

## Modelling Water Usage for Farming

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**Abstract :** Water scarcity is a problem for many regions which requires immediate action, and solutions cannot be postponed for a long time. It is known that farming consumes a significant portion of usable water. Although in recent years, the efforts to make the transition to dripping or spring watering systems instead of using surface watering started to pay off. It is also known that this transition is not necessarily translated into an increase in the capacity dedicated to other water consumption channels such as city water or power usage. In order to control and allocate the water resource more purposefully, new watering systems have to be used with monitoring abilities that can limit the usage capacity for each farm. In this study, a decision support model which relies on a bi-objective stochastic linear optimization is proposed, which takes crop yield and price volatility into account. The model generates annual planting plans as well as water usage limits for each farmer in the region while taking the total value (i.e., profit) of the overall harvest. The mathematical model is solved using the L-shaped method optimally. The decision support model can be especially useful for regional administrations to plan next year's planting and water incomes and expenses. That is why not only a single optimum but also a set of representative solutions from the Pareto set is generated with the proposed approach.

**Keywords :** decision support, farming, water, tactical planning, optimization, stochastic, pareto

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