



Assessment of winter wheat yield potential at spatially contrasting sites in Ireland using daily temperature, radiation and rainfall data.

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Although Irish winter wheat yields are amongst the highest globally, increases in the productivity of this crop are required to maintain its economic viability. However, in order to determine if efforts to further increase Irish wheat yields are likely to be successful, an accurate estimation of yield potential is required for different regions within Ireland. A winter wheat yield potential model (WWYPM) was developed that estimates the maximum yield achievable, within the confines of current genetic resources and technologies, using parameters for winter wheat growth and development observed recently in Ireland and a daily meteorological input (maximum and minimum daily temperature, total daily rainfall and total daily incident radiation). The WWYPM is composed of three processes: (i) an estimation of potential green area index, (ii) an estimation of light interception and biomass accumulation and (iii) an estimation of biomass partitioning to grain yield. Model validation indicated that WWYPM estimations of yield potential were significantly related to maximum yields recorded in variety evaluation trials in addition to regional average and maximum farm yields, reflecting the models sensitivity to alterations in the climatic environment with spatial and seasonal variation. Simulations of yield potential for long term average weather data at twelve sites located at spatially contrasting regions of Ireland indicated that the typical winter wheat yield potential varied between 15.6 and 17.9 t/ha, with a mean of 16.7 t/ha at 15% moisture content. These estimations of yield potential indicate that the majority of sites in Ireland have the potential to grow high yielding crops of winter wheat, when the effects of very high rainfall are not considered. Despite a relatively low degree of spatial variation in the estimated yield potential between evaluated sites, the factors that are limiting yield are thought to contrast spatially across the country, with contrasting rainfall incidence a major contributing factor.