



**VALUE ADDED WHEAT CRC
PROJECT REPORT**

**Argentine Wheat Industry:
Conference Report**

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Value Added Wheat CRC and Food Science Australia

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Argentine Wheat Industry: Conference Report

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The opportunity for Colin Wrigley to visit Argentina was provided by an invitation to contribute a Keynote Address by the organisers of the 7th International Wheat Conference, organised to be held in Mar del Plata, Argentina, from November 27th to December 2nd, 2005. This report summarises impressions of the conference and of the country's wheat industry.

THE ARGENTINEAN WHEAT INDUSTRY

Argentina produces hard red spring wheat almost exclusively. About five million tonnes are used domestically and a further eleven million tonnes are exported, mainly for bread production in both cases. Argentina is the fifth largest exporter in international wheat trade. Argentina's main export market has traditionally been Brazil, but Argentina is now finding competition in this market from Eastern Europe and from other South American neighbours. Argentina is thus looking to other export markets. A small amount of durum wheat is grown, mainly in the Buenos Aires province, to supply local manufacturers.

Production Details and Methods

Wheat yields average 2.8 tonnes per hectare in Argentina. The wheat belt ranges from 30° to 39° latitude, extending east even close to the sea. The main growing regions are mapped out in Figure 1, which includes quality details for the 2004/05 crop according to region. Table 1 shows national averages, plus production details indicating that the 2004/05 crop totalled nearly 16 million tonnes. Recent details such as these are available on the web site for the Argentine Wheat Institutional Quality Report – <http://www.trigoargentino.com.ar>.

The Pampas region is classed as prairie, with very good depth of soil. Soy is the main crop at about 70% of grain production, followed by wheat (20%) and maize (10%). Much of the maize is GM with the "Bt" gene. Wheat is planted in May or June, with heading in September and harvest in November - December. About 35 days is the usual period for grain filling. Soy is then planted for harvest late autumn, for the crop rotation continue with the planting of wheat or maize. The wheat crops are particularly free of weeds, due to the use of herbicide for the alternate crop of Roundup-Ready soy in the double-cropping system. Most (90%) of the soy is GM. It is processed locally, and there appears to be no problem with the consumption of GM soy.

Wheat production is reasonably intensive. Fertiliser use involves 40 to 60 kg N/ha and 10 to 20 kg P/ha. The alternate soy crops may also contribute some fixed nitrogen, but not sulfur deficiency. Pathogen problems in wheat crops appear to be routinely overcome with two or three spray treatments with fungicide, but breeders obviously also breed for resistance. Nevertheless, research field trials of advanced lines are quoted to provide better yields after such spraying – 1.8 to 3.3 tonnes/ha without fungicide and 2.4 to 4.2 tonnes/ha with fungicide treatments. Abiotic problems include nitrogen and drought stress, plus occasional heat (usually 30 – 33°C during grain filing). The use of certified (new) seed by farmers is only about 10% of sowings, so seed merchants try to push new varieties to maintain seed sales.

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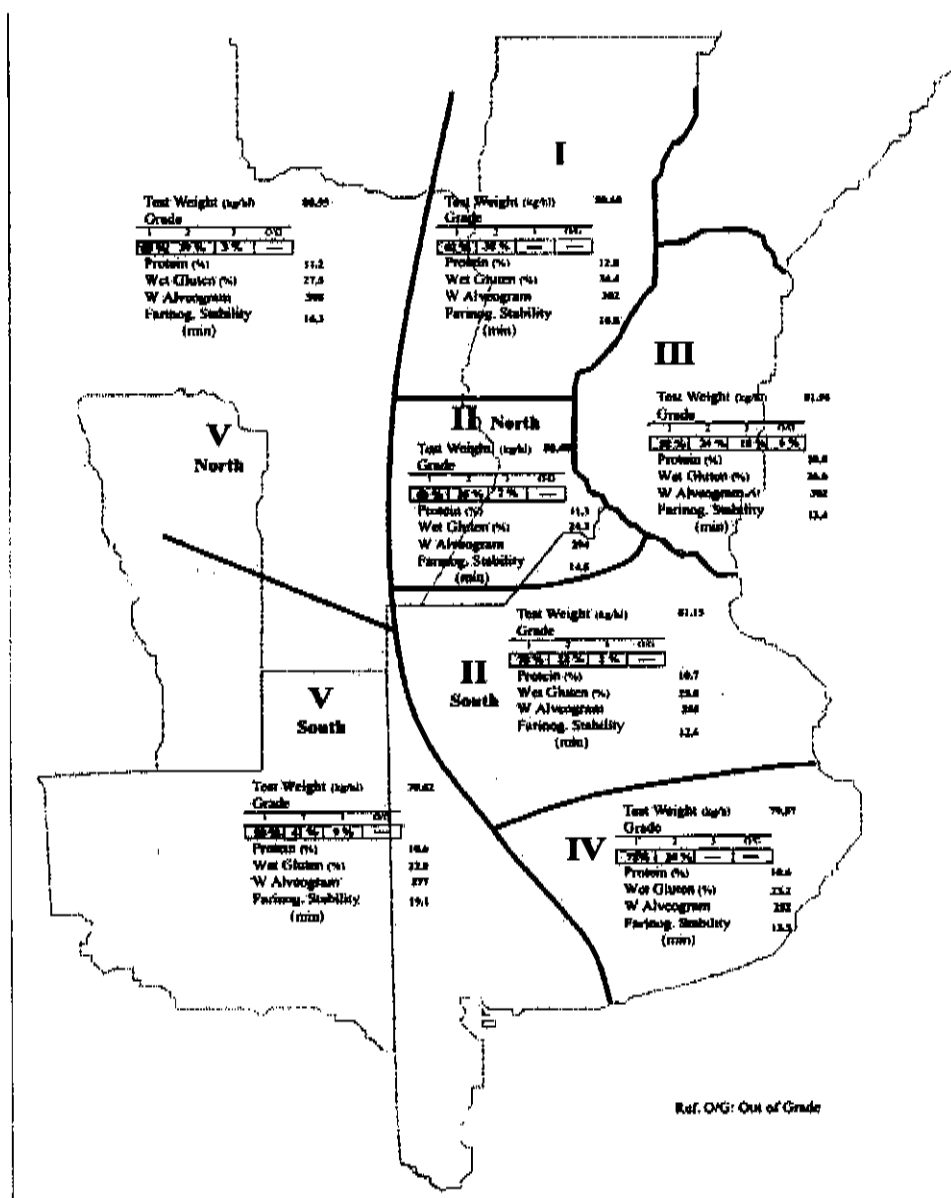


