



CHAPTER 2

GENERAL SITE DESCRIPTIONS

The transportation of sugar cane in the western region being studied in this research is an important element of national economy development. To investigate this behavior, some general background concerning the system used is necessary. Thus, the circumstantial performance of sugar cane transportation will be described in the following paragraphs.

2.1 Mode of Sugar Cane Delivery

At present, there is only one mode of transportation within the region. This is using 10-wheel diesel engine trucks to deliver the sugar canes from farms to the mills. The loading process of the sugar cane into the truck for transportation is performed as follows; after the cane have been cut by manpower which the numbers ranging between 8-15 persons in each cutting area (depending on the requirement of the farm owners for quickness and number of trucks to be used in delivering), they were tied up in bundles. Each bundle composed of about 10 pieces of canes, and laid down orderly in piles along the field. The next step is to load the cane bundles on the truck, which can be classified into two cases according to the ground conditions. The first one deals with cane loading in dry season or in the case where there is no rain to cause the mud, and the heavy trucks are able to run into the field conveniently. There must be

at least four men (two on the ground and the other two on a truck) for loading the bundles of canes from each pile to fill up the trucks which run slowly at a speed of about 0-5 kph to pick up cane bundles until full. The time spent for this step varies between 4-6 hours based on the skill of loaders and quantity of the canes. Procedures used in this step is illustrated in Fig 6 and Fig 7.

The second step deals with cane loading in the rainy season. The surface of cane growing fields are silty clay which becomes muddy when wet. Therefore, heavy trucks can hardly enter into the growing fields. In case where the farmer tractors are available, and able to pull the loaded trucks out of the mud holes, the procedure of loading is the same as in dry season. On the contrary, when the mud holes are so deep that the trucks cannot operate in the field and/or tractors are not available, then the bundles of cane have to be delivered by using pick ups or light trucks (Datsun 1,300-1,500 c.c. are normally used) from growing fields to the edges of roadways for further loading on trucks. The time used for loading bundles of cane into the pick ups or light trucks is about half an hour for four loaders, and the time used for loading to full the trucks are about three hours by four skilled loaders.

2.2 Characteristic of Line Haul Routes and Roadways

Local roads or farm roads and highways generally are line haul routes that farmers can move their agricultural products to markets or factories, or in turn, to move the farm inputs to the plantation areas. Better line haul routes will increase the efficiency of land transportations and result in the reduction of transport cost, operating cost (VOC),



FIG. 6 Cutting and Piling of Sugar Cane



FIG. 7 Loading of Sugar Cane on Trucks

accidents, etc. Improved roads and/or new roads can induce or effect an increase of agricultural products and cause extention of plantation areas

The line haul routes in this research can be classified into three major categories as follows:

2.2.1 National Highways and Provincial Roads

All of these roads that serve cane trucks travel from farm roads toward the mills are belong to Department of Highways, which mostly are paved with various types of surface; double surface treatment, penetration macadam, and asphaltic concrete.

The classified surface types and classes of highway responded by Highway Districts within the study area are illustrated in Table 4. The line haul routes and bridge conditions under controlled by Highway Districts are shown in Fig.8 and Fig.9 respectively.

Table 4 Classified surface type and classes of highways.

Primary Highway

Highway District	Surface Type						Total (K.M.)
	Conc. ¹	A.C. ²	Std. ³ P.M.	S.T. ⁴	Un.Std. ⁵ P.M.	Soil ⁶ Agg.	
Ban Pong	-	31.340	-	-	10.061	-	41.401
Suphanburi	-	-	-	-	-	-	-
Thonburi	32.927	115.339	-	-	1.626	-	149.892
Ratchaburi	-	102.433	26.313	-	-	-	128.746
Total							320.039

Table 4 (continued)

