

Planning conference for a 2005 Coordinated Agricultural Project (CAP) on wheat translational genomics

Denver Colorado, August 16 – 17, 2004.

Description of the proposed conference

(1) Justification for the meeting.

The objective of this workshop is to plan a 2005 Coordinated Agricultural Project (CAP) on wheat translational genomics. Participants will discuss priorities for research, training, education, and extension and will elaborate a sound management plan.

Participants of this conference will discuss strategies to address the priorities established by growers, public wheat breeders and industry representatives in a preliminary stakeholders meeting held in Kansas City, MO February 22, 2004 (see Section 2). The expected outcome of this meeting is a scientific plan to address the wheat industry priorities and a clear timetable for the preparation of the CAP proposal.

A scientific discussion is required to decide the best strategy to incorporate two new resources into the current public wheat breeding programs. The first one is the recent creation of four regional USAD-ARS high-throughput genotyping laboratories that have the capacity to generate tens of thousands of marker data-points a year. The second one is the recent incorporation of valuable genes into almost 100 new lines adapted to the different US wheat growing regions by the *MAS*wheat consortium using marker assisted selection (MAS). A creative combination of these new resources with the traditional breeding programs can have a significant impact on wheat improvement in the US.

Integration of genomics into practical wheat improvement programs is a high priority for the National Wheat Improvement Committee (NWIC) and the National Association of Wheat Growers (NAWG). Most of the public wheat breeders in the US are currently aware of the potential benefits of MAS technologies to their programs. The interest in this technology was confirmed by the participation of NWIC, NAWG and breeders from 23 states (representing 86% of the US wheat) in the Kansas stakeholder workshop.

During the last three years, eleven public wheat-breeding programs have been collaborating with the Kansas genotyping laboratory in the implementation of MAS in the public sector. The first phase of the *MAS*wheat program (Phase I, 2001-2005) is concluding in September 2005 and is on schedule to deliver 100 new lines from 10 different market classes carrying multiple valuable genes (IFAFS grant “Bringing Genomics to the Wheat Fields”). The objective of the second phase of the *MAS*wheat consortium (Phase II, 2005-2008) is to use these adapted lines to deploy valuable genes across the public wheat breeding programs using high-throughput technologies.

The group of scientists participating in the *MAS*wheat project has developed most of the molecular markers currently available for wheat and accumulated valuable experience in their use of MAS. An additional objective of this conference is to develop strategies to extend this experience to a broader set of public breeding programs.

The planned scientific discussion for this conference is relevant to the general issues of Genomics and Future Food and Fiber Production and to the CSREES goals for a safe, secure and more nutritious food supply and world food security through genomics. This conference is aligned with

the 5-year plan of the Interagency Working Group on Plant Genomes and extends the groundwork established by the research community to implement knowledge and tools generated by genomics research into practical wheat improvement programs. The results of this discussion will facilitate the implementation and integration of the numerous USDA-ARS and University projects that are currently developing improved lines by MAS, testing new marker technologies, and developing molecular markers for new traits.

(2) Recent meetings on the same subject with dates and locations.

In response to a request from the National Wheat Improvement Committee to include wheat in the 2005 RFP for the USDA-NRI CAP projects, USDA Under-Secretary Joseph Jen suggested that the wheat research community should first organize a national conference focused on bringing together a community of plant breeders, genome scientists, end-users, growers, and other experts, to identify research needs and discuss the priorities in wheat translational genomics.

In response to this request we organized a stakeholders meeting in Kansas City, MO February 22, 2004. This meeting was attended by 57 participants including representatives for the four USDA-ARS genotyping centers, the National Wheat Improvement Committee (NWIC), the National Association of Wheat Growers (NAWG), the American Institute of Baking (AIB), the North American Millers' Association (NAMA), and the milling and baking industry. Wheat breeders from 23 wheat-growing states and numerous wheat researchers also attended the meeting. A draft of the Kansas meeting report is being circulated among the participants of the meeting for its final editing. The final report will be posted at <http://maswheat.ucdavis.edu/>.

A summary of the conclusions of the meeting is presented below.

The first objective of this meeting was to request input from the wheat industry (growers, millers, and bakers) and the public wheat breeders on the prioritization of quality and resistance traits for the different wheat market classes. The main conclusions from the participants were:

1. Focus on the big-ticket items: yield, production consistency, and disease resistance.
2. Resistance genes: prioritize resistance to Fusarium Head Blight and stripe rust.
3. Quality traits: prioritize milling yield, preharvest sprouting, hardness and particle size, water absorption, gluten strength, and protein content. If possible also include in the list levels of dietary fiber and of Polyphenol Oxidase (PPO).
4. Initiate research in quality parameters for the fast processing technologies of modern bakeries.
5. In the soft wheat class develop two classes: weak and strong gluten.
6. In the durum wheats focus on pasta and semolina color, semolina yield, gluten strength and protein content.

