

# Calculating Distribution and Intensity of Agricultural Traffic for Sustainable Development

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**Key words:** Geoinformation/GI; GIM; agricultural traffic; land fragmentation

## SUMMARY

Land from many holdings is dispersed, which compels farmers to use public roads to access distant parcels. Agricultural traffic is somewhat different from other traffic with its bulky vehicles. When agricultural traffic mixes with other traffic, safety issues may arise. Another issue of agricultural traffic is its environmental impact. Dispersed land, or land fragmentation, generates more traffic than land around the farmstead and consequently increases carbon dioxide emissions.

Despite the relevance of the topic, little research has been conducted on agricultural traffic in relation to a the land allocation of a holding. That is, how agricultural traffic is distributed over the road network and how intense traffic is. This research aims to develop a GIS model that shows the spatial distribution and intensity of agricultural traffic for a specific area.

First, the route from homestead to distant parcels was determined for all holdings in the region. Then, the number of rides over each route was calculated. Finally, all rides over each road segment were summed up and mapped. Four factors that influence the number of rides (crop type, soil type, parcel size, and dump truck size) have been distinguished based on available literature. An initial run of the model produced a map with expected distribution and intensity of agricultural traffic for two different areas. The model was validated in two ways: by local experts and by traffic counting. For one area, a group of local farmers validated the results for that area. For the other area, the results were compared to available traffic measurements. Based on both validations, the model has been adapted.

The developed model has several advantages. First, it can be easily applied to any area as long as data on the land allocation of holdings and the area's road network is available. Second, it gives insight in intensity of agricultural traffic over the seasons. Third, it can be used to monitor

agricultural traffic distribution and intensity. Therewith the model facilitates a wide array of applications. With the information on distance and frequency of travelled routes, governments can investigate for instance possibilities to improve land allocation to reduce agricultural traffic, get to know road segments with different modes of traffic (safety issues), or estimate emissions from agricultural traffic.

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FIG Working Week 2016  
Recovery from Disaster  
Christchurch, New Zealand, May 2–6, 2016