Figure 1. Growth regions for wheat in Argentina, with quality data by region for the 2004/05 crop. Source: The Argentine Wheat Institutional Quality Report.

A much emphasised feature of their crop agronomy is the use of no-till sowing. They claim that the absence of conventional ploughing prior to sowing overcomes many problems. No-till has been in use for some thirty years, and it is now used for 90% of the soy, wheat and maize crops. Trash is left after harvest, and their seeders incorporate cutter blades to ensure penetration of seed through the trash. Their use of no-till was the main theme of the opening lecture of the conference by Roberto Peiretti, an Argentinean farmer who is prominent in Argentinean (and American) farming politics. He almost claimed no till agriculture to be an Argentinean invention; it was offered as a system for adoption around the world, even as a basis for regeneration of degraded soils.

The most popular varieties are listed in Table 2. Most of the wheat breeding is performed within the country by private breeders (especially Buck and Klein, Table 3), plus

some public breeding by INTA – see further details in the section on the pre-conference tour. Other seed companies have introduced European varieties, e.g., the Baguette lines (Table 2) by Nidera. In addition, the names DeKalb, Syngenta, Pioneer and Cargill were prominent, advertised on the fences (presumably) where their seed had been planted. The share of varieties grown in the 2004/05 season is listed in Table 3 according to breeder source.

Table 1. Production totals and average quality details for the 2004/05 Argentine wheat crop. Source: The Argentine Wheat Institutional Quality Report.

Subregion	Locality Composite Samples	Sampling (tons.)	Production (tons.)	Production Sampled (%)
I	8	38,250	831,270	6.06
II North	43	53,520	2,092,850	2.56
II South	41	164,000	2,010,126	8.16
III	17	66,844	803,365	8.32
IV	92	358,539	4,585,640	7.82
V North	31	125,979	1,331,790	9.46
V South	105	398,252	3,967,515	10.04
North of the Country	10	20,500	496,280	4.13
TOTALS	347	1,225,884	15,918,836	7.70

National Averages

Results of the Analyses, composite samples by Locality.
Averages weighted by Tonnage

Wheat Analysis	Minimum	Maximum	Average	Standard Deviation	Variation Coefficient
Test Weight (kg/hl)	74.10	83.95	80.11	1.44	0.02
Total Damaged Kernels (%)	0.00	4.09	0.60	0.43	0.71
Foreign Material (%)	0.02	1.96	0.42	0.31	0.74
Shrunken and Broken Kernels (%)	0.12	2.24	0.73	0.31	0.43
Yellow Berry Kernels (%)	0.00	27.60	3.34	3.95	1.18
Protein (13.5% Moisture) (%)	9.1	15.6	10.8	0.8	0.07
Weight of 1000 Kernels (gr.)	30.04	44.42	35.86	1.99	0.06
Ash (% dry basis)	1.543	2.307	1.815	0.099	0.05

