



Travel Grant Report:

Report on a study tour to USA, Mexico and Scotland (April 3 – May 17, 1999)

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The study tour was an outstanding opportunity for me to interact with scientists and producers involved in grassland agriculture in North America and in Scotland. The award of the Travel Grant also helped me attend and participate in the Vth International Symposium on the Nutrition of Herbivores, held in San Antonio (Texas) in April 1999. This report highlights some observations and impressions gained during the 6-week tour and for convenience, is divided into sections covering travel in the United States, Mexico and Scotland.

Section A: United States (3 weeks)

The visit to the USA was in fact my first visit there. Thanks to the support provided by the Travel Grant, and to the generous hospitality of colleagues old and new, I was able to interact with researchers and farmers in Washington State, Oklahoma, Texas and Virginia.

Washington State

The eastern half of Washington State lies in a rainshadow between the Cascade Mountains to the west and the Rockies to the east. Agriculture in the area is thus dominated by the low rainfall (125-150 mm/year) but also by the availability of good irrigation water from the Columbia River, which flows south from Canada and then turns west to form the border between Washington and Oregon. A further constraint to agriculture in south-east Washington is the former nuclear facility at Hanford, around which no agriculture takes place within a radius of some 50 km or more.

The bleakness of the sagebrush steppe around Hanford is in complete contrast to the intensive agriculture in the Columbia River valley. Here, sheep, beef and dairy production take place alongside lucerne, wheat, potato, vegetable (and vegetable seed) and especially apple production. Despite the low rainfall, the Columbia valley produces most of the apples consumed in the USA. The lucerne grown in the area is not for grazing, but predominantly for hay and especially for lucerne cube production. My co-host, Dr Bill Ford from Washington State University, is involved in extension work to support the lucerne growing and cubing as an export industry, for intensive beef production in Japan and South Korea.

Oklahoma

The agriculture of Oklahoma is quite different from that of eastern Washington, and was of particular interest to me because of the balance, in grazing systems, between wheat grain production and the grazing of either wheat or pasture. My hosts in this area were Dr Sam Coleman and colleagues of the USDA Grazinglands Research Laboratory at Fort Reno, just west of Oklahoma City. The Fort itself is of great historical interest, as a former remount station for the US Cavalry.

I was fortunate to visit the Laboratory on the same day as a group of producers from the Oklahoma Wheat Growers Association, who most graciously allowed me to be part of their tour. This was especially relevant for me, since my own work with CSIRO Plant Industry will shortly involve an evaluation of the grazing value of the winter wheat varieties which have recently been released for the High Rainfall Zone of Australia. Such grazing can be regarded as complementing the forage supplied by sown improved pastures. It was therefore of great interest for me to find from this visit, and interactions with the producers, that in the Southern Great Plains of Oklahoma wheat grazing IS the grazing system.

The work of Drs Sam Coleman and Bill Phillips at Fort Reno is directed towards finding pasture species which can 'make good the feed gap' in the wheat grazing system. In a sense, it is thus the 'flip-side' of the work in which I will be involved at CSIRO Plant Industry. Three outcomes from the visit to Fort Reno will be useful in my continuing work.

Dr Bill Phillips is involved in studies of adaptation or adjustment of stocker cattle to wheat grazing, especially early in the grazing system. Although

winter wheat has abundant protein and a high digestibility, performance of cattle in their first month of grazing it is often lower than expected. The reasons for this are unclear, but the effect reduces the overall economic sustainability of grazing systems based on winter wheat.

Although winter wheat is the major source of cool-season forage in the Southern Great Plains, producers are interested in options which would reduce the expense associated with the annual planting of the wheat 'pasture'. Dr Sam Coleman has been evaluating a range of cool-season perennial grasses which might fill this need. Oklahoma is primarily in the zone of the warm-season perennial grasses and the use of cool-season grasses is fairly recent. Grasses which have shown good potential, in terms of their establishment, forage production and persistence have been 'Paiute' orchardgrass (cocksfoot), 'Jose' tall wheatgrass and 'Lunar' pubescent wheatgrass. All withstand drought conditions well and the wheatgrasses, especially 'Jose' have good persistence and tolerance to saline soils.

Grazing effects on soils, vegetation and hydrology form a major component of work at Fort Reno, with Drs Bill Phillips and John Daniel involved in studies which have many similarities in approach to the work conducted at the southern (Book Book) and northern (Armidale) research sites of the Temperate Pastures Sustainability Key Program (TPSKP) here in New South Wales.

Texas

I had two major activities in Texas, both associated with the Vth International Symposium on the Nutrition of Herbivores, held in San Antonio. This is a unique conference, since it brings together nutritionists involved with both domestic and wild herbivores. My involvement was as the co-organiser of and speaker at a satellite meeting immediately before the Symposium itself and as the co-presenter of a plenary paper in the Symposium. The plenary paper discussed the role of decision support tools (such as GrazFeed in Australia and NUTBAL in the USA) in the day-to-day management of animals. My co-authors were Dr Mike Freer of CSIRO Plant Industry and Drs Jerry Stuth and Bob Lyons from the USA.

