

ASSESSING THE TRANSPORTATION PROBLEMS OF THE SUGAR CANE INDUSTRY IN THAILAND

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ABSTRACT

Transportation has a fundamental role in the economic development of all countries. It is not just a means to service commuting people, but also to collect products and materials from producers and distribute them to consumers. Transportation has become a significant factor affecting the production costs of commodities. The production of sugar cane in Thailand is no exception. The cost of transporting sugar cane from the farm gate to the mills is quite high, owing to the multiple transport facilities and time-consuming activities involved in the delivery process. The total transportation expenditure was estimated at 5,708 million baht for the crop year 1999-2000. The average cost per transaction incurred by farmers (excluding other labour costs) was in the range of 180-220 baht per ton in 1999. A large portion of this cost comprises truck rental and driver wages. These two elements together represent a high proportion of the overall production cost. The transportation issue has been overlooked in many industrial sectors and in the agricultural sector, in particular. The purpose of this paper is to present the findings of a study on the transportation and other relevant costs of sugar cane production. The findings and the subsequent recommendations could be considered for the enhancement of welfare of the sugar cane farmers and the increased efficiency of the industry in general and may also be applied to other agro-based industries facing similar problems.

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INTRODUCTION

Transportation is an essential element of the production-distribution chain. Delays in transportation are of serious concern since they affect production costs, which are eventually reflected in the consumer price. The present paper focuses on the assessment of transportation costs in the sugar cane industry, since they have been found to be very high in proportion to other variable costs. Owing to constraints, the study focuses only on the north-east region of Thailand. Data were collected through interviews with sugar-mill owners, sugar cane growers and truck operators. The study recommends a strategy for the establishment of an effective management mechanism in the delivery process of sugar cane products.

I. THE SUGAR INDUSTRY IN THAILAND

The sugar industry in Thailand has been growing rapidly, both in sugar cane production and in sugar mill expansion. Demand from domestic and international markets has been rising and has contributed to the economic growth of the nation. Sugar cane growing and processing into raw sugar is one of the largest industries in the country. Thailand is one of the largest sugar exporters in the world. The total export of white and raw sugar was 3.22 million tons in 2000. The Office of the Cane and Sugar Board under the Ministry of Industry has reported the total value of sugar exports for the crop-year 1998-1999 at 21.21 billion baht.

Cultivated in 5.62 million rais of land (1 hectare = 6.5 rais), total sugar cane production during the crop-year 1999-2000 was 53.10 million tons (see table 1), 20.26 per cent higher than the production of 44.17 million tons of the previous year. The Office of the Cane and Sugar Board reported total sales of sugar cane of nearly 24 billion baht for the crop-year 1999-2000. That year, the estimated cost of transportation for carrying sugar cane to the mills in the north-east was 2,379.18 million baht, which accounted for 41.68 per cent of the total transportation cost of sugar cane for the whole country (see table 2).

Table 1. Production of sugar cane and sugar, 1995/96-1999/2000

Year of production	Planting area (millions of rais)	Sugar cane (millions of tons)	Average yield (ton/rai)	Sweetness (CCS) ^{a/}	Sugar (millions of tons)	Sugar productivity (kg/ton)
1995/96	6.53	57.69	8.84	11.84	6.03	104.45
1996/97	5.89	56.24	9.56	11.78	5.82	103.47
1997/98	5.75	42.20	7.34	11.10	4.00	97.02
1998/99	5.45	44.17	8.10	11.66	5.20	103.72
1999/00	5.62	53.12	9.45	11.70	5.51	103.89

Source: Office of the Cane and Sugar Board, Ministry of Industry, Thailand.

^{a/} CCS is a measurement of sucrose content in cane, which can be refined into a form of white sugar if milling and purification processes are carried out according to standard procedures.

**Table 2. Transportation costs of sugar cane by region in Thailand
for the crop-year 1999-2000**

Area	Sugar cane production (millions of tons)	Transportation costs (millions of baht)
North	10.71	1,065.22
Central	18.00	1,849.68
East	3.52	413.92
North-east	20.87	2,379.18
Total	53.10	5,708.00

Source: Office of the Cane and Sugar Board, Ministry of Industry, Thailand.