Flour Analysis		Minimum	Maximum	Average	Standard Deviation	Variation Coefficient
MILLING	Wet Gluten (%)	16.1	46.7	24.5	4.1	0.17
	Dry Gluten (%)	5.6	16.6	8.7	1.5	0.17
	Falling Number (sec.)	290	466	397	28	0.07
	Flour Yield (%)	80.0	78.2	69.0	3.0	0.04
	Ash (dry basis) (%)	0.434	0.808	0.583	0.050	0.08
FARINOGRAM	Water Absorption (14 % H*) (%)	52.0	68.0	58.8	2.8	0.05
	Development Time (min.)	1.5	17.3	8.6	2.8	0.30
	Stability (min.)	1.3	58.9	15.4	7.0	0.45
	Degree of Softening (12 min.)	0	226	46	41	0.85
ALVEOGRAM	P (mm)	73	151	103	15	0.15
	L (mm)	33	141	77	18	0.23
	W Joules x 10 ⁻⁴	133	420	278	46	0.17
	P / L	0.65	3.78	1.34	0.46	0.34

The Quality of Argentinean Wheat

In years gone by, there appears to have been little pressure for Argentina to concentrate on grain quality. One breeding company visited during the pre-conference tour openly stated that their main aim was to maximise yield. There was little mention about the protein content of the wheat crop, but it is rather low, the national average being 10.8% for the 2004/5 crop (Figure 1 and Table 1).

Table 2.

**NATIONAL DISTRIBUTION OF WHEAT CULTIVARS
HARVEST 2004/2005**

CULTIVARS	AREA (has)	PERCENT
Buck Guapo	1,073,600	19.22
Klein Escorpión	1,056,000	18.9
Baguette 10	485,900	8.7
Buck Sureño	264,100	4.73
Buck Arriero	262,600	4.7
Klein D. Enrique	196,500	3.52
Coop. Liquen	194,400	3.48
Buck Pronto	142,900	2.56
Buck Poncho	132,900	2.38
Printa Gaucho	129,700	2.32
Klein Chajá	112,000	2
Klein Martillo	106,500	1.91
Klein Estrella	105,800	1.89
Not identified	1,323,600	23.69
Total	5,586,500	

Source: S.A.G.P.Y.A., April 2005.

Table 3.

**BREAD WHEAT NATIONAL DISTRIBUTION BY SEED CO.
HARVEST 2004/2005**

SEED COMPANY	AREA (has)	PERCENT
BUCK	2,302,482	41.2
KLEIN	1,912,097	34.2
NIDERA	490,605	8.8
ACA	437,517	7.8
INTA	180,097	3.2
RELMO	48,183	0.8
DON MARIO	12,090	0.2
Not identified	203,429	4.1
TOTAL	5,586,500	100.0

Source: S.A.G.P.Y.A., April 2005.

Table 4. Industrial quality of bread-wheat varieties, grouped according to the proposed classification.

CALIDAD INDUSTRIAL DE VARIEDADES DE TRIGO PAN
Categorización del Comité de Cereales de Invierno de la CONA
 (Comisión Nacional de Semillas)
 Variedades ordenadas alfabéticamente por Grupos

GRUPO 1 Trigos Correctores Panificación Industrial	GRUPO 2 Trigos para Panificación Tradicional (+ 8 horas de fermentación)	GRUPO 3 Trigos para Panificación Directa (- 8 horas de fermentación)
ACA 302 * BUCK PONCHO BUCK PRONTO BUCK PANADERO BUCK ARRIERO BUCK YASTO BUCK GUAPO BUCK SUREÑO BUCK BRASIL * BUCK BIGUA* CAUDILLO COOPERACION LIQUEN KLEIN DELFIN KLEIN PROTEO* KLEIN SAGITARIO * PROINTA BON. ALAZAN PROINTA COLIBRI PROINTA HUENPAN PROINTA MOLINERO PROINTA REAL PROINTA BON. HURÓN BIOINTA 2001*	ACA 223 ACA 303 * ACA601* ACA801* BAGUETTE PREMIUM 13* BUCK CHARRUA BUCK ARRAYAN BUCK GUATIMOZIN * BUCK PINGO * BUCK MATACO* COOPERACION NAHUEL COOPERACION CALQUIN COOPERACION HUEMUL GREINA BIOINTA 1000* BIOINTA 2000* INIA PLUS 14* INIA TIJERETA * INIA CHURRINCHE* KLEIN ESTRELLA KLEIN VOLCAN KLEIN DON ENRIQUE KLEIN ESCORPION KLEIN ESCUDO * KLEIN CHAJÁ * KLEIN FLECHA* KLEIN JABALÍ * PROINTA PUNTAL PROINTA FEDERAL PROINTA IMPERIAL PROINTA BON. REDOMON PROINTA ELITE PROINTA MILENIUM PROINTA DON UMBERTO PROINTA GRANAR PROINTA GAUCHO * TG 306 * BUCK FAROL*	BAGUETTE 10 * BAGUETTE SUR 5 * BAGUETTE SUR 15 * BUCK GUARANI BUCK CHAMBERGO BUCK HALCON KLEIN PEGASO KLEIN DRAGON KLEIN CACIQUE KLEIN MARTILLO * BIOINTA 3001* PROINTA QUINTAL PROINTA OASIS

Increasing competition for their export markets has recently prompted the industry to re-examine its quality needs and priorities. Dr Martha Cuniberti at the government research laboratories (INTA, Marcos Juarez) has developed a classification system for varieties according to their baking potential. Three classes for quality have been recommended for use with harvested grain, each designated by the initials TDA (Trigo Duro Argentino - Argentinean Hard Wheat), based on protein content and variety (Table 4).