The second objective of the Kansas stakeholder workshop was to discuss the best structure for a national program for marker assisted selection in wheat that integrates the public breeding programs, the University research laboratories, and the USDA-ARS regional molecular genotyping laboratories. The requests from the participants were:

1. Focus on MAS implementation in public wheat breeding programs and assign a lower priority to the development of a marker database.
2. Develop a high-throughput forward MAS strategy that integrates the four regional USDA-ARS genotyping laboratories and the public wheat breeding programs.

3. Develop clear criteria for participation in the second phase of the *MAS*wheat consortium and establish measurable landmarks to evaluate progress.

(3) Names and organizational affiliations of the chairperson and other members of the organizing committee.

A two-day conference is planned for August 16-17, 2004 in Denver Colorado at the Embassy Suites hotel.

Dr. Jorge Dubcovsky from the University of California - Davis will serve as the PI for this planning grant. His contact information is:

Jorge Dubcovsky,
Professor
Department of Agronomy & Range Science
One Shields Avenue, University of California
Davis, CA 95616, USA
Phone: (530) 752-5159. Fax: (530) 752-4361
E-mail: jdubcovsky@ucdavis.edu

Dr. Forrest Chumley from Kansas State University will be the Co-PI for this Conference Planning proposal. His contact information is:

Forrest G. Chumley,
Associate Director for Research
K-State Research & Extension
113 Waters Hall, Kansas State University
Manhattan KS 66506
Phone: (785)-532-6148. Fax: (785)-532-6563
E-mail: fchumley@oznet.ksu.edu

Drs. Nora Lapitan and Scott Haley from Colorado State University have agreed to serve as members of the local organizing committee. Their contact information is:

Nora Lapitan,
Professor
Department of Soil and Crop Sciences
C117 Plant Sciences Building
University Avenue, Colorado State University
Fort Collins CO 80523
Phone: (970) 491-1921
Email: nlapitan@lamar.colostate.edu

Scott Halley,
Plant Breeder and Geneticist
Department of Soil and Crop Sciences,
Colorado State University,
Fort Collins CO 80523
Phone 970-491-6483. Fax 970-491-0564
E-mail: shaley@lamar.colostate.edu

(4) Proposed program for the conference

August 16 day meeting 5:00 pm to 9:30 pm

1. 5:00 – 5:15 Summary of the conclusions from the Kansas stakeholders workshop and of the E-mail Questionnaire. D. Van Sanford.
2. 5:15 - 5:30. Presentation of the *MAS*wheat program: genes and genetic backgrounds that will be available by September 2005. J. Dubcovsky.
3. 5:30 - 6:15. Presentation of the current status of the four genotyping-laboratories and their predicted capacities by September 2005. G. Bai (KS), S. Chao (ND), K. Garland Campbell (WA) and D. Marshall (NC).
4. 6:15 – 6:45 Presentation from one representative from the Canadian MAS program (Suggested speaker Daryl Somers) and one representative from the Australian MAS program (Suggested speakers Rudi Appels or Peter Langridge).
5. 6:45 – 6:55. Round of introductions of the conference participants. A handout will be distributed containing detailed information about each of the participants and the responses to the Email questionnaire. (see section 6).
6. 6:55 – 7:30. Discussion of breeding strategies to integrate the high-throughput MAS techniques into the current breeding programs. The discussion will include recommendations for submission of samples to genotyping centers (eg DNA vs. lyophilized tissue).
7:30 – 7:45 Coffee break
7. 7:45 – 8:30. Discussion of required mapping populations, types of populations (double haploid vs. single seed descent), and assignment of trait responsibilities to programs.
8. 8:30 – 9:30. Discussion of criteria for participation in the project: competitive grant structure vs. stable participation of a broad group of programs with clear benchmarks.

August 17 meeting 8:30 to 12:30

1. 8:30 – 9:00 Priorities and plan for training, education, and extension.
2. 9:00 - 9:30. Selection of an advisory board. Discussion of mechanisms to obtain frequent input from stakeholders.
3. 9:30 - 10:00 Management plan. Discussion of measurable landmarks to evaluate progress.
4. 10:0 – 10:15 Coffee break
5. 10:15 – 10:45 Quotas for data-points to be assigned by each genotyping laboratory to each of the public breeding programs. Distribution of responsibilities
6. 10:45 – 11:30 Budget
7. 11:30 – 12:30 Designation of a writing committee and open discussion.
Break for lunch.
8. 1:30 – 5:30 The writing committee will elaborate a draft report for the meeting.

(5) Table1. Listing of scheduled participants and their institutional affiliations.