Secondary Highway

Highway District	Surface Type						Total (K.M.)
	Conc.	A.C.	Std. P M.	S.T.	Un.Std. P.M.	Soil Agg	
Ban Pong	-	-	40.169	55.924	51.682	-	147.755
Suphanburi	-	-	52.802	-	79.014	-	131.816
Thonburi	8.460	1.548	8.303	-	30.027	-	48.487
Ratchaburi	-	17.355	9.525	18.091	-	-	44.971
Total							373.049

Provincial Highway

Highway District	Surface Type						Total (K.M.)
	Conc.	A.C.	Std. P M.	S.T.	Un.Std. P M.	Soil Agg	
Ban Pong	-	-	103.314	-	0.704	-	104.018
Suphanburi	-	-	5.00	72.060	7.700	38.345	128.095
Thonburi	-	-	35.750	18.375	46.530	15.200	115.855
Ratchaburi	-	-	84.814	18.294	-	18.900	122.008
Total							469.976

Source; Department of Highways (1977).

*Ban Pong Highway District response highways in Kanchanaburi Province

**Thonburi Highway District response highways in Nakorn Pathom Province.

1. Conc. = Concrete
2. A.C. = Asphaltic Concrete
3. Std.P M. = Standard penetration macadam
4. S.T. = Surface treatment
5. Un.Std. P M. = Under standard penetration macadam
6. Soil Agg. = Soil Aggregate

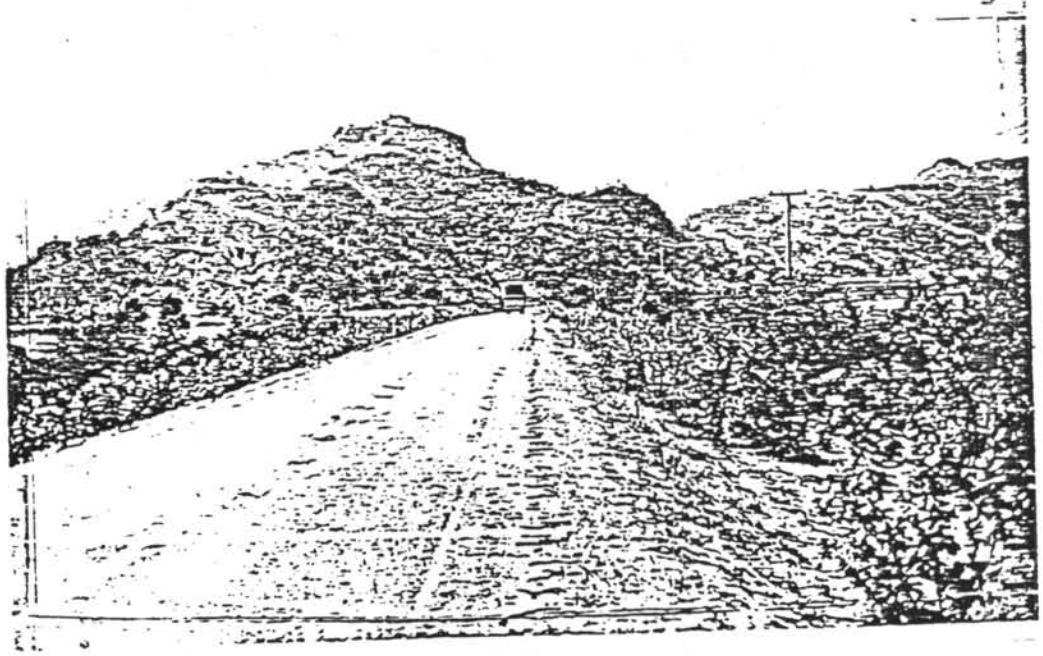


FIG 8 Cane Truck on the Line Haul Route



FIG 9 River Crossing of Cane Truck at Concrete Bridge

2.2.2 Farm Roads

Most of the farm roads within the study area are unpaved roads, of granular surface, and earth surface which lack of proper geometric design standard. They are temporary used for cane trucks and cane fertilizer trucks during harvesting and growing season which is only 4-5 months a year. All of these farm roads are under the maintenance of the Sugar Cane Plantation Association of the Seventh Part. Information on Location and distance of these farm roads by changwats and maintenance cost from the years 1968-1976 are presented in Table 5 and Table 6 respectively. Fig 10 illustrate the characteristics of farm roads which actually dominated over the plantation areas.