TDA 1 includes the highest quality ("superior") varieties. It is divided into three classes based on protein content: 10.5-11.5%, 11.6-12.5% and >12.5%.

TDA 2 includes high-quality breads suited for long fermentation times ("especial"). Its three classes are: 10-11%, 11.1-12% and >12% protein content.

TDA 3 includes "standard" varieties, less well suited to baking. There are two classes based on protein content: 10-11% and >11%.

While these classes are mainly based on variety and protein content, it is admitted that dough quality nevertheless may vary considerably, depending on growth region and conditions. Other physical considerations are also involved, such as test weight, soundness and the absence of contaminants.

At present, there appears to be little financial incentive for farmers to grow the better quality varieties or to aim for higher protein content. These incentives may come if there is increased competition, when quality considerations will become more important. A premium of US\$18/tonne was mentioned at one stage as an expectation for the top varieties at good protein content. Segregation according to quality type at harvest may not be of great importance, due to many farmers having on-farm storage thus providing "built-in" segregation. This facility also provides farmers with the opportunity to wait for favourable prices, but the time period is limited by the need to clear out these facilities to make space for the soy crop. There is also the opportunity for growers to deliver grain directly to the mills and seaboard terminals, because they are relatively close to the growing regions.

PRE-CONFERENCE TOUR

A bus tour was arranged prior to the conference to provide an overview of wheat-growing regions and of major organisations involved in wheat research and breeding. The timing of the tour proved to be excellent, as the year's harvest was later than usual and most fields and breeders' plots were mature, but not yet harvested. Much time was spent examining breeders' trial plots (Figure 2).

The tour involved about 75 people, transported in two modern double-decked busses. Hospitality was excellent, with traditional Argentinean dinners going on into the late hours of the evening, combined with some early-morning starts. The tour also provided good opportunities for discussion with the many international delegates.

INTA Laboratories, visited at Marcos Juarez, Cordoba (National Institute for Agricultural Technology)

These government laboratories cover a wide range of agricultural research - animals and plants relevant to the region. There are also several other INTA sites, but this one appears to be a major one for cereal research. There is only this one Argentinean organisation, publicly funded, involved in R & D and extension activities, thereby eliminating competition and duplication of effort. In industry-funded wheat research at INTA, there are projects jointly funded by the several breeding companies, indicating healthy cooperation between the breeding organisations.

