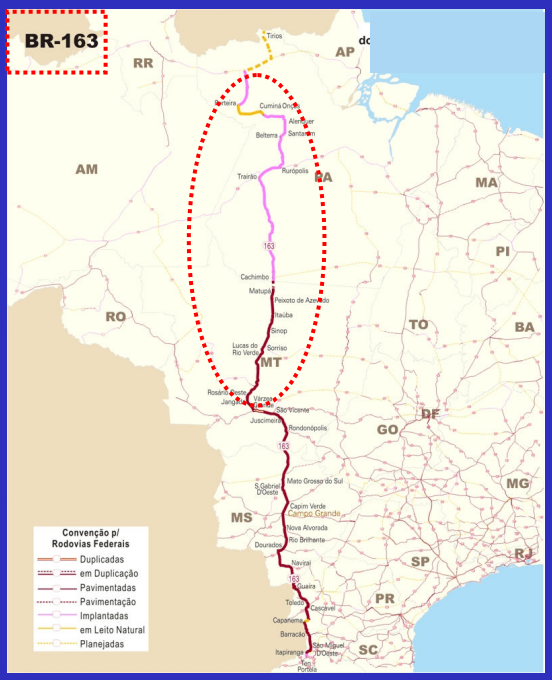

Source: Brazilian Ministry for Transportation

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ROUTES TO PACIFIC...

Prof. Dr. José Vicente Caixeta Filho

(1) Manaus (AM) - Santo Antônio do Içá (AM) - Puerto El Carmem del Putumayo (border Colômbia – Equador) - Quito/Esmeraldas (Equador);

(2) Manaus (AM) - Benjamin Constant (border Brasil – Peru) – Iquitos (Peru) - Yurimaguas/Sarameriza – Paita (Peru);

(3) Porto Velho (RO) - Rio Branco (AC) - Assis Brasil/Iñapari (border Brasil – Peru) - Puerto Maldonado (Peru) – Juliaca (Peru) – Puno (Peru) - Ilo/Matarani (Peru);

(4) Porto Velho (RO) – Abunã (RO) - Guajará-Mirim/Guayaramerim (border Brasil – Bolivia) - Caranavi (Bolivia) - La Paz (Bolivia) – Patacamaya (Bolivia) – Visiri (border Bolivia – Chile) - Arica/Iquique (Chile);

(5) Cuiabá (MT) - Cáceres (MT) - Cochabamba (Bolivia) - Arica/Iquique (Chile);

(6) Santos (SP) - São Paulo (SP) – Corumbá/Puerto Suarez (border Brasil – Bolivia) – Cochabamba (Bolivia) - Arica/Iquique (Chile);

(7) Santos (SP)-São Paulo(SP)-Paranaguá (PR) - Antofagasta (Chile);

(8) Santos (SP)-São Paulo(SP)-Paranaguá (PR) - Curitiba (PR) - São Borja/Uruguaiana (border Brasil – Argentina) - Mendoza (Argentina) - Valparaiso (Chile);

(9) Rio Grande (RS) - Uruguaiana/Paso de Los Libres (border Brasil – Argentina) -Mendoza (Argentina) - Valparaiso (Chile);

(10) Rio Grande (RS) - Uruguaiana/São Borja (border Brasil – Argentina) - Corrientes/Resistencia (Argentina) - Antofagasta (Chile).

(11) São Paulo - Entr. p/ Botucatu - Espírito Sto. do Turvo (SP) - Presidente Prudente (SP) - Presidente Epitácio (SP) - Campo Grande (MS) - Cuiabá (MT) – Cáceres (MT) - Porto Esperidião (MT) - San Ignácio (Bolivia) - Santa Cruz (Bolivia) – Cochabamba (Bolivia) - Desaguadero (Peru) – Moquegua (Peru) – Nazca (Peru) – Lima (Peru);

(12) Santos (SP) – Rondonópolis (MT) – Porto Velho (RO) – Rio Branco (AC) – Cruzeiro do Sul (AC) – Orolanna (Peru) – Tarapoto (Peru) - Puerto Bayovár (Peru).

MAIN HIGHLIGHTS...

- cargo's owner = logistics' owner;
- higher bargaining power of the shippers over the carriers;
- greater frequency of back-hauling operations

LOGISTIC EXPECTATIONS OF THE MARKET

- increase of the highway freight tariffs (and better level of service);
- efficient strategies for a systematic maintenance of the highways (PPPs???);
- decrease of the rail and waterway freight tariffs;
- rescue of the credibility of railway networks (lost under the public management period);
- expansion of coastal traffic (cabotage) and pipeline activities;
- increase of the capacity and efficiency of the seaport terminals;
- location of new industrial plants near to the main transportation corridors;
- expansion of the storage system (especially on the farms);
- active role of the transportation coordinating agent as a regulating policy maker;
- consolidation of the intermodal model in remote areas (North and Center-West);
- much greater importance of the evaluation of environmental effects to be resulted from logistic interventions.

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ESALQ-LOG – Grupo de Pesquisa e Extensão em Logística Agroindustrial (log.esalq.usp.br)
LEAN INSTITUTE BRASIL (lean.org.br)
SIFRECA – Sistema de Informações de Fretes (sifreca.esalq.usp.br)
TRANSPETRO (www.transpetro.com.br)

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