FIG.10 Characteristic of Farm Roads



Table 5 Existing farm route in the study area, year 1976.

Section	Plantation Area District	Changwat	Amount of Route	Distance (Km)
1.	Kamphaeng Saen	Nakhon Pathom	33	138
2.	Kamphaeng Saen, Dontoom	Nakhon Pathom	45	231
3.	Nakorn Pathom Ban Pong	Nakhon Pathom Ratchaburi	28	250
4.	Ban Pong Kamphaeng Saen Tha Makha	Ratchaburi Nakhon Pathom Kanchanaburi	18	85
5.	Song Phinong	Suphan Buri	24	174
6.	Suphanburi U-Tong Phanomtuan Lao Kwan	Suphan Buri Kanchanaburi Kanchanaburi	52	370
7.	Tha Makha Song Phinong	Kanchanaburi Suphan Buri	21	113
8.	Tha Makha Tha Muang	Kanchanaburi Kanchanaburi	28	149
9.	Tha Muang Phanom tuan	Kanchanaburi Kanchanaburi	19	90
10.	Pho Tha Ram Jom Bueng	Ratchaburi Ratchaburi	35	276

Table 5 (Continued)

Section	Plantation Area District	Changwat	Amount of Route	Distance (Km)
11.	Ratchaburi	Ratchaburi	38	370
	Photharam	Ratchaburi		
	Jom Bueng	Ratchaburi		
	King Suan Pheung	Ratchaburi		
12.	Kanchanaburi	Kanchanaburi	32	280
	Sai Yok	Kanchanaburi		
13.	Kanchanaburi	Kanchanaburi	35	279
	Bo Phloi	Kanchanaburi		
	Sri Sawat	Kanchanaburi		
		Total	408	2,705

Source: The Sugar Cane Plantation Association of the Seventh Part (1977).

Table 6 Maintenance cost of farm route in the study area, years 1968-1976

Year	Maintenance Cost, Baht	Index
1968	500,000	100
1969	600,000	120
1970	1,050,000	210
1971	2,210,000	442
1972	1,959,000	392
1973	2,201,000	440
1974	3,255,000	647
1975	4,501,500	900
1976	5,000,000	1,160

Source : The Sugar Cane Plantation Association of the Seventh Part (1976).

2.2.3. Roads within Community Area

The cane trucks travel through community areas at some portions, such as, Amphoe Ban Pong and Amphoe Mueng Kanchanaburi. These trucks affect the traffic flow within that area, and due to the large amount of payload of cane, some of it falls onto the road surface. Therefore, clean up of road surface, repair of pavement failures, and other are necessary.

2.3 Characteristic of Termini

The termini of sugar cane trucks are sugar mills which are mostly located in various points along the sides of the Mae Klong river and the highway route No. 323, starting from Tambon Wang Sala, Amphoe Tha Muang, to Amphoe Ban Pong. There are about fifteen sugar mills situated besides this main line haul route. Moreover, there are others six sugar mills located in Suphan Buri, Nakhon Pathom and Ratchaburi. The sugar mills in this region have relatively higher crushing capacities than that of the other regions in which the crushing capacity of each mill and amount of treated sugar cane by each mill for the years 1971 - 1978 are illustrated in Table 7 and Table 8 respectively.

The criteria for sugar cane purchasing in the region is primarily based on truck weighing process except at the Mahakun mill which the c.c.s^{*} method was adopted. For the payment process, money is usually paid by sugar mill owners to the quotamen who are the co-ordinators between the farmers and the mills. Then, the payment to the farmers will be carried on.

2.4 Characteristic of Truck Traffic

A large number of heavy trucks are used to transport the sugar cane from farm to the mills. For example, in the production years of 1976 - 1977, the amount of sugar cane needs for crushing in the western region per day were 133,530 metric tons. Thus, the number of trucks

* C.C.S. is the method of cane purchasing based on the quality of cane poles.

