
I. SPECIAL REPORTS**MINUTES OF THE WHEAT CROP GERMPLASM COMMITTEE****16 January, 2002.****Orlando, FL, USA.**

Present: G. Brown-Guedira (USDA-ARS, Manhattan, KS; Acting chair), K.G. Campbell (USDA-ARS, Pullman WA; Acting secretary), K.W. Simmons (USDA-ARS-NPS), O. Anderson (USDA-ARS Albany CA; GrainGenes curator), M. Bohning (USDA-ARS-PEO), Harold Bockelman (NPGS-NSGC; Curator), Bent Skovmand (CIMMYT), Carl Griffey (Virginia Polytech Inst), Dave Marshall (USDA-ARS, Raleigh, NC), Paul Murphy (NC State Univ), Dave Van Sanford (Univ KY), Barton Fogelman (AgriPro), Victoria Carollo (USDA-ARS, Albany CA; GrainGenes), and John Moffat (AgriPro).

Membership.

A review of the bylaws indicates that we are supposed to have 14 members. Recent resignations leave openings. The committee now stands with the following members: Gina Brown-Guedira, Kim Garland Campbell, John Moffat (or Barton Fogelman), Dave Marshall, Brian Stephanson, Bent Skovmand, Paul Murphy, and Carl Griffey, and ex. Officio members Kay Walker-Simmons, Harold Bockelman, Mark Bohning (or Alan Stoner), Olin Anderson, and Victoria Carillo.

One member is needed to represent state research programs in the west. Kim agreed to recruit a member from the Pacific Northwest. Canadian membership is difficult because they have no travel funding for this meeting. John Moffat agreed to contact Ken Richards in Canada to see if he would be willing to serve, otherwise the slot will be filled with a U.S. member.

Carl Griffey suggested that we stagger chair/vice-chair duties so that the chair serves a 3-year term and is replaced by the vice-chair. Gina indicated that assignment of the next chair and vice-chair would be determined through an E-mail ballot. (Note: Kim Garland Campbell was elected chair and Gina Brown-Guedira vice-chair).

Report from Harold Bockelman.

Last year the program at Aberdeen received an increase in funding. Interviews have taken place for a new Research Leader. Construction planning is ongoing. Significant additions were made to the collection in 2001. The total collection is now about 54,000 *Triticum* accessions. One hundred eighteen accessions were added from Warren Kronstad's winter/spring crossing program at OSU. The Iranian collection from C. Qualset (over 7,000 accessions) has been assigned P.I. numbers and duplicated at CIMMYT. Iran is now the largest donor of germ plasm in the collection. Data is available for many of the accessions. The data is still being added to GRIN. Bent reported that CIMMYT helped regenerate the Iranian collection and evaluated it for resistance to RWA. That information will be shared with GRIN. The great majority of the accessions are facultative winter habit. Very few have resistance to leaf or yellow rust. Harold anticipates that resistance to common and dwarf bunt and salt tolerance also may be present. The Iranian collection should be available for those who are interested in it by spring 2002.

Discussions.

Letter from Jeff Dahlberg and the National Grain United Sorghum Producers Growers regarding the establishment of a new federal agency for germ plasm. Kay Walker-Simmons presented data indicating that the high priority placed on putting more resources into germ plasm efforts has been successful and that money has been consistently increasing for the past 3 years. Kay reported that the budget for the NPGS for 1997 was \$20 million. After steady budget increases for a period of 4 years, the 2001 budget for the NPGS was USD \$32.1 million. An additional increase of USD \$3.9 million is estimated for the 2002 budget. New resources also were to have been added to the Griffin, GA, site and to Mayaguez, Puerto Rico, specifically for sorghum. Paul indicated that the letter cited 1981 and 1991 reports

critical of the NPGS with the implication that nothing had been done since then but the increased funding within the last 5 years contradicted that assumption. Carl stated that there was an additional need for characterization of germ plasm. Kay stated that NSF and the USDA were working together to ensure that new data coming from Plant Genome grants was available to the NPGS. Germ plasm also was being expanded to include beneficial microbes and some animals. The name of the National Seed Storage Laboratory in Ft. Collins has been changed to the National Center for Genetic Resources Preservation to reflect this broader mission. Security was being increased for the collections. Bent indicated that the U.S., the NPGS was one of the best. The consensus of the Wheat CGC was that given the documented increases in funding for the NPGS, we should not recognize the problems stated by the NGSP without further explanation. The wheat CGC feels that the system functions well as it is. The current system of managing the NPGS within ARS actually helps it to function by linking genetic resources to research programs involved in germ plasm enhancement and utilization. This provides a direct link to growers who are the ultimate beneficiaries. Therefore, the committee can not support the proposal put forth by the NGSP at this time.

Carl asked about the current status of the Vavilov collection. Bent and Harold suspect that they are still struggling along. ICARDA is working with the Vavilov collection. No action was taken.

