OPRE 6398.001 Prescriptive Analytics

Reading 3*

Sri Lanka is an agricultural country which depends mainly on tea, rubber, and coconut for its export earnings. The coconut industry is a major sector of the national economy and coconut products can take many different forms, including desiccated coconut, coir fiber, coconut shell flour, coconut shell charcoal, coconut oil, and coconut poonac.

S. A. Silva and Sons, Ltd., is the largest coconut miller in Sri Lanka. In the mid 1970s, the company employed the technique of linear programming (LP) to study its manufacturing strategy and see if there is any room for improvement. Data used to develop the coefficients of the profit maximization model were monthly production and sales statistics. The decision variables were grouped into several categories: (1) purchase of coconuts, copra, and parings; (2) production of intermediate products, copra, and parings; (3) production of commodities for sale (e.g., oil, charcoal, shell flour, etc.); (4) sales of desiccated coconut, poonac, etc.; and (5) strong shells for later charcoal production. The constraints imposed on the single-period LP represent inventory size, plant capacity, as well as process and sales limits. The optimal solutions obtained showed a profit 37% more than the actual profit for the month of September 1974.

Several sensitivity analyses were then performed by changing important sales policy variables and critical constraints. For instance, parametric ranging on the quantity of medium-grade desiccated coconut sold was conducted with production costs set at 1.2 million Rupees. Parametric ranging on production costs was also made while allowing a premium price to be paid on medium-grade desiccated coconut. The results showed that the most profitable plan was to concentrate resources on fancy-grade desiccated coconut and oil production. Moreover, granulate desiccated coconut production should be deferred until more funds became available.

Further analyses were carried out using the shadow prices generated by the optimal solution: hatcheting and paring capacities, shell flour sales, charcoal plant capacity, and oil production. While management at S. A. Silva and Sons, Ltd., agreed that such mathematical tools as linear programming and sensitivity analysis were useful, they preferred to go with production decisions based on experience. However, the company did reevaluate its initial plans of expanding the hatcheting and paring capacities and decided to postpone them as recommended by the LP model solutions.

* Adapted from Cabraal, R. A. Production planning in a Sri Lanka coconut mill using parametric linear programming. *Interfaces*, 1981, June, 16-23.