Table 7 Number of Sugar Mills and their Capacities Within Study Area;
Years 1976 - 1977

No.	Name	Capacity Ton/day	Quantity of Production Ton/day		Distance from Bangkok, Km.	
			Normal	Maximum		
1.	Prachuab Industry	9,600	11,000	11,300	98	
2.	New KrungThai	7,000	7,300	8,000	92	
3.	Tha Makha	8,500	8,300	99,300	98	
4.	Mitre Pole	9,500	9,900	10,500	89	
5.	Mitre Kaset Industry	8,000	11,400	12,300	90	
6.	Ratchaburi Industry	8,000	9,800	10,150	82	
7.	Thai Sugar	8,000	10,900	12,300	90	
8.	Ruam Kamrap	4,000	4,200	4,400	95	
9.	Ban Pong Industry	8,000	10,370	11,500	87	
	(1, 4)	10,500	12,130	13,000	91	
10.	Thai Rung Ruang	2	2,500	2,600	3,000	91
	3	3,500	3,700	4,000	91	
11.	Kanchanaburi Industry	8,000	8,500	9,900	91	
12.	Thai Permpool	8,000	7,870	8,500	106	
13.	Krung Thai Industry	2,500	2,780	3,100	95	
14.	Thonburi (1)	7,500	4,050	4,400	84	
	(3)	3,500	3,300	3,500	84	
15.	Nakorn Pathom*	13,930	-	-	105	
16.	Suphanburi	3,000	3,240	3,500	170	
17.	THai Industry**	12,000	-	-	105	
	Total	133,530				

Source: The Sugar Institute (1977).

*Closed now, Illegitimate Sugar Mill

**Not Opened.

Table 8 Actual treated sugar Cane from Sugar Mills within the Study Area, Unit: metric ton.

Name of sugar Mill	YEAR OF PRODUCTION						
	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977	1977-1978
Prachuab Industry	-	-	-	579,243.38	903,551.25	1,113,828.06	645,995.17
New Krung Thai	340,584.60	664,007.17	594,578.00	572,835.47	659,209.58	729,467.90	498,392.85
Tha Makha	-	-	408,319.11	465,565.88	732,475.56	966,150.58	598,032.50
Mitre Phol	596,955.95	1,025,697.05	1,116,025.36	946,356.43	1,055,772.31	1,272,327.15	676,072.10
Mitre Kaset	84,778.90	590,449.17	881,791.28	789,361.25	833,691.21	1,291,692.05	854,086.94
Ratchaburi Industry	-	-	-	155,298.84	798,816.40	1,194,334.04	738,099.89
Thai Sugar	-	-	503,554.79	744,100.09	956,285.06	1,192,012.56	793,776.84
Ruam Kamrab	321,765.71	508,298.30	381,649.73	282,038.22	410,898.03	555,439.08	275,125.45
Ban Pong Industry	-	-	-	303,548.27	832,565.63	1,101,074.38	677,433.99
Thai Rung Ruang	804,763.12	1,085,498.18	1,315,879.57	1,188,682.89	1,453,303.14	2,129,762.31	1,220,418.55
Kanchanaburi Industry	323,817.00	617,830.72	708,997.31	506,831.02	683,886.62	1,144,473.19	618,110.90
Thai Permpool	-	-	-	271,477.34	693,058.01	941,010.19	527,998.02
Krung Thai Industry	221,708.58	294,284.21	328,585.63	233,133.86	212,944.90	360,307.53	162,329.27
Thonburi 1, 3	696,586.69	1,016,765.93	875,735.26	616,685.13	691,523.39	603,348.51	416,846.91
Nakorn Pathom	-	-	-	-	137,389.00	390,691.04	-
Suphanburi	-	-	-	306,934.38	391,355.79	482,358.84	416,487.10
*Mahakun	-	-	-	115,957.46	523,920.00	1,349,610.79	831,328.11

Source: The Sugar Institute (1977).

