Agriculture and Food Minister Kim Chance released two new pasture legumes, expected to boost pasture production in Western Australia, at the Department of Agriculture and Food’s Sheep Updates conference in July.

Both new varieties had their origins in the Mediterranean. They were developed in six years of trials under a project supported by the Department of Agriculture and Food (DAFWA), the Centre for Legumes in Mediterranean Agriculture (CLIMA) and the Rural Industries Research and Development Corporation (RIRDC).

Flamenco, a short-lived perennial legume, is an erect, early flowering variety of sulla, for high quality fodder production. It was developed by Mr Kevin Foster and Mr Ron Yates (both DAFWA) from a sulla accession collected in Tunisia by Dr Walter Graves (USDA) in 1981. The Minister said it offered a new option in-between regenerating annual legumes and longer-term lucerne pastures.

Electra is a highly productive deep-rooted annual legume and was selected by Mr Peter Skinner (DAFWA) in 2002 from a purple clover accession collected in Turkey in 1995 by Professor Clive Francis (UWA). The high quality and productivity of Electra, particularly late in the growing season, makes it well suited to fodder production systems.

Mr Chance said emphasis during the development work was on improving the cost-efficiency of seed production in the two species. Reducing the cost of pasture seed is important to improve returns to farmers. Both varieties are targeted to high rainfall regions and have dual grazing and forage conservation benefits.

The Minister said the project to develop the two new pasture cultivars involved a considerable team effort, combining researchers and high calibre technical support.

The Minister said an exclusive licence had been awarded to a WA/South Australian consortium for the seed production of Flamenco, while three licences had been awarded for the seed production of Electra, one in WA and two in NSW. Seed of both new varieties should be readily available to farmers in 2008. Limited quantities of seed could be available in 2007.
it was agreed to appoint an Interim CLIMA Director to provide research leadership and continue the CLIMA momentum. The Board has unanimously agreed to appoint Professor Neil Turner until the future direction of CLIMA is determined. Professor Turner has been involved with CLIMA since its inception as a CRC in 1992. The CLIMA Board will continue its efforts and discussion regarding the future structure and directions of CLIMA beyond June 2007, when the current MOU between the partners expires.

Professor Kadambot Siddique
ksiddiqu@fnas.uwa.edu.au

Western Australia is facing a record dry season in 2006. Lack of rainfall in the grain belt is hurting many farmers and their families especially in the northern agricultural region. Recent rainfall in the southern region has boosted the confidence of the farmers in that region. Let us hope for above average rainfall in spring in the State.

Lack of profitable legumes in many parts of the grain belt is a major concern to growers. However, recent commercial releases of a number of improved legume species/varieties together with significant increases in fertiliser N price provides us with an opportunity to review the role of legumes in the farming systems.

CLIMA, under the guidance of its Industry Advisory Group (IAG), recently organised a very successful Industry Forum entitled “Grow your nitrogen, don’t buy it?”. We brought together some excellent speakers representing farmer groups, agricultural consultants, researchers, economists and extension agronomists (see article in this newsletter).

Recent commercial releases of two new pasture legume cultivars Sulla (cultivar: Flamenco) and Purple clover (cultivar: Electra) are the outcomes of 6 years of partnership in research and development between UWA, DAFWA and the Rural Industries Research and Development Corporation (RIRDC).

As you are aware, I have accepted the position of Chair in Agriculture and Director of the Institute of Agriculture at The University of Western Australia (UWA). I will commence my new position at UWA on 1st of August 2006. At the recent CLIMA Governing Board meetings

CLIMA’s Interim Director Professor Neil Turner

The Governing Board has approved the CLIMA operational budget for 2006-07. In addition to various operating costs there is an allocation of $45,000 each for Grain and Pasture legume Programs. This allocation is mainly for competitive CLIMA small projects and supplementary funds for essential travel/conference attendance by CLIMA researchers and postgraduate students. The CLIMA Program team will soon call for applications to allocate the above funds.

The Australian Research Council (ARC) has recently announced its Linkage Projects Round 2 and CLIMA has done extremely well with two of its projects submitted being funded:


I would like to congratulate all those involved, including the industry partners, in development of the above projects.

This will be my last message as CLIMA Director. During the past 5 years I have thoroughly enjoyed working with CLIMA researchers, support staff, postgraduate students, national/international collaborators, partner organizations, industry groups, funding bodies, program management team, governing board and the industry advisory group. Together we have produced some significant achievements and outcomes during the 2000-06 period:

• Maintained excellence in legume science and partnership with our original partners beyond the CRC phase.
• Maintained and grown our national and international profile in legume science and technology.
• Diversified our income/funding stream which is currently valued at over $5 million per annum in 35 projects.
• Successful completion of more than 30 PhD students and currently 20 postgraduate students are enrolled at two Universities linked with CLIMA projects.
• Commercial release of a number (about 20) of new grain and pasture legume varieties together with their production packages.
• Maintained an excellent record of scientific and technical publications on legume biotechnology, germplasm enhancement and breeding research.
• Successful communication of research outcomes (seminar series, newsletters, industry forums, farmer group visits, workshops, website, etc.) to the industry and community.
• Excellent industry interaction and partnership.

I sincerely thank you all for your support, friendship and collaboration over the years. The future of CLIMA is in the safe hands of its Board and the Interim Director. I wish you all the very best.