The price of sugar cane is based on the provisional price announced by the Government and the quality and sweetness as measured by Commercial Cane Sugar (CCS).¹ Cane with a higher CCS will fetch a higher price. In addition, the purity of the cane juice is also taken into account in setting the price. Freshly cut sugar cane has higher purity and produces more sugar than older sugar cane. Deterioration in the quality of sugar cane can also be caused by improper harvesting and delays during handling and transportation. These factors influence the price and thus the income of the sugar cane farmers.

II. STUDY RESULTS

The present study focuses on the operation of the sugar cane industry in the north-east region of Thailand, covering the provinces of Nakhon Phanom, Sakol Nakhon, Nong Khai, Udon Thani, Nong Bua Lam Phu, Loei, Mukdahan, Yasothon, Amnat Charoen, Kalasin, Khon Kaen, Maha Sarakam, Roi Et, Buri Ram, Chaiyaphum and Nakhon Ratchasima. The total sugar cane planting area in the region is 2.18 million rai. The region produced 21.51 million tons of sugar cane during the crop-year 1999-2000, representing 38.35 per cent of the country's total production. Udon Thani produced 5.23 million tons of sugar cane, making it the largest producing province in the region. Most of the cane-growing farms are owned and operated by individual families. It was also found that total transportation expenditure for the region was the highest in comparison to other regions.

¹ CCS is a measurement of sucrose content in cane, which can be refined into a form of white sugar if milling and purification processes are carried out according to standard procedures.

A. Cane and sugar industry in the north-east region

A total of 13 sugar mills are located in the seven provinces of Buri Ram, Udon Thani, Mukdahan, Kalasin, Khon Kaen, Chaiyaphum, and Nakhon Ratchasima of the north-east region.

The Office of the Cane and Sugar Board under the Ministry of Industry reported that during the crop-year 1998-1999 the most cultivated variety in this region was Phill 66-07, which occupied more than 40 per cent of the total planted area. The second most commonly cultivated variety was U-Thong I, which accounted for 13 per cent, and other varieties combined accounted for the remaining 47 per cent. The 13 sugar mills in the region processed 21.51 million tons of sugar cane into raw sugar (0.649 million tons), refined sugar (10.985 million tons), white refined sugar (2.843 million tons), and molasses (0.917 million tons) (see table 3).

Table 3. Total sugar production in the north-east region, 1999/2000

Mills	Raw sugar (tons)	Refined sugar (tons)	White refined sugar (tons)	Molasses (tons)
E-SAAN Sugar Industry	26,036	-	-	8,000
Mitr Phu Veang	34,324	1,278,167	-	83,524
Khon Kaen	107,799	909,615	800,705	108,507
Kumpawapi	82,331	628,302	113,080	66,121
Kaset Phol	56,265	560,934	-	62,410
Rerm Udom	68,927	892,258	-	72,774
Burirum	19,453	775,281	-	44,421
Saha Ruang	8,555	767,422	-	37,485
United Framer and Industry	62,186	906,859	976,736	91,121
Korat Industry	61,955	1,908,066	119,708	121,101
Ratchasima	95,614	641,339	400,045	90,236
Nong Yai	8,804	858,733	257,732	73,055
Mid Kalasin	16,496	857,723	174,944	58,014
Total	648,745	10,984,699	2,842,950	916,769

Source: Office of the Cane and Sugar Board, Ministry of Industry., Thailand.

B. Transport operations of sugar cane in the north-east region

Most sugar cane growers in the region are small farmers operating with their own families. Since most of them do not possess a truck and normally have only a small or a traditional multi-purpose vehicle, they have to pay the cost of transportation of the sugar cane from their farm to the mills. However, both small and large farmers face a common problem of transportation as the delivery of sugar cane per transaction requires a bulk carrier. They are required to rent a truck and pay hired labourers for cutting of sugarcane and loading the truck.

