EMS Annual Meeting Abstracts
Vol. 14, EMS2017-314, 2017

Watching grass grow: A spatial and geoclimatic analysis of grass growth in Ireland using remote sensed data

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Farm level differences in the volume of grass production per hectare may partially explain differences in farm economic performance in Ireland. The extent to which such differences in grass production are due to geoclimatic, agronomic, or other factors remains unclear. The absence of farm level grass measurement data presents a challenge in exploring this research question. A spatial model that explains the dynamic effects of location on grass growth would offer valuable insight to farmers and agricultural policy makers. Remote sensed enhanced vegetation index (EVI) data from 2002 to 2015 was used along with a wide range of pedologic and climatic data for over 90,000 farm locations in Ireland, representing nearly two-thirds of all farms in Ireland. Monthly and annual EVI was regressed on a range of spatially disaggregated geoclimatic variables at the farm and electoral district level using random effects models. The farm level and electoral district models explained up to fifty and seventy per cent of the overall variation in vegetation growth across the sample respectively and demonstrated that agronomic variables significantly influence EVI. This suggests that EVI is valuable proxy for grass production. Still, unobserved, individual farm management characteristics, which are included in the model residuals, play a primary role in determining grass growth at the most granular spatial scale. As farm locations are aggregated into districts, geoclimatic effects become more robust. This paper explains the impacts of nature versus nurture on grass growth and highlights the wide variation in growing conditions across Ireland. Large disparities in grass growth, even in similar geoclimatic zones underscore the importance of grassland management and the potential for significant increases in grass feed output on Irish farms.