

March 2007



IBMS Newsletter

Idaho Update: Barley For Rural Development

By Dr. Juliet Windes, Edited by Karen Hertsgaard and Paul Schwarz

A \$725,000 USDA-CSREES special grant awarded jointly to the University of Idaho (UI) and Montana State University (MSU) in 2006 has launched the Barley for Rural Development (BRD) Project. A primary goal of the BRD Project is the development of new malt, feed and food barley varieties adapted to the West.

The BRD project is intended to encompass the development of improved cultivars, and in broader, terms to help support sustainability of the barley production system for the grower. This includes maximizing profit, as well as production. Market diversification opportunities include ethanol, and specialty food and feed types. Developing enhanced agronomic factors and disease resistance are crucial to increasing marketability and end-use qualities.

The Idaho barley research effort is being spearheaded by Dr. Juliet Windes, a UI cereal agronomist and pathologist based in Idaho Falls. Dr. Tom Blake, barley breeder at MSU heads the Montana efforts. However, the scope of the project extends well beyond these two institutions, and cooperative research efforts are a key component of BRD.

Dr. Windes has indicated that

progress can only be made through the cooperation and coordination with the USDA-ARS barley breeding and genetic programs in Aberdeen. We are integrating our barley research programs more closely than was done in the past, and coordinating research and extension trials with ARS scientists Dr. Don Obert, Dr Victor Raboy and Dr. Phil Bregitzer. We enjoy the collaboration and team approach we can bring to solving problems. We have the same goal in mind - maximizing profitability and market potential for our producers. Through this unique collaboration, we can integrate research so that everyone from the breeder to the end user focuses on this same goal. The BRD Project will enhance the ability of the breeding program and the cereals agronomy/pathology programs to speed varietal development by expanding testing locations, increasing evaluation of specialty varieties, and enhancing disease resistance. We plan continued cooperation between state and federal programs in order to accomplish these goals, and we hope to incorporate the additional expertise available through our collaboration with Dr Tom Blake at MSU, and the IBMS at NDSU.

The major focus of the programs is for malting barley, because approximately 73 percent of the barley grown in Idaho was planted for malt, and 71 percent of the barley was produced under irrigation. Excellent environmental conditions in Idaho favor the consistent production of high quality barley. However, new cultivars also are needed to provide producers with other *value-added products* that provide additional marketing opportunities.

Therefore, specialty barleys like low phytic acid (LPA) and high beta-glucan (BG) types are being tested in addition to malting types. LPA cultivars will allow for the utilization of barley in the poultry, swine, and aquaculture production by providing a feed source that will reduce phosphorous contamination of both ground water and the Snake River. High BG types would allow producers to market barley specifically designed for food and fractionation into valuable components for nutraceutical use. High BG lines have earned the FDA "heart healthy" designation, and can reduce serum cholesterol when included in a heart healthy diet. New BG lines are currently under development but not yet available to producers.

Production information on new varieties, particularly those with specialty end-use traits, will assist growers in focusing on production for maximum profitability. For example, the LPA barley lines, developed by the team of ARS research scientists mentioned above, are being tested by the UI Cereals Program at four locations and under four different fertility regimes. Understanding how production environments may modify the LPA trait will benefit the release of new LPA lines, such as Herald.

A total of \$340,000 was awarded to the UI in Fiscal Year 2006 under this special research grant. A portion of the funding was used to purchase field-plot equipment that was badly needed by UI and USDA-ARS (Aberdeen) researchers, and to hire a scientific aide to help support UI and ARS barley research.

However, much of the funding is being used to directly support eight specific research projects at several locations in Idaho. These BRD projects are:

Development of production practices and variety evaluations for novel food and malting barleys in Northern Idaho
– Dr. Stephen Guy, Moscow

Barley value-added trait response to nitrogen management – Dr. Brad Brown, Parma

Evaluation of new fertilizer and fertilization technologies to enhance malting barley production
– Drs. Juliet Windes and Bryan Hopkins, Idaho Falls

Expedited development of feed barleys with novel end-use traits – Dr. Phil Bregitzer, ARS, Aberdeen

Effect of seeding rate and seed size on competitiveness of malt barley with broadleaf weeds in organic production system – Dr. Don Morishita, Twin Falls

