

IDAHO GRAIN

THE IDAHO GRAIN PRODUCERS ASSOCIATION MAGAZINE

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I realize I'm writing this for a summer edition of Idaho Grain, but I can't help but mention how great these spring rains are for my dry farm. Probably like many of you, the weather was not cooperating throughout much of April. As the saying goes, "Better late than never!"

With summer right around the corner, we as farmers are busy tending to our fields, families and financials. As your IGPA president, I've got a few additional chores on my to-do list. I'll start with the June 8-10 summer meeting of the National Barley Growers Association (NBGA).

The NBGA is a national organization whose mission is to advocate for federal policies and priorities on behalf of the American barley grower and related industry. The IGPA is one of about seven state affiliates of the NBGA. We are teamed up with our border neighbors from Oregon, Washington, and Montana, and also North Dakota, Minnesota and Maryland. There is talk of establishing a state barley grower group in Colorado as well.

The IGPA attends two NBGA meetings a year – a winter meeting in Washington, DC and a summer meeting at various locations around the country. The upcoming June meeting is set for Chicago, where MillerCoors headquarters. Attending from Idaho alongside myself will be IGPA Vice President Terry Kulik of Filer, IGPA executive member Dwight Little of Newdale, and District 3 Idaho barley commissioner Scott Brown of Soda Springs.

Idaho's position as the number one producer of barley in the country means that these meetings are very important. They provide us an opportunity to get a good handle on what challenges and opportunities are impacting other barley states and the industry as a whole.

We discuss federal farm programs – those that are working or those with issues we may need to address with either the USDA or Congress. We review the status of various federal barley research programs and how they are improving our production capabilities. We listen to presentations on topics ranging from sustainability, to crop insurance, transportation, energy, and trade.

Just as important, these gatherings allow growers to network with our industry partners. Key representatives from the malting and brewing industry attend our NBGA meetings. Anheuser-Busch/InBev, InteGrow Malt, Cargill, MillerCoors, the Beer Institute and others typically join us. Their partnership and input is extremely valuable as we look for ways to advance our industry.

Lobbying, yes lobbying, is an important function of the NBGA. Idaho and our fellow states employ a very effective consulting group, Gordley Associates, to be our eyes and ears in Washington, DC. Our lead lobbyist is Dale Thorenson, a North Dakota farmer who left his farm to his son's care to work on agriculture policy for former U.S. senator Byron Dorgan of North Dakota. He left the Senate in October 2002 to join Gordley.

Thanks to Dale's daily efforts and that of the NBGA organization, a 176 million bushel crop has maintained and improved its relevance in federal policy programs amongst the likes of corn, soybeans, wheat, cotton and rice.

Barley is very important to my operation and many farm operations particularly in southern Idaho. I hope that shedding some light on how Idaho barley farmers are working to keep this crop at the top of the list despite agronomic and market pressures is helpful to you.

Whether barley, wheat, hay, potatoes or sugar beets is your focus, just tending to your own farm and/or ranch is no longer good enough in today's agriculture industry. Being profitable in farming now means being involved and aware of what's happening past the edge of our field.

My hope is that more Idaho growers make it a priority to get involved in the IGPA or a similar commodity organization. You won't regret it! Best wishes for a safe and productive summer season to all Idaho farmers and farm families. ■

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Much To Do About...Everything



IT'S basically summertime for all intents and purposes, and just like a farmer in his tractor, the IGPA is also shifting gears from what I could call a significant "harvest season."

The Association's definition of harvest is measured by our effectiveness in advocating for the policies that our wheat and barley farmer-leaders and members adopted at our annual convention in November 2014. My opinion is that growers should be proud of our yield so far in this year.

With so much activity on key issues out there in the proverbial great wide open, I want to highlight some of our accomplishments to date. I recommend you turn the pages a bit further before "round filing" this edition for more information on several other efforts we're working on.

