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A QUANTITATIVE MODEL FOR THE DESIGN OF
A PROCESSED INFANT FOOD
PRODUCT FOR THAILAND

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ABSTRACT

A quantitative model was developed to design a processed infant food product for Thailand. Linear programming was used as a basis for the model. The model can select not only the raw materials but also the process, taking into consideration the nutritional requirements of infants and the product acceptability. Furthermore, any changes in the raw materials, process and product quality can be easily studied with the model.

The model was developed in three consecutive steps. Firstly, the Thai infant's nutritional requirements, and the compositions and costs of suitable indigenous Thai raw materials were included in the linear programming model. Secondly, the effect of heat processing on the destruction of the required nutrients was considered for different processes and the nutritional constraints in the model were modified to allow for the losses during processing. A mixture of raw materials was chosen by the model for each process and the most suitable combination of process and raw materials was selected. Finally, eating qualities were included in the model which enabled the model to select the raw materials not only subject to the modified nutritional constraints but also to the required eating quality.

To include the losses of nutrients during heat processing, data on the destruction of nutrients by heat

processing were collected from the literature to predict the reaction rate constants at different temperatures. First order reaction kinetics were assumed. The Arrhenius relationship between the reaction rate constant and the reciprocal of the absolute temperature was found to be generally true for the destruction of all vitamins and essential amino acids. The losses of vitamins and amino acids during a process were thus calculated from the Arrhenius relationship using the time and temperature history of the process.

By including these losses of nutrients into the nutritional constraints in the model, their effects on the nutritional composition and cost of the formulation were compared for different processes and a choice was made of the most suitable process. Several cooking and dehydration processes which could be used for infant food processing in Thailand were compared and batch cooking followed by drum drying was found to be best.

Consumer evaluation of the drum dried product suggested a need for improvement in the taste and colour of the product. Constraints restricting the selection of sugar and of raw materials with strong colours were included in the model, and a more acceptable product was obtained.

This model can be used not only to formulate an acceptable mixture of raw materials for any process but also to compare different processes for the production of an acceptable and cheap infant food.

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