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Relationships between climate and winter cereal grain quality in Finland and their potential for forecasting

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Abstract

Many studies have demonstrated the effects of climate on cereal yield, but there has been little work carried out examining the relationship between climate and cereal grain quality on a national scale. In this study national mean hectolitre weight for both rye and winter wheat in Finland was modelled using monthly gridded accumulated snow depth, precipitation rate, solar radiation and temperature over the period 1971-2001. Variables with significant relationships in correlation analysis both before and after difference detrending were further analysed using forward stepwise regression. For rye, March snow depth, and June and July solar radiation accounted for 66% of the year-to-year variance in hectolitre weight, and for winter wheat January snow depth, June solar radiation and August temperature accounted for 62% of the interannual variance in hectolitre weight. Further analysis of national variety trials and weather station data was used to support the biological mechanisms. Finally a cross validation technique was used to test forecast models with those variables available by making predictions of above or below the mean hectolitre weight. Analysis of the contingency tables for these predictions indicated that national hectolitre weight forecasts are feasible for both cereals in advance of harvest.

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