First up, the Idaho state legislative session. The 1st Regular Session of the 63rd Idaho Legislature convened on January 12th and adjourned (sort of) on April 11. As always, the session was an action-packed rollercoaster ride. By and large, the IGPA's legislative agenda was achieved.

Included in this edition is a comprehensive re-cappened by John Foster and Kate Haas, our state lobby duo. Their work on your behalf was very effective as you can read for yourself in their summary. I will expand on the results of a few issues that left much of our shoe leather on the floors of Idaho's Capitol building.

Transportation funding. It's no secret that Idaho's roads and bridges are in disrepair. It's no secret that public funds to repair them are woefully inadequate to even keep up with maintenance needs. Governor Otter knew this five years ago and made a big push to generate new dollars in the 2010 state session. But a conservative and cautious legislature ultimately denied him.

The 2015 State Legislature knew they could no longer kick the can down the road. Something had to be done and done immediately before a bridge collapsed or Idaho's recovering economy took a significant hit. Legislative leaders went to work and so did the IGPA alongside other commodity groups.

Turns out that reaching agreement on a new transportation policy was like squeezing a water weenie - applying pressure to fix one area of the problem can cause a larger problem in another. Raising taxes and fees on the public to fund highway infrastructure needs was a poison pill to some fiscally conservative legislators. The IGPA helped beat back proposals to tax off-road dyed diesel fuel. We vehemently argued that taxing off-road use to solve on-road problems was not acceptable.

Luckily the majority of elected officials held their nose and, after the issue forced one of the longest sessions in state history, voted in favor of a bill that created \$95 million in new funding. Compared to the \$262 million estimated maintenance needs, the new monies will not go as far as many including the IGPA hoped. But it's an important and symbolic start.

The Columbia and Snake River System is a critical conduit for moving Idaho grain and other commodities to foreign markets. It's old news that the system continues

to face threats by activist groups bent on removing every dam between Lewiston and Portland, Oregon.

Activists are now threatening to dissolve the Port of Lewiston through a citizen petition. In response, the IGPA teamed up with Rep. Caroline Nilsson-Troy (R-Genesee) to successfully pass a measure that makes a bold statement of Idaho's support for the Port of Lewiston. The memorial outlines the many benefits the Port and river system provides to farmers and the economy.

Speaking of activists, there are some who certainly don't like so-called "genetically modified organisms." The IGPA is a strong proponent of biotechnology and the benefits it could provide to wheat and barley farmers - drought tolerance, nitrogen use efficiency and weed resistance among them.

However the debate over food and food products containing GMO's is a daily staple in the diet of print and social media. On May 19, I served as master of ceremonies for public event in Boise featuring a very prominent former anti-GMO activist Mark Lynas.

Lynas made major headlines in 2013 when he publicly renounced his position against biotechnology. Between writing books on controversial social subjects, he travels around the world advocating for the safety and benefits to public health of biotechnology. The Boise forum attracted a diverse audience that, when given the opportunity to ask questions, only underscored the confusion that exists in the general public over the issue.

Now that the state legislature has adjourned until 2016, the IGPA has shifted its focus to federal priorities. Congress is working to reauthorize a 99-year old law called the Grain Standards Act (GSA). Originally passed in 1916, the Act established federal marketing standards for grains and oilseeds, and required these commodities be officially weighed and inspected before being exported.

Recall last summer's labor dispute between the Pacific Maritime Association and the longshoremen at the Port of Vancouver? The friction rose to the point that federally contracted inspectors halted their inspection of outbound commodities thereby disrupting sales and grain shipments to foreign buyers.

Although an agreement was reached earlier this year, the long-term reliability of Pacific Northwest ports is now being questioned. To avoid a repeat of the situation, the IGPA educated Idaho's congressional members and engaged its national wheat and barley grower associations based in Washington, DC.

On April 30, the U.S. House Agriculture Committee approved of its reauthorization of the GSA that includes new provisions to thwart disruption of inspections. The Senate Agriculture Committee is set to release its bill with similar protections. Idaho Senator Jim Risch has taken the bull by the horns and proposed legislation that would prohibit the use of a slowdown as a strike tactic. We greatly appreciate his efforts.

