grass roots

Newsletter of the Grassland Society of Southern Africa

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Integrating pastures and rangelands

Society legend turns 90

Holistic Management: embracing complexity

Lessons from South America

Advancing rangeland ecology and pasture management in Africa

Editorial

Dear Readers

Those of you who attended the GSSA research skills workshop will know that it was stimulating and exciting. More importantly, the workshop raised awareness among young practitioners of a lot of the basic skills of science. As with any profession, whether accounting or architecture, the real skills that separate the great from the rest are not taught at university. These skills are acquired through years of experience or mentorship (or rather, what used to be called apprenticeship before it became unfashionable). They are developed by spending hour after tedious hour at a workbench, in a library, in the field, or being grilled by peers at a congress, and there is no short cut to acquiring them.

The enthusiastic response of the participants was mainly as a result of the excellent talks and the speakers, but there is also a new, optimistic mood spreading through the broader agricultural/ grassland science community. The owners of the lodge where my colleagues and I stayed summed it up by saying that the mood of our team compared that of a recent visit by a group of civil servants was infectious and encouraging. Several agriculture departments are still battling with desperate staff shortages and uninterested management, but there are others where a new generation of young scientists have joined and brought along their youthful optimism.

Alan Short

The Grassland Society of Southern Africa is dedicated to the advancement of the science and practice of range ecology and pasture management.

We welcome any contributions to the Grassroots*, in the form of news, informative articles, reports, short research notes, scientific papers and letters to the Editor. Email shorta@arc.agric.za or admin@grassland.org.za or fax +27 (0)86 622 75 76*

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Erratum:

The photograph of lion guardians in the Amboseli-Tsavo system, Kenya (*Grassroots*, September 2008, p. 13) was used without permission of and was not credited to the photographer, Seamus Maclennan of the Wildlife Conservation Research Unit, Oxford University. *Grassroots* apologises for the error.

On the cover:

Radish and stooling rye in Kokstad. How do we economically integrate rangelands and pastures (p X)?. (Photo: John Cunningham)

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News

Dick Dickinson turns 90 on 15th September 2008

Albert Smith

Dick Dickinson was the 24th President of the GSSA. Dick is well known and respected in grassland circles and is a co-author of the Kynoch Weidingshandleiding which was recently translated as the Kynoch Pasture Handbook.

Dick farmed near Delmas and his property was a showcase often used for demonstration of pastures and animal production for visiting scientists. This feature opened up opportunities for Dick to meet some of the most eminent pasture scientists to visit South Africa. He had a long career with AE&CI and eventually Kynoch.

He is fortunate to have known, as personal friends, scientists like Mark Hutton (Australia) and Glen Burton (USA, Georgia) who are ranked as the best pasture scientists in their respective countries.

He is now retired and lives with his wife Annatjie in Mosselbay.

On the 14th September his close family and friends got together at Sun City to celebrate his 90th. Present were children from Australia and a host of family from South Africa. Friends who "went to varsity" with Dick and others who have known him for only about thirty years.

Of those present were two previous GSSA Presidents, Norman Rethman and Albert Smith, and their wives. It was wonderful to share some thoughts with Dick and to hear some of his plans for development of extensive pastures in our country

From left to right: Albert Smith, Dick Dickinson and Norman Rethman

Engaging the global grasslands agenda

Mahlodi Tau
Grasslands Programme, South African National Biodiversity Institute
Email: tau@sanbi.org

Mahlodi Tau and Anthea Stephens attended the World Temperate Grasslands Conservation Initiative Workshop organized by IUCN in Hohhot, China from the 28 to 29 June 2008. Hohhot is the capital town of Inner Mongolia Province, located 450kms north of Beijing. The workshop was a pre-event to the XXIth International Grasslands Congress (IGC) and VIIIth International Rangeland Congress (IRC) held from the 30th June to the 5th July 2008. Over 20 countries attended the workshop, representing the temperate grasslands of North and South America, Australia, Asia, Europe, East Africa and southern Africa. Each region presented an overview of the status of its grasslands. The purpose of the workshop was to identify opportunities for collaboration with a view to developing a global strategy for temperate grasslands conservation.

Participants from all regions emphasized the need to improve grassland conservation management on priority land outside formally protected areas, while strengthening the existing grassland protected areas, particularly through transfrontier parks. Southern Africa's Maloti-Drakensberg Transfrontier Park was acknowledged as providing lessons for similar efforts elsewhere. Other recommendations included the need for communications and awareness raising at a global level on the value and importance of grasslands. Exciting opportunities for collaboration between Australia, South Africa and North America where identified. These regions are all at different stages in testing market mechanisms and stewardship approaches in managing fragmented grasslands in production landscapes.

The workshop participants issued the "Hohhot Declaration" that outlines the enormous value but severe threats facing the world's temperate grasslands. The Declaration calls for urgent international collaboration and action to protect and maintain these grasslands and the services they provide. The Declaration was formally adopted by the XXIth IGC and the VIIIth IRC Congress.

Following the workshop and Congress in Hohhot, Mahlodi and Anthea held a day of meetings in Beijing with officials from the China office of the UNDP and the Ministry of Environmental Protection. The purpose of these meetings was to learn more about China's experience of biodiversity management, with a view to establishing interest in the possibility of a biodiversity learning exchange between South Africa and China. China is in the process of revising their National Biodiversity Strategy and Action Plan (NBSAP), and is beginning to draft a framework level Biodiversity Act. They are also in the process of concluding a National Spatial Biodiversity Assessment (NSBA).

Report on combined International Rangeland and Grassland Congress held in Hohhot, China from 28 June – 5 July 2008.

PW Conradie
Manager: Pasture Science, Döhne ADI
Email:

The combined IGC-IRG 2008 congress hosted in Hohhot, capital of Inner Mongolia, People's Republic of China was attended by two pasture scientists from Döhne. Approximately 1500 delegates representing countries with rangeland and grassland vegetation attended the congress. The South African delegation of 22 was one of the largest after USA, Australia, New Zealand, Argentina and the host country China. The Eastern Cape was represented by Professor Trollope and Dr Dube, from Fort Hare University, Dr Palmer from the ARC, while Messrs Conradie and Goqwana represented the Eastern Cape Department of Agriculture.

The congress had as theme "Multifunctional Grasslands and Rangelands in a Changing World" with sub themes Resources and Ecology, Production Systems and People and Policies. International phenomena such as global warming, biofuel and carbon sequestration received much attention in presentations and discussion, while ongoing issues such as grazing capacity norms, desertification, encroachment of undesirable species and vegetation monitoring were also addressed.

Mr Goqwana presented a paper entitled: "Does Landcare result in changes in perceptions of livestock keepers on sustainable use of natural resources", while Mr Conradie's paper dealt with critical success factors for development projects in communal rangelands. Both presentations were well received and attracted much discussion as it addressed developmental challenges faced by many countries. Ideas were shared with world leaders in rangeland science and networking for future international collaboration was done.

During the course of the congress a special meeting of the African delegates was attended where environmental challenges facing the continent were discussed. The Grassland Society of Southern Africa of which Mr Conradie is currently the president agreed to assist Nigeria and other African countries to establish their own societies and thereby strengthen structured research on the continent.

We would like to thank the Senior Manager Agricultural Development and Research for his support and the Eastern Cape Department of Agriculture for the opportunity to attend the congress. The importance of international exposure in stimulating new research approaches and applying the latest technology is invaluable to develop a competitive research component. We strongly recommend further cooperation with grassland scientists from China, as such collaboration can be mutually beneficial.

Theo Scholtz receives GSSA award for best MSc student at North-West University

From left to right: Prof Leon van Rensburg, Prof Klaus Kellner, Mr Theo Scholtz and Prof Huib van Hamburg

Mr Theo Scholtz received the GSSA award for the best MSc student in Range and Forage Science for 2007/8 at the North-West University. The title for his masters study was: *The evaluation of the establishment and growth of indigenous trees to restore deforested riparian areas in the Mapungubwe National Park, South Africa*.