Bent reported that the International Treaty on Plant Genetic Resources for Food and Agriculture was adopted by the FAO Conference on 3 November, 2001. The U.S. and Japan did not sign. Kay reported that the opinion of the U.S. State Department was that provisions of the agreement violated U.S. Patent law, therefore, the U.S. could not sign for private companies but could sign only for the public sector. The text of the undertaking can be accessed through <http://www.fao.org/ag/cgrfa/IU.htm>. Bent reported that the international centers are not sure about the whole meaning of the undertaking. CIMMYT will probably keep its 'designated' and 'nondesignated' germ plasm classifications but other aspects of germ plasm exchange are unclear. One concern for germ plasm sites is that sample tracking may be required for compensation.

Collection trips for wheat. Gina stated that there has not been a NPGS funded collection trip of Triticeae for over 10 years. The committee needs to recommend areas for collection. Harold reported that Ned Garvey at the Plant Exploration Office, negotiated an agreement with ICARDA involving Armenia and Uzbekistan where opportunities will arise to participate in or obtain material from collecting trips. In the past year, they collected in Armenia including *Aegilops*. Gina has a collaborator who collected in Tajikistan and sent 120 accessions including 40 *Ae. tauschii*, some *Ae. cylindrica*, *Ae. triuncialis*, and *T. aestivum* land races. Bent recommended that collections be made in the former Soviet Republics, the Hill country of Nepal and *T. aestivum*, *Hordeum* and *Secale* in Tibet if someone knows how to get in. *Aegilops* species in Mongolia, Manchuria, and China would also be useful as well as in North Korea if anything is left. Harold recommended that we pursue the ICARDA agreement. Kim agreed to contact R. Hanna and the NPGS-Western Plant Introduction Center in Pullman for further details.

Revision of the Wheat CGC report. Steve Jones revised the introduction. The rest of the sections were divided as follows:

Current activities: Harold

Germ plasm enhancement: Kim

Status of crop vulnerability: ??

Taxonomy: Victoria said she would check with Laura Morrison at OSU about translating the Dorofeev taxonomy and making it available in HTML.

Trends in genetic diversity of the U.S. wheat crop: Gina

Impediments to maintaining and implementing genetic diversity: Kim

Germ plasm and collection needs: Bent

Preservation needs: Harold

Evaluation and enhancement needs: Gina and Kim

Collection evaluation. Harold noted that if proposals were put forward for new trait evaluation in the germ plasm bank, he would consider it. The funds for germ plasm evaluation are held by the R.L. at Aberdeen.

Much discussion ensued regarding evaluation of specific traits. Some of the traits mentioned were resistance to Karnal bunt, root rots, *S. tritici*, *St. nodorum*, adult plant leaf rust (latent period evaluation), BYDV, salt and drought tolerance, protein, texture, seed color, waxy alleles, polyphenol oxidase, and molecular markers for *Lr12*, *Lr13*, and *Lr34*.

GRIN: Mark discussed improvements to GRIN. A new system release for plant curators will be available in May 2002. Improvements to the public interface will be made after that. Some of the improvements will include better downloading of information, a spreadsheet view of data, a shopping cart for selected accessions, and better navigation. The passport data for wheat is very good compared to other plants. GRIN now includes insects and animals. Harold has been adding images of spike and seeds for accession identification purposes. Kim and Gina asked if the information in release and/or registration notices could be better integrated into GRIN. Crop registration notices published in *Crop Science* are copyrighted so they can not be directly copied into GRIN. Dave Marshall agreed to ask if direct links to registration articles could be established from GRIN.

Distribution of germ plasm protected by international property rights. John reported that anything registered in *Crop Science* is available for distribution worldwide. The USDA has formed a committee that is not very active right now. John spoke with Ken Richards in Canada who indicated that they are watching the U.S. to see what policy develops. Harold commented that distribution of IPR-protected materials occurs only if the owners volunteer the material to be distributed. As Stan Cox commented in 1996, "Germ plasm exchange has floundered on the shoals of IPR." Discussion occurred regarding the role of the committee in this issue. Harold stated that although the NSGC has material with plant variety protection, nothing has been accepted with proprietary traits. Kay mentioned that the ARS wants to encourage freedom to operate. An agreement was reached for maize with the coöperators of the GEM (Germ plasm Enhancement of Maize) project in which coöperators crossing with the materials agree to return progeny to the originator. USDA-ARS-NPS will not obtain utility patents of research and will not work with 'reach-throughs'. Materials will be provided freely. Soybean and wheat regional nurseries do contain genotypes with proprietary traits and coöperators are required to select away from the trait or obtain agreements with the owner if they make crosses with the material. In his 1996 report, Stan Cox encouraged reestablishment of international germ plasm nurseries and funding to support that.

Gina pointed out the material transfer agreements exist for molecular markers in wheat, particularly those developed by researchers at Gaterslaben, Germany, which are being patented. When using markers for cultivar development and/or proposing cultivar release, it is wise to negotiate in advance.

Olin reported on the status of the wheat EST project. There are now over 75,000 wheat ESTs. The goal is to reach 115,000 and then swap collections with others such as Japan. Mapping of ESTs onto the wheat deletion stocks is ongoing. People have started to mine the mapping and EST data. J. Dvorak is P.I. on a project to obtain a physical map of the D genome and hybridize mapped ESTs from the first project to align the BACs with the deletion map.

