Logistics and efficiency of grain harvest and transport systems

Greg Butler

SANTFA

Improvement of efficiencies, reduction of costs and optimum allocation of resources is becoming more important to grain growers in the face of climate change constraints. Australia has many areas where production is carried out under very marginal growing conditions and it is often the scale of farms that makes them profitable. A discrete event simulation was built upon the data collected during field trials to model some typical southern Australian harvesting systems and was compared to actual data collected in the field during harvesting. Simulation parameters included: harvester or header (in the Australian context) size/capacity, operating speed, turning time, unloading time and overall work rate efficiency. Field shape, size and location of temporary storage (field bins) along with the travel distance to the grain silo were recorded and monitored and investigated in a case study. The model was able to optimize the harvest pattern, the number and location of field bins and the number of road transport trucks to best match the harvester and grain transport. Example benefits for a 5000 ha wheat farm included a reduction of 9.5% in harvesting time and a fuel saving of 2100 kg (equivalent to 5.8 t/year reduction in CO_2 emissions). The validated model will form part of a decision support tool that farmers can use to optimise their investment patterns for the complete harvest system. This tool aims to minimise production costs, and maximise harvested yield and cropping income, in a strategy to reduce farming risks and improve sustainability.

The work was carried out as part of a collaboration between researchers from the Dept. of Agricultural, Forestry and Environmental Economics and Engineering at the University of Turin, Italy and Researchers from the Institute for Sustainable Systems and Technologies – Agricultural Machinery Research & Design at the University of South Australia.