The Symposium itself emphasised the integration of concepts related to the nutritional ecology of herbivores, whilst the satellite meeting, entitled 'Emerging Techniques for Studying the Nutritional Status of Free-ranging Herbivores' dealt exclusively with methodological matters. My own paper at this meeting was about developments in our use of plant wax markers for estimating diet selection in grazing animals. This technique is increasingly allowing us to determine what grazing animals select and why, which has important ramifications for plant breeding objectives.

Both the Symposium and the satellite meeting were great successes, thanks principally to the efforts made by authors in preparing stimulating papers and by the delegates in participating in vigorous discussion. Approximately 200 people attended the Symposium and over 90 of these also took part in the satellite meeting. In the Symposium itself, plenary papers were presented in an auditorium, but discussion occurred in a much smaller room and was steered by 'Evocateurs' appointed by the organisers. This system worked really well, perhaps because the discussion was given structure, and because the discussion venue was less daunting than the main auditorium. It is an approach to discussion sessions which should be attempted by other conference organisers.

As is often the case, the mid-Symposium tours were a highlight, allowing the chance to visit properties in south-west Texas and the Texas Hill Country. In the course of an afternoon and evening, we visited a large feedlot, a deer farm running fallow deer, a game ranch and a sheep/goat property on rocky limestone outcrops in the Hill Country. The game ranch was a revelation. I am still coming to terms with the idea of a property which pays such special attention to pastures and to the health and well-being of its 50 or more species of ungulates, in order that these animals can then be shot from golf-carts by people rich enough to afford it.

By contrast, the Giles ranch in the Texas Hill Country was like 'coming home'. The problems faced by Robin Giles and his family in rearing sheep, Angus cattle and Angora goats in that country were reminiscent of those faced by many of our producers whose animals graze rough native pasture and scrub. However, few Australian producers would have the predation problems which the Giles ranch encounters with coyotes.

Virginia

The gentle greenness of Virginia was very different from the Texas Hill Country, and while there were sheep running on the Virginia Polytechnic field station at Blacksburg, I saw very few on actual properties. Production is based primarily on dairy, beef and horses.

Beef and dairy research by Virginia Polytechnic is concentrated mainly at Blacksburg in southern Virginia, and is based on pastures of orchard grass (cocksfoot), kentucky bluegrass and white clover. Here, I was struck by two things in particular. First, their dairy research approaches the use of pasture as a 'supplement' which dairy cows might graze for only 2-4 hours per day! For the rest of the day, the cows are housed and fed a complete diet. Second, I encountered again the concern with the effects of grazing on the whole system and its sustainability. In beef systems, Prof. Joe Fontenot and colleagues are comparing high- and low-input systems as they influence forage utilisation, mineral metabolism by animals (especially in relation to grass tetany), sul-

phur fertiliser use (in relation to the sulphur content of acid rain) and the recycling of animal wastes. The work is impressive and involves animal scientists, parasitologists, forage agronomists, soil scientists, entomologists, plant pathologists and engineers. Once again, I was struck with the similarity of this work to the TPSKP work mentioned above, and to the work at Fort Reno in Oklahoma.

The other major campus of Virginia Polytechnic is at Middleburg in northern Virginia, where the main focus is on horse nutrition, especially the nutrition of the brood mare. In this environment, there were two major concerns about pastures for horses. First, tall fescue was regarded as 'a weed', with cocksfoot-based pastures being much preferred. Second, pastures containing low levels of water-soluble carbohydrates (WSC) were also preferred. This is in complete contrast to current feelings about the role of WSC in pastures for ruminants, which select in favour of such pastures and can benefit from them. The 'problem' with high WSC for horses appears to relate to effects of high levels of absorbed glucose on temperament and behaviour. Low-WSC pastures coupled with high-fat supplements were preferred, since they appeared to have a 'calming effect' on the horses.

In each campus, I gave two seminars, one consisting of a summary of the material presented at the Texas Symposium and especially the Satellite Meeting, and the other on our work in CSIRO Plant Industry on nutrient cycling through grazing animals.

Section B: Mexico (1 week)

The Travel Grant allowed me to visit Mexico for the first time; it will not be my last visit. This fascinating country confronted me with agriculture at its most sophisticated and its most basic, with animal and especially human nutrition at its most replete and its most deficient, and with opulence and crushing poverty side-by-side. Contrast seems to be the general theme of this report, and certainly the two areas I visited in Mexico could not have been more different.

The Bajío region

The high valleys north-west of Mexico City are known collectively as 'the Bajío'. They include some of Mexico's most intensive and sophisticated agriculture. In driving through the Bajío with my host Mr Alberto Torres Rodriguez, I encountered every grain crop imaginable, plus crops as varied as lucerne (for hay), strawberries, onions and garlic, many varieties of peppers and chilli and a host of vegetables. Animal production consists of beef, dairy and goat enterprises, with the latter being a very traditional and relatively low output form of production.