GrainGenes report. Dave Matthews works with the database. Victoria works with the Web site. Mirror sites exist in Europe (2) and Japan (1), and a future site at CIMMYT. A new home page for GrainGenes has been developed and users can search the website. New features include additional links, hot topics, employment, archived copies of the *Annual Wheat Newsletter*, 8,000 references, and interactive maps. Sequence data is also available for 60,000 ESTs and links to TIGR are available. The gopher (text) files are being converted into HTML files. Database files are being constructed using both object-oriented and relational-database methods.

Olin noted that with a change in direction of USDA-ARS bioinformatics, an oversight committee is needed for GrainGenes. The consensus of the committee was that GrainGenes was an important resource and an oversight committee was necessary to provide direction. A member representing the Wheat CGC should serve on the oversight committee.

A decision was made to meet in the future with the NWIC. The NWIC will be meeting in Cincinnati following the National FHB Forum. The Wheat CGC will meet on the Monday following the FHB forum at 1 p.m.

**MINUTES OF THE NATIONAL WHEAT IMPROVEMENT COMMITTEE (NWIC)
MEETING.**

17 January, 2002.

Orlando, FL, USA.

Attendance.

Committee members: Dave Van Sanford (chair), Bob Graybosch, Bob Zemetra, Harold Bockelman, Craig Morris, Allan Fritz, Scott Haley, Sid Perry, Yue Jin, Carl Griffey, Greg Marshall, and Kim Garland Campbell.

Noncommittee members: Victoria Carollo, Bent Skovmand, Mike Davis, Sue Canty, Kay Simmons, David Marshall, Paul Murphy, Olin Anderson, Gina Brown-Guedira, Bob Bowden, Forrest Chumley, and Brett Carver.

Preliminaries.

The minutes from the 2001 NWIC meeting (see *Annual Wheat Newsletter* 47:1-10) were approved as written. Bob Graybosch, USDA-ARS, Lincoln, NE, was appointed as the new secretary for the NWIC.

Annual Wheat Newsletter.

Brett Carver, Oklahoma State University, presented a report on the status of the *AWN*, including copy distribution and finances. At present, the *AWN* fund has a positive balance of \$11,600. A discussion followed on the proper utilization of these funds. It was noted that, historically, oversight of *AWN* has been a responsibility of the NWIC. Scott Haley moved we explore the possibility that J. Raupp and B. Gill (Kansas State University) be approached regarding the possible use of the funds to enhance the *AWN* or its production. Craig Morris seconded. Motion passed.

Annual Wheat Newsletter Report to NWIC, 17 January, 2002.								
Year	Volume	Pages per volume	No. of contributions			No. distributed		Cost per copy
			Corporate	Country	State	paper	disk or CD	
2001	47	371	4	28	13	100	50	18.62
2000	46	344	3	24	16	125	65	15.08
1999	45	377	6	29	19	125	70	15.88
1998	44	471	7	28	16	125	80	20.79
1997	43	424	10	28	19	125	115	18.92
1996	42	463	10	32	21	100	111	13.45
1995	41	358	11	31	21	100	170	9.25
Financial statement								
End of year	Debits		Deposits			Balance		
1997	—		—			6,906.20*		
1998	3,970.32		8,951.95			11,887.83		
1999	4,729.35		4,698.95			11,857.43		
2000	2,916.32		3,133.24			12,074.35		
2001	3,225.06		2,821.66			11,670.95		
*Transferred from Herring National Bank, Vernon, TX to Home National Bank, Stillwater, OK on 12 December 1997.								

Summary of ARS programs.

Kay Simmons presented a summary of ARS programs and budgets. The new peer-review process for ARS research programs was described. It was noted that national leaders in various research areas will be asked to serve as reviewers. Budget increases were obtained in FY02 with additional resources being committed to the support of germ plasm collections. The Gramene database is being developed as a central cereals database. A new program in biotech risk mitigation is being established at Albany, headed by A. Blechl. The program will be designed to develop new promoters and other material for use in biotech applications, especially promoters not owned by private firms. Other funded programs in the federal (U.S. government) budget in FY02 include an \$800,000 increase for the wheat quality laboratories, to be divided equally among all of the labs, with funds used to upgrade equipment, obtain new technology, and explore new testing procedures for new products. Other commitments included \$600,000 to Fargo, ND, toward the establishment of a second proposed regional wheat genomics lab and \$320,000 for barley and oat work at Madison, WI. Other projects include aflatoxin research at Mississippi State and new cereals genomics positions and a Hessian fly position at Purdue. Bob Zemetra asked if the NWIC should not meet earlier in the year, to better assist in providing advice on budgetary matters (see below). Carl Griffey raised a question regarding the stem and leaf rust position (McVey position at St. Paul. In March, there will be a review of the Cereal Disease lab, and they will look at the future of this position. Mike Davis also indicated that current funding at the Cereal Disease Lab may not be sufficient for the replacement of all present positions.

Regional reports.

Eastern soft wheat region (Gregg Marshall, Pioneer). The Stine Program was sold to Western Plant Breeders. David Marshall has assumed the USDA-ARS research leader position (formerly S. Leath's position) at North Carolina State University. The Eastern Wheat Workers will meet in St. Louis, MO, 20-21 May, 2002. The USDA-ARS Soft Wheat Quality Lab at Wooster, OH, will hold its annual meeting 10 April, 2002. Acreage trends in the eastern soft wheat region were described. Carl Griffey noted that stripe rust has been spreading in the east.