Demonstrating best management practices for traditional and organic barley production
– Drs. Juliet Windes and Bryan Hopkins, Idaho Falls

Develop a rapid evaluation of ruminal digestibility of barley protein and identifying barley varieties with slower rate of ruminal degradation suitable for daily diets – Drs. Alex Hristov and Carl Hunt, Moscow

Assessment of production/market risk management in Idaho barley – Dr. Chris McIntosh and Paul Patterson, UI

For more information on the Barley for Rural Development Project or Idaho Barley Research please contact: Dr. Juliet Windes, Idaho Falls Research and Extension Center, 1776 Sciences Center Drive, Suite 205, Idaho Falls, ID 83660-9637; Tel: 208-529-8376; FAX:208-522-2954; E-mail:jwindes@uidaho.edu; Website: <http://www.ag.uidaho.edu/scseidaho/>



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Washington, DC Update

By Scott Heisel, Edited by Karen Hertsgaard

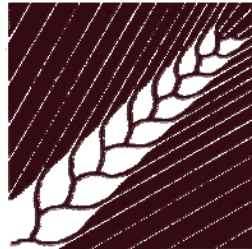
The National Barley Growers Association (NBGA) and the American Malting Barley Association's (AMBA) Agriculture Policy Committee held discussions to develop common goals for the upcoming 2007 Farm Bill and visited with key officials in Washington, D.C. Feb. 11-14.

During the two days of scheduled visits with 14 key Senators, Representatives and legislative staff several key points were covered, involving production, economic and political factors which have affected producers and end users of barley.

Production factors have negatively impacted the barley industry. Acreage has declined by 70 percent and production by 65 percent in the last twenty years. 2006 harvested acres of 2.95 million were the lowest since USDA began collecting statistics in 1890. The costs of barley production are increasing more rapidly than returns and malt imports are rising. In fact, imports have increased four-fold in the last ten years

Economic and farm policy factors also have had impact. The barley loan rate is set at a level that is equal to 75percent of the Olympic average price (2000-2004). This is much lower than other program crops like corn (92 percent), wheat (86 percent), oats (88 percent), soybeans (95 percent), cotton (111 percent), sorghum (95 percent). (Table 1) Barley's loan rate needs to be raised to the levels of other program crops. NBGA recommends that loan rates be set at 95 percent, target prices at 130 percent and Direct Payments at 17 percent of the 2000-04 Olympic average price amounts, thus providing equity between program crops. With recent increases in commodity prices, the Congressional Budget Office (CBO) projects lower baseline farm spending levels. This would result in lower funds available for 2007 Farm Bill spending while proposals exist for increased spending on conservation, energy and fruits and vegetables. NBGA supports spending above CBO baseline projections.

American Malting Barley Association



National Barley Growers Association

The Fiscal Year 2007 Farm Bill Proposal NBGA Supports Would:

- Set loan rates at **\$2.35/bu**
- Set target prices at **\$3.21/bu**
- Set a Direct Payment no less than **\$.42** for barley
- Oppose the Administration's proposed FSA payment limits
- Support increasing Farm Bill spending
- Support continuation of the three entity rule

Table 1 Commodity	2000-2004 Olympic Avg. Price	Loan Rate			Target Price			Direct Payment	
		Current 2004-07	as a % of Oly. Avg.	Proposed 2008	Current 2004-07	as a % of Oly. Avg.	Proposed 2008	Current 2004-07	as a % of Oly. Avg.
Barley (bu.)	\$2.47	\$1.85	75%	\$2.35	\$2.24	91%	\$3.21	\$0.24	10%
Wheat (bu.)	\$3.19	\$2.75	86%	\$3.03	\$3.92	123%	\$4.15	\$0.52	16%
Corn (bu.)	\$2.12	\$1.95	92%	\$2.01	\$2.63	124%	\$2.75	\$0.28	13%
Soybeans (bu.)	\$5.27	\$5.00	95%	\$5.01	\$5.80	110%	\$6.85	\$0.44	8%
Cotton (lb.)	\$0.468	\$0.520	111%	\$0.520	\$0.724	155%	\$0.724	\$0.067	14%
Grain Sorghum (bu.)	\$2.05	\$1.95	95%	\$1.95	\$2.57	125%	\$2.66	\$0.35	17%

IBMS Projects

By Karen Hertsgaard

Survey Work Continues

A barley production and information survey was sent out by the Institute of Barley and Malt Sciences (IBMS) to 5000 growers in Idaho, Montana and North Dakota in late November 2006. Approximately 1200 surveys had been received by December 15, which was the prize drawing deadline. Sixty barley growers were chosen as winners of the prizes, which included fifty \$50 gas cards and other items. The prizes were mailed the second week of Feb.

