A COMPARISON OF ENVIRONMENTAL RISK MODELS DEVELOPED FROM NZLRI AND TOPOCLIMATE SOUTH SOIL SURVEY DATA

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Abstract

Land evaluation models can be prepared with an environmental focus to assist policy makers to determine areas at risk to a particular issue. The Southland Region of New Zealand has seen an increasing number of dairy farm conversions over recent years. The environmental risks due to the intensive nature of dairy farming are well documented, two of the issues are decreased water quality from nutrients and sediment and decreased soil quality from structural breakdown and erosion.

Two models for evaluating the risk of environmental degradation due to dairy farming in Southland were developed. One re-classified the New Zealand Land Resource Inventory within existing Land Use Capability units and the other was based on a recently completed soil survey of the valleys and floodplains of the Southland Region undertaken by Topoclimate South. The models were entitled Land Environmental Risk (LER) and Soil Environmental Risk (SER), respectively.

Using a framework that allowed for differences in the information held in each data source meant different limiting factors were addressed with the two models. The framework listed a number of land characteristics for rural land evaluation that were applicable to environmental issues, but also detailed how other land qualities can be used once a relative ranking is applied to each factor of interest. A limitation method was used for the overall classification. The overall classification is represented numerically one to five, with the environmental risk represented by a letter.

Each model had three limiting factors, the LER model Soil Vulnerability (SVI), Potential Erosion and Slope; the SER, Soil Vulnerability, Leaching risk and flooding risk. One key difference in the results stemmed from the fact that data collected during the Topoclimate Soil survey meant the SVI could be calculated for each soil mapped. Compared with the LER where the SVI was applied from averages of the soil group noted for the LUC.

A range of GIS software packages were used to add attributes to existing data sources, generate maps of the individual models, and to allow comparison of the models by overlaying the attributes. The data generated was examined statistically using a spreadsheet.

Both models reduced the complexity of the data to result in maps that should be understandable by a wide range of users. The LER model resulted in 10 classes, from an original 37 LUC units and complexes. The SER model resulted in 27 classes, from an original 190 soil units and complexes.

The LER model classified 93% of the study area as having a high risk of environmental degradation. The influence of the SVI was the single most dominating factor of the LER classifications. Two classifications, 4 LER S e, and 4 LER sl S e accounted for 88.1% of the study area. Only two SVI rankings were able to be applied which limited the overall rank of classifications generated.

The SER model presented a wider range of ranking, from 1 – 5, the percentage of land under the respective risk rankings were 0.6%, 6.2%, 24%, 52.2% and 17%. Soil vulnerability featured heavily as the most limiting factor, three classes with SVI as the most limiting factor, 4 SER l S, 3 SER LS and 4 SER f l S, accounted for close to 50% of the study site.

The greater detail of data available from the soil survey resulted in what was felt to be a more robust classification. The LER model resulted in an over simplified classification. If the LER model was used to identifying areas to target policy implementation, areas of land would be both under and over-rated in terms of their risk of environmental degradation from dairy farm conversion.

The limitation of working with data that was already classified in the LUC was seen as restrictive for this evaluation. This needs to be understood if evaluation systems based on LRI are to be used for regional planning purposes.

Using the subclass limitation of the LUC units could be a first step in identifying areas for more detailed study if the focus was on soil limitations, if other detailed soil surveys were not available. LUC units with soils as the subclass were all found to have SVI as a limiting factor.

Further research as a result of this study could take the form of a model that addressed a wider number of issues and incorporated information from both data sets.

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