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Optimal Inventory Control Policies for Avoiding Food Waste

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Abstract

Considering that 120 million people in the EU face the risk of poverty or social exclusion, while at the same time a 35% of perishable food is unnecessarily discarded at supermarkets, the redistribution of the perishable food surpluses could provide a complete and balanced diet for almost 60.000 people a day or an equivalent reduction of ~100 million € per year expenses in poverty confrontation. Moreover, the reduction of food waste through the timely donation to facilities that support socially vulnerable groups of a small amount of a food product (that most probably will end up to waste), could significantly promote a company's Corporate Social Responsibility (CSR) policy. Under this context, the purpose of this paper is to explore inventory control policies that at a specific time instance close to the expiration date donate food when the inventory level is above a certain threshold and thus, reduce the expected amount to be disposed at the expiration date. Analytic and numerical models are employed in a single period setting to calculate optimal order quantity and threshold values that maximize the company's profit. Numerical experimentation for a specific case discusses the conditions under which the proposed policy is feasible.

Keywords
Food waste, Social Sustainability, Inventory planning, Perishable products, Redistribution

Biographies

Prof. Dimitrios Vlachos is the Director of the Laboratory of Statistics and Quantitative Analysis Methods of the Department of Mechanical Engineering of the Aristotle University of Thessaloniki, Greece. His research interest include supply chain management, logistics management, applied operational research, combined transport systems management, business restructuring and strategy development. He has contributed in more than 60 research projects (in 15 of them as a principal investigator) in the field of Supply Chain Management, and he has co-authored the respective technical reports. He has published more than 200 papers in scientific journals, conference proceedings and book chapters. He has participated as a consultant or expert in numerous projects funded by public and private

organizations. He is a member of the Institute for Operational Research and Management Science (INFORMS), the Council of Supply Chain Management Professionals (CSCMP) and the Hellenic Operational Research Society (EEEE). He is now President of the Greek Association of Supply Chain Management.

Dr Ioannis Mallidis is a Postdoctoral Researcher at the Laboratory of Statistics and Quantitative Analysis Methods of the Industrial Management Division of the Mechanical Engineering Department of the Aristotle University of Thessaloniki (AUTh). Dr Mallidi's scientific interests indicatively cover the fields of inventory management, sustainable supply chains, agrifood management, operations research and analytical optimization processes. He has published his research work in top peer reviewed Journals such as Transportation Research Part E, European Journal of Operations Research, Journal of Transport Geography, Journal of Simulation, Annals of Operations Research and others, while achieving more than 400 citations in Scopus. He has also participated in several national and European research projects (e.g. GREEN-AgriChains) and acts as a reviewer in top per reviewed international scientific journals. In addition, Dr Mallidis is a lecturer in two undergraduate courses at the Mechanical Engineering Department of AUTh, and four undergraduate courses at the department of Business Administration of the Technological Educational Institute of Western Macedonia.

Volha Yakavenka is a Ph.D. candidate of the Laboratory of Statistics and Quantitative Analysis Methods of the Industrial Management Division of the Mechanical Engineering Department of the Aristotle University of Thessaloniki, and her Ph.D. Thesis deals with the Strategic design of intermodal transport network for sustainable supply chain of perishable goods. She has received her five-year Diploma and Master's Degree in Economics and Industrial Management, with a specialization in transportation and Logistics from the Belorussian National Technical University, Minsk, Belarus. For seven years. V. Yakavenka has been serving as the Head of the Economics Research, Reformation and Investment Department of the Belarusian Scientific and Research Institute of Transport «Transtekhnika». Her research interests are directly related to the management of supply chains of perishable products, and include sustainable supply chain management, applied operations research, sustainable development and strategy development, food logistics, blockchain innovation across the food supply chains, intermodal transportation, transport economy, inventory management, pricing, financial analysis, investment, labour management. Her achievements include more than 40 publications in scientific and practical journals, conference proceedings and book chapters. She has participated in more than 30 research projects on transport and logistics, funded by public and private entities of EU, Belarus and Russia.