The survey was produced through the cooperative efforts of the IBMS, the Idaho Barley Commission, the North Dakota Barley Council, the Montana Wheat and Barley Committee and the USDA/CSREES funded barley Coordinated Agricultural Project (CAP). The survey was sent with the help of ND Ag Statistics Service.

Questions on the survey included such topics as yield, acreage, transportation, factors influencing barley growers decisions to produce barley, information sources, farming practices, producer support system effectiveness and satisfaction levels for growers.

Hoped for outcomes of the survey include identifying efficient informational programs desired and needed by growers, gathering information that will help educate policy makers, and increasing understanding by barley and malt users of the challenges and concerns faced by growers.

Prizes were donated by the American Malting Barley Association, Anheuser-Busch, Cargill Malt, International Malting Co, a subsidiary of Archer Daniels Midland, Molson-Coors Brewing, and Rahr Malting Co.

At this time approximately 1400 growers have responded to the survey. The data are being tabulated and analyzed and the IBMS will share the results with stakeholders when completed.



IBMS to Offer Experimental Design Short Course

The NDSU Institute of Barley and Malt Sciences is planning to offer a short course on Experimental Design in January 2008 on the campus of NDSU. Richard Horsley will be the instructor.

The course is suited for field agronomists, breeding program technicians, and laboratory personnel who conduct research using agricultural products, and will cover different statistical techniques for

the analysis and interpretation of experiments. Statistical techniques to be studied will include analysis of variance, simple linear regression, and simple correlation. The planning of experiments to test hypotheses related to biological problems in field and laboratory research will also be covered.

The short course will last 3.5 days and will be designed for students ranging from those with a minimal background in statistics to those wanting to refresh their knowledge. The minimum class size will be six.

If there is enough interest a second course in experimental design specifically set up for individuals conducting laboratory research will be planned for the future. This course will include the topics of chemometrics, fractional factorial designs, and response surface analysis. The first course in experimental design will be a prerequisite to the second course.

The cost of the course will be approximately \$300-400. If you are interested in the course please contact Karen Hertsgaard (701)-231-8068 or Karen.Hertsgaard@ndsu.edu by July 1, 2007.

Future Meetings

31st Congress European Brewery Convention

<http://www.ebc-nl.com/venice07/home.htm>

31st International Congress of the European Brewery Convention Venice, Italy, May 6-10, 2007

American Society of Brewing Chemists

<http://meeting.asbcnet.org/>

Mark your calendars and plan to attend the 2007 Annual Meeting in Victoria, British Columbia, Canada, June 16-20, 2007.

Canadian Barley Symposium

http://www.mbaa.com/Districts/WesternCanada/pdfs/2007_06_25Meeting.pdf

The Science and Joy of Canadian Barley and Beer

June 25-29, 2007
Winnipeg, Manitoba, Canada

Master Brewers Association of the America

<http://meeting.mbaa.com/>

Mark your calendars today and make plans to join MBAA for its 120th Anniversary Convention, October 26-28, 2007, in Music City USA—Nashville, Tennessee

Barley Improvement Conference a Cooperative Effort

By Karen Hertsgaard

The cooperative nature of barley research and improvement efforts was evident at the 36th Barley Improvement Conference at the Hacienda Hotel in San Diego, Calif., on Jan. 10-11.

Nearly 80 barley researchers, scientists, industry officials and outreach personnel from the U.S., Canada, Scotland, Australia and the Czech Republic attended.