At the beginning and end of the season, the sugar mills face an inadequate supply of raw materials for crushing, whereas during the peak season supply is higher than the capacity of the mills. At that time hundreds of trucks can be seen queuing in front of the mills, waiting to unload sugar cane.

Truck owners normally operate their businesses as middlemen by charging for transport services per ton. They also face problems of delays during transportation and excessive time spent at the mills waiting to unload the raw sugar cane. Truck drivers might spend up to 24 hours for just one transaction. This, of course, has an impact on the cost of transportation. If the mills could manage the flow of trucks and unloading operations more efficiently, the cost of sugar production would be lower.

The study found that all of the three parties involved, that is, sugar mill owners, cane farmers and truck operators are affected by the problem of transportation, which eventually affects the cost of sugar production. It was found that the cost of transportation was high compared to other costs. In the crop-year 1999 the average cost of transportation in this region was 180-220 baht per ton.

C. The sugar cane delivery system

Both small and large farmers usually deliver sugar cane to the mills in either 10- or 6-wheel trucks which have legal loading limits of 21 tons and 10 tons respectively. However, trucks are always overloaded to keep down the cost of transportation and to maintain sugar cane quality. Many small growers cannot manage a bulk carriage by themselves and need to hire outside workers for help. The existing system has also led farmers to harvest prematurely in order to fill in the bulk capacity and thus economize on transportation. A worse situation occurs for small farmers operating far from the mills, who do not grow enough for a full truck load of sugar cane, which may eventually force them to give up growing sugar cane.

D. The high cost of production: cutting and loading

Table 4 below shows that labour costs represent slightly over 45 per cent of the total production cost per rai. Cutting and loading costs represent the highest portion of the variable cost. Since the transporting of raw materials requires bulk carriage, growers may not always have sufficient family members to do the work, forcing them to hire extra workers for cutting and loading. The labour cost for cutting and loading is estimated at 85 baht per ton, which is about 13-14 per cent of the total cost, but it can be even higher, depending on the number of cutting days required. Moreover, farmers have to pay at least 180-220 baht per ton in transportation costs, which are not dependent upon distance. Total labour costs for cutting, loading and transportation are in the range of 265-305 baht per ton. These costs represent 43-48 per cent of total costs and represent a significant proportion of the production costs for small and self-owned and operated families (see table 5).

Table 4. Cost of sugar cane production in the north-east region, crop-year 1999/2000

Items	Canes cultivated in first year (baht/rai)	Percentage of total production costs	Canes cultivated in second year (baht/rai)	Percentage of total production cost	Canes cultivated in third year (baht/rai)	Percentage of total production cost
Cutting and loading	1,071.49	21.05	781.09	32.42	819.39	34.39
Other labour costs	1,199.70	23.57	307.37	12.76	238.00	9.99
1. Total labour costs	2,271.19	44.63	1,088.46	45.17	1,057.39	44.37
2. Materials	1,812.39	35.61	630.31	26.16	603.33	25.32
3. Other variable costs	412.92	8.11	170.72	7.09	157.13	6.59
Total variable costs	4,496.50	88.36	1,889.49	78.42	1,817.85	76.29
1. Depreciation of agricultural tools	205.39	0.04	159.96	6.64	214.56	9.00
2. Land rental	387.15	7.61	360.1	14.94	350.52	14.71
3. Opportunity costs	0.02	0.00	0.02	0.00	0.02	0.00
Total fixed costs	592.56	11.64	520.08	21.58	565.10	23.71
Total production costs	5,089.06	100.00	2,409.57	100.00	2,382.95	100.00

Source: Office of the Cane and Sugar Board, Ministry of Industry, Thailand, survey carried out in 1999/2000-2001.

Note: The costs presented in this table do not include transportation.