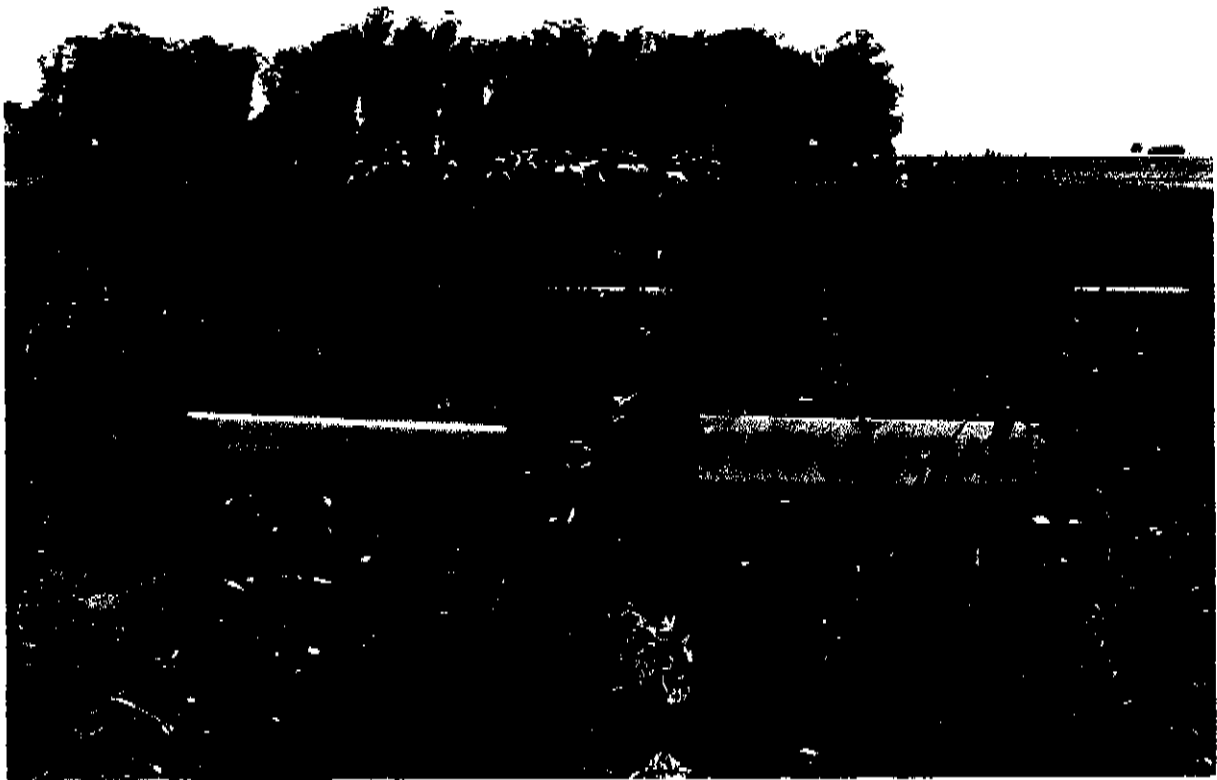


Figure 2. Inspection of breeders' trial plots during Pre-Conference Tour, including a very old Australian variety, Purple Straw, used as a rust typing differential

INTA is also involved in breeding commercial wheat varieties, although theirs do not gain the degree of popularity (nor royalty returns) of the commercial varieties (Tables 2 and 3). INTA varieties are marketed under the pre-fix "BIOINTA", e.g., BIOINTA 1003, BIOINTA 3003. Collaboration includes joint evaluation of advanced lines at up to 15 trial sites. The main accent of INTA breeding is on bread wheats, but interest was expressed in soft and waxy wheats. Breeding efforts obviously include selection for pathogen resistance, especially to leaf rust, using MAS at the early stages of selection. However, spraying with fungicide appears to be routine in commercial farming.

Selection for grain quality involves determining *Glu-1* scores using SDS-PAGE analysis of HMW glutenin subunits. Selection using LMW subunits is "just starting", with the identification of Glu-A3 and Glu-D3 combinations in sets of lines with similar HMW subunits. Gliadin and secalin analysis by acidic PAGE is used for identifying 1A/1R and 1B/1R lines, and for fingerprinting lines to check for possible mix-ups of genotypes.

The cereal chemistry laboratory is well equipped for conventional testing with test-milling equipment, various systems for test-baking, dough-test equipment (Alveograph, Farinograph, Extensograph, Mixographs (two bowl sizes), Glutomatic and Gluten Index equipment. The (separate) Molecular Lab is set up for PCR and various forms of gel electrophoresis.

All current Argentinean wheats are similar in their purindoline genes, so there is the intention of broadening the genetic basis for grain hardness. This statement was linked to the desire to develop white soft wheats adapted to the growing region. They are selecting durum lines for pasta colour based on lipoxygenase genes (*Lox A*) on chromosome 4B. GBSS alleles

are being studied with a view to the production of (partial) waxy wheats for the region. The local starch-gluten processor has asked for waxy wheats, reckoning that there is a market for the resulting starch. The Argentinean starch-gluten industry does not produce any ethanol, nor is ethanol used in their commercial petrol.

INTA Laboratories, visited near Mar del Plata

This extensive agricultural site was visited during the Wednesday afternoon of the conference. It is shared between INTA and university staff/students, thus serving for training as well as government research and extension. The full range of agricultural sciences is researched and taught at this site.

Klein Breeding Company

The two private/family breeding companies (Klein and Buck) are very impressive. Both were started by a German horticulturalist in the 1920s, and both have developed largely as family-owned and family-run companies. Both have extensive farm areas, plus breeding plots, set in beautiful grounds. As Tables 2 and 3 show, both companies are prominent in producing popular varieties for Argentina.

Criadero Klein, 85 years old, is primarily involved with wheat, both breeding and seed propagation. There are six professional breeders. They were especially proud of their variety Klein Proteo, which consistently produces grain with higher protein content than conventional varieties (1% to 1.5% higher). Selection priorities are for grain yield, followed by pathogen resistance and dough-baking quality (evaluated by Alveograph). They have an open policy of germplasm exchange, and they cooperate with other breeding companies in shared trial sites for advanced lines, as well as for joint research projects at INTA laboratories.

Buck Semillas S.A.

The Buck breeding station and experimental field are only about 30 km from the coast, and from an export terminal at Necochea. Buck breeds and sells seed for a range of crop species, in addition to wheat. Nevertheless, their major interest appears to be in wheat. This includes durum; their three durum varieties account for half the durum production from about 150,000 hectares. Buck hexaploid varieties topped the production lists for 2004/05 (Tables 2 and 3).

The company was founded in 1930 by José Buck, and it is now the property of his four daughters. The company President, daughter Hilda Buck, was Co-Chair of the 7th International Wheat Conference. José Buck came from Germany in 1923, working initially with early wheat breeders to select improved populations from crops brought by immigrants. He set himself up independently in 1930 and began his own crossing program. Since then, his company has released 65 bread wheats and 11 durum varieties.