Ten educational sessions, as well as breakout meetings to discuss malting barley research, agricultural policy and quality evaluation issues, were held. The educational sessions included topics on international barley disease control, malting quality standards, biofuel production, barley winter hardiness, the health benefits of food barley, and genomics and technology methods used to enhance barley breeding.

The capstone of the conference was a speech by Richard Groven, Northwood, ND farmer and vice president of the National Barley Growers Association, titled "Barley – the Outlook and the Look-Outs."

Changes in barley production have been rather dramatic in recent years. According to Groven, production has decreased from 118,800,000 bushels in 2003 to 48,755,000 bushels in 2006. Barley acreage decreased from 1,980,000 acres in 2003 to 995,000 acres in 2006.

However, recent events give cause for increased optimism for barley producers. Prices have increased since July and the feed barley market has revived due in part to the increased need for corn for ethanol production. Dry conditions also have forced increased consumption of carryover stocks. New variety research also looks promising. Groven stated that "sound varieties and improved prices allow for an optimistic outlook for barley in 2007."



Barley CAP Holds Annual Meeting

By Gary Muehlbauer, Edited by Karen Hertsgaard

Thirty-nine barley CAP participants, and scientific and stakeholder advisory board members met in San Diego, CA on January 12, 2007 to report on progress and discuss future plans. Approximately 30 additional scientists attended the meeting. Eight presentations were given by eleven Primary Investigators.

Overview of project

An overview of the barley CAP was provided by Gary Muehlbauer (University of Minnesota). He discussed the development of an authorship policy and a framework for avoiding duplication of work.

Outreach and education

Brian Steffenson (University of Minnesota) and Peggy Lemaux (University of California, Berkeley) outlined the outreach and education component of the project. Peggy presented the materials that she and Barbara Alonso have developed including: the barley CAP logo, a business card, PowerPoint slides, technical and nontechnical posters, and a brochure.

Brian presented the priorities of the extension/education effort of the barley CAP, emphasizing the need to integrate outreach and education efforts in all aspects of the project.

The barley CAP has teamed with the NDSU Institute of Barley Malt Sciences (IBMS) on the outreach/education component. The barley CAP partially funds the salary of the barley information specialist position (Karen Hertsgaard) in Fargo at the IBMS. The IBMS and barley CAP have conducted a survey of producers and users to determine their needs in optimizing barley production, end-use, utilization, and the best means of disseminating information to stakeholders. Data from the survey have been obtained and results will be available soon.

The barley CAP also is identifying at least one extension educator in all of the participating barley CAP states who will assist in outreach and extension activities. These educators will make presentations about the barley CAP and deliver printed material, such as the brochures, to barley growers at various venues in their states. Hans Kandel (extension educator) and Marv Zutz (Minnesota Barley Council) are presenting CAP materials at grower meetings in Minnesota in the Fall 2006 and Winter 2007. Similar work will follow in other barley producing states.

Educating the next generation of scientists is also a key goal of the barley CAP. Nine graduate students, three post-doctoral research associates, two technicians, and seven undergraduates were hired on the barley CAP. These individuals will be involved in research as well as outreach and Extension activities.

Another important outreach goal is communicating the applied outcomes of the project to barley growers and end users on. Marv Zutz and David Ruark (Washington State barley grower), have presented barley CAP materials at grower events, and Scott Heisel (American Malting Barley Association) has presented the barley CAP at industry meetings.

Single Nucleotide Polymorphism (SNP) mapping and genotyping

Tim Close (University of California, Riverside) described the Illumina SNP technology and the development of the SNP genotyping platform. SNP development and mapping is an international effort of the Barley CAP, the Scottish Crop Research Institute (SCRI, Dundee, Scotland), and the Institute of Plant Genetics and Crop Plant Research (IPK, Gaterslaben, Germany). Tim described the plan to develop three pilot Illumina oligonucleotide pool assays (OPAs) each containing 1,536 single nucleotide polymorphisms. These three OPAs will be used to map three mapping populations and genotype germplasm sets from the US and Europe. From these three pilot OPAs, over 3,000 high quality SNPs will be used to design two OPAs (3,072 SNPs) for genotyping. In addition, we plan to integrate the Bacterial Artificial Chromosome (BAC)-based physical map with the mapped SNPs.