Spring wheat region (Y. Jin, South Dakota State University). Dave Garvin has filled the USDA-ARS position formerly held by Bob Busch (happy retirement, Bob!) at St. Paul, MN. The position will work on germ plasm enhancement, include disease resistance and will continue to coordinate the regional nursery. The Cereal Disease lab needs an increase in funding for current positions and facilities. At North Dakota State University, Drs. Maan and Froberg retired, and Dr. Mohamed Mergoum from CIMMYT has been hired to assume the spring wheat breeding duties. Also at NDSU, Mike Edwards has been appointed as a ARS new research leader. The spring wheat crop acreage remains stable, with recurring problems with scab in the eastern zone. New races of stem rust seem to be appearing.

Western region (Bob Zemetra, University of Idaho). Dan Skinner was appointed the new research leader with the ARS at Washington State. Agripro will be establishing a new breeding facility in eastern Washington this June. A decrease in wheat acreage has occurred, due to both planting reductions and drought. The next western wheat workers meeting will be around 10 July, 2002, in the Idaho Falls/Aberdeen area. There was a discussion on the eastern European nursery distributed by Oregon State University. Monsanto donated the Hybritech germ plasm to public programs in the region.

Winter wheat region (Scott Haley, Colorado State University). The USDA-ARS regional genomics lab at Manhattan, KS, is up and running. Jackie Rudd has joined the faculty of Texas A&M, and will be conducting breeding work at Amarillo. A wheat molecular biology position at Texas A&M, College Station, is being established. Brian Beecher has filled the wheat biochemistry/wheat quality position at the University of Nebraska. The 22nd Hard Wheat Workers Workshop was held in February, 2001, in Kansas City, MO. The annual breeders' field day will be at Akron, CO, scheduled, at this writing, for 18 June, 2002. Stripe rust ravaged the Great Plains in 2001. Karnal bunt showed up in four counties in Texas. Several meetings have been held in the region to address the Karnal bunt issue.

IFAS-funded project update.

The IFAS-funded project 'Bringing Genomics to the Wheat Field' was described by Kim Campbell, USDA-ARS. Eleven labs in all parts of the nation are participating in this effort to integrate marker-assisted selection in wheat breeding programs and germ plasm development. The program will produce up to 322 germ plasm lines and cultivars,

and all genetic materials will be in the public sector. Also targeted will be improved, user-friendly molecular markers, increased public awareness of biotech, and a marker-assisted selection workshop.

Wheat Crop Germplasm Committee.

Gina Brown-Guedira, USDA–ARS, gave an update on the Wheat CGC meeting. Carl Griffey and Paul Murphy were elected recently as members, G. Brown-Guedira is acting as interim chair, and Kim Campbell as interim vice-chair. This led to a discussion of a letter from the National Sorghum Board regarding the future of germ plasm collections and a proposal to create a separate germ plasm system. Regarding this request, Bob Graybosch proposed the motion the NWIC feels that the present organization of the USDA–ARS germ plasm system is useful and efficient and should be maintained, that the link between researchers and germ plasm curators is important, and that it should be retained in its current structure. The motion was seconded by C. Griffey and passed.

Karnal bunt initiative.

Bob Bowden (formerly of Kansas State University, now with the USDA–ARS, Manhattan, KS) presented regional program NC503 activities and plans for the KB-research project. The Texas outbreak was the first in the world on winter wheat. There was much discussion on the various approaches that could be used to combat the disease and screen germ plasm. Scott Haley moved that the NWIC endorse the two resolutions of NC503 and support the development of appropriate research and extension activities to reduce or prevent economic damage to the U.S. wheat industry from Karnal bunt. The motion was seconded by Carl Griffey. The two resolutions of NC503 (passed at the NC503 meeting, 1/15/02) are: I. NC-503 strongly supports deregulation of Karnal Bunt as a quarantine pest, while protecting wheat export markets, and II. NC-503 supports strengthening current research and extension programs to develop information and technologies to reduce or prevent economic damage to the U.S. wheat industry from Karnal bunt.

Cereal genomics.

Dr. Forrest Chumley, Kansas State University, presented a proposal being formulated by Dr. Robert Zeigler (also of Kansas State) of an AID proposal to create a global cereals genomics effort. The NWIC passed a resolution (see below) in support of this effort.

Legislative visits.

The spring 2001 legislative visit and the success of small grains in general was discussed by Dave Van Sanford (University of Kentucky) and Mike Davis (American Malting Barley Association). Paul Murphy, Mike Ellis, Tom Anderson, Rick Siemer, and Dave Van Sanford served as the team. Ellis and Anderson are wheat farmers. Members for the legislative visit team are needed from some big wheat states. The date of visit will be approximately 10 March.

Wheat Quality Lab initiative.

Scott Haley presented the proposal for the wheat quality labs. Only 20 % of the requested funding was obtained for FY2002. The new document outlines uses of and plans for the requested funds. Technical and temporary postdoctoral fellow positions will be filled with these funds. No new scientist positions will be filled at this time because of insufficient funds. Additional funds of 2.45 million are requested.

