Speaker: Onur Boyabatli, Singapore Management University

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Title
Crop Planning in Sustainable Agriculture: Dynamic Farmland Allocation in the Presence of Crop Rotation Benefits

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Abstract:
This paper examines crop planning in sustainable agriculture. In contrast to industrial agriculture—which relies on continuous planting of a single crop over multiple growing periods—sustainable agriculture relies on planting of multiple crops that have rotation benefits across periods. We consider a farmer who periodically chooses the farmland allocation between two crops in the presence of revenue uncertainty, where revenue is stochastically larger and farming cost is lower when a crop is planted in a rotated farmland—where the other crop was planted in the previous period. We identify two strategies, rotate (plant each crop in the rotated farmland) and monoculture (plant only one of the crops) that characterize the optimal periodic allocation decision. We provide rules of thumb for the impact of revenue uncertainty: The farmer benefits from a lower revenue correlation between two crops and a higher revenue volatility of each crop only when this volatility is sufficiently high; otherwise, a lower volatility is beneficial. Using a calibration based on a farmer growing corn and soybean in Iowa, we show that sustainable agriculture has substantial value over industrial agriculture. We propose a simple sustainable heuristic allocation policy, and characterize the periodic allocation decision with this policy in closed form. Using our model calibration, we show that the proposed policy not only outperforms the commonly suggested heuristic policies in the literature but also provides a near-optimal performance.
Bio: Onur Boyabatli is Associate Professor of Operations Management at the Lee Kong Chian School of Business, Singapore Management University. He holds a Ph.D. in Technology and Operations Management from INSEAD, France, M.S. and B.S. degrees in Industrial Engineering from Bilkent University, Turkey.

His research interests are in the area of integrated risk management in supply chains. His first research stream, operational decision making in commoditized industries with a special focus on agribusiness, primarily focuses on the integration of input risk management (through sourcing decisions) with output risk management (through processing and pricing decisions) in agricultural industries, and studies several operational problems (such as capacity management, procurement, farm-yield management, product pricing) of supply chain agents (such as farmers and processors) in this setting. His second research stream, technology and capacity management including integration with financing and financial risk management, studies technology and capacity management under financing frictions in capital-intensive industries (such as automotive); and operational and financial hedging in global supply chains.

His research papers have been published in Management Science. He is the co-editor of “Handbook of Integrated Risk Management in Global Supply Chains.” He was awarded the Management Science Distinguished Service Award in 2012. He was nominated for the iFORM (Interface of Finance, Operations and Risk Management) SIG (Special Interest Group) Chair in 2014. He co-organized the iFORM SIG conference in 2012 and 2014, the 5th Mini-conference on Integrated Risk Management in Operations and Global Supply Chains in 2008. He is currently the co-chair of the iFORM Cluster at the 2015 INFORMS Conference. He was the co-chair for the same cluster at the 2012 and 2013 INFORMS Conferences.