Grassland Research: Goals for the Future

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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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Our goal as scientists must be to provide sufficient food for the world's population, while returning sufficient income for effort to the food producer. It has been established elsewhere in the conference that pasture-based systems can return high milk production per hectare at low input cost, but are limited to highly fertile, temperate regions with evenly dispersed rainfall patterns and moderate maximum and minimum temperatures. There should be two goals of grazing research in the future; to sustain or improve the profitability of current grazing production systems, and to develop plant and animal varieties that allow grazing in currently less suitable environments. Both of these goals can, and will be achieved through improvements in biotechnology.

Traditional breeding shuffles whole genomes, making it difficult to predict the transfer of desired traits and the loss of others. Bioengineering differs in that only one or two specifically identified trait-inducing genes are typically introduced into the background of tens of thousands of genes (Conko & Prakash, 2002). Moreover the introduced gene(s) could be isolated from the host plant, mimicking traditional breeding but in a more precise and predictable approach, so called Cisgenics®. For example, the breeding of current maize varieties took thousands of years, but only involved a change in five or so of its own genes resulting in a loss of plant hardiness, a common problem in plant breeding. Similar improvements could be achieved in 10 to 15 years using current bioengineering techniques without any loss in plant hardiness (K. Elborough, personal communication). Future grassland research must identify production and nutritional limitations in currently used herbage species, and focus on molecular improvements. According to the NRC (1989), "we are in a better, if not perfect, position to predict the characteristics" of organisms modified by molecular methods.

Pasture-based cows have traditionally been low yielding when compared with cows offered total mixed rations. Kolver *et al*. (2002) reported milk production differences of 2,500 kg between cows of similar genetic merit for milk production, either grazing or offered a total mixed ration in confinement. Low yielding cows partition a greater proportion of energy eaten into maintenance and activity and are therefore less efficient converters of energy into saleable product. This will be a significant limitation to profitable grass-based farming in the future and must be the focus of any future research. Improvements in the ability of forage species to withstand temperature (cold or hot) and moisture stress, and/or improvements in the nutritional quality of grazed forage (lower protein, higher sugar, less indigestible fibre) will increase milk production per hectare and per cow with very little additional cost.

Biotechnology will also provide land (and potentially animals) that would previously have been unsuitable for grazing systems. Advances in biotechnology are being made – acid-, saline- and drought-tolerant plants will allow forage production in some of the world's traditionally less suitable places. Animals that are more suited to grazing systems or are more efficient at converting energy into milk are also not beyond the realms of imagination.

The challenge for grassland scientists is to integrate this new technology into sustainable profitable farming systems.

References

Conko, G. and Prakash, C.S., 2002. The attack on plant biotechnology. Chapter 7 in Global warming and other eco-myths: how the environmental movement uses false science to scare us to death. R. Bailey, ed. pp 179-217.

Kolver, E.S., Roche, J.R., De Veth, M.J., Thorne, P.L. and A.R. Napper. 2002 Total mixed rations versus pasture diets: evidence for a genotype x diet interaction in dairy cow performance. Proceedings of New Zealand Society of Animal Production. 62:246-251.

National Research Council, 1989. Field testing genetically modified organisms: Framework for decisions, Washington, DC: National Academy Press. Pg 13.