The award was presented at the Award giving ceremony on 14 October 2008 for all post graduate students in the Sub-programme: Remediation and Sustainable Management of Ecosystems at the School of Environmental Sciences and Development, North-West University (Potchefstroom campus).

Email your submissions to the African Journal of Range and Forage Science to journal@ grassland.org.za. There will be **NO PAGE CHARGES** for 2009.

South Africa to host 2012 World Dairy Summit

South Africa will host the International Dairy Federation's (IDF) annual World Dairy Summit in 2012. "This is really good news for South Africa and the South African dairy industry, and bears testimony to our industry's stature in the world," said Bertus de Jongh, chief executive officer of Mposa, holding company for the Milk Producers' Organisation (MPO) in South Africa.

De Jongh attended the IDF World Dairy Summit in Mexico City, where he was elected to the IDF council for the second consecutive year.

The 53 member countries of the IDF represent 82% of the total world milk production. The annual World Dairy Summit is a culminating event which provides an overview of what is happening in dairying on all fronts.

For more information, contact Bertus de Jongh at 012 843 5600 or 082 552 0594 or e-mail bertus.dejongh@mposa.co.za.

Bursaries

From www.grassland.org.za

Postgraduate Training Fellowships for Women Scientists from Sub-Saharan Africa and Least Developed Countries (LDCs)

The Fellowships are offered to women scientists to purse postgraduate research in the following fields of basic sciences: biology, chemistry, mathematics and physics.

This fellowship programme is for female students from Sub-Saharan Africa or Least Developed Countries (LDCs) who wish to pursue postgraduate training leading to a doctorate degree at a centre of excellence in the South outside their own country.

The Third World Organization for Women in Science (TWOWS) with funds generously provided by the Department for Research Cooperation (SAREC) of the Swedish International Development Cooperation Agency (Sida), has instituted a fellowship programme for female students from Sub-Saharan Africa and Least Developed Countries (LDCs), who wish to pursue postgraduate training leading to a Ph.D., at centres of excellence in the South (developing countries), outside their own country.

The general purpose of the scheme is to contribute to the emergence of a new generation of women leaders in science and technology, and to promote their effective participation in the scientific and technological development of their countries.

Contact Details

Ms. Leena Mungapen
TWOWS Secretariat , c/o TWAS, ICTP Campus, Strada Costiera 11, 34014 Trieste, Italy
Tel: +39 040 2240-321
Fax: +39 040 2240-689
E-mail:info@twows.org

MSc, PhD and Post-doctoral bursaries available in the Research Centre for Plant Growth and Development, University of KwaZulu-Natal

Applications can be made to Professor J. Van Staden for bursaries (MSc, PhD or Post-doctoral) in the following areas: Plant physiology – seed biology, hormone physiology, eco-physiology Molecular biology Ethnobotany Algal biotechnology.

Applications must include a short CV, two letters of reference and a letter of motivation for the position with potential project/areas of interest. Please submit applications via e-mail to rcpgd@ukzn.ac.za

Funding opportunities

From www.grassland.org.za

Development and implementation of a monitoring system for sustainable resource use, Kgalagadi Transfrontier park and environs (Possible MSc Project).

An opportunity exists for a highly motivated person with GIS skills and access to own or institutional funding and transport, to work on a monitoring system with members of the Khomani San (Bushmen).

The Khomani San own, and have access to, land in and around the Kgalagadi Transfrontier Park. They have rights to sustainably harvest plants and animals and are anxious to ensure that the exercising of these rights is done on a sustainable basis.

The rudiments of a plant-use monitoring system, using Cybertracker-GPS-GIS based technology have been developed. Assistance is now required for the further development, refinement and implementation of the Monitoring and Evaluation system. Working with community monitors, this will entail assessing current populations of selected plants; developing first approximations of sustainable offtake levels, particularly for species where destructive harvesting occurs e.g. whole bulbs; and systems for recording all offtakes. Field data should be transferred to GIS for storage, analysis and graphic representation in order to facilitate adaptive management. Coaching and mentoring of community monitors will form an integral and critical part of this task.

Interested persons should in the first instance submit Expressions of Interest and CV to Dr David Grossman: dawg@mweb.co.za

Wildlife Conservation Society: Research Fellowship Program

A small grants program designed to build capacity for the next generation of conservationists through supporting individual field research projects that have a clear application to the conservation of threatened wildlife and wildlife habitat. Deadlines for applications: March 15 and September 15 annually.

The RFP is a small grants program designed to build capacity for the next generation of conservationists through supporting individual field research projects that have a clear application to the conservation of threatened wildlife and wildlife habitat. We seek projects that are based on sound and innovative conservation science and that encourage practices in conservation that can contribute to sustainable development.

For more detailed information about the application process please visit www.wcs.org/international/tcbp/rfp/rfpapplication.

Charles Stewart Mott Foundation: Environment Program

The mission of the Environment program is to support the efforts of an engaged citizenry working to create accountable and responsive institutions, sound public policies, and appropriate models of development that protect the diversity and integrity of selected ecosystems in North America and around the world. Letters of inquiry welcome all year round but at least four months before funding is required

Please visit their website for more details about what areas the Environment Program funds and for details about the Application Procedures: www.mott.org/about/programs/environment.aspx

Joint Research Grants available through the NRF: Economic and Social Research Council of the UK and Northern Ireland, and NRF/Japan Science and Technology Agency Cooperation Agreement

This call is open to working researchers residing in South Africa and affiliated with a recognised higher education or research institution such as a university, university of technology or science council. An application must designate two principal investigators, one in South Africa and one in the UK or Japan, who will bear the main responsibility for the project, including its technical and administrative coordination as well as scientific and financial reporting. The South African applicant must be in possession of a PhD. Commercial institutions and private education institutions are not eligible to apply.

Application forms may be downloaded from the NRF website: www.nrf.ac.za/. Contact Ms Lee-Anne Seymour: (012) 481-4121, email Seymour@nrf.ac.za

Red Meat Research and Development Trust of SA: Call for Proposals

Projects which are funded are focussed on specific problem areas as indicated by the various sectors of the red meat industry. For a list of focus areas and projects recently funded, there are two documents available which describe the research and development plan for a) the pork industry and b) the large stock and small-stock meat industries in South Africa. These can be viewed at the website: Www.samic.co.za/samic/rd.htm#rdRMRDT

Upcoming events

From www.grassland.org.za

International Forestry and Environment Symposium 2008
Date: 27-28 December 2008
Venue: Kalutara, Sri Lanka
Email: fesymposium@gmail.com

The 24th Tall Timbers Fire Ecology Conference
Date: 11-15 January 2009
Venue: Tallahassee, Florida, USA
Contact: Kaye Gainey
Email: kaye@ttrs.org
Website: www.talltimbers.org/FEconference/contact.htm

Africa Climate Change Conference
Date: 12 -16 January 2009
Venue: University of Cape Town
Tel: 033 3559258
Contact: Ms Pavs Pillay OR
Email: humboldt@africaclimatescience.org

1st Africa Regional Conservation Science – Policy Conference
Date: 28-30 January 2009
Venue: University of Ghana, Accra, Ghana
Contact: Patrick Ofori-Danson
Email: scbafrica2009@conbio.org
Website: www2.ug.edu.gh/ecolabconference/

African Science Communication Conference 2009
Date: 18—21 February 2009
Venue: Gauteng, South Africa
Contact: Maphefo Chauke
Email: maphefo.chauke@saasta.ac.za
Tel: 012 392 9300
Website: www.saasta.ac.za

First International Workshop on Summer Dormancy in Grasses: Coping with increasing aridity and heat under climate change
Date: 36 – 8 April 2009
Venue: Ardmore Oklahoma USA
Website: www.nobleorg?ForageImprovement/Summer dormancy/index.html

5th World Environmental Education Congress:
Earth as our common home
Date: 10 - 14 May 2009
Venue: Palais des Congrès in Montreal
Email: 5weec@jpdl.com
Tel: + 1- 514-287-1070
Website: www.5weec.uqam.ca/EN/

Environmental and Resource Economics Conference
Date: 21 - 22 May 2009
Venue: The Ritz Hotel and Conference Centre, Sea Point, Cape Town
Contact: Wendy Paisley
Email: paisley@botanicalsociety.org.za
Tel: 021 799 8824

The 10th International Congress of Ecology:
Ecology in a Changing Climate: Two Hemispheres - One Globe
Date: 16 - 21 August 2009
Venue: Brisbane Convention Centre, Queensland, Australia
Website: www.intecol10.org

Council News

The new Council met for the first time on 9 October 2008 in Pretoria. It was heartwarming to see so much enthusiasm and energy from new Council members throughout the meeting.

