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## **Evaluating labour constraints within a multi-objective land-use planning tool**

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### **Abstract:**

In undertaking participatory testing of a multi-objective land use planning tool, patterns of labour availability and utilisation were identified as key evaluation metrics for alternative land use strategies. Labour availability was seen as a potential constraint on which patterns of land use can be adopted and land-use change as an opportunity to eliminate underemployment or reduce peaks of seasonal demand. Labour and associated equipment costs were also highlighted as highly influential for financial impacts.

This paper presents the implementation and application of a resource scheduling tool (RST). The RST allows the evaluation of the options for, and impacts of, labour usage as part of a spatial, multi-objective, land-use planning system. The RST considers full-time, part-time and seasonal workers, with options for regular and overtime, the type and availability of equipment and the use of contractors. The financial implications of both operational and capital costs of resources are also modelled.

The RST uses a pair of linked schedulers interfaced to a geographic information system and relational database RDB. Individual jobs are user-prioritised and have time-windows within which they have to be completed; these time windows may be either fixed or respond to prevailing environmental conditions. The scheduled tasks are stored in the RDB allowing the counter-factual analysis of scenarios, iterative learning, interrogation of utilisation rates and costs and financial analysis. Using the RST it is also possible to establish the resilience of the land use system to external factors such as weather events.

The application of the RST analyses is demonstrated using a series of land-use plans collected in a soft-systems evaluation. The RST analyses have enhanced the land use planning tools ability to discriminate between alternative land use strategies in particular emphasising the potential importance of voluntary labour from off-farm family members for sustaining agriculture in marginal areas.

**Keywords:** Land-use planning, multi-objective, scheduling, labour