Nidera Seeds

The Nidera company appears to be more involved in the importation of varieties than in breeding them locally, taking advantage of its strong ties with Europe. Importations include the Baguette lines from France. They have proved popular (Table 2), more because of their yield potential, than because of their grain-quality classification (see Table 4) or their protein content (averaging below 10%). High grain yields were claimed, requiring high inputs of fertiliser and fungicide. Their varieties are less popular with millers, but the millers are still slow to provide premiums for quality, so there is little incentive for farmers to grow better varieties or to raise protein levels.

Nidera is also involved extensively with other species, including soy, sunflower, maize and sorghum. It is an agrifood company involved in oilseed processing, and trading in a diversity of food grains, fertilisers and crop-protectant chemicals.

THE CONFERENCE

The Seventh International Wheat Conference brought a host of international wheat scientists, mainly breeders and agronomists, to the seaside resort of Mar del Plata, Argentina from November 27th to December 2nd. Many of them also joined in a pre-conference tour of wheat-growing areas and breeding programs. This is a five-yearly conference cycle. The whole conference voted for the site of the next conference from several offers. Kenya was elected with Russia coming a very close second.

Gems from Presentations

- **First Keynote Presentation** – by Roberto Peiretti, advocate of no-till agriculture, the system to be “the pillar to achieve modern, sustainable, highly productive agriculture”. (see above). Possibly an essential part of the Argentinean model is the alternating Roundup Ready soy crop, which permits the eradication of weeds prior to sowing the wheat crop. There was thus a question about this part of the model from Chile, where GM crops are not permitted. (Abstract page 1)
- **Second Keynote Presentation** – John Dixon, CIMMYT, based in Armidale, NSW, gave an excellent presentation on the “Economic aspects of wheat production” and on progress with the Millennium Development Goals of CIMMYT. Progress is much better in the North Africa-Asia region than in other regions of CIMMYT attention. He made the point that CIMMYT (and the world) need to now decide on the most important traits for which to breed, to meet needs that will arise in twenty years or so. He suggested that breeding should start to target grain quality primarily, in preference to the current procedure of checking quality after selecting for agronomic traits. In my subsequent discussions with him, he was interested in some suggestions I made by which such new quality breeding might be pursued. I reckon that he could be a good ally in planning for the renewal application of the Wheat CRC. (Abstract page 2)
- **International Wheat Genome Sequencing Consortium** – A workshop was conducted by two of the co-chairs of the Consortium, Rudi Appels (UWA) and Kellye Eversole (KSU). Bikram Gill (also KSU) is another c-chair, but he missed this session due to the airline strike. Their aim is to produce a freely available sequence of the wheat genome, as a basis for 21st-century research – an “encyclopedia of genes”. Work will focus on the variety Chinese Spring, a genotype that has long been the subject of many aneuploid and genetic studies. Initially, a physical map will be developed to be linked to a genetic map. Rudi is starting by getting a physical map of Chromosome 3B. (I have further details.) All results are to be in the public domain, with no IP restraints. An international committee has been formed. Significant funding has already been obtained and more is being requested. Details are available at the web site – www.wheatgenome.org. It would be good for the Wheat CRC to register, at least (no cost). Contact can be made by e-mailing to Kellye Eversole at eversole@eversole.biz (No abstract)
- **Precision Agriculture and N-use Efficiency** – Kyle Freeman (Oklahoma State University) claimed that there is a coming crisis due to the increasing world use of nitrogen fertilisers (see next item). Thus fertiliser use must be made more efficient. Suggested ways include “titrating” N application based on the use of test strips within a field and various devices for determining crop coloration. (Abstract page 23)

