Production is not a dirty word.
A report from the XXI International Grassland Congress and VIII International Rangeland Congress

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Agriculture for production in the United Kingdom and mainland Europe has over the last few years received a persona of something that we should be embarrassed about. Environmental groups have asserted pressure to turn our ‘Sir George Stapledon’ improved grasslands back into ‘native grasslands’ with species diverse pastures for insects and birds with sheep and cattle as impostors and destroyers of natural habitats. Production was a dirty word in a land where food was plentiful and the countryside was for tourists and environmentalists. Times are changing with food prices rising and pressure for land increasing with the development of energy crops and the ever expansion of the human population. There has been too much pressure on our farmers to embrace these environmental schemes at the detriment of production. Good farmers care about what they produce and the land they manage. But the scale has been too heavily tipped towards ‘environment’ and ‘land managers’ and away from what they had become farmers for; to provide good quality products which requires well maintained grasslands. Do not get me wrong there is need for a careful land management approach where the producer (I make no apologises for using the word) balances the environment and ‘natural habitats’ with improved grasslands to produce quality products which match the needs of global and national demand.

Numerous talks at the XXI IGC and VIII IRC held in Hohhot in China addressed these global issues. There is scope to combine the introduction of the species rich ‘native’ grasslands with improved grasslands for the production of quality products. Numerous papers addressed the advantages of ‘weed’ species contained in these ‘native’ grasslands which through novel plant compounds alter the metabolism of fats in the gut of ruminants to produce products (meat and milk) with healthier fatty acid profiles. Simply grazing can also improve product quality as opposed to feeding conserved forage or cutting and carting systems due to the ‘green odour effect’. These green odours released when herbage is cut have antimicrobial properties and during ingestion at grazing act in similar ways to the novel plant compounds.

A combination of approaches is required to take the benefits from more ‘natural’ grazing practices with their abundance of novel plant compounds and environmental benefits and improved pastures which will be required to meet demand. The benefits of breeding plants with higher levels of water-soluble carbohydrate have been elucidated for numerous years but even more so in the current climate. Not only do these grasses improve animal performance but they have also been shown to reduce environmental pollution in the form of N and the potential to reduce methane emissions (a greenhouse gas). Breeding for particular plant enzymes may also be advantageous e.g. red clovers polyphenol oxidase enzyme improves product quality by enhancing polyunsaturated fatty acids but also as with high sugar grasses reduce environmental pollution by increasing the efficiency for which animals can utilise plant protein. Natural forage systems have been shown to improve the content of conjugated linoleic acid and phytanic acid in animal products. These particular fatty acids have been shown to have a role in preventing cancer and regulating the immune response in man and are
solely produced by the metabolism of unsaturated fatty acids and chlorophyll, respectively, in the rumen.

For too long we have been quite about the benefits of our production methods. There is a key role of production alongside environmental schemes so that we can produce quality products to the benefit of the producer, consumer and the global environment.

I have tried to give an overview of some of the issues regarding production of quality products from grasslands given at the meeting in China. I would like to thank the British Grassland Society for giving me the opportunity to present my findings at the meeting and also to get a broader overview of grazing for quality across the globe.

Times are changing again and it is an exciting time to be a producer!
Report
on the attendance of XXI International Grassland Congress/VIII International Rangeland Congress
held in Hohhot, China

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Thanks to the British Grassland Society and the SAC Trust Fund for financial support, I attended the XXI International Grassland Congress/VIII International Rangeland Congress held in Hohhot, China, 29th June – 5th July, 2008. The title of the poster I submitted is “The impact of climate change on grassland – a modelling approach”.

The poster received attentions from a number of delegates from different countries. During the display time, people approached me to ask various questions. For example, a delegate from Australia is interested in the methodology presented in the poster and said that the same procedures are used in his project; delegates from the South America asked potential impact of climate change on livestock in general. Two participants expressed their interest on the model which is used in the presentation and technique on model development and implementation. Some delegates from China who are not familiar with the topic I presented asked general questions how quantitatively to assess the impact of climate change on grassland and arable lands.