As you might guess, there is much ado about almost everything. Never a dull moment is another accurate phrase. As the spring backs out of the driveway and summer pulls up to the doorstep, the IGPA will be taking care of business for you while you work hard to produce a crop. Best wishes for a safe and profitable harvest! ■



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The 2015 Idaho Legislative Session: A Review

By *Kate Haas & John Foster of Kestrel West with IGPA Executive Director Travis Jones*

THE 1st Regular Session of the 63rd Idaho Legislature adjourned “sine die” (sort of) in the wee morning hours of Saturday, April 11. Legislative leaders were forced to abandon their original adjournment date



Kate Haas

goal of March 27 due to a sensitive and, at times, heated debate over transportation funding between the House and Senate chambers. However, a disagreement over child support enforcement laws has forced Governor Otter to call back legislators for a special legislative session on May 18.

The rollercoaster ride over transportation policy showcased a struggle by House and Senate leaders to find common ground on solutions to alleviate a statewide \$262 million backlog in road and bridge maintenance. The two negotiating parties finally reached a compromise that neither preferred, but proved sufficient to achieve a critical mass of votes in their respective chambers.

Throughout the session, the IGPA was directly engaged in this and many other issues on behalf of Idaho’s wheat and barley farmers and our industry partners. Weekly reports were sent to IGPA members highlighting the progress on key issues. Below is a summary of major initiatives, accomplishments and “next steps”.

IGPA’s lobby team consisting of Travis Jones, Kate Haas, John Foster and Benjamin Brocksome felt that the Association’s 2015 legislative goals were met and good relationships forged with the significant crop of newly elected legislators from all over the state.

Below is a listing of the high priority legislative items and results that IGPA’s efforts helped achieve. Although the state legislature is es-

entially adjourned until January 2016, the lobby team is already strategizing for next session. The IGPA encourages the input and participation of any and all Idaho wheat and barley farmers who may have concerns or issues that the IGPA can assist with.

TRANSPORTATION: In the early hours of Saturday morning, legislators passed a transportation package before adjourning for the year. The package raised at least \$95 million, primarily from a 7-cent fuel tax increase and a budget-surplus eliminator.

NEXT STEPS: Though the package didn’t close the gap of the maintenance shortfall, legislators are not likely to expand the plan. A tax increase was a hard vote for many legislators, and they aren’t going to do it again anytime soon.

AG TECH: Idaho Department of Commerce Director Jeff Sayer presented on the topic to the House Ag Committee and highlighted how IGPA Past President Robert Blair is using technology in agriculture. Sayer committed to making it more of a priority in his department.



John Foster

NEXT STEPS: Since the session ended, Sayer has hosted a drone demonstration and has unofficially announced an agriculture tech summit for June 16 in Boise. He has called Idaho the “Silicon Valley” of agriculture technology in recent news articles. IGPA officer Robert Blair is slated to speak at the summit about the application to agriculture of unmanned aerial systems.

PORT OF LEWISTON: Rep. Carolyn Troy (R-Genesee) championed the eventual passage of a memorial (i.e. resolution), with help from

IGPA, that recognizes the importance of the Snake River Dams. The bill passed both bodies overwhelmingly with very little opposition. IGPA executive director Travis Jones provided testimony to a legislative committee in strong favor of the memorial.

NEXT STEPS: The Port of Lewiston recognized IGPA’s efforts in a recent news release by thanking Travis Jones for his testimony. The Port will need continued support as they fend off local efforts seeking to eliminate the Port’s operations.

DYED DIESEL: Early in the session, the Idaho Tax Commission passed a bill to streamline violations, penalties, and appeals provisions for dyed diesel. The bill was sold largely as a cleanup measure and had very little opposition in either body.