It was reported that Congress 43 2008 was very successful with 237 delegates attending. Forty farmers also attended the day-long DoA workshop. In general, the relationship between the DoA and the Society was further strengthened by the Congress. Council would like to thank everybody who was involved in organizing Congress 43.

The first announcement for Congress 44 2009 has already been circulated. Please make use of the early-bird registration opportunity. Students are again reminded about the sponsorship from Trust to attend Congress. The Organizing Committee looks forward to receiving your inputs regarding special sessions and symposia. Keep an eye on the website for further updates!

Members are requested to complete and return the Expertise Database questionnaire. This will form a very good functional database for members of the Society.

African Journal of Range and Forage Science is now listed on the Thompson ISI database. It will take a couple of years to produce an impact factor as it takes into account the number of papers published as well as citations over a particular period. The challenge to members is to submit papers to the Journal to assist in this process.

A meeting will be set up with the SACNASP Council to discuss the problems we are facing with regards to SACNASP registration. Members will be informed about the outcome of this meeting.

Council would like to congratulate Theo Scholtz who received the GSSA award for best M.Sc. student in 2008. His thesis dealt with the evaluation of the establishment and growth of indigenous trees to restore deforested riparian areas in the Mapungubwe National Park.

We would like to wish everybody a wonderful festive season!

Holistic Management:

Embracing complexity in managing rangelands

Allan Savory

Thank you for offering me the opportunity to respond to the article by Richard Fynn – "**Savory Insights – is rangeland science due for a paradigm shift?"**

First I must express my gratitude to Harry Biggs for arranging the visit of South African scientists to see Holistic Management at first hand. As Richard Fynn points out, Holistic Management has been ridiculed and condemned by many academics over the forty-odd years of its development; however, this group came with open minds, which was deeply appreciated. I believe they have initiated a collaboration that will prove vital to the future of South Africa.

As Richard reports, the group observed naturally expanding wetlands and restored river flow even though two of the last four years have been droughts. What readers need to understand is that this improvement was achieved with a 400% increase in livestock numbers. Without that increase it could not have been done. Further increases are now required if we are to maintain the higher levels of production now being experienced. Associated with this increase in livestock numbers has been a large increase in buffalo and elephant in particular (not due to management but to the removal of a veterinary fence). Early South African records of vast wetlands associated with very high animal numbers and less fire are now becoming more understandable as we restore what we call "animal maintained" grasslands and savannas.

Richard draws attention to a recent paper by Briske *et al.* which states that grazing systems and rotations are dead, that range scientists don't know what to recommend as an alternative, and noting that the needs of research and management differ significantly. Applied ecologists engaged in management, like myself, have known for many years that grazing systems and rotations had to fail for two reasons: 1) they were designed to avoid complexity, which management must embrace to be successful; and 2) they focused on managing land and livestock when both are so tied to the mind and culture of the manager and the economy he or she operates in that they are unmanageable on their

own. It is management of this complexity that Holistic Management was designed to handle, and which the group came to observe. Holistic Management involves the use of a decision making framework that assists people to make decisions in a manner that is simultaneously economically, socially and environmentally sound, short and long term. It is simple in principle but not always easy in practice because it involves changing some deeply ingrained range science paradigms.

Holistic Management planned grazing is a management process developed about forty years ago that effectively replaces grazing systems and rotations in any environment. It was based on a military planning procedure developed over some 300 years in difficult, complex and ever-changing situations. Holistic planned grazing can be observed in South Africa on several properties – for example Ian Mitchell-Innes near Elandslaagte, (KZN) and Dick Richardson, near Vryburg, both of whom have many years' experience and monitoring data.

Before looking at the range science paradigms that require a shift in thinking, let me correct some errors in Richard's comments on Holistic Management. First let me say that had he had available to him my book, *Holistic Management: A New Framework for Decision Making, 2nd Edition* (Island Press, 1999), many of his concerns would probably have been alleviated.

Richard states that the improved hydrological cycle observed on Dimbangombe, where the formerly dry river now runs once more, is due to reduced rainfall runoff and to reduced transpiration from grass kept short by grazing with increased animals. While reducing runoff is a major component in the improvement, Richard did not comment on the greatest component: the closer plant spacing and the increased, stable litter cover at the soil surface, which is reducing soil surface evaporation. Previously when over 90% of the soil between plants was bare, the water loss from surface evaporation would have been in the region of 50 – 80%. Now most rainfall is effective as it no longer evaporates from the bare soil between grass plants. (I emphasize the area between grass plants because so many are fooled when they view a grassland by looking across it instead of straight down, when the amount of bare ground becomes obvious). The group saw the property at the end of the rains when grass plants are beginning to be grazed down on a significant scale because growth and transpiration is ending. Had they observed throughout the growing season when grass plants are transpiring heavily, they would have found that despite the 400% increase in cattle and goats, very few plants were ever grazed down and those that were re-grew rapidly as overgrazing of plants is minimized through planned grazing.

Richard comments a great deal on the new concept of the "brittleness scale" but sees little use for it in range management because he does not see how it assists planned grazing. Richard feels

some sort of scale of productivity would be better suited to grazing planning. This is an understandable error, given such a brief exposure to Holistic Management. The brittleness scale is not used in planned grazing at all and was never intended to be. Allowing for and adjusting for productivity of each and every grazing area or paddock is, however, a major component of holistic planned grazing. There is no need to develop any scale of productivity as Richard suggests because great productivity detail emerges for each unit of land from proven offtake by animals (animal days per acre/ hectare) every season. This, as we learned from the Charter Trials in Zimbabwe over thirty years ago, is far more accurate than any research technique yet developed and the data is gathered routinely at no cost (money or time).

The brittleness scale is used mainly to diagnose the land's condition and determine how best to modify it to produce the result you want. For example, faced with severe erosion, flooding, drought and brush encroachment, when managing holistically we would want to learn the likely cause or causes before taking any action. This would be done through what we call a structured diagnosis in which the brittleness scale plays an important role along with a greater understanding of overgrazing of plants, partial and total rest, primary effects of fire and so on. Not doing this leads to millions of rands being squandered on addressing symptoms as we see in conventional range management. This is why soil erosion, droughts, floods and brush encroachment are generally getting worse since the development and adoption of "range management" in South Africa, the U.S. Australia and many other countries.

Richard reports no improvement on shallow, arid, poor soils "because they are still dominated by annual grass species." In fact, training sites on the ranch that were used for years on such soils had to be abandoned when dense-growing annual grasses covered the bare ground following treatments with "herd effect" and planned grazing. These sites are now gradually shifting back to perennial grasses, which we know they were historically because of the fire scars on the trees. A major reason for the slow progress, which Richard correctly observed on the poorer areas, is because when managing holistically all decisions need to be simultaneously economically, socially and environmentally sound short and long term. To focus attention on the poorer areas would not meet such criteria. Most ranchers, intent on remaining profitable, would understand this need to have more productive areas generate income to gradually improve all areas. This is one reason why a study by Ohio State University of early adopters of Holistic Management across the U.S. found they averaged 300% more profit.

