Abstract TE 132988

Sugar cane industry in Thailand is facing with over processing capacity. This study was thus aimed at investigating the optimal locations, sizes and number of the sugar cane processing plants. Linear programming was used for the analysis aiming at minimize transportation and cane production cost. The model was formulated to analyze 3 different scenarios including 1) current scenario, 2) sugar cane production based on potential production areas scenario and 3) optimum sugar cane production based on potential sugar cane processing plants.

The current scenario was described as having 53,129,107 tons of sugar cane production in 49 provinces. There were also 46 sugar cane processing plants with the maximum and minimum capacity of 102,594,460 and 720,681 tons of raw material. The analysis revealed that the 46 processing plants were fairly and acceptably located. Twenty eight of the 46 plants had optimum sizes. The 12 plants had potential of expanding capacity while the rest of 6 plants should operate at their minimum capacities. This analysis yielded the total cost (transportation cost plus cane production cost) of 26,450 million baht. However, if the processing plants were allowed to operate beyond their minimum and maximum capacities, the optimum number of processing plants reduced to 31 locations. Nine of the 31 plants had potential for expanding capacities while the other 22 plants had optimum sizes. Such scenario provided as high as 78 million baht reduction in the total cost of transportation and cane production.

As sugar cane production based on potential production areas predicted to be 75,183,749 tons, the second scenario modified the current one to adopt such production capacity. The results showed that 27 plants should expand their capacities, 16 plants had optimum sizes and 3 should operate at their minimum capacities. This analysis yielded the total cost of 39,887 million baht. But if the sugar cane plants were not limited to their capacities, there would be only 30 optimal plant locations. Of which the 18 plants should expand their capacities while the 12 plants had optimal sizes. The total minimum cost produced in this scenario was 691 million baht lower.

By adding 17 prospected plants to the basic model of the second scenario yielded that the 16 prospected plants were optimal. As a result, the total cost was reduced by 1,416 million baht. In addition, when minimum and maximum capacities of the existing plants were relaxed, the optimal plants would consist of 25 existing and 16 prospected plants. This modification added the total cost reduction by 301 million baht or as much as 1,717 million baht of the total saving.

The third scenario analyzed the optimum sugar cane production resulting from the 31 optimal plants obtained from the current scenario which operating at 80% of their maximum capacities. The computed total sugar cane production, as required by these 31 plants, was 82,363,568 tons. The findings showed that there would be 849 million baht saved in total cost as compared to the current scenario. The analysis also suggested that 22, 16 and 11 provinces currently producing sugar cane should expand, reduce and not produce sugar cane respectively.

The above findings suggested that the adjustment of sugar cane production according to their potentials and requirements of those optimal plant locations which had actual operating capacities at fairly acceptable levels or the relocations of sugar cane processing plants to their optimal locations and limitations on sugar cane production potentials would provide significant economic returns to the industry. The constructed linear programming model in this study could provide more detailed information on optimal locations, sizes and number of processing plants as well as sugar cane production.