The design was completed for the first of two project pilot OPAs. The name PilotOPA1 refers to a pilot OPA developed prior to Barley CAP in an National Science Foundation (NSF)-funded project of Close and Lonardi. Using PilotOPA1, data were obtained from 96 samples from each of three mapping populations (Morex x Barke, Oregon Wolfe Barley, Steptoe x Morex) provided by Nils Rostoks (SCRI) and a set of 96 European germplasm selections from Nils Stein (IPK). Subsequent to this effort, the barley CAP funded genotyping of the barley CAP core with PilotOPA1. PilotOPA2 was a product of the barley CAP. PilotOPA2 was ordered, synthesized, received and used at the University of California, Los Angeles genotyping lab to generate data from 480 DNA samples. These included 96 samples for each of three mapping populations, the barley CAP core, and the 96 European germplasm selections. Pat Hayes (Oregon State University) developed a SNP-based map of the Oregon Wolfe Barley population. Taken together, PilotOPA1 and PilotOPA2 resulted in 1,810 high quality mapped SNP markers to an evolving SNP-based barley genetic linkage map.

The first permanent OPA, BarleyOPA1, was designed using only highly successful SNPs from PilotOPA1 and PilotOPA2. The content includes only loci that have a minor allele frequency of at least 8 percent; of these 1536 loci, 1314 have been genetically mapped and 222 have not been genetically mapped.

The barley CAP will be using the USDA-ARS genotyping lab (S. Chao) for genotyping breeding lines. The Illumina Bead Station was purchased and shipped in late August and installed Oct. 24. Ten people from the USDA-ARS Fargo genotyping lab, Rich Horsley's lab, Shahryar Kianian/Elias Elias's lab (both NDSU), Brian Steffenson's lab (University of Minnesota) and Tim Close's lab received training on the equipment, Nov. 27 through Dec. 1, 2006. Chao subsequently obtained high quality pilotOPA1 data from the barley CAP core.

Bioinformatics

Bioinformatics are key enabling technologies in the barley CAP. Two major projects are the development of The Hordeum Toolbox (THT) database and the Quantitative Trait Loci (QTL) miner software program. Julie Dickerson (Iowa State University) described the progress on the development of THT. THT will house all genotype and phenotype data collected from the ten 0 barley breeding programs. This database will enable barley breeders to more efficiently breed superior varieties. Rex Bernardo (University of Minnesota) provided an update on the development of QTL Miner. QTL miner will help identify marker-trait associations in breeding lines. THT and QTL miner are both expected to be ready for beta testing by April 2007.

Phenotypes and traits

Phenotyping the breeding lines submitted to the barley CAP is a large and complicated task. Over forty traits are being evaluated on 960 breeding lines each year of the project. Kevin Smith (University of Minnesota) provided an update on the seed collection, dispersal and phenotyping. To facilitate consistent data collection and seed dispersal, an updated participants guide has been developed by Kevin and is now on the Web site. The phenotype data are being collected for most of the forty traits and should be available in the near future.

Jennifer Kling (Oregon State University) described her efforts to obtain pedigrees from each breeding program to place them in a standard format.

Scientific Stakeholder Advisory Board Reports

The advisory boards attended the barley CAP meeting and were provided with summary progress reports from year 1 and summary work plans for year 2 (see barley CAP website for summary progress and work plans).

The complete scientific and stakeholder advisory board reports along with the barley CAP responses, barley CAP participants and research, outreach and education activities and more can be found on the barley CAP website <http://www.barleycap.org/>

Barley and Distillers Grains Make a Great Cattle Ration

Expanded ethanol production is creating opportunities for the feed barley market and feeders around the world. Barley and distillers grains compliment each other exceptionally well in diets for ruminant animals. This combination provides the appropriate protein and starch digestion pattern for optimum animal performance. Research trials have observed excellent performance with this combination of feeds when forages and supplements are included.

Barley is the oldest and most widely used feed grain in the world. There is significant and steady demand for feed barley worldwide. Feed barley is a mainstay in many beef and dairy rations and is also used in formulations for swine, poultry, horses, dogs, and other species. USDA has recently recognized the health benefits of barley in human diets. Barley is equal to corn in economic value by weight, containing slightly less energy but significantly more protein (Table 1). Barley is widely fed by professional cattle feeders and dairymen in mixed rations that include forages and supplements.

