Research School for Operations
Management and Logistics

Design of healthy, acceptable and sustainable menu plans using mathematical optimization and machine learning techniques

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Population growth and climate change constitute a serious threat to food security. Experts agree that a future-proof diet must comply with the following requirements: “Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (Burlingame & Dernini, 2012). As regards nutritional adequacy, it is estimated that over 30% of the global population suffers from micronutrient deficiencies. To mitigate nutrient deficiencies, governments have set dietary reference values and food based dietary guidelines for the amount of nutrients and foods to be consumed to remain healthy. However, these dietary requirements are developed for broad population groups and Jan Fransoo do not take individual differences in physiological requirements and eating habits into consideration. Current diet models might be improved when individual differences are modelled explicitly. Accordingly, the aim of the thesis is to contribute to food security and global health by investigating opportunities to improve personalized nutrition advice by optimizing the nutritional value, acceptability and sustainability of menu plans from an interdisciplinary perspective using both mathematical optimization- and machine learning techniques.