

Application of Agent Based Modeling in Agriculture: Experiences from Sugarcane Mechanization in India

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Agricultural operations are characterized by variations in practices driven by climatic and local factors, such as field sizes, labour availability, crop varieties, regulatory incentives, etc. Moreover, most operations involve multiple stakeholders (labourers, contractors, transporters, etc.) driven by different incentives. Consequently, it is difficult to anticipate the emergent effects of any design interventions. Often such design decisions are based on experience and intuition of experts in the field. In this presentation, we demonstrate the use of Agent Based Models and simulation to build quantitative evidence to assist these experts in decision making. Specifically, we describe models developed for three decision problems in mechanization of sugarcane cultivation in India, covering planting and harvesting operations along with fleet management. In addition to modeling independent interacting agents, the models incorporate discrete event style behavior, parameter variation, and a visual encoding of what would otherwise be tedious software code, only accessible to programmers. These models were simulated under different possible scenarios to study the effect of certain decisions on overall efficiency of the operations. Thus, while enabling robust decisions, the models also helped develop a nuanced understanding of system behavior, our thought models of the system, and the trade-offs implied in any design decision.