Genotyping centers.

Kim Campbell presented the proposal for the four USDA–ARS regional genotyping centers. Currently, the center in Manhattan is providing marker work for several projects, including IFAS, scab, and common bunt projects.

Building and maintenance initiatives.

Mike Davis summarized the status of possible building and maintenance initiatives, including the Aberdeen seed storage facility, the Cereal Disease Lab at St. Paul, and possible initiatives at Fargo. Other cereals-related legislative items were presented, including Cereal Disease Lab staffing issues and the Scab (*Fusarium*) initiative. In FY02, the initiative provided funding to over 100 projects in 27 different states.

Legislative items.

Several items were considered as possible targets for the 2002 legislative visit. By vote, legislative priorities were established. In order of priorities, these are

1. Quality lab initiative
2. Genotyping centers
3. Karnal bunt initiative
4. Increased funding for the Cereal Disease Lab
5. Increased funding for the scab initiative.

Possible requests for building and maintenance items were prioritized as follows:

1. Cereal Disease Lab.
2. Aberdeen Seed Storage Facility.
3. New ARS facilities at Fargo.

GrainGenes.

O. Anderson and V. Carollo, USDA-ARS, provided an update on the GrainGenes database and various EST, mapping, and genomics projects in wheat. GrainGenes is establishing a new mirror site at CIMMYT and a reorganized home page. Gopher files have been converted to HTML and now are searchable. A tribute to Ernie Sears is available on-line. There are new pages for genomics and microarrays and a database of repetitive sequences.

Resolutions adopted at the National Wheat Improvement Committee Meeting, Orlando, FL, 17 January, 2002.

Subject: USAID proposal. The NWIC recommends that The National Association of Wheat Growers (NAWG) and The American Malting Barley Association (AMBA) adopt the following resolution: *We support funding for a global comparative cereals genomics program among U.S. institutions and international agricultural research centers. We further urge support using for this purpose a portion of the funds within USAID allocated for plant biotechnology in developing countries.*

Subject: Karnal bunt initiative. *The NWIC endorses the two resolutions of NC503 and supports the development of appropriate research and extension activities to reduce or prevent economic damage to the U.S. wheat industry from KB.* The two resolutions of NC503 (passed at the NC503 meeting, 1/15/02) are: I. NC-503 strongly supports deregulation of Karnal bunt as a quarantine pest, while protecting wheat export markets and II. NC-503 supports strengthening current research and extension programs to develop information and technologies to reduce or prevent economic damage to the U.S. wheat industry from Karnal bunt. Letters are needed for the Raleigh research leader position, for funding of GrainGenes, to APHIS on Karnal bunt and flag smut, to regional coordinators on nursery recommendations, and to Tom Sim on the barberry quarantine issue.

Subject: Acknowledgment of Dr. Rollin Sears' contributions to the National Wheat Improvement Committee, 1992-2000.

WHEREAS, Dr. Rollin Sears gave generously of his time and expertise beyond normal duty and served as an influential member of the NWIC for more than 15 years, making significant contributions in both political and research arenas, and;

WHEREAS, he provided outstanding and insightful leadership as Chair from 1992 to 2000 during which period many significant changes and issues, such as genetically modified organisms and protection of plant germ plasm, were paramount, and;

WHEREAS, his vision and example have and continue to foster significant advancements in small grain research, most notably his position and support of free germ plasm exchange;

THEREFORE, be it resolved that the NWIC collectively expresses its most sincere gratitude and utmost appreciation to Dr. Rollin Sears for his distinguished service and innumerable contributions to the National Wheat Improvement effort.

Subject: Acknowledgment of Dr. Mike Davis' contributions to the National Wheat Improvement Committee.

WHEREAS, Dr. Mike Davis has served as Executive Secretary of the National Barley Improvement Committee for over a decade and as a vital member of the U.S. Wheat and Barley Scab Initiative's Executive Committee, and;

WHEREAS, he has successfully integrated and supported the endeavors of the National Barley Improvement Committee, the National Wheat Improvement Committee, and the National Oat Improvement Committee, and;

WHEREAS, he has given generously of his time beyond normal duty on political and research efforts supporting these organizations and the agricultural community, and;

WHEREAS, his dedication and commitment has resulted in significant increases in Federal funds supporting small grain research;

THEREFORE, be it resolved that the NWIC collectively expresses sincere gratitude and utmost appreciation to Dr. Mike Davis for his unselfish commitment and dedication towards the advancement of small grain research and the agricultural community.

Subject: Acknowledgment of Ms. Sue Canty's contributions to the National Wheat Improvement Committee.

WHEREAS, Sue Canty has dutifully served and contributed significantly to the success of the U.S. Wheat and Barley Scab Initiative and the small-grain community through her gracious and devoted commitment to small grain research, and;

WHEREAS, she has played a vital administrative role in facilitating the research endeavors of the USWBSI through her direct involvement with 22 Land Grant universities, USDA-ARS and CIMMYT, and;

WHEREAS, she has generously contributed of her time and expertise beyond normal duty towards political and research efforts of NWIC in garnering increased Federal funding for small grain research;

THEREFORE, be it resolved that the NWIC collectively expresses sincere gratitude and utmost appreciation to Sue Canty for her unselfish commitment and dedication towards the advancement of small grain research and the agricultural community.