From the Director

Volume 7, No.2 August 2006
Bringing the Genes Back Home

by Dr Chris Johansen and Mr A.M. Musa, Bangladesh

Grass pea (Lathyrus sativus), also known as lathyrus or khesari, is the dominant pulse crop in Bangladesh in terms of area and production. This is as a result of declining levels of production by other important pulse crops such as lentil and chickpea, due to their susceptibility to disease and the expansion of irrigated agriculture in the winter season which favours cereal crops (mainly rice, wheat and maize) and vegetables. Grass pea is grown in areas not suitable for other pulses and most other crops, usually in low lying areas that remain waterlogged after harvest of rainy season rice in November-December. Lathyrus seed is normally relay broadcast into standing rice crops where it grows after harvest of the rice. It receives no inputs and suffers little from any biotic or abiotic stresses, producing grain yields averaging 0.75 t/ha at the national level. In contrast to other pulse crops, grass pea has received little research and development attention, and even discouragement due to its potential for causing the paralysing condition “lathyrism”. Grass pea contains 3-(N-oxalyl)-L-2,3-diaminoproprionic acid (ODAP) which if consumed in large quantities can be toxic to humans, a situation which only occurs in times of severe food shortages when there are few dietary options.

In Western Australia, there has been interest in developing grass pea as a multi-purpose, low-input crop that could be used as a grain legume, green forage species, hay or green manure crop. The priority has been to combine yield potential with low ODAP levels. CLIMA has bred and recently released in Australia a high-yielding, low toxin grass pea, Ceora (see “Ceora, Australia’s first grass pea (Lathyrus sativus) cultivar”, CLIMA variety leaflet 2005; and WA Department of Agriculture/CLIMA Farmnote No. 58/2005). Ceora was selected from a cross made at CLIMA between a low toxin line from Bangladesh (8604) and a line from Pakistan (K33).

In our attempts to diversify post-rice cropping in the High Barind Tract (HBT) of north-western Bangladesh, we tested Ceora in a farmer’s field in the 2005-06 post-rainy season (Rabi season, or winter). The HBT is an uplifted, undulating area more prone to drought than waterlogging after harvest of rainy season rice, as surface soils dry out quickly when the monsoon rain ceases and winter rains are usually negligible. Ceora was hand broadcast after harvest of rice in November, with 20 kg P/ha as triple superphosphate applied. No other inputs were given and the crop grew on residual soil moisture with no rainfall occurring during the growing period.

The crop flowered in February, matured in March and was harvested late 18 March. The grain yield was 0.84 t/ha and straw yield 1.73 t/ha. The area was severely moisture stressed, with surrounding chickpea fields yielding less than 0.5 t/ha. The Ceora had suffered insect damage to pods, and yields would otherwise have been much higher.

This preliminary test indicates potential for Ceora as an alternative Rabi crop to chickpea in the HBT. Alternatives are required as continuous cultivation of chickpea multiplies pests and disease problems. Existence of a low toxin grass pea variety that can yield satisfactorily may increase the status of this crop in Bangladesh, especially as an alternative for stressed environments. As grass pea has not been grown to any extent in the HBT, as it is preferred for low-lying areas, the region would be ideal for seed multiplication of Ceora. Grass pea is an outcrossing crop and thus varietal purity could be maintained due to absence of “local” grass pea.

For further information on Ceora see www.clima.uwa.edu.au/research/pulses/varieties

TRIALLING GRAIN LEGUMES IN RAISED BEDS

As cropping increasingly becomes an option for farmers in the high rainfall areas regarded traditionally as grazing country only, research is being done to assess the potential of achieving yields to match the rainfall.

One aspect of this farming system that has not been addressed is the role of grain legumes in a cropping rotation. Clover based pastures usually provide an adequate nitrogen base for cereal crops, but if a long term cropping rotation is used, the need for a grain legume arises. But which one?

A trial of grain legumes at Frankland in raised beds at the Shields’ property, Gunwarrie, is looking to answer that question. Cereals and canola have been grown in rotation for five years. Field peas, yellow lupins, narrow-leaved lupins and faba beans have now been sown to assess if any are adapted to the environment and show any tolerance to waterlogging.

During the season, assessments will be made of the incidence of disease, tolerance to waterlogging, weed control and herbicide tolerance, harvestability in raised beds and yield. Market opportunities and price outlook will also be considered when assessing the right legume for the rotation. The aim is to identify species and varieties that are profitable and fit into the farming system and farm operations at Gunwarrie.

Pulse Australia would like to thank Kellie Shields from Gunwarrie for the opportunity to conduct the work, PlantTech and Gary Hine for provision of seed, and Cliff Span and Greg Hamilton from the Department of Agriculture and Food for seeding with their raised bed seeder.

INTERNATIONAL TRIFOLIUM NETWORK:

The International Trifolium Network (ITN) was established in July 2005 by 23 clover researchers from 17 research organisations and 11 countries to co-ordinate, integrate and progress genetic and genomic approaches in Trifolium and the translation of tools, resources and approaches from model legumes, particularly M. truncatula.

White clover (Trifolium repens L.) and red clover (T. pratense) are extensively grown in the temperate grasslands of the world. The rapid and extensive development worldwide of understanding of the genetics of the two ‘model legumes’ Lotus japonicus and Medicago truncatula offers tremendous opportunities for research into clovers.

Currently, the extent of synteny between clovers and Medicago is unknown but presumed to be high. Development of common web-based resources and tools is necessary to underpin developments within Trifolium and facilitate links with Medicago.