One of my academic interests is climate change impacts, which falls in the theme of climate change and impacts on grasslands/rangelands on the congresses. There are about 50 posters in total in this theme. Most of them describe carbon sequestration by grassland/rangeland and carbon cycling in grassland. Others depict greenhouse gas emissions, e.g. N$_2$O and methane. A series of field experiment (with 2-3 yrs) conducted at the Prairie Heating and CO$_2$ Enrichment facilities in Wyoming, USA showed that CO$_2$ enrichment increases plant production in semi-arid grasslands, and combined rising CO$_2$ and temperature may enhance productivity of C$_4$ grasses, and suggest carbon storage in soils could be reduced in a future greenhouse world but reductions in C storage could be offset because grasses with lower litter qualities are favoured by elevated CO$_2$ or warming. However, some participants pointed out that carbon storage is affected by farm management strategies. A long-term monitoring system established on the Eastern South coast of Western Australia indicated that under appropriately managed perennial pastures, soil carbon can develop to a level greater than in other types of plant community.

In the middle of the conference, I attended the mid-congress tour on the resource protection and utilization in the area of mixed agriculture and animal husbandry. Three academic sites were shown on the day: the Wuchuan Dryland Farming Experimental Station, Conservation Agriculture Demo Base in Wuchuan County, and Anti-desertification Demo Base in Siziwang Banner. The objectives of these studies are similar: to protect agricultural eco-environment, promote sustainable utilization of farmland and increase nutrient use efficiency. I was given deep impression by the technique they adopt: no-tillage, minimized tillage and crop rotations. Although environmental conditions in Scotland are much different from those in Inner Mongolia, similar field managements could be applied to either sites for mitigating greenhouse gas emissions and increasing nutrient use efficiency.
Mid Congress Tour to Engebei Sand Control Centre

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The joint meeting of the 21st International Grassland Congress and the 8th International Rangeland Congress was held in Hohhot, China from 29th June to 5th July 2008. I was very fortunate to be there with over 1500 delegates from over 40 Countries. The meeting presented me an opportunity to experience a wide range of knowledge in grassland and rangeland, and also the beauty of rangeland and desert in the mid-conference tour.

On Wednesday 2 July 2008, I joined a group of 150 delegates in six buses to visit Engebei Desert Demonstration Area. We left our hotel at around 7.00 and arrived at the destination after 5 hours. The reason for me to select this route was that I wanted to see real desert, not the one in movie or TV screen. Engebei Desert Demonstration Area is located in Kubuqi Desert. But I was rather disappointed that on the way to the destination, there was no sign of desert which in my mind is a huge area of yellow sands. What I saw from the window of bus is farm land (although not rich) with crop, tree and grass.

Our visit in the site included several views: Engebei sand control museum, ostrich farm, a border site between oasis and desert and Half-Moon Lake. Afterwards, we had lunch in the site restaurant, and were entertained by the Mongolian folk music and dancing. I have attached five pictures to highlight this visit.

Engebei Desert Demonstration Area is one artificial oasis. This centre was part of Kubuqi Desert over 10 years ago. In 1990, a group of Chinese, led by Mr. Wang Minghai, started an experimental project to turn the desert into an oasis. During the progress of work, they received help from various sources, especially advice and help from a Japanese desert expert (Toyama Masahide). Today, years of effort have gained considerable results in Engebei’s desert control and development: One third of the 20,000-ha exemplary zone has been covered with trees, with more than 3 million clumps of shrubbery such as Salix and Mongolica. Reservoirs have also been built up. There are farms for cultivating improved strains of sheep, raising ostrich, planting herb and fruit trees, and cultivating flower and grass seeds in the exemplary zone. Starting from wind and sand control to the development of desert-related industries, the people in Engebei enjoy social, ecological and economic benefits at the same time.