To support his view that holistic planned grazing will not improve poor shallow soils, Richard quotes a paper by Burgess that states Holistic Management did not lead to improved rangeland on poor soils in the US. Burgess studied various properties using rotational grazing in

a radial cell layout which, although borrowed from Holistic Management, is not Holistic Management. Burgess, like Briske *et al*, who also condemn holistic planned grazing, never made any attempt to study it. These researchers are entirely correct in stating that rotational grazing does not improve such situations but they are unethical in attributing such failure to holistic planned grazing (which they did not study). Many researchers confuse rotational grazing and holistic planned grazing although they are virtually opposites as the book cited explains in detail.

Finally, Richard states that I personally am against fire. I am not against any management "tool" – technology, fire, rest, animal impact or grazing – as each can only be assessed in a context. We use fire on Dimbangombe to create firebreaks and to backburn. And we will use fire at any time that it passes testing – simultaneously economically, socially and environmentally sound short and long term toward what we are striving for. Richard is correct in that right now we use no fire and go to great lengths to exclude it because there is nothing fire can do that we cannot currently do better with animals. Where animals, by maintaining grass vigour, help sequester both carbon and water in our soils, a one and a half acre fire produces more, and more damaging, pollutants than 4,000 cars per second, while exposing soil to water runoff and evaporation (Brustet *et al.* 1992). Yet for far too long the idea of using herbivores under planned grazing to keep grass vigorous has not been acceptable to researchers.

Finally, what are the paradigms of range science that Richard says are challenged by my work? Since he doesn't elaborate, I would like to. They are:

Overgrazing is due to too many animals and is controlled by limiting animal numbers and amount of grass offtake.

Resting rangelands is beneficial to their health.

Land can be overgrazed; and land can be managed.

Plants compete with one another for water and nutrients and some oust others that are less competitive.

Droughts are best planned for by reserving grazing areas to utilize when there is a drought.

These are generally myths, unsupported by any research I'm aware of, and are all dealt with in detail in my book (cited earlier). Here I will cover them very briefly.

The research, and thus the science, is clear. Overgrazing is a function of time of exposure and re-exposure of grass plants to severe grazing. This was discovered by a French pasture scientist (Andre Voisin) over fifty years ago but ignored by range scientists. So deep, however, is the myth that despite thousands of PhD dissertations and papers no range scientist I know of has ever defined overgrazing simply because all knew it was due to too many animals.

Resting land varies in effect across the brittleness scale world wide. Toward the low end (perennial humidity of atmosphere and soil) it is the most powerful tool known to us

to restore biodiversity and land health. As any environment shifts across the scale toward the higher end (erratic humidity in soil and atmosphere), the effects of rest (total rest or partial rest – animals present but in low numbers with little "impact") becomes increasingly adverse for perennial grasslands. Again the research and science is clear, based on the work of S.I. McNaughton and others as well as many protected (from animals) plots studied world wide, but the myth prevails in range science.

Range scientists talk and write of overgrazed land. Only plants can be grazed and browsed or overgrazed and overbrowsed, but not land. The distinction is important since many of the world's rangelands include overgrazed plants on overrested soils, when they could be grazed or overgrazed plants on periodically-disturbed healthy soils.

Plants can be said to compete with one another when viewed at the species level. But when viewed at the community level this changes. Plants, animals and soil life in communities function as wholes of great synergy and complexity. Species will even speciate to avoid competition. In an effort to reduce the numbers of a species "outcompeting" a more desirable one, US officials spend over $300 million every year to poison the noxious invaders, and they have been doing so for over 30 years with little impact. People on the same rangelands managing holistically have solved the problem at no cost by simply changing the circumstances that result in a particular plant filling a major vacuum and dominating the community.

The belief that droughts are best planned for by reserving areas of land ungrazed in case of drought is another costly and destructive myth. Droughts planned for in terms of time rather than area (i.e., number of days of grazing preserved spread over an entire ranch) result in far higher production of the animals and the land every season – drought or no drought – with far less risk. Range science drought planning actually increases the danger of drought while decreasing the production (on both animals and plants). Despite great increases in livestock numbers it is rare indeed for any rancher practicing holistic planned grazing to have to destock in dry years.

Clearly not all range scientists will agree with the above for some years to come, and my own views change as new knowledge emerges, but at least, thanks to Harry Biggs, Richard Fynn, and the others in the group, the door that was slammed shut forty odd years ago has been opened and we can begin learning with and from one another.

References

Brustet M, Vickos JB, Fontan J, Podaire A and Lavenu F. 1992. Characterization of Active Fires in West African Savannas by Analysis of Satellite Data: Landsat Thematic Mapper. In: Global Biomass Burning, Joel S. Levine (ed) MIT Press, Cambridge, Massachusetts: 53-60.

The Eskom Expo for Young Scientists, 2008

GSSA award for best ecological project

Alan Short and Freyni du Toit
Grassland Society of Southern Africa
Email: info@grassland.org.za

The Society was represented by ten judges at seven Regional Expos. At the regional level, six projects presented by six scholars received the award. All of these scholars will receive a framed certificate from the Society.

The GSSA Award for the Best Ecological Project is judged according to the following criteria:

- The project must deal with an ecological issue (rangelands/pastures, rehabilitation, alien and invasive species, game surveys, animal production, etc.)
- The students must exhibit a clear understanding of the problem
- The project must have a sound scientific approach
- Presentation must be good

At a regional level, the prize consists of a GSSA certificate for each member of the winning team. At national level, the prize consists of a GSSA certificate and medal for each member of the winning team. If possible, the prize may also include "tickets" to the next GSSA Congress. It is advisable that if this part of the prize is to be awarded, the GSSA specifies (under the special requirements section requested by the organisers) that only Matric and Grade 11 students may be awarded the Grassland Society Award.

Regional Expos

Grahamstown: Vuyile Sixaba, Grade 10, Nathaniel Nyaluza High School.
The power of mycorrhiza on euthophicated (sic) *ecosystems*,
The student's interest in the topic arose because there are some very nutrient polluted rivers in the area where he lives and he is concerned about the environmental and health effects of this. As mycorrhizas aid plants in absorbing phosphorus, one of the main causes of eutrophication, he thought this might be used to help reduce phosphorus levels in water. His experiment showed that mycorrhizas removed most phosphorus from eutrophied river water and water mixed with phosphorus-rich detergent. There is thus potential to apply this in cleaning up nutrient-polluted water or reducing nutrient levels of run-off that could end up in rivers and lakes. His teacher, Mrs Rejoyce Batyi, says that the project is the result of much hard and meticulous work in the field

Nadine Nowers (Port Elizebeth Expo) on her fertilizer trial

and laboratory.

The Science Expo judges rated the project as excellent, awarding him a gold medal at the regional expo.

Susi Vetter and James Gambiza, Rhodes University

Bloemfontein: Michael Leeuw, Grade 11, HTS Louis Botha

Termite mound - no growth

Mr Leeuw done a very intensive study on the dynamics of the anthilltermite, an insect that can give problems in some grasslands. He identified the most important aspects around the insect influencing the functioning of the grassland ecosystem. Surveys were done in terms of the distribution of grass species around the mounds and in the open. In his study he came up with some solutions for a more sustainable utilization of the grassland ecosystem and how the mounds can be used in different ways.

Hennie Snyman, University of the Free State

North West Cape: Susan van der Merwe, Postmasburg High School

Weiveldbestuur (Grazing veld ,management)

Marna van Zyl

Port Elizabeth: Nadine Nowers, Grade 11, Stutterheim High School

Be wise…fertilize

Nadine is a keen horse rider and investigated alternatives to fertilize the, ryegrass oversown kikuyu paddocks to save costs. Comparing no fertilizer, conventional inorganic fertilizer, horse manure and chicken litter (the last two being freely available) she determined growth rate and palatability. Chicken litter proved to be the best option.