Some EST based and array resources have been developed in white clover. However, there is a need for the development of complementary resources and for the initiation of similar programmes in red clover. A key need is to overlay the physical and genetic maps of Trifolium and in turn to relate these to M. truncatula. One route to this is sequencing of BAC ends in clovers and use of genetic markers to relate physical and genetic maps. Although much progress can be achieved with greater co-ordination of existing work, a main activity of ITN will be co-ordinated approaches to funding bodies at the national level and beyond.

ITN is based entirely on openly accessible resources. Members of ITN are free to withhold resources, for IP or other reasons, which they have developed under their own funding. However, resources available within ITN will be freely available to all members and other researchers.

At the inaugural ITN meeting in Aberystwyth, UK (July 2005), West Australian researchers proposed that subterranean clover (T. subterraneum) could be one of the best species for achieving the goals of the ITN due to its ploidy level (diploid) and therefore comparative genome simplicity compared to red and white clover. It’s annual growth habit is also an advantage over the perennial red and white clovers. Dr John Forster (DPI Victoria) and Professor German Spangenberg (DPI Victoria) were very supportive of the proposal. At the second ITN meeting in Brisbane (April 2006), it was eventually agreed that the development of a mutagenised population of sub-clover would be a useful resource for these studies. Australian pasture researchers now have the opportunity to focus on our strengths in this field with technical and equipment support from local and overseas colleagues. In this way all ITN members will benefit. CLIMA has already initiated collaborations with VDPI and the Agricultural Research Centre, Hokkaido, Japan.

Website: http://www.trifoliumnetwork.org/
**PROFESSOR KADAMBOT SIDDIQUE TO HEAD UWA AGRICULTURE INSTITUTE**

The University of Western Australia (UWA) has appointed Professor Kadambot Siddique to its Chair of Agriculture and Director of the UWA Institute of Agriculture, which is being rejuvenated to create a critical mass of research excellence in UWA’s agricultural science groups. The Vice Chancellor of The University of Western Australia, Professor Alan Robson, said that The University was delighted to have attracted such an international expert as Professor Siddique. His recruitment would take agricultural research and teaching at UWA to a new level.

Professor Siddique’s career began when, as a UWA PhD student, he explored the potential of chickpea adaptation. This was the starting point for an industry currently valued at more than $200 million annually in Australia. He went on to introduce, evaluate, breed and select superior lines of pulses and to release elite genetic material as commercial varieties in Australia.

Taking up employment with then Department of Agriculture, Professor Siddique worked in cereal and pulse breeding, research and industry development. In 2001, he was appointed Director of the Centre for Legumes in Mediterranean Agriculture (CLIMA), based at UWA, when CLIMA had just lost its federal funding as a Cooperative Research Centre. Under his leadership, CLIMA built on its research partnerships with UWA, CSIRO, the Department of Agriculture and Food WA and Murdoch University, whilst diversifying its funding base, and has become internationally recognised for its contribution to grain and pasture legume basic and applied scientific research.

During a career that has seen him win many awards and fellowships – including the Urrbrae Memorial Award for his contribution to Australian agricultural science and the industry and more recently being elected as a Fellow of the Australian Academy of Technological Sciences and Engineering – the UWA researcher has established a diverse range of international and national collaborations with researchers and research centres. His research links today extend from Turkey, Bangladesh, China and India to major US research centres at Washington State University and the University of Saskatchewan.

Professor Siddique says that the future of agricultural research and training at UWA will depend to a large degree on combining resources and building collaborations that make the best use of its considerable expertise, and by forging new links with industry and with national and overseas partners. Having created extensive effective networks in agricultural research and teaching in WA, he aims to extend the trust already built to forge a focussed vision for agriculture at UWA.

**ALTERNATIVE OILSEED FOR WA GROWERS**

CLIMA researcher, Ms Margaret Campbell and Riverland Oilseed Processors Operations Manager, Mr Tom Tremlett, inspecting Camelina meal, which has high protein levels making it perfect for protein bars and for the health food sector. As part of a CLIMA project, seed originating from the Vavilov Institute in St. Petersburg, Russia, was grown for the first time last year on 25 hectares at Mr John Thomas’ Dowerin farm and produced 19 tonnes of seed with a 42 per cent oil content that was cold crushed at Riverland Oilseed Processors in Pinjarra. Ms Campbell said the oil was healthier than canola because of its high alpha linolenic acid (an Omega-3 fatty acid) content, plus natural antioxidants, and it has a mild nutty flavour. It could become an alternative crop for the oilseeds industry that currently relies heavily on canola, which lacks the blackleg resistance that camelina possesses.
LUPIN INTERSPECIFIC CROSSING PROJECT REVVING UP

A GRDC-funded project (UWA00094) has begun that is attempting to develop methods for interspecific crossing among the four main crop lupin species: *L. angustifolius* (narrow-leafed lupin – the major lupin species grown in Australia), *L. mutabilis* (Andean or pearl lupin), *L. albus* (albus or ‘white’ lupin) and *L. luteus* (yellow lupin).

At the outset of the project some preliminary crosses have been attempted between less common and clearly distinct New World lupin species from the Australian Lupin Collection as the male parent, with pearl lupin lines as the female. The crosses, conducted by Mr John Quealy, are now at the F1 stage and are intermediate in appearance, with partial leaf hairiness coming from the wild type, which has indicated their hybrid nature (see Photo A). Project supervisor, Dr Jon Clements, said that the majority of western South and North American lupin species are known to have the same chromosome number (2n = 48) as pearl lupin, and crosses like this demonstrate the potential for phylogenetically related species to be used in its improvement.

Photo A: intermediate leaf type of the hybrid (F1) with partial hairiness.