I visited one dairy farm with 210 milkers grazing excellent pastures of perennial ryegrass, fescue, cocksfoot, white clover and red clover. The property

was unusual for the region in having substantial quantities of legume in the pastures. In most of the Bajío, the nitrogen requirements of pasture are provided via ammonium sulphate application. While milking performance was excellent, the property was experiencing only 35-40% conception to artificial insemination and is seeking extension advice to help solve the problem. Like many such properties in the Bajío, it is run by a manager acting for an absentee landlord.

On my second day in the Bajío, I visited Semillas Berentsen (Berentsen Seeds), where Alberto Torres and colleague Salome Salinas are breeding improved lines of lucerne and annual ryegrass. Because of the fear of bloat, most lucerne crops in the Bajío are grown for hay production, especially in dairy/beef enterprises. The lucerne varieties were being selected for morphology and vigour. While some lines looked very impressive, I could not judge how well the improved varieties would cope under farm conditions.

The breeding work with annual ryegrass was something of a surprise to me, since I did not realise the species was used in pastures in that region. Some selections looked especially vigorous, but are not being tested under grazing because the basis of production from this species is again hay or silage production. The principal vehicle of release of new varieties to farmers is through the seed company's own field days and, to a lesser extent, through the use of the improved lines on selected farms. There is little interaction with the Mexican equivalent of the Department of Agriculture.

The Yucatan

The Yucatan Peninsula in eastern Mexico is as poor as the Bajío is rich, as low and flat as the Bajío is high and rolling, and was my first experience of 'slash and burn' agriculture. There are two striking features of the landscape. First, the soils are thin and stony over limestone and the vegetation is a complex legume shrubland. Second, there are no rivers. All water available for agriculture is underground and is obtained either via wells, or at points where the water emerges naturally through the limestone as 'cenotes'. These features result in an agriculture dominated by crop production on slashed and burnt areas close to villages. Maize is the main crop with some fruit production. Animal production, at least as I encountered it, seemed to consist mainly of free-range pig and poultry production in the villages.

My hosts in the Yucatan were Dr Guillermo Rios Arjona of the Autonomous University of the Yucatan and Mr Roberto Sangrines Garcia of Instituto Tecnológico Agropecuario (ITA). Each is involved in research to improve animal production in the region, though in very different ways. Dr Rios is a member of a multidisciplinary team which aims to improve human (and especially child) nutrition in the region using goat production as the vehicle. In

contrast to most of Mexico, there is no tradition of goat production in the Yucatan. Its introduction is seen as a means of providing fibre, meat and milk and through them, money and animal foods. The project is ambitious, and includes scientists from fields as diverse as soil science, social science and food technology. The latter reflects the ambition of having home-based cheese and yoghurt production as part of the improved food supply for children.

The work at ITA appeared more 'high-tech', involving ovum transplantation and artificial insemination in a major cross-breeding program to generate sheep crossbreeds more suited to the area. Persian Black-bellied sheep and Poll Dorsets form the basis of the program. It remains to be seen whether this approach is the appropriate one for the problem.

Section C: Scotland (2 weeks)

All of my time in Scotland was spent at the Macaulay Land Use Research Institute (MLURI) in Aberdeen and in particular with Dr Bob Mayes, with whom I have had a long-standing collaboration. My main activities were the writing up of work from a previous collaboration, and the development of some new analytical techniques to support our work on estimation of diet selection and intake by grazing animals. I also had the opportunity, albeit brief, to visit a couple of properties at Udney, north-west of Aberdeen.

I frequently posed the question, "What are the grassland issues which currently limit animal production in the United Kingdom?" and was always surprised at the answers (or rather, the lack of answers) which I received. From discussions with producers, it appeared to me that their enterprise mix and income from farming related mainly to two things: first, the cost-price structure which they

faced as a result of European Community support schemes and second, the major impact of very restrictive regulations on cattle production arising from the advent of BSE (mad-cow disease). I visited one farm (crops/dairy/beef/pigs) where the owner confessed that, with poor pig prices in the previous year, the only thing which had kept him financially viable was the money received for his 'set-aside', that is, the land which he put to one side and upon which he did NOT grow crops.

It is thus no surprise that a major part of the work of MLURI is on the integration of animal production with other land uses, including those related to re-afforestation and tourism. A frequent question asked was, "What do you want the Scotland of tomorrow to look like?". As a result, a major component of the work is on the ecological impact of agriculture, just as I encountered in Oklahoma and Virginia and indeed, in studies in Australia.

Acknowledgments

This study tour was one of complete contrasts: from dry, irrigated valleys between the Cascades and the Rockies, to the lushness of the Bajio in Mexico; from the Southern Great Plains of Oklahoma to the Scottish Hills; from the hot, flat, slash and burn agriculture of the Yucatan to the horse country of Virginia. I hope that in the seminars and talks which I gave during the tour, I was able to impart something to my hosts; I know that I learnt much from them and their agricultures. None of this would have been possible without the generous support of the Grassland Society of New South Wales, together with its sister organisation the Grassland Society of Victoria, the Australian Nutrition Trust Fund, Virginia Polytechnic and CSIRO Plant Industry. Finally, I thank the many researchers, farmers, seed company and extension personnel, whose outstanding hospitality and enthusiasm made the tour such a memorable experience.