NEXT STEPS: As legislative leaders considered various mechanisms to generate new funding for Idaho’s transportation infrastructure, an increase in the tax on dyed off-road diesel was considered. Legislators debated applying a 2-cent increase to the transfer fee, a relatively unknown tax placed on all fuels when delivered to fuel distributors in Idaho. The fee is used to finance the Idaho Petroleum Storage Tank Fund that provides insurance coverage for cleanup costs for accidental releases of petroleum. Facing strong opposition from Idaho commodity groups and others, legislators ultimately kept the transfer fee off the table and promised discussions about how to step up dyed diesel enforcement measures next year.

MOTOR FUELS: This bill was another cleanup bill from the Idaho Tax Commission. For taxpayers who file monthly returns, the bill eliminates the need for reconciliation to claim a motor fuels credit on the taxpayer’s annual return.

NEXT STEPS: IGPA does not need to take any further action on this bill. However if members have any issues or problems with implementation, the IGPA can work with the Tax Commission to address it.

PORT OF PORTLAND: The IGPA is co-hosting with the Idaho Wheat Commission the second tour of the Port of Portland for state legislators and other key officials. The tour is set for June 14-16, and there has been a great response from legislators who have expressed their appreciation for the invitation.

NEXT STEPS: We are assisting the IWC in finalizing the logistics for legislators' travel. As of today, we expect about 10 legislators on the trip, one staffer for Governor Otter and Brian Oakey, Deputy Director of the Idaho State Department of Agriculture. They are all looking forward to an informative and fun tour.

FUGITIVE DUST: The legislature approved the Idaho DEQ's fugitive dust rules that the IGPA worked to create last summer. The rules exempt a farmer's activities from the DEQ-administered federal fugitive emissions rules, as long as those activities are generally recognized agricultural practices.

NEXT STEPS: The rules should mean that Idaho wheat and barley growers can go about their business without concern that they will be cited for creating dust. If producers experience any problems related to this issue, please contact the IGPA right away.

DEQ COMPLAINTS: The IGPA worked directly with Rep. Gayle Batt (R-Huston) to address an important issue that arose last summer from the DEQ dust rulemaking sessions. The IGPA drafted a bill requiring the DEQ

to give notice and ensure due process when the agency receives and intends to investigate a nuisance complaint against a producer.

NEXT STEPS: The IGPA was scheduled to meet and discuss the issue with DEQ Director Curt Fransen. But soon after receiving a meeting confirmation, Director Fransen announced his retirement. His successor has yet to be appointed by Governor Otter.

SMALL BREWERS: A compromise bill clarifying that brewers producing under 30,000 barrels per year must only self-distribute their product was cleared by the Idaho legislature. The Idaho Beer & Wine Distributors Association pushed the bill based on their perception that Idaho's alcohol beverage control laws contained a loophole allowing small brewers owned by a macro-brewer could self-distribute the brands of the macro-brewer along with their own.

NEXT STEPS: As the bill developed, the IGPA consulted with its brewing partners to determine its impact on the industry. Modifications to the original language were made alleviating any concern that the bill would affect the market for beer sales. Rather, it codified status quo.

PURE SEED LAW: Former IGPA officer now State Representative Clark Kauffman (R-Filer) led an effort to pass legislation amending Idaho's Pure Seed Law. The bill preempts local governments from regulating additional agricultural activities.

NEXT STEPS: Processing, cultivating and producing will now be protected from those seeking local regulations. The bill helps make sure our growers and their suppliers are regulated by the people with expertise in agriculture.

EMINENT DOMAIN: The IGPA worked closely with Senator Jim Guthrie (R-McCammon) to support his efforts on bill seeking to restrict local governments from using eminent domain power to build bike paths and other greenways through private property. Though controversial, the bill ultimately passed both the House and Senate.

NEXT STEPS: This bill protects private property rights for landowners, who will no longer be subject to local governments condemning land to put in a bike path. Senator Guthrie appreciated our help and let his colleagues know.