The crossing was successful without the need for in-vitro methods (eg. embryo rescue), and F1 plants will be checked for fertility after anthesis. Recent crossing methodology experiments by the team have greatly enhanced the success of crossing with pearl lupin. The related species utilized may be useful in providing certain characters such as better water use efficiency, adaptation or disease resistance to pearl lupin which is receiving special attention because of its high protein and oil content in seed. Pearl lupins are currently being developed in a related GRDC-funded CLIMA project (UWA00093) with the intention of producing a new cultivar by 2008.

The interspecific crossing project will attempt to develop methods for the more difficult crossing combinations, for example, between *L. angustifolius*, *L. luteus* and *L. mutabilis*, where in-vitro methods are likely to be required. Dr Julia Wilson will be developing these methods for lupins, having had previous experience in CLIMA projects developing in-vitro methods for other legume species.

SOFT, STRONG AND VERY LONG: A NEW, IMPROVED MAP OF NARROW-LEAFED LUPIN

A new, improved genetic map of narrow-leafed lupin (NLL) has recently been developed by Dr Matt Nelson (UWA) in collaboration with DAFWA researchers. The new map combines the strengths of two previously published maps of NLL and will serve as the standard reference map for researchers worldwide to find their way around the NLL genome.

“Justify the corny title”, taken from an advert for Andrex toilet rolls, I hear you say! Well, from a genetic point of view, the map is indeed strong. This strength arises from two factors: firstly, the large number of genetic markers that were used (>1,000 markers); and secondly, the map was developed using an unconventional approach, whereby a skeleton map of the most robust markers was first constructed before adding the remaining markers to the skeleton map. The end result was a very strong map with twenty well-defined linkage groups corresponding to the known haploid chromosome number of NLL. The map was indeed long, with the total length of the map being greater than either of the original two previously published maps. And soft? Well, admittedly that one is a bit of a stretch: *mollis*, a key domestication gene controlling soft seededness in NLL, was located in a well-defined region of the new map.

For more information about lupin genome mapping, check out the recently updated CLIMA website page (http://www.clima.uwa.edu.au/research/pulses/molecular/). Details of the new, improved map of NLL will be added to this webpage in the near future.
TOLERANCE OF LUPIN AND CHICKPEA TO AFFINITY HERBICIDE

A project is underway at CLIMA to screen lupin and chick pea germplasm for better tolerance to a number of herbicides used in controlling wild radish and other broad-leaved weeds. The GRDC funded research is being done in collaboration with Dr Mark Sweetingham (Department of Agriculture and Food Western Australia), Dr Michael Walsh (WA Herbicide Resistance Initiative) and the National Pulse Improvement Program.

100 accessions each of lupin and chick pea germplasm (including wild types and land races) with various agronomic traits, Australian varieties and advanced breeding lines, were screened against the cereal herbicide “Affinity” (active ingredient: carfentrazone-ethyl) during the growing season. “Affinity” is a relatively new herbicide and is used post-emergent in mixture with MCPA to control wild radish and other broad-leaved weeds in cereal crops. It belongs to the Group G of herbicides which work by inhibiting protoporphyrinogen oxidase activities. The herbicide acted fast and leaf damage to weeds was visible within one week of application. Wild radish was completely scorched at the recommended rate. There were however, large variations in lupin and chick pea responses. Some genotypes had limited foliage damage whilst some genotypes were completely scorched at the recommended rate. Interestingly, tolerant genotypes were able to recover from the foliage damage caused by “Affinity” even at a rate higher than that recommended and they grew into normal plants without any symptoms. There were however, large variations in lupin and chick pea responses. Some genotypes had limited foliage damage whilst some genotypes were completely scorched at the recommended rate. Interestingly, tolerant genotypes were able to recover from the foliage damage caused by “Affinity” even at a rate higher than that recommended and they grew into normal plants without any symptoms. The photo shows plants of narrow-leaved lupin (WALAN 2173M), yellow lupin (WALLU 2003), chick pea (cv. Sonali) and wild radish, 5 weeks after spraying the herbicide at several folds higher than the recommended rate. The lupins and chick pea in the photo completely recovered.

Our results thus far indicate that “Affinity” on its own has the potential to be used in lupin and chick pea for the selective control of wild radish. However, it is desirable to develop cultivars that are damaged minimally at any growth stage and mutation breeding has been initiated in lupin and chick pea to identify good tolerance. Producers of Affinity, FMC Australasia Pty Ltd, based in Queensland have shown interest in the work which augers well for getting the herbicide registered for use in lupin and chick pea, once tolerant cultivars are released. Managers Ian Pegg and Jos van Ast visited CLIMA in July to learn about our research results and assess the commercial benefits of using Affinity in pulses.

Alternatively, we need to identify a herbicide safe to lupin and chick pea, but complementary to Affinity and use this new mixture for the selective control of wild radish in lupin crops. The search continues!

SEEDS OF LIFE – EAST TIMOR: REBUILDING AN AGRONOMIC RESEARCH PROGRAM

The CLIMA managed “Seeds of Life – East Timor (SoL)” program endeavours to establish a sustainable agronomic research program within the Ministry of Agriculture Forestry and Fisheries (MAFF) in East Timor through training, infrastructure development and by implementing an agronomic research program with subsistence farmers in East Timor. The project is funded by the Australian Centre for International Agricultural Research (ACIAR), the Australian Agency for International Development (AusAID) and by the MAFF. The challenges are considerable, working with a small number of qualified personnel in the MAFF, diverse ecologies in the half island nation, poor infrastructure and an impoverished farming community. However, initial results are encouraging, with a 50% increase in grain yields on research station trials and on farmers fields. It’s just a matter of overcoming some associated crop production and storage problems before the farmers will adopt the new varieties!