Acknowledgment
My trip was partially sponsored by a travel award from British Grassland Society.
The change of Engebei Desert Demonstration Area. Desert in 1990 (above) and oasis in 2004 (bottom)

The planting at Engebei Desert Demonstration Area

Ostrich farm
Half-Moon Lake created by a heavy flood

Mongolian dancing
Firstly can I thank the BGS for the opportunity that the scholarship offered my in terms of the ability to travel out to Hohhot for the International Grassland Congress, which in turn allowed me the opportunity to meet and talk with many leading researches in the field of grassland.

As the congress was being run jointly by the IGC and the IRC the topics being covered spanned a broad range of land uses from improved productive grassland through to rangelands in arid conditions with less than 60 growing days per annum.

On the production side one of the most interesting papers to be presented was ‘Progress in silage research in relation to animal production and food safety’ presented by N. Nishino, Okayama University, Japan.

The presentation started by looking at the flexibility of big bale silage versus clamp silage in terms of chop length being generally longer in bales giving lower moisture crops, the restricted fermentation of silage in bales which can lead to higher pH silages. Another risk is that of contamination being greater in bales due to greater surface area in total. On the clamp side there is the problems that can arise from ineffective filling of the clamp and incorrect consolidation, along with the fact that by the nature of doing clamp silage, lack of flexibility, it is highly probably that not all grass will be at the right stage.

If we take the above in terms of the risk levels from paratuberculosis (MAP), mycotoxins and dioxins take can be found in silages there are linking factors.

Incorrect fermentation, leading to higher pH can allow contamination of the clamp by MAP microbes. While ensuring anaerobic conditions will inhibit the multiplication of mycotoxins.

Dioxin contamination in silage is not affected by ensiling but it is thought that the microbes enter via either air or possibly soil in the clamp.

On the back of this work research is on going as to the use of probiotics “live microbial feed supplements that beneficially affect the host animal by improving its intestinal microbial balance” where aerobic spoilage of a crop has happened plus looking at varying uses in clamps to limit the spoilage.

One point of particular interest was as part of the research they did clamp face analysis. This consisted of eight samples taken across the face of grass silage clamp, of these eight samples the results came back with seven different pHs varying up to 0.4 of a point. Further work is to be done to see if this is replicated across clamps and to see if the difference can be attributed to exposure to air from time of face cutting.

The conclusion of the paper was something I think we can all take on board, “silaging has gone from simple preservation of a moist crop to bioprocessing” and as research goes on we will see more what effect different actions have on the feed we produce.

Two of the more rangeland papers also caused me to listen, firstly from Brazil, P. Carvalho presented a paper on ‘managing natural grasslands in a changing world’
The Brazilian livestock industry accounts for 16% of GDP so any changes in grassland availability can have a major effect on livestock numbers. Taking the land mass within the Brazilian Pampa Biome, which accounts for 2.07% of total Brazilian land, this area is under threat from:
- Agricultural expansion - including growing of cash crops and land being given over to forestation
- Overgrazing - legislation is in place for minimum stocking densities, these take no account of whether the land is improved grassland or natural grass.
- Alien plants - Eragrostis plana covered 20,000ha in 1978 it now covers over 1 million hectares.

Currently the rate of loss stands at 410,000ha per year of grassland.

A focus is now being put on the relationship between plant and animal in terms of grazing management and grazing behaviour, looking at optimum sward heights for both plant and animal.

The second of these papers also came from the South American continent, Uruguay, a country very different in size to Brazil but facing a similar situation in terms of loss of grassland for livestock production to forestry and cash crops. Grassland is being turned over to forestry at a rate of 10% per year since 1990 while the rising market for soyabeans has seen land prices rise by 2.8X in a five year period.

Grassland areas in Uruguay are split 20% improved sward 80% natural, the move in markets is causing the livestock sector to move to more marginal areas which in itself can cause greater problems in terms of potential contamination of water plus reductions in the chemical and physical properties of the soils. The livestock sector also sits under the introduction of legislation for full traceability by 2010.