Sikhalazo Dube, University of Fort Hare and Pieter Conradie, Eastern Cape Department of Agriculture

Cape Town: Siobhãn O'Donovan, Grade 6, St Cyprian's High School

Global Warming - Armageddon or Utopia?

Siobhãn showed how elevated atmospheric CO2 concentrations increased the growth of bean plants. She commented that it is generally accepted that elevated atmospheric CO2 is bad for the environment, but that there are also some positive effects in the form of higher crop production. She further noted that the challenge is to create technology that would be able to extract CO2 from the atmosphere for use in greenhouses, while simultaneously mitigating the global warming effect of this greenhouse gas. What

impressed me was her innovative use of basic materials to ask an important question of how a high atmospheric CO2 world will affect plant growth. She showed awareness of global food security issues and how elevated atmospheric CO2 can be used to mitigate food shortages globally. Her knowledge of current issues and debates on global warming was impressive for her level.
Dawood Hattas, University of Cape Town

Lebowakgomo: No award given
Pieter Wagner, Limpopo Department of Agriculture

Nelspruit: Adriaan Mosterd, Warmbad High School
Overgrazing: Impact on ecosystem.
Jorrie Jordaan and Erna van Schoor, Limpopo Department of Agriculture

National Finals

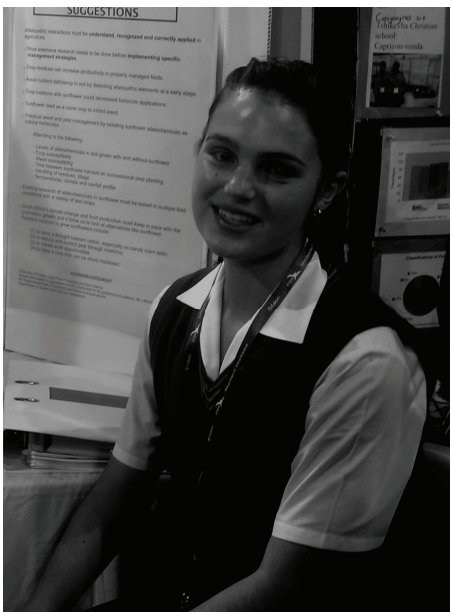
The National Finals were held at the Pretoria University Sports Grounds in October 2008.

Emelia Swart, Waterkloof Hoer Skool.
The role of allelopathy in Agriculture.
Emelia used sunflower, maize and tomato as a model to demonstrate allelopathy. Apparently, sunflower has allelopathy, a common phenomenon in most invasive plants and some field crops that seem new and as such not clearly understood by farmers. She demonstrated experimentally how allelopatic compounds in sunflower inhibit the growth of tomato and maize when grown together on the same pots. She believes the same effect do take place in nature among some of the invasive and indigenous plants. The student had a clear understanding of the problem, had a sound scientific approach, had a very good presentation, and most importantly was from the grade 11-12.
Julius Tjelele, Gilbert Pule and Malenyalo Bathlatswi (ARC - Range and Forage Unit)

The quality of the work exhibited by all the learners was impressive, and shows that there is an enormous amount of talent in the next generation of scientists.

The GSSA thanks all of the judges for their time in judging the Expos.

Emelia Swart, winner of the GSSA award for best ecological project at the National Finals



Linking cultivated pastures with rangelands

AJ Aucamp
National Wool Growers' Association
NWGA, PO Box 34291, Newton Park, Port Elizabeth 6055

Photo: John Cunningham

Introduction

A word of caution about pastures as a possible intervention to relieve rangeland degradation: Cultivated pastures, although offering an opportunity to increase forage yield and consequently carrying capacity of farming systems, could under certain circumstances, result in increased degradation of the natural vegetation instead of relieving the pressure on the rangeland. For example, if animal numbers are increased through provision of extra forage from cultivated pastures or other supplementary feed, the stocking rate of the summer rangeland may be exceeded,

leading to increased, and not reduced, degradation of the natural vegetation. The ratio of supplementary resources (e.g. cultivated pastures) to other vegetation resources (summer rangeland) is the key to sustainable use. Therefore, an integrated (holistic) and careful assessment of all available forage resources in a particular farming system needs to be done before cultivated pastures are introduced.

The importance of cultivated pastures for increased livestock production

The importance of livestock to rural development and poverty relief is extensively discussed in the Livestock Strategy Plan. Reference is also made to be expected "Livestock Revolution" which is based on the principle that once the income of people rises, they diversify their diet and tend to eat more livestock food products instead of traditional staple foods. If the steady increase in the total population (currently about 1.7% per year) and the potential markets in Africa and elsewhere that should be exploited for export, are further added to the equation, there is little doubt that the demand for livestock food products will increase. This will be partially accommodated by production in intensive systems such as broilers, eggs and pork, but ruminant meat and milk will have to provide the bulk of the supply in rural areas, because the majority of livestock farming is natural resource dependent.

That being the case, it is interesting that total cattle and sheep numbers have not changed much since 1995. In fact, cattle numbers which were estimated as 14 million in 1995 also have not changed appreciably over the last 40 years, and sheep numbers at 29 million in 1995 similarly are not much different from the numbers in the mid fifties – they may even have declined in recent years. Whereas there may be economic reasons as well, the main reasons are associated with the limitations of the natural resource itself (rangeland quantity and quality, degradation, biome limitations, drought, etc.). It is evident; therefore, that increased production (both turnover and numbers) will have to come from cultivated pastures. Studies and experience have shown that the conversation of appropriate areas into pastures can be done profitably. Furthermore, it is also attractive because it can be done within the constraints of acceptable patterns of land use and resource conservation.

The integration of cultivated pastures into the farming system

It should be appreciated that rangeland and cultivated pastures can be complementary in providing fodder to livestock. Before cultivated pastures are introduced into any system, however, an assessment should be made of the extent to which productivity is likely to be increased, the capital input needed, the livestock system which is envisaged, the availability of labour and management expertise, and perhaps most important of all, the attitude of each individual farmer to pasture establishment. There is perhaps few

other farming ventures that can so rapidly lead to financial ruin that an unplanned or poorly planned headlong dash into cultivated pastures.

It is essential before embarking on a pasture programme, to view the forage resources of a property holistically so that species can be selected which meet identifiable season-specific needs within the specific forage and livestock programme of the property concerned. So, for example, on a particular property it may not be profitable to maintain a cow herd all year round on cultivated pastures, but such pastures may be used to provide strategic grazing for cows or for weaners that have to be weaned prematurely. In other situations, legume-based pastures may be used to boost the protein concentration in the diet of livestock during the winter. A complete forage inventory of the property needs to be undertaken firstly, to identify the weak points in the fodder flow programme. The pasture programme then needs to be targeted specifically at these weak points.

Unfortunately, cultivated pastures will do little to reduce the risks associated with variable rainfall conditions unless they are irrigated. Also, any forage they produce will normally cost more than that produced by rangeland. A full economic evaluation is therefore essential before a decision is made to embark on a pasture programme, particularly in the semi-arid regions where pastures normally do not have a quality advantage over rangeland and where production may be extremely variable from year to year. This evaluation should provide an estimate of the amount that can reasonably be spent on establishing and maintaining the pasture.

Pastures suitable for different biomes and regions

Legumes

The energy crisis of the 1970s and the rapidly increasing cost of nitrogen fertilizers directed attention to the potential role of legumes in providing protein-rich forage and in their potential to reduce the nitrogen fertilizer needs of pastures. The reawakening interest in legumes is based largely on the successes that have been achieved with their use in countries such as Australia and New Zealand and under certain circumstances in this country. For successful livestock production, a balanced diet is necessary and in this context legumes can be a valuable supplement. A monoculture of legumes will normally more than satisfy the protein needs of highly productive animals. However, as with other cultivated pastures, considerable management attention needs to be given to legumes if they are to be used effectively in livestock systems.