Recent civil unrest in East Timor has caused a division amongst ethnic groups from the eastern and western districts of this small nation. The breakdown in security, especially in Dili has slowed the activities of the SoL program, but not stopped them. The program’s activities continue in the districts where the majority of SoL’s work occurs. These areas remain reasonably calm but some staff may have to be moved to work in their district of origin if east – west antagonisms continue. The program will also have problems sourcing on-farm trial materials for this coming cropping season if shops remain closed past the end of July. The main setback for SoL is the looting of the MAFF building during May. As a program within MAFF, SoL is reliant upon MAFF supplied infrastructure and assistance from counterparts from its divisions. However, all four Australian team members resident in East Timor remain positive about the SoL program, its activities and its long term benefit to the country’s agriculture. Their enthusiasm motivates East Timorese MAFF personnel in both Dili and the districts to continue contributing to the program.
HairpinRNAi discovered and developed by CSIRO Plant Industry in the 1990s is rapidly becoming one of the most widely used gene silencing technologies in plant science with over 2,000 laboratories around the world requesting CSIRO’s hairpinRNAi vectors.

“This technology is effective in any plant that is transformable and its speed is only limited by the transformation efficiency of the plant under investigation” says team leader Dr Peter Waterhouse.

CSIRO’s breakthrough research led to a construct with linked sense and antisense or inverted repeat sequences. When transcribed, a self complementary RNA was produced that forms a ‘hairpin’ structure by folding back on itself.

“The double-stranded RNA produced by the cleaving of the intron in the hairpinRNAi construct forms a substrate for the Dicer enzyme,” says Dr Peter Waterhouse. “Dicer cleaves the hairpin into small interfering RNAs, which interact with the RNA-Induced Silencing Complex, whose helicase activity directs siRNAs unwinding. These unwound single stranded siRNA are then used by the complex to find the target mRNA using base pairing. Once found, the target mRNA is sliced and the resulting fragments are destabilised and fully degraded through natural endogenous mechanisms.”

CSIRO Plant Industry’s Dr Linda Tabe and her colleagues are using the technology in their work. Earlier, they doubled the amount of methionine in lupins by adding a sunflower gene. This improves the nutritional value of the lupins for sheep, but more is needed to fulfill dietary requirements. In a new approach, the team are now employing hairpinRNAi to silence a gene for an enzyme from a competing metabolic pathway, to try and facilitate higher production of free methionine.

HairpinRNAi GIVES MOST EFFECTIVE GENE SILENCING
by Ms Sophie Clayton and Dr Bill Taylor

CSIRO Plant Industry team specially developed a set of hairpinRNAi vectors, available online, to make the technology simple to use. “There are now seven vectors designed for different applications,” says Dr Waterhouse. “These are available free to academic researchers.”

With intellectual property around the technology now clarified, CSIRO is also able to offer research and commercial product licences. For more information and vectors see www.pi.csiro.au/rnai

NEW PUBLICATION FROM SPRINGER

“Genome Mapping and Molecular Breeding in Plants” provides a timely overview of the current status of genome analysis, with an emphasis on economically and academically relevant species. The publication focuses on genetic and physical genome maps; on mapping, cloning, and monitoring of economic genes through molecular breeding; and on the most recent advances in genomics. The series comprises seven volumes and Volume 3: Pulses, Sugar and Tuber Crops, is due out in November 2006.

For more information: http://www.springer.com/west/home/life+sci?SGWID=4-10027-69-173624911-0

MEETINGS DIARY

Agricultural Biotechnology International Conference, Victoria, Australia

CRC for Plant Biosecurity Symposium, Canberra, Australia
September 5th – 6th, 2006 www.crcplantbiosecurity.com.au

13th Australian Society of Agronomy Conference, Perth, Western Australia.
September 10th-14th, 2006 http://www.agronomy.org.au

2006: International workshop on faba bean breeding and agronomy, Córdoba, Spain Faba Bean.
September 25-27th, 2006 anam.torres.romero@juntadeandalucia.es Anna Maria Torres

FOCUS 2006: “Pulses in the Feed Industry”
October 16th – 18th, 2006 pulse.trevor@bigpond.com Trevor Bray

VIIth Australasian Plant Virology Workshop, Rottnest Island, Western Australia.
November 9th -12th, 2006 http://science.murdoch.edu.au/conf/7apvw/index.html

15th International Congress on Nitrogen Fixation, Cape Town, South Africa.
January 21st - 26th, 2007 http://15nifconference.org

International Conference on Sustainable Agriculture for food, bio-energy and livelihood security, India.
February 14th – 16th 2007 http://www.jnkvv.nic.in/

12th International Lupin Conference, Fremantle, Western Australia.
September 14th- 18th, 2008 kadhikari@agric.wa.gov.au Kedar Adhikari
CLIMA INDUSTRY FORUM

In July, 62 agricultural consultants, farmers, researchers, economists and other industry members met at a Forum where presentations and discussions were around the theme of “Grow your Nitrogen don’t buy it!” The forum, held at The University of Western Australia, was hosted by CLIMA and convened by CLIMA’s Industry Advisory Group. The most recent research results on the contribution of nitrogen from legumes to farming systems, methods of assessment, decision support and future developments in grain and pasture legume varieties and agronomy were conveyed to the industry. The future industry needs of farmers were invited and discussed.

