

Food production and supply chain management

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Consumers require high quality, safe, healthy, and convenient food. Focus shifts to fresh as well as to more value-added ready-to-eat products. As a result, product variety has increased significantly. The food sector shows a number of distinct features, such as an often rapidly declining quality of the products, production processes which show both continuous and batch characteristics, the generation of by-products, severe food safety and sustainability requirements, and the susceptibility of agricultural production to environmental impact factors such as the climate.

In close cooperation with engineering and the natural sciences, operations research can contribute substantially to the decision making for numerous specific problems arising in the food sector. It may also support the current industry efforts of a farm-to-fork integration in food supply chains. The primary objective of this special issue is to reflect the recent developments made in this respect and to examine research issues concerned with the analysis and decision support at the strategic, tactical, and operational levels.

The importance of the topic has also been recognized by the European Operations Management Association EurOMA when allowing us to promote a special track in its annual conference in 2008. It was then the idea of this special issue was born. We received 20 submissions with first authors from 11 different countries. The reviewing procedure was carried out according to the general standards of OR Spectrum. However, we also placed large emphasis on seeing the specific challenges in food

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production and supply chain management reflected in the operation research approaches developed in the submissions. Five papers were finally accepted for this special issue.

In their review of the literature on food distribution, *Akkerman, Farahani and Grunow* focus on three key concerns, i.e. food quality, food safety, and sustainability, which currently dominate the discussion in the industry. Under this perspective, they analyze the operations research contributions to distribution management in food service and food retail chains separately for the strategic, tactical, and operations levels. Their results show significant research gaps, some of which operations researchers can only fill if collaborating with researchers from other disciplines.

Kilic, van Donk, Wijngaard and Tarim investigate the order acceptance for food products such as potato starch, for which the raw material supply is fixed, but due to the variability in raw material qualities and in processing operations, the exact amount of raw material consumption is unknown. They analyse the influence of this stochasticity on the quality of different order acceptance policies and develop a heuristic approach with a simple structure suitable for use in practice, which could, for example, also be applied in the dairy industry.

Two papers in the special issue deal with an integration of production and distribution planning. The increasing variety of food products amplifies the complexity in production scheduling. *Bilgen and Günther* build upon previous work which aims at creating a simplified, cyclic production schedule through a methodology termed 'block planning'. However, they now also integrate distribution in order to increase the responsiveness of the integrated system. Two different types of alternative transportation modes (full truckload or less than truckload) are selected in a mixed-integer linear programming model. Their numerical results show that significant cost savings can be obtained from integrating production and distribution planning.

Rong and Grunow are the authors of the second paper aiming at such integration. However, their focus is on food safety. They develop a methodology for modelling the risk originating from the dispersion of safety hazards in the distribution network. On this basis, a mixed-integer programming model and heuristic solution approaches are developed, which trade the efficiencies in production obtainable from large batch sizes off against an increased risk exposure resulting from the dispersion of such potentially hazardous, large batches to a larger number of retailers.

Finally, *Minner and Transchel* deal with stock-outs at food retailers, a notorious problem which is continuing to cause significant financial damage. Building upon inventory theory, they develop a numerical approach capable of determining order quantities also under non-stationary demand and multiple service level constraints. The proposed approach is shown to be superior to widely adopted methods, such as base stock or constant order policies.

We would like to thank the editorial board for making it possible to devote this issue of the journal to the topic of food production and supply chain management and the referees for their invaluable support in the reviewing procedure.

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