Subject: Acknowledgment of contributions of Dr. Rick Ward and Mr. Tom Anderson to the National Wheat Improvement Committee.

WHEREAS, Dr. Rick Ward and Mr. Tom Anderson contributed significantly to the inception, initiation, implementation and continued success of the U.S. Wheat and Barley Scab Initiative, and;

WHEREAS, they have given generously of their time and expertise beyond normal duty as cochairs of this initiative and have provided insightful leadership in political and research endeavors and;

WHEREAS, their efforts have greatly facilitated significant increases in Federal funding provided to scientists working on scab research at 22 land grant universities, USDA-ARS, and CIMMYT;

THEREFORE, be it resolved that the NWIC collectively expresses sincere gratitude and utmost appreciation to Dr. Rick Ward and Mr. Tom Anderson for their unselfish commitment and dedication towards the advancement of small grain research and the agricultural community.

Announcements.

Location and time of meetings. Allan Fritz proposed we meet in Cincinnati after the Scab Forum, 10 December, 2002 (the scab meeting starts on Saturday, 7 December). The motion was seconded by Carl Griffey and passed.

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January, 2002.**

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WHEAT WORKER'S CODE OF ETHICS

This seed is being distributed in accordance with the 'Wheat Workers' Code of Ethics for Distribution of Germ Plasm', developed and adopted by the National Wheat Improvement Committee on 5 November, 1994. Acceptance of this seed constitutes agreement.

1. The originating breeder, institution, or company has certain rights to the material. These rights are not waived with the distribution of seeds or plant material but remain with the originator.
2. The recipient of unreleased seeds or plant material shall make no secondary distributions of the germ plasm without the permission of the owner/breeder.
3. The owner/breeder in distributing seeds or other propagating material grants permission for its use in tests under the recipient's control or as a parent for making crosses from which selections will be made. Uses for which written approval of the owner/breeder is required include:
 - (a) Testing in regional or international nurseries;
 - (b) Increase and release as a cultivar;
 - (c) Reselection from within the stock;
 - (d) Use as a parent of a commercial F1 hybrid, synthetic, or multiline cultivar;
 - (e) Use as a recurrent parent in backcrossing;
 - (f) Mutation breeding;
 - (g) Selection of somaclonal variants; or
 - (h) Use as a recipient parent for asexual gene transfer, including gene transfer using molecular genetic techniques.
4. Plant materials of this nature entered in crop cultivar trials shall not be used for seed increase. Reasonable precautions to ensure retention or recovery of plant materials at harvest shall be taken.

II. ANNOUNCEMENTS

Introducing IGROW (International Genome Research on Wheat).

Bikram S Gill, Wheat Genetics Resource Center, Plant Pathology Department, Kansas State University, Manhattan, KS 66506-5502, USA.

At a recent meeting of ITMI in Winnipeg, Canada (1–4 June, 2002), cereal workers discussed the concept of IGROW to lead wheat genomic and improvement effort for the next 10 years. Dubbed as the IGROW 2010 project and similar to the Arabidopsis 2010 project to elucidate a functioning plant model, the vision of IGROW is rather modest:

- create a knowledge base on the genetics and biology of wheat plant,
- sustain wheat genetic infrastructure and resources, and
- serve as a platform for all wheat stakeholders.

The IGROW challenge is to coordinate and provide direction to diverse wheat research in the following ten areas:

- Bioresources: wild species, mutants, mapping populations, cytogenetic stocks, and DNA libraries.
- Structural and functional genomics.
- Proteomics.
- Transformation and genetic engineering.
- Chromosome engineering and alien transfers.
- Genetics of wheat–pest interactions.
- Wheat plant physiology.
- Breeding and crop improvement.
- Wheat utilization.
- Bioinformatics.

I propose that we identify our best scientists who will coordinate and lead research in the above mentioned areas. I envision community resources and a research effort in each of the above areas. I propose that *Annual Wheat Newsletter* publish research as short notes in all of the above areas after peer review by respective focus groups. It will be a major change in the mission of *Annual Wheat Newsletter* to become an instrument that will provide leadership at this critical juncture.

IGROW project on the sequencing of the bread wheat genome.

Steering committee: Rudi Appels (Australia) and Bikram Gill (USA), lead coordinators; Olin Anderson (USDA–ARS, USA); Boulos Chalhouh (URGV–INRA, France); Jun Yu (BGI, China); Yasumari Ogihara (Japan); Beat Keller (Switzerland); and Graham Moore (UK). The committee will expand as additional countries join the project.

One of the first challenges of IGROW is selective sequencing of the bread wheat genome to access most of the genes in the wheat plant. Some arguments that can be advanced for wheat genome sequencing are as follows.