Pasture and forage legumes are unique among crop plants because of their ability to contribute to soil N by N fixation, which is sufficient for own use and to some extend to grasses and other crops established thereafter. In Australia it has been found that temperate annual legume pastures can contribute between 40 and 100 kg N/ha/annum of which 11% to 40% will be available to subsequent crops. A total of 16.9 million ha of land in South Africa is suit-

able for the establishment of legume pastures. Such an area of legumes would contribute in the range of 430 000 kg N/ha/annum, which at the present cost of mineral N fertilizers (R6720/t) should be worth about R29 million/annum.

Legume pastures can be integrated into fodder flow programmes in a number of ways, for example, by using them:

- To reinforce rangeland
- To replace rangeland
- In mixtures with grasses; or
- In rotation with cash crops

The first determining factor here is the environmental potential and the availability of adapted species for the area under consideration.

There is also wide variation in optimum soil conditions for the growth of different legumes and they generally have more specific requirements than grasses. They also require more careful management than grass pastures, especially in grass-legume mixes, but forage tree legumes are more robust and easy to manage. Perennial legumes in particular tend to be extremely susceptible to disease in their post-establishment years. Great care should therefore be taken when choosing legume species for use in particular circumstances.

Grasses

South Africa is world renowned for the rich diversity in grassland flora. The value of this flora was only recognized locally when a number of species indigenous to South Africa were successfully adopted as pasture species elsewhere in the world. Selections from among these species can (dryland conditions or irrigation), produce 2 to 15 times as much dry matter as native rangeland e.g. *Eragrostis curvula, Digitaria eriantha*, etc. These selections are well adapted to the South African environment, and therefore should play a prominent role in the choices of cultivated pastures for the country.

Drought-tolerant fodder crops

The climate of South Africa, particularly between longitudes 17° and 24° E (representing arid and semi-arid regions), is conducive to dry spells, seasonal droughts and cyclic long term droughts. It is therefore sensible to make provision for dry periods through usage of drought tolerant crops to feed livestock. Three drought-tolerant forage crops have received a great deal of attention over the years. These are the American aloe *(Agave mexicana),* the spineless cactus *(Opuntia aurantiaca)* and Old Man Saltbush *(Atriplex nummularia).*

The Potential Role of Pastures in different Types of Rangeland

The major role of cultivated pastures in farming systems is to satisfy the forage requirements of animals during periods when the quantity and/or quality of forage produced by rangelands is inadequate.

Their primary role should be to:

- Provide forage during the periods of food shortage in the fodder flow programme; and
- Increase the total amount of forage and digestible nutrients produced on the property.

The role of the cultivated pas-

ture will depend on the nature of the livestock system and the quality and quantity of forage that is available. The role therefore, will be a function of rangeland type.

In sourveld, cultivated pastures can:

- Increase the length of the growing season, particularly in the spring and autumn periods;
- Increase the total amount and quality of forage produced on a property;
- Provide high quality green forage during the winter months (particularly for the dairy industry, using irrigated temperate pastures);
- Provide high quality forage for carry-over into the winter in the form of foggage, hay or silage; and
- Increase the level of animal production per unit area of land.

In sweetveld, on the other hand, the major role of cultivated pastures is likely to be one of the following:

- To provide forage for summer use when rangeland needs to be rested;
- To provide hay for drought periods;
- To increase the total amount of forage available for animal feeding, and
- To increase the level of livestock production per unit area of land.

Finally, in mixed veld, the major role of cultivated pasture is likely to be:

- The provision of forage in early summer, when it is often in short supply;
- To provide fodder during the summer in order to rest the rangeland;
- To provide high quality forage during the winter months; and
- To increase the level of livestock production per unit area of land.

In accomplishing any or all of these objectives in the different rangeland types, the cultivated pasture can have a pivotal role.

Summarised challenges

Given the current state of the natural resource in many parts of South Africa, together with an increasing demand for animal-based foods, poverty relief and socio-economic upliftment, increased efficiency of livestock production and a substantial increase in livestock numbers are required. This emphasizes that cultivated pastures would be required if major increases in forage production are to be realized.

The incorporation of cultivated pastures into farming systems can be economically successful but it will require a high level of management and sound, objective planning. There is no doubt that there is considerable, as yet, untapped potential for their use in many parts of the country. The development of this potential should make it possible to increase forage production to levels capable of supporting the envisaged expansion in livestock numbers in South Africa.

It should be noted that the areas suitable for cultivated pastures overlap with the crop production and high potential areas, which would require dual objectives and sometimes mixed farming.

Livestock production, however, should not be in competition with crop production, but complementary.

It is not possible for a scientific community which is so compartmentalized to obtain insight into the complexity of rangeland and cultivated pasture problems.

This has been shown in the winter rainfall cropping area where cultivated pastures, especially legumes, are playing a significant role in rotational cropping systems, reducing input costs significantly due to reduced N fertilization.

It is interesting to note that dairy farms are increasingly established in the eastern high potential areas, making use of cultivated pastures. The East London, Alexandria, Tsitsikamma and George areas, situated within the eastern seaboard, are at present responsible for 61.9% of the countries' milk production compared to only 13% in 1992. Total cow numbers have decreased significantly in the RSA as a whole, particularly in specific production areas, but there has been a significant increase in numbers in the eastern seaboard.

The scope for expansion of legume-based pastures within the winter rainfall cropping area to increase stock numbers, especially sheep, is significant. There is also considerable scope for cultivated pastures, especially legumes, in the summer rain cropping areas. Although the arid Karoo and Savannah areas have low potential, drought tolerant species can assist in stabilizing fodder flow, especially during dry periods. Bearing in mind the rich plant species biodiversity, the potential for selection and improvement of well-adapted local species to increase and stabilise fodder flow is enormous and should be exploited.

How farmers and others will react in future with regard to the degradation or enhancement of South Africa's land resources is open for speculation. There are several possible scenarios: globalization and the local growth of other economic sectors may reduce the intensity of rural land use, which would probably slow down degradation. Alternatively, a shift in global and national market relationships could stimulate increased rural resource use without allocating adequate labour and other resources to agriculture. This could aggravate land degradation. In a third scenario, dwindling economic opportunities and deteriorating international terms of trade could lead to agricultural intensification. For this purpose, much more research and extension needs to be done by land users and supporting government agencies to develop small scale, intensive systems with high food yields, and that also optimise and conserve resources for long term sustainability.

Strategy

The fact that 80% of the agricultural land allows only animal husbandry implies that livestock production is primarily natural resource dependent which indicates a prime responsibility of the livestock industry to the sustainable usage of this valuable but vulnerable resource. History shows that the livestock industry, research institutions and policy makers have not been effective in grasping this concept. It is therefore imperative that role players within the livestock industry (research institutions, government departments at national and provincial level, primary producers as well as the related secondary industries) must recognize that the natural resource is vital to sustain livestock production.

Given the current state and limited potential of some vegetation resources over much of South Africa, and the low productivity of the national livestock herd, alternative fodder crops should be established as a priority. There is undoubtedly considerable, as yet, untapped potential for cultivated pastures in many parts of the country.

A total of 16.9 million ha of land in South Africa is suitable for the establishment of legume pastures. A national legume R & D programme must therefore be implemented.

South Africa is world renowned for the diversity in grassland flora. Selections from among these species can, under both dry-land conditions and irrigation, produce 2 to 15 times as much dry matter respectively as rangeland. A national plant-breeding programme must therefore be implemented.

The climate of South Africa is conducive to seasonal, annual and long term droughts. Drought-tolerant crops can alleviate the resulting feed shortages and therefore a high priority should be given to drought tolerant crops in the Nama-Karoo and Savannah.