*The mill situated in Changwat Singburi

required to transport the cane would be about 6,675 truck trips per day (average payload weight of a cane truck was 20 metric tons). Table 9, illustrated the number of truck registration within four changwats and the whole kingdom.

The important characteristics affecting cane truck traffic are speeds and congestion with other traffic. During the harvesting season, cane trucks will travel all day and night from many line haul routes which convert to route No. 323 before entering sugar mills for unloading. At the same time, the unloaded trucks from each mills will use this route to return to the plantation areas. Thus, during 4-5 months of the crushing period, these trucks create a lot of problems to other traffic on this route. A figure showing the convoy of cane trucks on route No. 323 was given in Fig.11.

Table 9 Number of Truck Registration within Four - Changwats and the whole Kingdom

Changwats Year	Kanchanaburi				Suphanburi				Nakorn Pathom				Ratchaburi				The whole Kingdom			
	Public	Private	Total	Index	Public	Private	Total	Index	Public	Private	Total	Index	Public	Private	Total	Index	Public	Private	Total	Index
1970	2,053	1,457	3,510	1.00	974	970	1,944	1.00	858	3,391	4,349	1.00	680	1,838	2,518	1.00	23,692	107,935	140,627	1.00
1971	1,843	1,741	3,584	1.02	1,056	1,523	2,579	1.33	822	3,935	4,757	1.09	741	1,948	2,689	1.07	35,619	113,317	148,936	1.06
1972	2,200	1,653	3,853	1.10	1,055	1,683	2,738	1.41	748	4,692	5,440	1.25	619	2,559	3,178	1.26	37,702	102,663	140,365	1.00
1973	1,103	2,860	3,963	1.13	1,026	2,155	3,181	1.64	816	5,666	6,482	1.49	604	2,904	3,508	1.39	41,807	140,365	182,057	1.29
1974	2,095	5,138	7,233	2.06	746	2,872	3,618	1.86	980	7,358	8,338	1.92	541	3,307	3,848	1.53	46,292	169,141	215,433	1.53
1975	2,813	5,476	8,289	2.36	751	3,789	4,540	2.33	559	9,354	9,913	2.28	480	3,884	4,364	1.73	47,573	194,322	241,895	1.72
1976	1,526	6,247	7,773	2.21	880	4,982	5,862	3.01	859	11,866	12,725	2.93	433	4,423	4,856	1.93				
1977		NA.				NA.				NA.				NA.						

Sources: National Statistical Office, Thailand

Notes: The truck registration of the wole Kingdom were not included the Trailer & Semi-Trailer