PASTURES AUSTRALIA WA WORKSHOP

The results from CLIMA’s survey of pasture growers for annual pasture legume R&D priorities were presented by Dr Debbie Thackray at the Pastures Australia workshop in Perth in May. The Pastures Australia (PA) initiative is a partnership between the Grains Research and Development Corporation (GRDC), Australian Wool Innovation (AWI) Ltd, Meat and Livestock Australia, Dairy Australia, and the Rural Industries Research and Development Corporation. Their aim is to develop a more market-led approach to investment in pasture research, development and extension. The potential scope for program investment includes pasture agronomy and management, pasture improvement for all species and better adoption of practices and products. As part of the new model, efforts are being made to better understand the contribution made by pastures to Australian agriculture and an independent market analysis has been commissioned.

PA held a preliminary meeting of stakeholders in Adelaide in February and subsequently a number of regional workshops with researcher and industry representatives were held in May. The purpose of these was to fine-tune the market analysis and to ask farmers and advisers for their input and advice on setting priorities for investment to maximise the value of pastures in farming systems. Results from the workshop were used to complete the analysis and develop a strategic investment plan for PA. It is anticipated that the program will be launched shortly.

This article was adapted from Dr Greg Bender’s original articles in Ground Cover’s Pastures Supplement, June-July 2006.
**WHAT’S NEW ON CLIMA’S WEBSITE**

- CLIMA newsletter August 2006
- Lupin molecular maps
- Lathyrus Lathyrism newsletter volume 4
- Press releases since the last newsletter
  - “Eastern wheatbelt wish list” (April)
  - “Pulse pioneer becomes new UWA Professor” (June)
  - “WA grower has crush on Camelina” (June)
  - “New pasture varieties for WA” (July)
  - “Iran, Egypt, Pakistan and China fighting in WA” (July)
- Updates to Grower Group Alliance events calendar
- Meetings Diary – updated for July 2006
- Seminar series 2nd semester

**RECENT CLIMA RESEARCH PUBLICATIONS**

Since the April 2006 newsletter, we have been notified of the following publications by CLIMA researchers and associates. Less recent publications are included in the 2003, 2004, 2005 and 2006 CLIMA publications lists which are on the website: [www.clima.uwa.edu.au](http://www.clima.uwa.edu.au) under “publications”.

We encourage all CLIMA staff and associates to forward 2 hard copies of your CLIMA-related publications to CLIMA’s Director. Journal papers, refereed conference papers and book chapters attract considerable research income payment to CLIMA from its University partners.

**Scientific Journals**


Agricultural scientists from Iran, Egypt, Pakistan and China, along with their Australian allies, are fighting the negative effects of disease, drought, salinity, waterlogging and temperature on legume crops in WA and their own countries.

Three other CLIMA visitors are collaborating with local scientists at UWA, CSIRO and the Department of Agriculture and Food (DAFWA). Visiting WA on an Australian Government Endeavour Fellowship, Dr Magdi Abdelhamid, of the National Research Centre, Cairo, is working with UWA researchers Professor Neil Tuner, Professor Craig Atkins and Professor Kadambot Siddique to improve water use efficiency in faba beans and studying how they fix nitrogen when moisture stressed. “Drought is extremely stressful for crops and understanding how they grow at that time will allow us to define drought-tolerant traits and ultimately breed cultivars better able to withstand stress and produce respectable seed yields,” Dr Abdelhamid said.

At the opposite end of the rainfall spectrum, Asia Gulnaz of the Nuclear Institute for Agriculture and Biology (NIAB), Pakistan Atomic Energy Commission, is exploring the interactions between waterlogging and salinity and their effects on legumes. Funded by the International Atomic Energy Agency (IAEA) and working with Dr Tim Colmer and Professor Kadambot Siddique (both UWA), her study, using radio-isotope techniques, will help legume breeders to develop and select appropriate cultivars tolerant to salt and waterlogging conditions. “Salinity and transient waterlogging are important production constraints in Pakistan and Australia,” she said.

WA will also benefit from the genomic researching skills of Dr Ruiming Lin of the Chinese Academy of Agricultural Science, Beijing. He is collaborating with UWA (Dr Guijun Yan) and DAFWA (Dr Hua’an Yang) to identify a marker in lupin to create an anthracnose resistant plant using the Microsatellite anchored Fragment Length Polymorphisms (MFLP) technique. Developed by CLIMA, MFLP shows DNA patterns and produces genetic markers. Dr Lin will use the MFLP technique he has learnt in WA to develop a yellow rust resistant wheat variety when he returns to China.

CLIMA Director, Professor Kadambot Siddique, described international collaboration as a very important CLIMA activity, enhancing research capability in WA. “Simultaneously hosting such high achieving scientists from four countries reflects CLIMA’s standing in the global legume science community and augers well for the future of WA legume growers, the ultimate beneficiaries of such collaboration.”
PORTUGUESE LUPINS COLLECTED IN JOINT MISSION

by Dr Jon Clements and Dr Kedar Adhikari

Drs Kedar Adhikari (DAFWA) and Jon Clements (UWA) have recently returned from a 10 day mission to collect wild and landrace lupins from central and northern Portugal, done in collaboration with the Departamento de Recursos Genéticos e Melhoramento, Estação Agronomica Nacional, Oeiras, Lisbon, Portugal. The route covered more than three thousand kilometres of contrasting and spectacular natural terrain, varying agricultural regions, beautiful historic small villages, larger centres with thousand year-old castles and new modern motorways connecting populated cities.