It is clear that biomes and the respective grazing areas are not confined to provincial boundaries and for R&D to succeed, to eliminate duplication and to strengthen the efficiency and impact of research, it is essential that projects should be carried out across provincial boundaries. The complexity of solving a comprehensive problem such as vegetation deterioration, the linking of cultivated pastures to rangelands, warrants the inputs of various researchers and expertise. Furthermore, it is not possible for a scientific community, which is so compartmentalized, to obtain insight into the complexity of rangeland and cultivated pasture problems. This should be addressed urgently.

We have to take cognizance of three documents, namely the (i) Strategic Plan for SA Agriculture, (ii) the National Livestock Strategy and (iii) the Policy document of Veld and Pastures. Are we using these documents to the benefit of Grassland Science? If not, then it is time to do so!

Grass impressions of South America

Johan Mouton
Senwes Agricultural services

Introduction

Senwes is a grain company that handles 25% of S.A. grain. The company employs a few agriculturists that vary from Agricultural Economists, Agronomists to Livestock scientists that services its client's technical requests and render internal support to management. Against this background Argentina and Brazil was visited during June 2008 by two agriculturists to gain technical information about integrated cash crop – livestock production systems. The remarks must be seen as pure observations regarding grassland science.

Brazil

The country could be referred to as paradise as rainfall is very consistent with averages of 1500mm / annum and above. Soils are heavy "peat" type soils. Sub tropical grasses like *Panicum* species are common and were green (June) in the warmer parts. Large dairy operations (500 + cows in parlor) are common in the high cash crop areas. Fodder flow is extremely easy with corn silage during summer time and "cover crop" green chop during wintertime. All the cash crops are produced on a no-till system, when the last crop are harvested in autumn a so called "cover crop" is planted which main purpose is to prevent erosion during winter. The "cover crops" can be anything from Rye, Oats, Barley, or any winter small grain. These "cover crops" are

Bulls on Cenchrus pasture

green chopped on a daily basis and fed in TMR systems.

Sheep and beef production in this area are on *Pennisetums* during summer over sown with *Lolium* species during autumn, very much the same way the KwaZulu-Natal dairy farmers operate. Clovers are used widely with white clovers dominating. According to Brazilians, the uses of no-till planters are essential. *Cynodon* species were also seen and used in the same way. The carry capacity and economics justify these systems for meat production in Brazil in contrast to S.A. Under "normal rainfall" conditions 6 – 10 tons of useable dry matter is produced per annum; these were calculated from the long-term carry capacity that were observed. The main advantage is that the quality is much more stable without the extreme fall S.A. experience in winter.

Within the context, the visit Brazil to was most interesting regarding grassland science, but not adaptable to S.A. conditions.

Argentina

Rainfall in the area visited is summer rainfall, with 600 – 750 mm / annum. The soils are sandy and similar to those of the western Free State with the exception of high silt content. Sub-tropical grasses are used extensively and are established every 5-7 years. The majority of the grasses used, originated from South Africa and enter into Argentine via Australia! Rotation of these grasses and grazing rotation between seasons realize good animal performance year round with high weaning percentages. Table 1 give an indication of the rotations. These pastures are never fertilized and are grazed quite intensively. In drier seasons more *C. ciliarus* are used and wetter seasons more *P. coleratum*.

With soil pH of 6.5 – 6.8 and phosphorus levels of 80 p.p.m. the good animal performance are no surprise. With no fertilizer, this can pose problems in future. As the winters are cold and dry, a fall in quality do occur. The interactive use of grazing animals and growth patterns of the different grass species are utilized to enhance winter forage quality with great success.

Medicago sativa are widely used in animal production systems alone as well as in crop rotation with cash crop production systems. Al-

Table 1: Extensive pastures for animal production in Argentina

Period	Species
January - March	*Panicum maximum*
April - May	*Cenchrus ciliarus, Digitaria eriantha*
June - September	*Panicum coloratum*
October - November	*Cenchrus ciliarus, Digitaria eriantha*
December	*Panicum maximum, Cenchrus ciliarus*

Ryegrass oversown in permanent pastures

though used as hay and green chop, the vast majority of *Medicago sativa* are grazed in Argentina. Dairy cows (large frame Holsteins), beef cows and oxen are all on intensive lucerne grazing systems throughout the year. Dormancy classes of eight and above are used with extensive breeding programs for low dormancy, low bloat cultivars. Animals are 24 hours on the lucerne with different approaches regarding bloat management; all with success as mortalities are kept under 1%. The key is perhaps the lighter soils and the 24-hour grazing where enough high quality grazing is always available.

Conclusion

Although Brazil is beautiful and interesting to see out of a perspective of central S.A. there are very little common ground regarding agriculture. Perhaps our high rainfall coastal belt can benefit here. Argentina has much common ground with the central grassland parts of S.A. with similar production systems. Valuable information can be gained from them to manipulate quality for over wintering with grazing animals.

International Carbon Sequestration Meeting

The Conservation Technology Information Center (CTIC) and United Nations carbon offset meeting paves the way for paying farmers to capture greenhouse gases

Supported by science and spurred by emerging markets, more than 80 participants in an international workshop on carbon sequestration called on world policy-makers to focus research and create fair-priced carbon offset markets that would pay farmers to adopt conservation agriculture practices that will capture carbon in the soil.

Carbon offset markets would allow farmers to sell the service of capturing and storing – sequestering – carbon from the atmosphere. In turn, that would help offset the levels of greenhouse gases emitted by human activity, essentially locking up enough carbon in the soil to cancel out airborne emissions of tons of carbon dioxide, methane and nitrogen oxide. Currently, carbon credits from industrial sources are widely traded, but soil carbon has generally not been a marketable commodity.

The meeting – called the Conservation Agriculture Carbon Offset Consultation – was hosted by the Conservation Technology Information Center (CTIC) and the Food and Agriculture Organization of the United Nations (FAO) at the Purdue University campus October 28 through 30. Bringing experts from an array of disciplines, from soil science to economics, to focus on carbon sequestration was a bold move to use science and markets to promote opportunities for farmers around the world.

"To create working markets for farmers' efforts to capture atmospheric carbon, we need to understand the science of how carbon acts in the soil, and the science behind no-till systems," said Karen Scanlon, executive director of CTIC. "With that insight, we can quantify the effect that farmers have with specific practices and on specific soils, and create a fair compensation structure for those effects."

Working Meeting

After sharing their research results and field experiences from six continents, the participants spent several hours at the end of the meeting's third day in a lively discussion, hammering out a position statement calling for the inclusion of soil carbon in worldwide carbon offset markets.

"This has been one of the better meetings I've been to because the focus has been on 'this is what we

know, these are the answers we have, this is what we can accomplish today,' rather than focusing on the problems we have and what we don't know," said Dan Uthe, an industrial process consultant with Novecta in Johnson, Iowa.

The first day of the consultation was dedicated to exploring the science of soil carbon sequestration in the soil. Researchers from the South American tropics, the Australian bush, the Midwestern United States and China presented the results of their studies on how soil carbon levels responded to various tillage regimes. Not surprisingly, there were no simple answers.

Changes in soil carbon are small – imagine finding 1,000 pounds of carbon in a mass of soil 2.5 acres in area and 3 feet deep. Complex chemistry dictates that the soil can only sequester a limited amount of carbon per year, and that after a certain number of years – scientists believe it is 15 to 20 years – a field reaches a plateau.

To make it even more complex, the soil's capacity to store carbon depends on soil type, tillage system, the use of cover crops, cropping history and how much carbon it lost in the first place. Research from highly degraded soils in South America put into improved pasture showed dramatic jumps in carbon levels after five years – much higher storage than Midwestern soils in the U.S. Deep-rooted pasture plants also have the capacity to place carbon deeper into poor South American soils than annual crops do in cooler climates with richer ground. However, Corn Belt farms have the capacity to capture and store significant amounts of carbon, too.