Another continent which brought forward some interesting and varied papers was Australasia, ranging from working out the optimum stocking rates for drought prone land to a poster on the potential of kangaroo production as a low emission meat.

Closer to home, Emer Kennedy from the Dairy Production Research Centre, Ireland presented a volunteer paper on “Effect of restricted access time to pasture on dairy cow milk production, grazing behaviour and dry matter intake” in the tight ten minute time slot she highlighted when looking to use early spring grass or late autumn growth the time the cows have access to the grass can have a varied effect on the time spent grazing and in turn the dry matter intake. The cows in the research has access in four different time variables, 24 hours, 1 nine hour period, 2 three hour periods and 2 four and half hour periods in a day. Being monitored for yield, body condition, milk protein levels and DM intake, there was no significant differences recorded between the time periods in terms of yield or body condition score. In terms of protein levels there was a drop recorded in those grazed for 2 three hour periods opposed to those grazed for the 24 hour period. Those grazing for the 9 hour period showed a reduction in dry matter intake. In terms of time while at grass that was spent grazing the most efficient users of time where those put to grass for the three hour periods twice a day.

- 2 x 3hrs spent 97% time grazing
- 24hrs spent 41% time grazing
- 2 x 4.5hrs spent 78% time grazing
1 x 9hrs spent 80% time grazing

In conclusion it was aid that in order to make the most of the grass in the field the grazing habits of the cows must be recognised and access planned around this.

Of course there were numerous other papers and posters which covered the whole spectrum of the grassland and rangeland management and I am sure the two books of papers, total weight over 4kg, which I brought back from the congress will hold various gems of information which I will pick up on a time goes by. However for now the opportunity that travelling to the congress gave me and the papers I heard have helped me understand more the differing level of research being done around the globe and how different countries are prioritising issues in relation to food production and environmental issues.
International Grassland Congress
in
Hohhot – China
from
30th July
to
4th August 2008
Introduction:

An International Grassland Congress is held every four years at an important world wide venue. On this occasion (2008) it was held in Hohhot, a city within the inner Mongolia province of China (the grassland centre for China). This provided an ideal opportunity to meet with grassland research experts from over sixty seven countries worldwide. Invited and offered papers were complimented by a series of poster sessions applicable to each day’s theme. During the conference (mid-way) information tours were organised to study the farming subjects in support of the conference i.e. Grass Breeding Centre/Bull Testing Station etc.

An opportunity was also available to join one of the pre-conference tours to experience China. There were four different tours offered

Cansu Tour  
Yunnan Tour  
Hunlunbeir Tour  
Xilingol Steppe Tour

These tours provided a significant insight into the grassland farm and lifestyle in China. A real potential eye-opener, and a lead into the conference.
Aims/Objectives:

The aim and objective of the visit was three-fold:

- To gain experience and knowledge of Chinese farming expertise, particularly grassland and livestock production.
- To add to my personal knowledge of grassland production and utilisation.
- To appreciate and understand the Chinese lifestyle.

It was intended to gain information and experience to be able to return to England and pass on this beneficial information to the U.K. grassland/livestock farmers. Access to grassland research, education and farming were all equally important. This would assist in establishing the possible direction to be taken by English grassland/livestock farmers in relation to Chinese development.

How would it be possible to improve:

- Grassland Production
- Grassland Utilisation

In the U.K. in order to maintain an efficient and effective grassland system.
Pre-Conference Tour - Gansu Province

○ See the attached programme.

Day One: Tibet:
A visit to study alpine meadow management with grazing by White Yak (a threatened species). A complete insight into how not to transfer responsibility from the State to individual farmers. Farming at this low level is measured by the capital value of the livestock i.e. the number of head. This leads to serious over-grazing and potential erosion of the landscape.

Great Wall:
To see the Great Wall on the way to an overnight stop; a visit to the real history of China.