Portugal is not only a centre of diversity of Lupinus luteus and L. hispanicus but is also rich in plant species such as cork oaks, olives, historic grape varieties, wild lavender, celery, garlic, cereals and other genera.

Portuguese genebank curator, Eliseu Bettencourt assisted in the planning of the route which included many regions not covered in previous legume collection trips. The group collected 61 lupin accessions including L. luteus and the closely related species L. hispanicus as well as L. angustifolius and L. albus. L. albus has been traditionally cultivated in the region and the seed is widely eaten as a snack food after soaking in salted water. The group visited the Banco Portugues de Germoplasma Vegetal, in Braga, where a total of 16,000 accessions of approximately 100 species of native and exotic economically important crop, vegetable and herb species are stored.

Lupins were found almost exclusively in disturbed soils on the roadsides. Some of the more interesting accessions included L. hispanicus from a soil pH of 8.0 with a calcareous component (unusual since the species is found mainly on acid soils), L. luteus from altitudes as high as 830 m from Vilar de Perdizes (when previous collections have come from 500m or lower), L. albus types with both very large and very small seed cultivated by the same village farmer, and a surprisingly large seeded L. angustifolius landrace.

Seed samples will be deposited in genebanks both in Lisbon and Perth (after quarantine procedures), and accessions grown out in the near future for further evaluation where particular selections will be used in crossing with elite breeding lines as part of the breeding programs in Perth.

Dr Jon Clements went on after the collection mission and with Dr Julia Wilson (UWA) visited groups in Rostock (Germany), Wroclaw and Poznan (Poland) regarding their CLIMA lupin interspecific hybridization project. Dr Kedar Adhikari visited Innoseeds Ltd at Downham Market in England where he inspected some breeding lines in the field. Our WA bred lupin varieties Mandelup and Pootallong seemed much superior to the other lines in their trial. This private breeding company is in the process of commercialising the yellow lupin variety Pootallong which was developed at DAFWA.

A VERY FRUITFUL “-OMICS” WORKSHOP: THE STARTING POINT FOR LONG TERM COLLABORATIONS

by Dr Kioumars Ghamkhar

A workshop to which I was invited on “Systems Biology: from Single Cells to Environments” convened by Professors German Spangenberg and John Forster at La Trobe University, Victoria in May, attracted 90 participants representing many disciplines (genomics, proteomics, transcriptomics, transplastomics, phenomics, and metabolomics).

Presentations in the morning sessions were from a global prospective and not only on plant research. Five different hands-on practical modules took place in the afternoons: Microarray and DNA chip technology; Data analysis and computational biology applications; SNP discovery, genotyping, DNA sequencing and sequence analysis; Proteome analyses; and Metabolome analyses. This was the first attempt to bring scientists from these five different fields together. Late evening we had the opportunity to meet with the scientists at the Victorian Agriculture and Biosciences Centre (VABC) and discuss potential collaborations.

There were many interesting presentations during the workshop. Different methods and future prospects for different “-omics” tools were discussed. A couple of presentations where dedicated to algorithm developments to be launched in the near future. Statistical methods and developing better analytical models were the focus of the modelling session. In particular there were a number of interesting talks on studying the relationships between different aspects of systems biology (such as tissue-specific molecular profiling of transcripts, proteins, and metabolites).

Apart from attending the theoretical and practical sessions, I had two fruitful meetings with Professor John Forster (VABC and La Trobe University) and Dr Tony Gendall (La Trobe University) to discuss future collaborative research. I also met with researchers at VABC with extensive experience in the use of FAFLP and ABI 3730 machines, and discussed our approaches in making the relevant software (GeneMapper) more efficient for AFLPs.
IN SEARCH OF NEW PASTURES IN CALMER TIMES IN ISRAEL
by Mr Richard Snowball and Dr Phil Nichols

We have recently returned from a very successful 3-week mission to collect pasture legumes in Israel, fortunately just before the recent troubles. This was conducted in collaboration with the Israel Gene Bank (Volcani Center), as part of a GRDC-funded project aimed at collecting plants from low rainfall areas. Israel was a particular target for collection as it lies on the same latitude and has a similar Mediterranean climate to the agricultural areas of Western Australia.

Among material collected of particular significance are the accessions of *Trifolium glanduliferum* collected from the Upper Golan region, which may provide a new source for low flowering and cold tolerance, the accessions of *Trifolium spumosum*, which add significantly to the existing collection and extend the range of collection sites to as low as 300mm annual rainfall, the remarkable discovery of *Biserrula pelecinus* in very low rainfall sites (including one with only 105 mm annual rainfall), and non-aromatic types of *Bituminaria bituminosa*, a species which holds promise as a potential perennial fodder legume.

GERmplasm of species with the greatest potential for pasture plant improvement will undergo initial characterisation from 2007.

BREEDING FOR SUCCESS - NZ CONFERENCE

by Dr Heather Clarke

In April this year, six CLIMA researchers packed their bags, laptops and posters to head for Christchurch, New Zealand and the 13th Australasian Plant Breeding Conference. The conference attracted 320 delegates from 14 countries. Delegates from CLIMA were Dr Jon Clements (UWA), Dr Ping Si (UWA), Dr Fucheng Shan (UWA), Ms Kerry Regan (DAFWA), Dr Kioumars Ghamkhar (UWA) and Dr Heather Clarke (UWA). The theme for the conference was “Breeding for Success: Diversity in Action”.