- **No-till and Fertiliser Use** – According to Terry Roberts (Potash and Phosphate Institute of Canada), N is the most limiting nutrient worldwide, followed by P, K and S. He advocates no till as a means of limiting fertiliser use. (Abstract page 24)
- **Organic-Grown Wheat** – Kevin Murphy (WSU, Pullman) has been screening many very old varieties to see if they might be better suited to organic growing systems than modern wheats. (Abstract page 29)
- **Improving Yield under Drought Stress** – Richard Trethowan (CIMMYT, Mexico) summarised many of the achievements of CIMMYT over its forty-year global influence, going on to give recommendations for genotype improvement for drought stress. Richard comes to Sydney University next June as Plant Breeding Professor, so we can expect to profit indirectly from his many years at CIMMYT. (Abstract page 40)
- **Breeding for High Iron and Zinc** – In a further talk, Richard Trethowan (CIMMYT, Mexico) described advances in breeding for mineral enrichment. (Abstract page 115)
- **CIMMYT Research on Quality** – Roberto Peña (CIMMYT, Mexico) gave an excellent review of current issues worldwide with respect to grain quality, also looking at future needs. I have his power point presentation. One point made was that dough extensibility is important for wheat quality, and that he has made good progress in distinguishing between the various LMW subunits of glutenin and in using them in selection for quality. (Abstract page 59)
- **Transfer of D-genome Proteins into Durum Wheat** – Domenico Lafiandra (Italy) described the introduction of various D-genome HMW-glutenin subunits (2+12, 5+10, 7+8, 7+9 and 20) into durum wheat, resulting in increases of up to 25% in % unextractable polymeric protein (UPP), thus modifying dough properties, and better suiting durum wheats for baking (a use in many Mediterranean countries). [Would such novel genotypes be useful as “ingredient wheats?”] (Abstract page 61)
- **Size Distribution of Gluten Proteins** – Oscar Larroque (CSIRO Plant Industry) felt back at home and could provide us with local background information. He described a novel approach to solubilising gluten with acetonitrile, plus the use of advanced methodology to determine molecular-weight distribution for the extracted proteins. (Abstract page 64)
- **UK Intensive Wheat Growing and Resulting Quality Problems** – The European approach to management described by Mike Gooding (Reading) is a contrast to ours in Australia. He described the average daily maximum of 17°C and plenty rain during grain filling, plus the extensive use of fertilisers, fungicide and insecticide sprays, commonly producing yields of 8 t/ha. One of the consequences is sulphur deficiency. Millers now consider that loaf volume is more related to grain sulphur content than to nitrogen content. It is thus common for millers to require both S and N analyses before buying. This now confirms our conclusions about the importance of sulphur in determining dough quality of two decades ago. He also described the loss of baking quality following fungicide use. Further problems include LMA (gumming up cutting equipment), and black point (causing milling problems). He was interested in my suggestions for checking on sulphur deficiency based on analysis of omega-gliadins by immunoassay or Lab-Chip analysis. (Abstract page 78)
- **Sulfur Deficiency and Durum Quality** – Abstract page 76 describes a further study of sulphur deficiency affecting quality, in this case for durum wheat.
- **Breeding Soft Wheat** – Prof Souza (University of Idaho) described an improved efficiency in breeding for soft-wheat quality. He was keen on the solvent retention capacity set of tests, and offered a DVD describing their approach to using this and related testing methods. I have a copy of it. (Abstract page 68)
- **Low Phytic-Acid Wheat** – M.Gutteri (University of Idaho) described a mutant (*Lpa1-1*) with reduced phytic acid P and increased inorganic P. (Abstract page 71)

Personal Contacts

- **Postdoc Position Required** – A PhD graduate from Brazil (Martha de Miranda) is seeking a Post-Doc position in Australia or Canada, planning to specialise in quality testing associated with wheat breeding. She hopes to obtain sponsorship from the Brazil Government.
- **Domenico Lafiandra (Italy)** – In addition to his enquiries about Lab-on-a-Chip, Domenico expressed interest in our efforts to combine all published lists of gluten genes, suggesting that the matter should be further pursued at next September's Gluten Workshop, maybe provide it as a CD. He also suggested that there is a need to pursue matters of nomenclature at the Gluten Workshop.
- **Rudi Appels** – Rudi appears to be very busy in a range of projects, pursuing well worthwhile research at Murdoch University, especially with the initiative with genome sequencing. Another point of interest is that he is again pursuing the development of the small-scale direct-drive Mixograph with John Albers at TMCO, Nebraska.
- **Rollin Sears** – Now a private breeder (AgriPro Coker, Kansas) was concerned about low Falling Number results for his latest release in some regions. The most obvious reason is LMA, and he did not appear to be aware of this possibility.

Interest in VAW CRC Research

- **WheatRite Test Kits**

My poster, co-authored with Felice Driver, created some interest, with several requesting further information. Most of these contacts have been passed on to C-Qentec for follow-up contact.

- **Lab-in-a-Chip System**

In my talk, I mentioned our use of the Agilent Lab-in-a-Chip equipment, and I had a surprisingly large number of enquiries about the method and equipment. I have sent back further information about the method as requested. These contacts form a basis of contacts for possible development, with Agilent, of software suited to the identification of varieties and dough quality. Enquirers included Domenico Lafiandra (Italy): 'How many samples per working day?' and a Monsanto guy from South Africa: 'Could you identify the specific variety we provide to a special customer?' The latter has since made a formal approach for us to check his varieties for distinguishability.

- **Heat Stress and Quality**

Dirk Hays (Texas A & M Univ) is following up on our QW CRC research on the dough-weakening effects of heat stress. Our discussions could complement our e-mail exchanges of recent years. He has consistently found the (Australian) variety Halberd to be tolerant to heat stress, but he was not impressed with Halberd's dough quality. Nevertheless, he has used Halberd as the heat-tolerant parent in a cross with the susceptible cultivar Cutter, intending to confer heat-stress tolerance on local wheats. They are identifying relevant QTLs. Over 1,920 unique ESTs have been sequenced, and identified as various proteins. (Abstract Page 53)

COMMERCIAL GROWING OF VAW CRC VARIETIES IN ARGENTINA

I met with Laureano Mones-Cazon of Wheat Quality Network, Argentina, on a few occasions, initially the day after our arrival and during the conference. During the past year or two, he has been introducing VAW CRC varieties for trialling and commercial propagation in Argentina. My wife and I were renewing an established friendship with Laureano and his wife Maria Marta, following previous meetings with them overseas and during his visit to Australia. He is enthusiastic about the successful propagation of QAL wheats in the "fringe" regions of the Argentinean wheat belt, where growers do not usually expect to grow wheat successfully.