- DNA sequencing is a given for all modern cutting-edge research.
- Most agronomic genes are crop-plant specific.
- Although the wheat genome is huge (16×10^9 bp), gene islands are accessible to sequencing.
- Cytogenetic stocks can be skillfully used to unravel complications associated with polyploidy.
- Sequence information will be essential to understand mechanisms associated with diploidization of the polyploid wheat genome including DNA sequence changes, gene regulation, and epigenetic silencing.
- Developing a strategic plan to tackle the huge wheat genome will be a crucial first step.
- International mobilization and collaboration will be essential for the success of the project.

Concepts and aims. The IGROW project will provide an international infrastructure to integrate existing wheat sequencing projects and a mechanism to leverage new funds for the sequencing of the gene-rich regions from bread wheat. The focus on gene-rich regions aims to capture structural information on agronomically important genes which are generally crop-specific.

Background. Cultivated wheats belong to three ploidy levels, diploid (einkorn), tetraploid (emmer or durum), and hexaploid (dinkel, common, or bread). It is the hexaploid or bread wheat (genome size 16 billion bp) that is of overwhelming economic importance. Wheat is grown on more areas of land than any other crop plant and is a staple food of 40 % of the world's population. It provides for 20 % of the calories consumed. Wheat originated in the Fertile Crescent, an arc of land stretching from the Persian Gulf, north to Turkey, and south again to Egypt. The fertile soil watered by rivers like the Euphrates and the Jordan enabled humans to invent farming, cities, trade, and writing. The Sumerians formed the first empire in 4000 BC followed by Babylonia, Assyria, Mesopotamia, and Arabia. The development of wheat as a food source is deeply linked into this history of modern civilization. The present proposal will identify the genes that were critical in this development. The large-scale, genome-sequencing proposed in this project interfaces with studies worldwide to identify disease-resistance and abiotic resistance genes and quantitative trait loci defining agronomic and quality traits and will, therefore, include genes that helped establish human civilization.

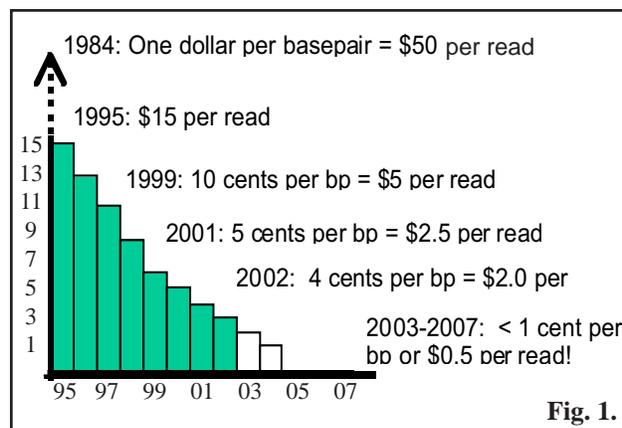
Chinese Spring is a bread wheat land race from China that has been used as a genetic model for over half a century by the international wheat genetics community. A vast array of cytogenetic stocks and genetic resources have been developed for trait discovery. During the past few years, several genomics projects on bread wheat have been established in different countries and include the sequencing of over 200,000 ESTs from over 50 different wheat tissues and the large-scale mapping of EST and BAC clones. These wheat genome projects and resources will constitute the starting material for large-scale genome sequencing. Gene discovery findings through this large-scale genomic sequencing will drive the continued adaptation of wheat with respect to both agronomic and quality traits. New grain storage protein genes discovered through functional genomics will, for example, provide for novel approaches to altering quality traits in breeding programs. The creation of specific food products for human consumption and health, and maintaining crop production in difficult environments will depend on utilizing novel genes revealed by large-scale sequencing.

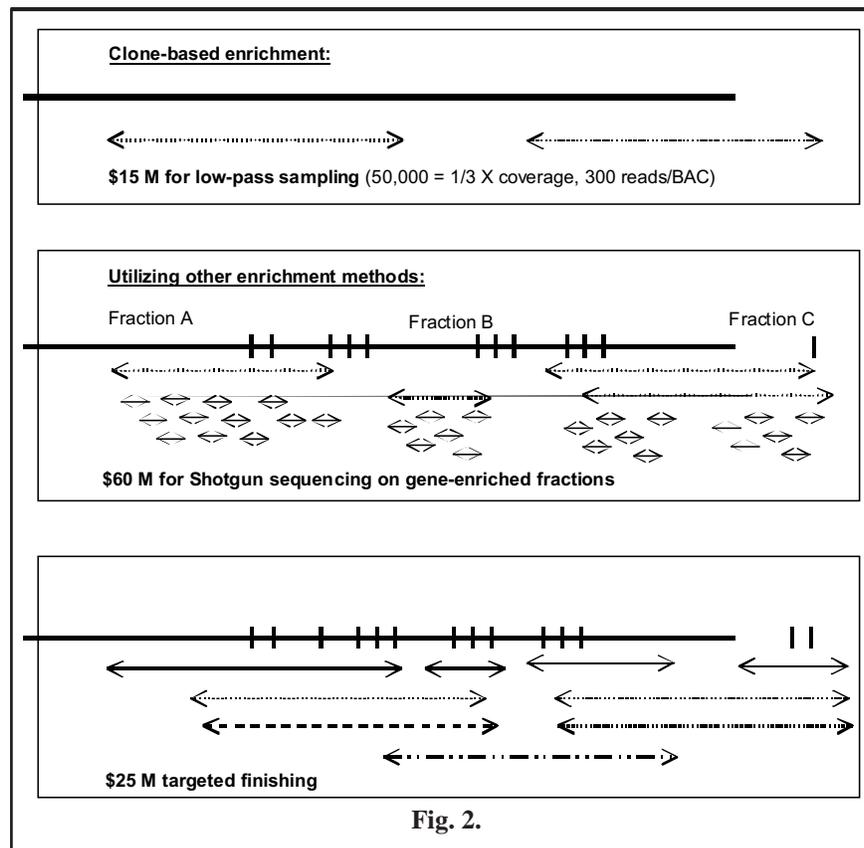
The polyploid nature of wheat has allowed nature to 'experiment' with its genetic material in a way not possible in other major crops or well-studied systems such as *Arabidopsis* and rice. New versions of genes have, for example, been discovered in the analysis of starch biosynthesis.