"The higher the clay content, the more capacity there is to store carbon," said Charles Rice of Kansas State University.

Which Practices Help?

The less tillage used, the better the sequestration of the carbon, according to many scientists at the meeting. Though there were lively discussions on definitions of terms such as "conservation agriculture" and "no-till," the data showed that tillage burns soil carbon and releases greenhouse gases. The difference in the amount of crop residue required to rebuild soil carbon stocks also varied widely. Joao Carlos de Moraes Sa of the University of Ponta Grossa in Brazil pointed out that tropical Brazilian soils consume 9 to 14 tons of crop residue per hectare each year – often in a matter of months – while Rice's studies in Kansas showed that three tons of residue per hectare in his state was enough to yield an increase in soil carbon.

In Brazil, Telmo Amado of the Federal University of Santa Maria plants corn and a deep-rooted, perennial pasture grass called Brachiata together for great sequestration results. Tightly planted corn quickly grows tall, while shaded Brachiata sends roots deep into the soil. The result is a tremendous amount of biomass above and below the ground – a cash crop, a grazing opportunity and plenty of residue for carbon-fixing microbes.

But just growing biomass isn't enough, says Amado. "One side of the equation is introducing this carbon," he noted. "The other side is how we stabilize it in the soil. Both physical and chemical protections are important."

That means protecting the soil surface with plenty of residue, maintaining soil structure by no-tilling or minimizing tillage, keeping soil microbes healthy (again through minimal soil disturbance), fertilizing crops adequately, avoiding soil compaction and rotating crops. "It's really site-specific, and we really need to understand the crop system we're talking about," said Amado.

Got to Pay

Building carbon levels in the soil delivers a variety of important benefits, from improved soil quality to better water-holding capacity, higher fertility and resistance to erosion. Still, the biggest enticement to sequestering carbon will be creating markets through which farmers can sell the service they provide.

"I think what we're really looking for as a farm organization, or society in general, is some way to reward farmers and ranchers for doing things like storing carbon and some other environmental practices," said North Dakota farmer Dale Enerson, who serves as director of the Carbon Credit Program for the National Farmers Union in Jamestown, N.D.

The National Farmers Union has served as an aggregator of carbon credits, collecting pledges from 3,700 growers in the U.S. to sequester carbon on 4.7 million acres of cropland and rangeland and selling the bundle of carbon credits on the Chicago Climate Exchange (CCX). Participating growers received an average of $1.20 per ton of sequestered carbon. Official CCX estimates for carbon sequestration range from 0.2 to 0.6 metric tons per acre on no-tilled cropland, 1 metric ton per acre on long-term grassland (such as CRP ground) and 0.12 to 0.52 metric tons on rangeland with enhanced management practices.

In a pioneering carbon offset trading program in Alberta, Canada, 47 percent of the offsets are from agricultural land. On the Chicago Climate Exchange, 25.52 percent of the offsets have been purchased from farmers. In Canada, provincial carbon offset trading in Alberta and Saskatchewan are paving the way for nationwide caps on industrial greenhouse gas emissions that will kick in on Jan. 1, 2010. Capping emissions will boost the market for tradable carbon offset credits, and agriculture wants to be part of the package.

Preparing soil carbon offset credits for a full-scale, regulation-driven market will require policymakers to sort out an array of issues, ranging from how long the contracts should be, who owns the carbon (the operator or the landowner), how practices are verified, and how to handle situations in which an operator releases carbon by disturbing the ground in violation of his contract.

"These cross-cutting issues can be worked out by working together," noted Don McCabe, an Ontario farmer who serves as vice president

of the Soil Conservation Council of Canada, "because at the end of the day, it's the same science. We're starting to see the ball running down the hill. We've got to keep it rolling."

Though voluntary markets have kept the value of a ton of sequestered carbon low – prices on the Chicago Climate Exchange have ranged from 90 cents to $7.50 per metric ton, and Alberta prices have ranged from $6.00 to $12.00 – McCabe believes a free market in which buyers are motivated by regulatory emissions caps could reach $65.00 per metric ton by 2020.

That would be music to the ears of farmers – and the participants in the October meeting. "There has to be a fair-price incentive," said Rattan Lal, director of the Carbon Management and Sequestration Institute at The Ohio State University, "and $2 or $3 or $4 per acre in the market isn't going to do it."

Meeting sponsor Theodor Friedrich, senior officer for Crop Production Systems Intensification in the FAO's Crop and Pasture Service at the organization's world headquarters in Rome, Italy, said the program exceeded his expectations.

"We had a very good, sound gathering of experts and we had an unexpectedly high degree of coinciding views and agreement, and that allowed us to come up with a fairly punchy, clear and concise document with relevant recommendations," he said. "I could imagine that this meeting, the outcome and the proceedings being produced might be future references to further our objective to get soil carbon into the international carbon trading markets."

The Conservation Agriculture Carbon Offset Consultation was hosted by the Food and Agriculture Organization of the United Nations (FAO) and the Conservation Technology Information Center (CTIC), with sponsorship from Agrotain, Mosaic, Syngenta, the National Corn Growers Association, Case IH and the Indiana Soybean Association. Further information on the consultation, no-till farming and carbon sequestration is available at CTIC's web site, www.conservationinformation.org.

Tony Vyn of Purdue describes the university's 33-year-old no-till plots to a group of soil carbon experts from around the world.

Research skills workshop

Alan Short
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One of the challenges facing the research community in the developing world is the large proportion of young, inexperienced scientists relative to experienced mentors. It was to help address this challenge that Justin and Freyni du Toit arranged a research skills workshop in the Midlands of KwaZulu-Natal on the 12th and 13th November 2008.

The workshop was packed, with over 70 participants from all over the country and one visitor from Zambia, mostly from government agencies.

Dave Spurret, of the University of KwaZulu-Natal, opened the day with a philosophical discussion of what knowledge means and how we obtain it. For an audience educated almost entirely in the technical disciplines of science, his talk was engaging and exciting.

Several talks discussed the fundamental skills required for a career in science. Mark Hardy outlined the basics of setting up and running meaningful field trials. Frikke Calitz explained how to conduct statistical analyses such as various types of Analyses of Variance using MS Excel. Craig Morris also gave an entertaining account of how to choose the correct statistical tests for the data (with one comment that one school of thought considered these tests to be a waste of time).

Justin du Toit described the best ways of managing data from research trials, and later supervised a practical exercise where participants learned how to use Pivot tables in spreadsheets.

Terry Everson described the challenges and rewards of working with complex rural communities for many years, and what she had learned along the way. The most important factor was that the community should want the outsiders to be involved. Luthando Dziba described arguably the most useful tool for a modern professional - networking and collaboration across boundaries.

Finally, three talks outlined basic skills for shouting one's work to the world. Dave Ward described the basic rules of writing up results for peer-reviewed publication. His advice could be summed up as: keep it simple and answer the question! Starting with the figure that addressed the basic question and work backwards from there. Terry Olckers outlined the right way to do a PowerPoint presentation (do NOT use the fancy animations!) and Adrian Schrader explained how to attract interest in 11 seconds with a poster at Congress.

The participants were as enthusiastic at the end of the second day as at the beginning. As Kwezi Booi of the ARC put it: "The workshop showed young researchers that anything is possible if you put your mind, hard work, and dedication to it".

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Management Hint: For a balanced fodder flow and longer utilisation, plant more than one cultivar between February and April.

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Management Hint: Plant when maximum day temperature begins to drop below 25°C. Plant shallow and roll to ensure good contact with soil and moisture.

Forage Cereals Package:
Planting date and expected grazing period.

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
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LE TUCANA	x	xx								
PAN 248	x	xx								
PAN 233 & PAN 263	x	xx								
SOROM	x	xx								
PAN 299	x	xx								

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