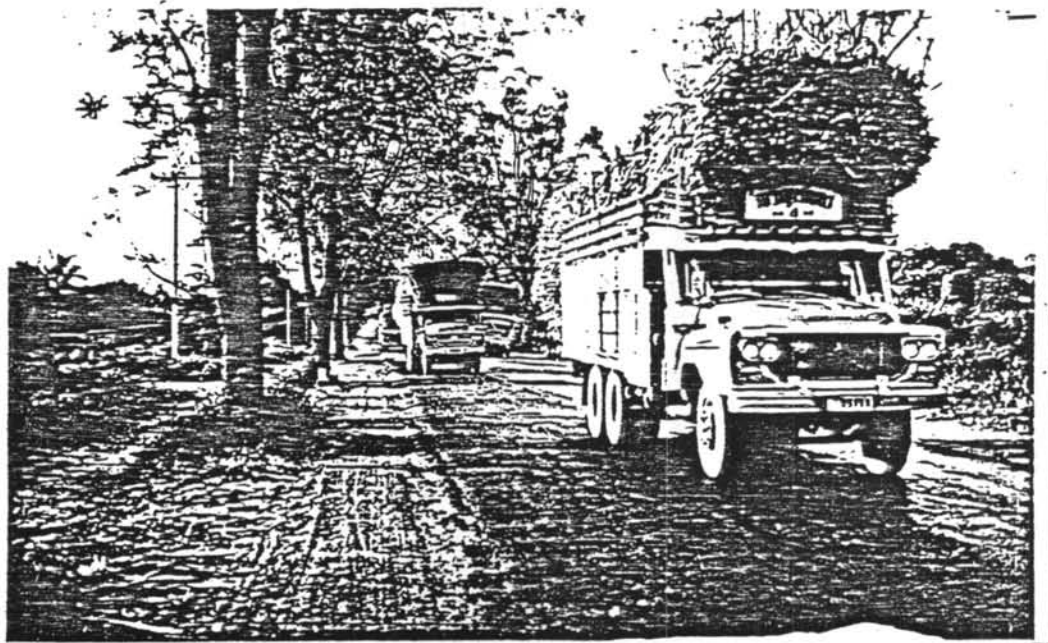


FIG 11 Convoy of the Cane Trucks on Highway Route No. 323

2.5 River Crossing for Cane Trucks

There is only one main line haul route (Route No. 323) on the north bank of the Mae Klong river which serve the cane trucks for cane transportation. Therefore, in the north part of cane growing area, the minor line haul routes were easily accessible to this main route, and consequently, the cane transportation by trucks are convenient. on the other hand, there are only minor line haul routes on the south bank of the river. Thus, the cane trucks have to cross the river of about 80 - 130 meters wide by using three reinforced concrete bridges and three truck carrier boats. Details of these river crossing can be described as follow.

2.5.1 Reinforced Concrete Bridges

There are three long span bridges for the cane trucks to cross over the rivers in the defined study area. The dimensions and locations of these bridges are shown in Table 10.

Bridge No. 1 is situated at about 150 - m from route No. 323 and By - Pass Ban Pong intersection to the south. This bridge serves the cane trucks from Amphoe Chombueng and Ban Pong, Changwat Ratchaburi. The distance between the bridge and the nearest sugar mills is about 3 - km to the west.

Bridge No. 2 is situated at about 200 - m from Tha Maka intersection to the west. This bridge serves the

cane trucks from Amphoe Sai Yoke and some parts of Amphoe Muang, Changwat Kanchanaburi. The distance to the nearest sugar mill is about 20-km to the east.



Table 10 The dimensions and locations of the bridges

Bridge No.	Location (Amphoe)	Cross over river	Length (m)	Roadway width(m)	Condition
1.	Ban Pong Ratchaburi	Mae klong	300.00	8(1.50)*	Fair
2.	Tha Maka Kanchanaburi	Mae klong	210.00	8(1.50)	Fair
3.	Tha Makham Kanchanaburi	Kwai Yai	200.00	8(1.50)	Fair

SOURCE: DEPARTMENT OF HIGHWAYS (1977).

* 1.50-m, is the width of walkway on both sides of the bridges.

2.5.2 Truck Carrier Boats

Truck carrier boats which is pulled by tug boat have dominated for the cane trucks from the southern part of the Mae Klong river and Kwai Yai river before reaching the main line haul route as there are no brigdes at the specified ferries location. These ferries are operated by private sectors. Dimensions of each truck carrier boat

are given in Table 11. Locations of these ferries are explained as follow:

Ferry No. 1 is located at the front of Kanchanaburi township gate.

Ferry No. 2 and No. 3 are located at Tambol Ban Tai Changwat Kanchanaburi. These two ferries which are operated by two owners are about 100-m apart at nearby location.

It is noticed from site survey that each ferry has two truck carrier boats, one in duty and the another one for spare.

Table 11 The dimension of truck carrier boats.

Truck Carrier at Ferry	Length (m)		Width(m)			River width in metre (approx)
	Floor	Total	Floor	Walkway	Total	
No. 1	30	* 34	8	4	12	80
No. 2	30	* 34	8	4	12	100
No. 3	30	* 34	8	4	12	130

* Include 2-m. steel bridge at both ends of the truck carrier boats.