Name	State	Affiliation
Breeder & Associated Researcher		
Anderson , Jim	MN	University of Minnesota
Bacon, Robert	AR	University of Arkansas
Berzonsky, Bill - Shahryar Kianian	ND	North Dakota State University
Baenziger, Steve	NE	University of Nebraska
Barnett, Ron	FL	University of Florida
Carver, Brett	OK	Oklahoma State University
Costa, Jose	MD	University of Maryland
Dubcovsky, Jorge	CA	University of California
Edge, Ben	SC	Clemson
Elias Elias - Shahryar Kianian	ND	North Dakota State University
Fritz, Allan- Bikram Gill	KS	Kansas State University
Glover, Karl D.	SD	South Dakota State University
Haley, Scott – Nora Lapitan	CO	Colorado State University
Harrison, Stephen	LA	Louisiana State University
Hole, David	UT	Utah State University
Ibrahim, Amir	SD	South Dakota State University
Kidwell, Kim - Gill, Kulvinder	WA	Washington State University
Kolb, Frederic	IL	University of Illinois
Griffey, Carl	VA	Virginia Tech.
Johnson, Jerry	GA	University of Georgia, Athens
McKendry, Ann	MO	University of Missouri
Milus, Gene	AR	University of Arkansas
Mergoum, Mohamed	ND	North Dakota State University
Murphy, Paul	NC	North Carolina State University
Ohm, Herb	IN	Purdue University
Peterson, Jim – Riera-Lizarazu, Oscar	OR	Oregon State University
Rudd, Jackie – Menz Monica	TX	Texas A&M University
Seyran, Esra	AR	University of Arkansas
Sneller, Clay	OH	The Ohio State University
Sorrells, Mark	NY	Cornell University
Souza, Ed	ID	University of Idaho
Talbert, Luther	MT	Montana State University
Van Sanford, David	KY	University of Kentucky
Vincent, Robert	SD	South Dakota State University
Ward, Rick	MI	Michigan State

Table1. Continuation

Name	State	Affiliation
Genotyping Laboratories		
Bai, Guihua	KS	USDA-ARS-Manhattan
Bowden, Bob	KS	USDA-ARS-Manhattan
Brown-Guedira, Gina	KS	USDA-ARS-Manhattan
Garland Campbell, Kim	WA	USDA-ARS-Pullman
Chao, Shiaoman	ND	USDA-ARS, Fargo
Edwards, Michael	ND	USDA-ARS, Fargo
Marshall, David	NC	USDA-ARS, Raleigh
Skinner, Daniel Z.	WA	USDA-ARS, Pullman
Quality laboratories		
Manthey, Frank	ND	North Dakota State University
Morris, Craig	WA	USDA-ARS Pullman
International participants		
Daryl Somers	Canada	AAFC-CRC
Peter Langridge	Australia	Waite Agricultural Research Institute
Rudi Appels	Australia	Western Node MPB CRC

(6) Method of announcement or invitation that will be used.

Invitations will be sent to:

- All public wheat breeders from wheat growing states
- All the members of genotyping laboratories
- Wheat genome scientists interested in teaming with their respective breeding programs to collaborate with the project.

Those breeders that do not have molecular marker capabilities within their own program will be encouraged to contact and invite their molecular genetics counterparts from their Universities or research stations. This strategy was used successfully to establish the initial *MAS*wheat consortium.

Complete E-mail lists for the public wheat breeders are available from the regional nursery coordinators. An additional mailing list is available for the genotyping laboratories, including project leaders, laboratory scientists and wheat researchers interested in the implementation of these laboratories.

These mailing lists were used to advertise successfully the Kansas workshop (February 22).

Communication activities planned before the meeting

Questionnaire: A series of specific questions will be sent to all public wheat breeders, members of the regional genotyping centers, members of the regional Quality laboratories, and wheat researcher to request their input.

Answers will be compiled, analyzed and the results will be presented at the beginning of the Meeting (See Agenda August 16).

The questionnaire will request information about the participant's research programs including

- Wheat Market Class they breed.
- Size of the wheat production regions served by their program.
- Technical capabilities of their laboratories.
- Expertise in MAS in their programs/ Universities
- Publications in the area of MAS.
- Traits and mapping populations they would like to contribute. Current status of those populations.
- Preference of mapping populations (double haploids versus single seed descent).
- Capability and interest in providing double haploid service to the project.
- Preference for grant structure (competitive each year vs. stable participation based on productivity).
- Suggestions for the organization of the Colorado Planning Meeting.
- Expectations for the Colorado Planning Meeting.

Communication activities planned after the meeting

The writing committee will elaborate a draft of the Planning Conference, and assign responsibilities for a more elaborate writing of specific sections.

Time line for the elaboration of the report:

- One week after the meeting the members of the writing committee will send their input to J. Dubcovsky and Forrest Chumley. They will produce a draft that will be circulated through the writing committee.
- Two weeks after the meeting a draft of the report will be sent to all the participants for input.
- Three weeks after the meeting all the input will be compiled into a final report. The Final report will be circulated one more time.
- Four weeks after the meeting the final report will be sent to all participants and posted in the MAS wheat WEB site.