The conference theme was “Breeding for Success: Diversity in Action” and there were many inspirational presentations on genetic resources and their utilisation. Most of us came away feeling reassured that our projects are taking the right approaches for legume improvement though our existing emphasis on utilising wild relatives. We also heard a few interesting talks on modelling in breeding, as well as hearing about the latest in plant gene technology. Of course, the success story of Kiwi fruit stimulated some interesting discussions about its recent rapid domestication compared to the ancient domestication of most other world crop species. The question remained open as to whether breeders should consider a purposeful “re-domestication” of some older crops, such as wheat, by starting over with the ancient ancestors.

Many of us took the opportunity to experience other aspects of New Zealand hospitality and opportunities for adventure from the hot pools at Hanmer Springs to the ice and snow at The Fox Glacier. The conference had its own share of adventure from the “budding” beauties that put the real models back into modelling at the welcome reception (pictured), to some neck breaking harness racing at The Australasian Plant Breeders Stakes. And yes, there were real horses with eminent plant breeders hanging on in the sulkies as they raced around the track!
China, particularly northern China, faces a critical water shortage as industry and the burgeoning population demand water for domestic and industrial purposes, while food security relies on water for irrigation. National wheat yields have increased from 0.5 t/ha to 4.5 t/ha since 1960 (a much higher rate of increase than in Australia), but this has been largely driven by increasing use of irrigation. The consequences are that on the North China Plain the water table has dropped from 10 to 30 m since 1970, while the Yellow River has failed to reach the sea on several occasions.

The First International Conference on the Theory and Practice of Biological Water Saving in Beijing, China, organized by the Chinese Academy of Sciences, was held in May 2006. There were about 200 delegates, about a third of which were from overseas. As Vice President of the conference, I had the privilege of welcoming delegates on the first morning, along with Enhua Song, Vice Governor of Hebei Province, and Professor Zhu Chen, Vice President of the Chinese Academy of Sciences, who were sponsors of the conference. I also gave an invited paper on the Australian experience with improving the water use efficiency of rainfed agriculture by both genetic and agronomic means.

The papers presented at the conference were almost evenly divided between genetic and agronomic means of improving water use efficiency, including increasing the efficiency of irrigation. The researchers presenting genetic papers were often using molecular genetics to try and improve the water use efficiency. While this work is still in its infancy, it was clear that China is investing heavily in molecular genetics and some of the visitors who visited laboratories in China indicated that facilities in some were better than in the USA or Europe. The proceedings of the conference should be available at the end of the year.

One interesting experience during the conference was participation in an on-line discussion at the Chinese Academy of Sciences headquarters in Beijing. This involved questions being asked in Chinese, translated into English, answered in English and translated back into Chinese. Questions and answers were typed on to the internet as the discussion progressed and then some of the 500 people on-line started to ask questions that we had to answer. The whole process took over two hours, before we were honoured with a banquet!

### CLIMA VISITORS - 2006

<table>
<thead>
<tr>
<th>Name</th>
<th>Dates</th>
<th>Institution</th>
<th>Main Purpose of Visit</th>
<th>WA Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Jesus Arellano</td>
<td>February - August</td>
<td>Centre of Genomic Research, National University of Mexico</td>
<td>Learn the CLIMA legume transformation method. Use this technology to establish a transformation method for Phaseolus vulgaris.</td>
<td>Ms Simone Chapple, Dr Susan Barker &amp; Prof. Craig Atkins, UWA.</td>
</tr>
<tr>
<td>Assoc. Prof. Nasser Hosseini</td>
<td>February- August</td>
<td>College of Agriculture, Karaj, Iran</td>
<td>Sabbatical leave: To study abiotic stress in chickpea and lentil.</td>
<td>Prof. Kadambot Siddique, UWA, and Dr Jairo Palta and Dr Jens Berger, CSIRO.</td>
</tr>
<tr>
<td>Dr Rui Ming Lin</td>
<td>April to August</td>
<td>Institute of Plant Protection, Chinese Academy of Agriculture, beijing</td>
<td>Collaboration with CLIMA researchers on lupin markers.</td>
<td>Dr H. Yang, DAFWA, and Dr Guijun Yan, UWA.</td>
</tr>
<tr>
<td>Ms Gulnaz Asia</td>
<td>May- November</td>
<td>Nuclear Institute for Agriculture and Biology, Faisalabad, Pakistan</td>
<td>International Atomic Energy Agency (IAEA) supported trainee on “Waterlogging and salinity tolerance in grain legumes”.</td>
<td>Prof. Kadambot Siddique and Dr Tim Colmer, UWA.</td>
</tr>
<tr>
<td>Dr Magdi Abdelhamid</td>
<td>May- November</td>
<td>National Research Centre, Cairo, Egypt</td>
<td>Endeavour Research Fellow: “Effect of water stress on growth and N fixation in faba bean”.</td>
<td>Prof. Kadambot Siddique, Prof. Neil Turner and Prof. Craig Atkins, UWA.</td>
</tr>
<tr>
<td>Mr John Sykes</td>
<td>August 2nd – 3rd</td>
<td>NSW Agriculture</td>
<td>Update on pulse and Albus lupin work at CLIMA and DAFWA</td>
<td>Dr Tanveer Khan, DAFWA and Prof. Kadambot Siddique, UWA.</td>
</tr>
<tr>
<td>Dr Bob Redden, Mr Ranjan Balachandra</td>
<td>August 26th – 30th</td>
<td>Horsham, Victoria</td>
<td>Discuss Crop Database and Genetic Resources and give seminar at CLIMA.</td>
<td>Dr Jon Clements, UWA.</td>
</tr>
</tbody>
</table>