Table 5. Average costs of sugar cane production in the north-east region, 1999/2000

Items	Average cost of cane production over three-year period (baht per rai)	Percentage of total production costs
1. Total labour costs	1,472.35	44.70
2. Materials	1,015.34	30.83
3. Other variable costs	<u>246.92</u>	<u>7.50</u>
Total variable costs	2,734.61	83.02
1. Depreciation of agricultural tools	193.30	5.87
2. Land rental	365.92	11.11
Total fixed costs	<u>559.25</u>	<u>16.98</u>
Production costs	3,293.86	100.00
Average output tons per rai: 7.75		
Average cutting and loading costs (baht/ton)	85.00	13.00-14.00
Average other costs	<u>340.14</u>	<u>53.00-56.00</u>
Cost of production (baht/ton)	425.14	66.00-70.00
Transportation costs (baht/ton)	<u>180.00-220.00</u>	<u>30.00-34.00</u>
Total costs (baht/ton)	606.14-646.14	100.00

Source: Office of the Cane and Sugar Board, Ministry of Industry, Thailand, survey carried out in 1999/2000-2001.

E. Queuing operations

Although most farmers in the region have contracts with certain mills, some trade and deliver sugar cane to any mill. However, they have to wait in a queue prior to unloading their sugar cane at the mill. Trucks unload on a first-come-first-serve basis. It may take up to 30 hours to complete the handling process, which raises the cost of transportation. To cut costs, farmers should have alternative choices of where they could deliver their product and thus change to mills with shorter queues. This kind of practice could, however, give rise to another problem. If sugar mills faced uncertainty as to whether they would be able to utilize their full capacity for crushing, they may resort to imposing higher prices in order to compensate for the uncertainty in supply of sugarcane from farmers.

III. THE LOADING STATION STRATEGY

The Office of Agricultural Economics under the Ministry of Agriculture and Cooperatives, in close cooperation with the sugar mill owners has developed a “loading station strategy” to reduce the costs of transportation in the sugar cane industry.

A “loading station” is an area prepared for loading activities. It should be located in the neighborhood of the growers in order to facilitate a smooth supply of cane to the mills and reduce the costs of transportation borne by the farmers. Currently, only one loading station has been established, in Khon Kaen Province. The station is owned and operated by a mill and is located just less than 100 km from it. The initial investment was approximately 11 million bath, which paid for the construction of facilities, the procurement of equipment such as an overhead crane and a weighbridge, and building and land costs. Over 80 per cent of the province’s sugar cane farmers use this facility and they deliver approximately 2,000-3,000 tons of sugar cane per day. Most of the farmers can rely on their own resources. The station also enables the mill to reach its target level of capacity utilization. The idea behind the loading station is to help small sugar cane growers to reduce their cutting and loading and transportation costs, which can represent 20 per cent or more of total costs. The decrease in costs means higher earnings for sugar cane farmers.

Figure 1 is a flow chart illustrating a loading station operation. Ideally, the loading station is a market trading spot for all sugar cane growers, and particularly for small farmers. They transport sugar cane from their farms to the station in their own vehicles and need only rely on family labour. The mill collects the sugar cane from the station and arranges onward transportation to the processing plant. Farmers pay a standard cost of 85 baht per ton to the mill for the transportation from the loading station to the processing plant. Under this new scheme, farmers and truck drivers save time and costs, since they no longer have to wait in line to deliver their product. Under the former, traditional system farmers delivered their product directly from their farms to the mills by bulk carriers and had to bear the whole cost themselves.