The northern tier of states in the western U. S. and Canadian provinces produce most of the barley in North America. North Dakota leads all states in barley production. New barley varieties developed at NDSU and other institutions are showing significant yield improvements and will be highly suitable for feed production and possibly for malting. At present, most barley is grown for malting with a small proportion deliberately raised for feed.

Publications on ruminant protein requirements (NRC, 1985, 1996, 2001), describe the proper proportion of rumen degradable and undegradable protein critical to optimum animal performance. Approximately 60 percent of protein (rumen degradable protein) should be digested in the rumen. The 40 percent that does not degrade (by-pass, escape, or rumen undegradable protein) passes through the rumen and into the lower gut where it is absorbed as peptide chains or amino acids. The rumen degraded protein provides nitrogen to support the billions of microbes (primarily bacteria) that actually digest forages and grains.

Barley and distillers grains compliment each other for these needs in ruminant diets. Barley degrades readily in the rumen providing nitrogen to the microbes. Distillers grains, especially dry distillers grains, are high in escape protein, providing animals with a directly absorbable protein source (undegradable protein).

Information received from Dr. Vern Anderson regarding research conducted at the NDSU Carrington Research Extension Center has proven the value of the barley and distillers grains combinations. One study included both wet and dry distillers grains with urea as the rumen degradable protein source in the barley based beef finishing diets. Treatments were described as 1) high level of rumen degradable protein (72 percent degradable-28 percent undegradable), 2 and 3) high levels of rumen degradable and undegradable protein (65 and 67 percent degradable – 35 and 33 percent undegradable), and 4) high levels of rumen undegradable protein (62 percent degradable – 38 percent undegradable).

Table 1 Nutrient Profile of barley compared to other feeds	Barley	Corn	Dist. Grains	Wheat Midds	Milo	Canola Meal
Crude Protein %	13.7	9.8	29.5	18.4	11.6	40.9
Udegradable, % of CP	27	55	73	26	49	32
Net Energy gain, Mcal, lb	.63	.7	.68	.62	.61	.45
Total Digestible Nutrients, %	88	90	89	80	82	69
Calcium, %	.06	.07	.32	.15	.04	.70
Phosphorous, %	.39	.27	.14	1.00	.34	1.20
Potassium, %	.57	.44	1.83	1.10	.44	1.37

Dry matter intake (DMI) improved with any distillers product in the diet (27.1 lbs) vs. the highly rumen degradable diet (24.2 lbs). Daily gains were also significantly greater with wet and/or dry distillers grains in the ration (3.61 lbs) vs. no distillers (3.30 lbs).

A second study with barley finishing rations evaluated stepped increases of dry distillers grains (0, 12, 24, and 36 percent of DMI). Steers ate more feed and gained faster (4.34 lbs) on the 24 percent distillers grains diet vs. 0, 12, and 36 percent (3.68, 3.72, 4.04 lbs, respectively).

The 24 percent distillers grains diet provided exactly 60 percent degradable and 40 percent undegradable protein to the rumen. Canola meal, which is highly rumen degradable, was used as the control protein source. This and other studies are on-going and will investigate other combinations of barley and distillers grains.

This research applies to all ruminant animals including lactating dairy cows, yak, buffalo, or beef. Barley and distillers grains fed together provide a safe, nutritious, palatable, and productive diet. Corn can be fed with distillers grains but an additional degradable protein source is needed in the ration. Further, the escalation in the price of corn due to demand for ethanol production may price it out of many markets.

Recommended References

- National Research Council. 1996. Nutrient Requirements of Beef Cattle, Seventh Revised Edition. National Academy Press, Washington D. C.
- National Research Council. 1985. Ruminant Nitrogen Usage. National Academy Press, Washington D. C.
- National Research Council. 2001. Nutrient Requirements of Dairy Cattle, Seventh Revised Edition. National Academy Press, Washington D. C.

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We'd Like To Hear From You

The IBMS Newsletter is produced quarterly. We welcome any comments or ideas you might have for our future newsletters. Please contact Karen Hertsgaard

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