Day Two:
A study into the history of China, with a visit to the Great Buddha Temple and the Great Wall Museum. The Temple, having been seriously neglected, was in urgent need of renovation, being undertaken at the time of the visit. This provided an insight into Chinese renovation work being mainly undertaken by labour. Many workers were present, operating wheel barrows and hand mixing concrete/tar for the roof.

Day Three:
A day of agricultural study with visits to:
○ A seed cleaning machine manufactures
○ Alfalfa production and drying for cubing and transfer throughout China.
○ Visit to 400,000 hectare Wildlife Park within the Gobi Desert.
**Day Four:**

A day of sight seeing to:

- Mingsha Mountain and the Crescent Spring
- Visit to the historic Mogao Grottoes

**N.B.:**

It was of the utmost importance to the organising committee for the visitors to see the project in full. Therefore, the White Yak had been delayed three weeks from their transfer to the high summer pasture. At the farm for producing alfalfa, the harvesting had been delayed ten days, awaiting our visit.

Both actions were much appreciated by the visitors, but created two effects:

- The disadvantage to the Chinese farmers who receive no compensation for the effect on their business.
- The effect on the visitor, who though they were made aware of the circumstances, still felt it was bad management rather than concern for the farmers.

The returns from both projects were low enough without being influenced by delegate direction. An alternative way of seeing these projects should have been considered.
Dairy & Bull Breeding Centre

I chose to take the Route 2 mid-congress tour, covering grass seed production, ecological protection, bull breeding and milk production; a round trip of some 150 kilometres. My report covers the bull breeding centre and milk production, both at Helinger.

China is a country extreme contrast with mainly small farms, average two hectares, or large new industrial size units. Development of brown field sites into large industrial units is now taken whenever there is an opportunity. In this case, providing significant rewards for Helinger; a development from a small village (population 20,000) to a large town (population 250,000). A decision had been taken to develop a brown field site adjacent to Helinger around bull breeding, milk production and a processing dairy.

A complete new green field infrastructure was added

- A ninety bull breeding research centre with embryo transplant and gene data base.
- A 10,000 cow milking unit producing 10,000 litres per cow, sold per annum, with three times per day milking.
- A new computerised dairy processing unit with mainly robotic management.
- A need to build new housing, together with all the infrastructure i.e. schools for an additional 200,000 plus people.
- A need to build a power station to deliver all the required energy.
- To surround the area with a woodland and parks (over 200 hectares) for the benefit of the new population and to develop possible climate change.

Bull Breeding:

A new unit breeding and housing unit for managing ninety bulls. All bulls were large Holstein/Friesian, mainly purchased from world wide stock. Only highly genetic material was acquired with a view to establishing a world leading bull sires. Complete monitoring of the project, including cloning was being undertaken. Testing semen for all aspects, including fertility, was available. One of the leading bull breeding and monitoring units in the world. The unit was headed up by one of the leading genesists in the world who had been involved for the previous fifteen years with the Cogent breed unit in the U.K. A world leader in semen product, sexing of semen and bull appraisal. A most impressive set up for bull research, and comparable with anywhere else in the world.
Milk Production:

A new state of the art milk production unit was built for 10,000 cows; on three times a day milking (25,000 milkings per day). Production of 10,000 litres per head lead to annual sales of 100,000,000 litres (equivalent to 0.75% of the U.K. milk quota on one unit). Milking was undertaken through four separate units:

- A sixty cow rotary
- A 40/40 quick release herringbone
- A 12/24 traditional herringbone
- One robot unit

The robot was in full operation for sixty cows (Alpha Laval) though it was proving ineffective, failing to apply the first unit on numerous occasions, even with even udders. Three times/day milking in the rotary (non stop for twenty four hours), was successfully carrying out 10,000 milkings per day (or 40% of the total milkings). The herringbone (non stop) was carrying our 12,000 milkings per day (or 48% of the total milkings) with a three, eight hour, shift system. The small herringbone was then kept in reserve to make up the balance of the required milkings.

