Irish Dairy Farming: Effects of Introducing a Maize Component on Grassland Management Over the Next 50 Years

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The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

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Introduction Typical management of Irish dairy units is based on a low-cost spring-calving strategy with 90% of annual feed derived from grass grown on the farm. Almost 70% of feed is from grazed grass managed by rotational grazing, the remainder is conserved forage and concentrates. The objectives of the work were to examine how the management system has to be modified when part of the dairy unit land is allocated to maize silage instead of grass silage production, and to examine how climate change over the next 50 years will impact on grass and maize management within the production system.

Materials and methods A dynamic, mechanistic dairy unit simulator (Fitzgerald *et al.,* 2003) was used to simulate the operation of a hypothetical farm at three locations under current climate and under the climate conditions predicted for the climate period 2055 (2041-2075), and at 0, 10 and 20% allocation of dairy unit area to maize. Unit 1 was located in the warm, dry south-east (Wexford). Unit 2 was located in the cool, humid north (Leitrim) and Unit 3 in the warm, humid south (Cork) (Holden and Brereton, 2004). In each unit/climate/maize scenario the system was simulated for 30 successive years using weather data generated from monthly means by stochastic weather generation (Geng *et al.,* 1986; Richardson, 1985). The same weather data was used to simulate the production of a generic short-season maize type using the Ceres – Maize model (Jones *et al.,* 1984). The grassland management simulated was the same as the blueprint described by O'Donovan (2000).

Results In the current climate the stocking rate (SR) at 0% maize area was 2.4 cows ha^{-1} for units 1 and 2 and 2.7 for unit 3. In the 2055 scenario the rates were 2.6 for unit 1 and 3.1 for units 2 and 3. In all unit/climate scenarios SR was reduced as the maize area increased. At 20% maize area SR was reduced by about 10% in all cases. The number of grass silage paddocks was reduced but the reduction did not compensate fully for the allocation of land to maize. Similarly, the reduction in land area for grazing also created a feed deficit at turnout and late in the season.

Conclusions The conversion of part of a grassland unit to maize silage production would result in a stocking rate reduction over the range of production environments existing or predicted for Ireland. However in all cases, the stocking rate on the grass area of the unit increased, by more than 10% in most cases, as the maize area increased. This suggests that the acquisition of maize silage from outside the unit would enable significant increases in stocking rate within the unit, but the potential increases to approximately 3 cows/ha are environmentally challenging. An alternative interpretation of the results is that the out-sourcing of maize silage would allow a dairy unit to maintain environmentally acceptable SR using less nitrogen fertiliser.

References

Fitzgerald, J.B., A.J. Brereton & N.M. Holden (2003). Dairy farm system simulation for assessment of climate change impacts on dairy production in Ireland. In J. France and L. A. Crompton, Proceedings of the Thirty-fifth Meeting of the Agricultural Research Modellers' Group, *Journal of Agricultural Science, Cambridge 140***,** 479-*487*

Geng S., F. W. T. Penning de Vries & I. Supit (1986). A simple method for generating daily rainfall data. *Agricultural and Forest Meteorology 36*, 363-376.

Holden, N. M. & A. J. Brereton (2004). Definition of agroclimatic regions in Ireland using hydro-thermal and crop yield data. *Agricultural and Forest Meteorology 122*, 175-191

Jones, C.A., J. T. Ritchie, J. R. Kiniry, D. C. Godwin & S. I. Otter-Nacke (1984). The CERES Wheat and Maize model. In: *Proceedings International Symposium on minimum datasets for Agrotechnology Transfer*. ICRASET, Pantancheru (India). pages 95-100.

O'Donovan M.A. (2000). The relationship between the performance of dairy cows and grassland management on intensive dairy farms in Ireland, PhD thesis, University College Dublin.

Richardson C.W. (1985). Weather simulation for crop management models. *Tranactions of the American Society of Agricultural Engineering, 28*, 1602-1606.