Potential for forecasting UK summer grass growth from the North Atlantic Oscillation

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Introduction The North Atlantic Oscillation (NAO) is a large-scale atmospheric circulation pattern which is well-known to influence the UK winter climate (Wilby *et al*., 1997). Recently, it has been shown that the winter NAO also affects summer rainfall in the UK (Kettlewell *et al.,* 2003). Since water supply is an important limitation to summer grass growth in many parts of the UK, the winter NAO may influence summer growth. The objective of this study was to test the hypothesis that there is a relationship between the winter NAO and summer grass growth using data from reference plots at North Wyke in Devon.

Materials and methods Plots of perennial ryegrass (cv. Cropper) were established each year from 1982 to 1992 at North Wyke. In the year following establishment four series of plots were cut every four weeks in rotation and dry matter yield recorded. Growth rates were calculated for each week according to the method of Corrall and Fenlon (1978) and the mean growth rate calculated for the conventional climatological summer (June, July, August) corresponding to weeks 22 to 35 inclusive. The plots were duplicated with one set of plots unirrigated and the other set irrigated to field capacity each week. The mean summer growth rate each year was regressed against the preceding winter (December, January, February) NAO index of Hurrell (taken from http://www.cgd.ucar.edu/~jhurrell).

Results The summer growth rate of the unirrigated plots showed a clear relationship with the preceding winter NAO index. Years with very high winter NAO indices had summer growth rates only about half those of years preceded by intermediate or low winter NAO indices (Figure 1a). In contrast, the growth rate of irrigated plots was high in almost all years irrespective of the preceding winter NAO index (Figure 1b).

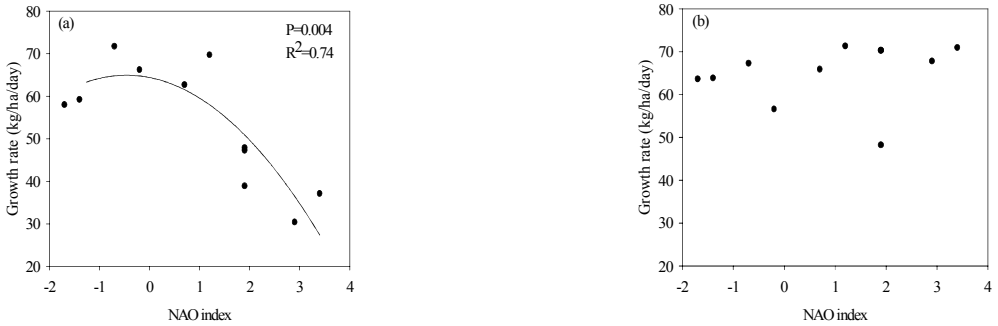

Figure 1 Effect of the winter North Atlantic Oscillation on summer grass growth rate in (a) unirrigated and (b) irrigated plots at North Wyke 1983-1993

Conclusion These results indicate that summer grass growth at North Wyke is dependent on the preceding winter NAO and that the relationship may be mediated through soil water supply. The results are consistent with previous work showing that a high winter NAO index tends to be followed by a dry summer in England and Wales (Kettlewell *et al.,* 2003). Analysis of local weather and soil moisture data is in progress to confirm the mechanism. The relationship is based on a very small dataset at one site only and needs to be confirmed at other sites. If the effect proves to be widespread throughout the UK, a general forecast of summer grass growth may be feasible with a lead time of at least three months. This may be of benefit to farmers in assisting with planning e.g. deciding the area to be sown with maize or spring cereals for wholecrop silage.

References

Corrall, A.J. & Fenlon, J.S. (1978). A comparative method for describing the seasonal distribution of production from grasses. *Journal of Agricultural Science, Cambridge*, 91, 61-67.

Kettlewell, P.S., D.B. Stephenson, M.D. Atkinson & P.D. Hollins (2003). Summer rainfall and wheat grain quality: relationships with the North Atlantic Oscillation. *Weather*, 58, 155-164.

Wilby, R.L., G. O'Hare & N. Barnsley (1997). The North Atlantic Oscillation and British Isles Climate variability, 1865 – 1996. *Weather*, 52, 266-276.