Even with twenty four hours per day operation, it was still proving difficult, particularly at the higher yields, to complete the required 25,000 milkings. Teams were operating eight hour shifts, with one team off at any one time. A total labour force of over fifty being required to manage the unit. No feeding was being undertaken in any of the parlours.

Housing:

Housing was on either side of the centre milking unit in loose housed feed lots. As the unit was on the edge of the desert, it had low rainfall and high, dry temperatures. Manure and pee therefore, evaporating as there was no roof required, limiting capital investment. A centre feed area was undercover, providing shelter from the sun and occasional rain, mainly for the TMR feeding. A simple cost effective housing system well planned out (green field site) for managing 10,000 cows with as little effort as possible.
Feeding:

A TMR diet was fed at all times, providing a balanced ration throughout the unit. Feeding was twice per day to allow the animal maximum intake time. Diets were built around alfalfa as the raw material, together with maize and wholecrop.

All dry matter needed to be brought into the unit; a total requirement of 65,700 tonne of dry matter per annum. The diet has a high average dry matter and access to sufficient water was required, including adding into the feeder. A target mean dry matter for the ration for the ration.

The landscape around the unit had been rough terrain, difficult to bring fully into production. What do the Chinese do - flatten it? A two hundred hectare area had been bulldozed level, and brought into alfalfa production, with a further two hundred hectares of reclaim to be undertaken. Obviously a total area of six hundred hectares is insufficient for the dairy herd, requiring considerable quantities of feed to be brought in from local farmers.

Margins from the unit were excellent, as you might expect, with a cheap workforce and higher per litre prices. Difficulty with the language proved unreliable in providing costing information.
**Cropping:**

Reclaimed desert is an excellent medium for growing maize - wholecrop - alfalfa. You are effectively dealing with hydroponics. You are provided with:

- Sun
- High Dry Temperature
- Light Sandy Soils

You need to provide:

- Water
- Fertiliser

High yields are available under these conditions, with upward of 10 tonnes/hectare of dry matter production. Utilisation is excellent as it is all cut and clamped in ideal conditions.

Mixed forages provide excellent diets for high yielding Holstein cattle. Diets were around 50% dry matter as forage with 50% dry matter of mixed straights.

*The Key:* WATER
The Dairy:

An unbelievable experience. It is difficult to describe this unit in print. A new, all stainless steel, complete robotic unit. Around ten people are running this unit with twenty five packing lines working flat out. Tankers enter the unit and are connected to the system. The milk then remains untouched until it has been retailed.

- Pasteurised
- Homogenised
- Packaged
- Boxed
- Transported
- Stored
- Off-Loaded

All the above is completely automatic and was working most effectively, breakdowns being on-existent. What you can achieve with a green field site, using and implementing technology.
Conclusion:

Water supply, for the developing population, will be of serious consideration to the Chinese in future. Much of their new development is reclaimed from the Gobi Desert, requiring delivery of water. China is moving the Yellow River over 750 kilometres to these new sites from a mountain source, receiving less snow, and with retreating glaciers; a real change to their future prosperity. To combat this requirement, China is building a new canal from the south, over 2,000 kilometres long, to deliver water to these new developing cities. A seriously expensive and risky project. They are certainly progressive.

Productivity in China, at present, is exceptional whether this will continue as their prosperity grows debatable. Over the next generation, with improved lifestyles and education, they are sure to be unwilling to continue hand production. How they progress to their larger units (from a base of 2.0 hectares) will be an interesting observation.

However, to support this development, China is:

1. Accepting new technology - GM cropping
2. Reclaiming land, particularly the Desert
3. Prepared to rail-road through their progressive plans
4. Moving water to areas of requirement.

Production of grassland is high, mainly alfalfa, with their production it competes favourably with the West. However, if you measure the grassland output in the West, there is plenty of scope for at least 20% improvement in production and utilisation. Therefore, we have no reason to be fearful of the Chinese, but to compliment them on their progress.