QAL2000 and QALbis are growing well in lower rainfall areas towards the foothills of the Andes where wheat is not regularly grown. He thus maintains that he is not encroaching on parts of the wheat belt that are the traditional domain of the established wheat industry. He also maintains that by introducing soft wheats, he is not antagonising the current breeding and seed industry, because most wheat grown in Argentina is hard red grade. Nevertheless, a few breeding organisations that we visited stated that they plan to include white soft wheats in their programs, although there was little evidence of progress with this type. In fact, Laureano claims that he was encouraged to introduce soft wheats for trial by Argentinean breeders. In addition, he plans to introduce beans, canola and lupins from Australia. His trials with various WA barley varieties are going well. Keith Alcock (WA Agriculture) drove 3,000 km with Laureano in the week prior to the conference to inspect barley trials.

I understand that his system with CRC wheats involves giving the seed to suitable growers, who contract with him to deliver the harvested grain at an agreed price, based on world prices. Just before our visit, Laureano had signed an agreement with Cargill flour mills for the delivery of QAL soft wheats for Cargill to mill for biscuit manufacturers and various other processors. Earlier, a test of soft QAL wheat at a Cargill mill had created "how do you say ... chaos!". The millers had previously milled only hard wheats, so the soft wheat behaved in unexpected ways for them. These initial problems appear now to be resolved.

The area sown to QAL wheats in 2005 was about 800 ha in the north-western region. Ten times this area is planned for 2006! Yields in the 2005 harvest (Nov-Dec) were running at about 2.4 tonnes/ha and about 10.6% protein content (reasonable for soft wheat). He and his growers were happy with these results.

Laureano would like the VAW CRC to provide him with a range of waxy wheats, especially to provide flour to Chile for manufacture into aquaculture feed for this important industry there. He also sees the need to trial Australian hard wheats, reckoning that they have potential to provide advantages over the current Argentinean varieties.

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SOURCES OF FURTHER INFORMATION

Relevant Web Sites

7th International Wheat Conference- 7iwc.com.ar
The Argentine Wheat Institutional Quality Report – www.trigoargentino.com.ar.
The Arbitration Chamber of the Cereals Exchange- www.cabcbue.com.ar
INTA at Marcos Juarez, Cordoba (National Institute for Agricultural Technology)-
www.inta.gov.ar/mjarez
INTA seeds- www.bioceres.com.ar
Klein Breeding Company- www.kleintrigo.com.ar
National Institute of Statistics and Census (Instituto Nacional de Estadística y Censos)-
www.indec.mecon.ar
MegaSeed Crop Improvement Center- www.megaseed.com.ar
Nidera Seeds- www.nidera.com.ar
Secretariat of Agriculture, Animal Husbandry, Fisheries and Food (SAGPyA)-
www.sagpya.mecon.gov.ar
Tecnotrogo wheat varieties- www.relmo.com.ar
wheat Quality network (Laureano Mones-Cazon) www.wheatqnet.com.ar

Literature Available from the Trip

*See Colin Wrigley for further information about matters described in this report.
The following documents are available to provide further information.*

Seventh International Wheat Conference:

Abstracts. (A Proceedings book is in press, containing 10-page articles for keynote talks and 2-page papers for posters.)
Contact details of delegates.
Poster Presentations as a Compact Disc.
Pre-conference tour program, including information about INTA, Klein, Buck and Nidera.
Conference program

Argentine Wheat Institutional Quality Report for 2004/05

The Arbitration Chamber of the Cereals Exchange:

Leaflet describing this centre for dispute resolution, including laboratory and analytical facilities.

Buck Seeds:

Buck Semillas S.A. History of Buck, details of current breeding program and variety trials.

INTA:

BIOINTA catalogue of wheat varieties

Klein Breeding:

7th I.W.C. Visit to Criadero Klein, describing the development of the Klein breeding company, its breeding strategies, the pedigrees of its commercial varieties, and its trial network.
Anon. (2005). Klein Wheats and their Baking Quality. Tables and dough-test traces for Klein varieties.

MegaSeed:

Crop Improvement Center leaflet

Nidera Seeds:

Catalogue (2005). In Spanish, for maize, sunflower, soy, wheat and sorghum.

Profertil:

Fertilisation of Wheat (in Spanish). Profertil S.A., Bahía Blanca, Argentina.

Tecnotrogo:

Catalogue of varieties available

Hanisova, A. 2003. A Century of Breeding: 1903-2003. Solgen A.S. Czech Republic.