Molecular and cytogenetic mapping of ESTs in chromosome bins using deletion stocks has revealed that the wheat genome is sharply partitioned into gene-poor and gene-rich components. The gene-rich regions are accessible either by EST probing of large DNA (BAC) libraries or generalized genome-fractionation methods for a large genome-sequencing project. The increased efficiency and lower cost of large-scale genome sequencing makes it feasible to plan a project as large as sequencing the gene-rich regions of the wheat genome.

Proposal. In view of the large size of the genome, it is proposed that IGROW will focus on the gene-rich regions of the wheat genome. Three phases can be defined:

- Phase 1 will include the evaluation of wheat genomics sequences as well as assess the methodologies for sorting gene-rich regions. Two strategies/methodologies will be investigated.
 - The first strategy has the resources in place through large-insert (BAC) libraries from the wheat genome being made available by the Genoplante (France) group. In this phase, low-pass sequencing on a set of random BAC clones (50 to 300) will determine the distribution of gene-rich BAC clones and the effectiveness of assaying these by simple prescreening procedures utilizing repetitive-sequence probes.
 - The second strategy will evaluate cloning methods for sorting gene-rich regions such as Cot-based procedures and differential nonmethylated DNA cloning. Shotgun sequencing would then be used to analyze the DNA recovered in these procedures.
- Phase 2. Following the research in phase 1, a detailed strategy for shotgun sequencing the gene-rich regions of the wheat genome will be established. In addition, large numbers of BAC clones (up to 50,000, low-pass sequencing) from gene-rich regions will be analyzed and anchored to individual chromosomes.
- Phase 3 most likely will focus on large regions of specific agronomic or quality interests and will be according to the required detail using overlap sequencing.





The estimated budgets for the phases, based on the Beijing rice sequencing project (published in April issue of *Science*, 2002) are identified in Figs. 1 and 2. Note the reduction in the cost of sequencing over time. The IGROW estimate for sequencing the gene-rich portion of the wheat genome is \$100 M (Fig. 2)

Integration of other sequencing activities. The extensive sequencing of expressed genes (cDNAs) in wheat, especially in Japan, the U.S., and Europe, with a focus on full-length cDNAs, is essential for the annotation of the genes in the genomic-sequencing work. This also will provide the basis for capturing the functional assignment activity for similar genes in other organisms such as *Arabidopsis* and rice. Many agronomic and quality related genes will have functions unique to wheat, and the genome-sequencing project will form the basis for investigating the functional attributes of these genes in more detail.

A major resource that makes the present proposal feasible is the extensive molecular genetic maps that have been established for wheat. In addition, the assignment of the location of over 10,000 ESTs within the molecular genetic map using chromosome deletion stocks, currently funded by the National Science Foundation (NSF, USA), is starting the process of identifying candidate genes associated with QTLs of importance in wheat. These resources provide the basis of positioning and orienting the large-scale sequencing effort. Large-scale sequencing of wheat ESTs in Japan, especially full-length cDNA sequencing will be crucial for interpreting the sequence structure of the genome.

The major resources for the wheat genome project established in Europe include the BAC library in the cultivar Renan available from the French Genoplante Consortium and the BBSRC/INRA BAC library from Chinese Spring; the large-scale, hexaploid wheat EST sequencing in France (Genoplante Consortium); and a project to anchor 10,000 ESTs on the Renan BAC library and the sequencing of 2–3 Mb segments of the genome.

A significant resource that will complement this project is the current investment by the NSF (USA) in establishing a complete representation of the D genome of wheat (*Ae. tauschii*) by BAC clones. The analysis of this resource will be particularly significant in phase 3 of the project proposed, where the detailed structure of specific regions will be greatly aided by the availability of homoeologous genomic clones from a diploid donor of one of the wheat genomes. Similarly, the detailed analyses of the *T. monococcum* BAC library clones by Keller and colleagues (Switzerland) and Dubcovsky and colleagues (USA) also will provide a key resource for refining analyses of specific regions of the wheat genome.

Plan of action. This preliminary proposal has been developed for the benefit of individual scientists and organizations for obtaining funding in their respective countries for participating in the IGROW project. All sequence data will be in the public domain. You may contact Rudi Appels (rappels@agric.wa.gov.au) or Bikram Gill (bsg@ksu.edu) for further information.