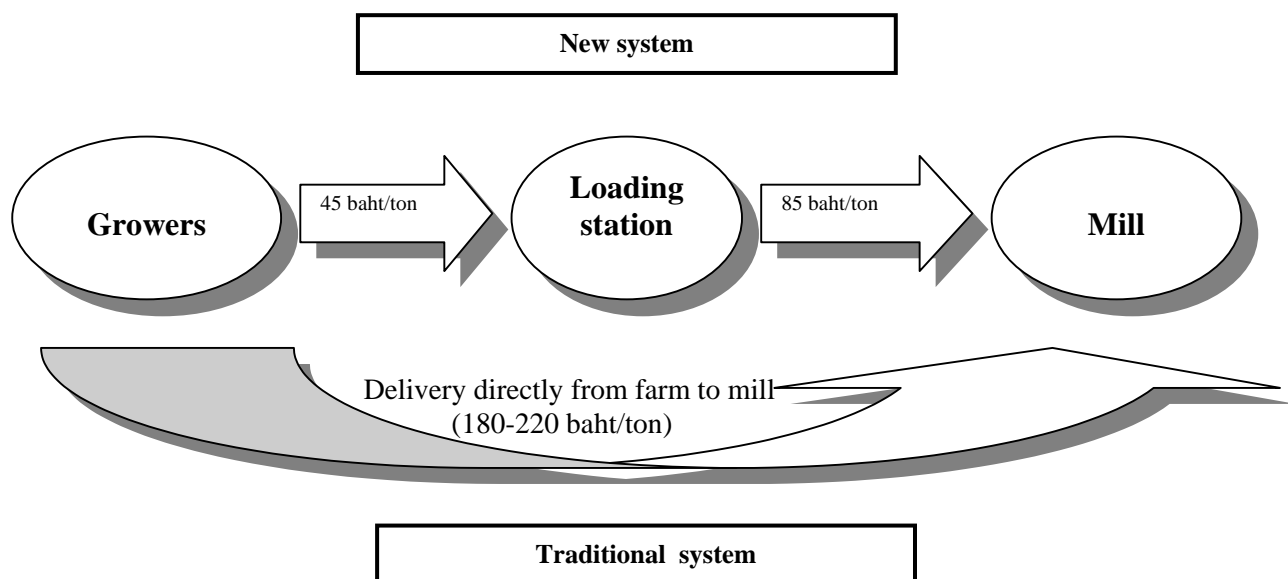


Figure 1. Loading station model: A cost-saving approach to sugar-cane transportation

There are three major benefits of supplying sugar cane to mills through loading stations. First, as already discussed, it reduces transportation costs significantly and can help maintain steady supplies of sugar cane to the mills. Second, it enables farmers to use land and other resources more efficiently and, by assuring them a higher income, encourages them to continue to grow sugar cane. Third, small farms owned and operated by family members can rely on their own labour for cutting and loading and thereby save at least another 85 baht per ton (see table 6).

Table 6. Comparison of sugar-cane transportation costs under the traditional system and the loading station system in north-east Thailand

Cost item	Traditional system (baht/ton)	Through loading station	
		Hired labour (baht/ton)	Own labour (baht/ton)
Cutting and loading	85	85	-
Cost of transportation from farm to station	-	45	45
Cost of Transportation from station to mill (charged by the mill)	-	85	85
Cost of Transportation from farm to mill	180-220	-	-
Total costs	265-305	215	130

The system of loading stations allows farmers to harvest a small amount of sugar cane at a time and use their own vehicles instead of renting a large truck. The loading station strategy also brings social benefits, as small farmers can operate and produce sugar cane by using their own family labour; they do not need to employ outside labour for cutting and loading since they can harvest little by little. In addition, they can find a market to sell their products more easily.

Owing to the fact that labour costs for cutting and loading are relatively high, the Office of Agricultural Economics and the Ministry of Agriculture and Cooperatives recommend vehicle- and labour-sharing among growers within a village for further savings in cost. Alternatively, the Government could consider providing loans to small farmers to buy trucks for use within the village and from farm to loading station. To obtain further benefits from loading stations, they could be managed through farmers' cooperatives or other suitable institutions that could protect the small farmers' interests.

CONCLUSIONS AND RECOMMENDATIONS

The success of the sugar cane industry in Thailand is built upon best practices in production, handling and marketing. However, further improvements in the overall efficiency of the industry and improvements in the welfare of sugar cane farmers are possible through a reduction in the transportation costs of sugar cane, which appears to be an important component of the total cost of production. Loading stations, which would benefit all the parties involved, that is, growers, truck operators, and mills, are proposed as a possible solution to the problem. Small farmers who rely on their own family labour would be expected to benefit the most from their introduction. A delivery system using loading stations has the potential to reduce transportation costs significantly and ensure better management of the supply chain. The system could also be considered for other similar agro-food sectors in Thailand. However, it is recommended that an in-depth study be undertaken to cover all regions in the country. A further study should also investigate the possibility of cooperation between agro-food industries for more efficient management of the supply chain.