OPEN RANGE AGREEMENT: After a year of working with the Idaho Cattle Association, the IGPA took big steps forward this legislative session by launching a formal joint process for addressing open range issues at the local level.

NEXT STEPS: The announcement received good coverage in the Capital Press weekly newspaper. The IGPA will continue this positive public relations effort while fortifying the new statewide network of grower/rancher liaisons and spreading the word to members. Please contact the IGPA should any open range problems arise throughout the spring and summer.

GMO FOODS: As the session began, Amalgamated Sugar Company unveiled a bill seeking to prohibit any bans on GMO foods in Idaho. The IGPA engaged with Amalgamated's representatives and through the Food Producers of Idaho to set this bill aside and focus instead on a Memorial to Congress, which easily passed the legislature.



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NEXT STEPS: IGPA has an opportunity to lead the new conversation about the safety of GMO food production and consumption. Monsanto and other companies are looking to grower organizations for new voices and messages on the issue.

SENATE AG COMMITTEE CHAIRMAN JIM

RICE: As a very conservative and still somewhat new legislator, Senator Jim Rice (R-Caldwell) maintains an independent streak. He applied his views as chairman of Idaho's Senate Ag Affairs Committee in part by showing his willingness to vote against industry-supported bills.

NEXT STEPS: An IGPA photo hangs in his Senate office, a symbol of the hard work IGPA invested during the session to maintain and expand our great relationship with Chairman Rice. The IGPA has a great opportunity to cultivate Senator Rice as a champion for Idaho wheat and barley farmers.

U OF I RESEARCH & EXTENSION FUNDING:

While the line-item state appropriation for the University of Idaho College of Agriculture and Life Sciences was never in doubt, there remained uncertainty with the funding level due to shifting state revenue forecasts and the heavy emphasis on significantly increasing K-12 education funding.

NEXT STEPS: We will meet with Rich Garber, the government affairs director for the University's CALS program, to see what IGPA can do in the coming months to help reinforce the need for continued funding growth for the program.

NEW UI AG DEAN: In February the UI announced its list of members for its search committee to select a new Dean of its College of Agriculture and Life Sciences. The search committee did not include representatives of any agriculture commodity group. The Food Producers of Idaho, chaired by IGPA Executive Director Travis Jones, successfully appealed for representation in the selection process.

NEXT STEPS: In response to the Food Producers of Idaho appeal, IGPA officer "Potlatch" Joe Anderson was added to the search committee. In late April, the committee announced a slate of four finalists. IGPA staffer Travis Jones is attending meet and greet events in Boise of each finalist. ■



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Wireless Data Transfer Between Farm and Field for Real-time Informed Decision Making

By Chris Carrier, New Holland Precision Land Management (PLM) Marketing Manager

AGRICULTURE is constantly evolving, and being able to make informed decisions with real-time information is transforming today's farming. When equipment is connected through a telematics system, producers stay better connected with their farming operations through secure real-time transfer of data.

Telematics capability essentially places farm managers at the operators' side without leaving their desk. An easy-to-use web portal enables accurate management of all data and helps facilitate fast decisions based on up-to-the-minute information so optimal settings or operating instructions can be relayed to the operator.

Here's how it works: A telematics modem, located in the equipment, collects and processes data from the machine's electronics and GPS. Data is forwarded via a mobile network so producers can remotely monitor their equipment through a centralized web portal in their farm office, or on-the-go through a tablet or smart phone.

Depending on the telematics package, benefits include:

Wirelessly transfer data

Wirelessly transfer data, such as yield maps, fuel usage and job status, between the machine and the portal, where it can be easily accessed by the farm manager on their PC or tablet. Using the cloud, the data is transferred easily and securely so that it can be transformed into informed decisions that can improve yield productions and enhance overall efficiencies.

Real-time monitoring

Producers can remotely monitor where their machines are and proactively plan where they are going to best optimize the utilization and productivity of their fleet. They are able to see key operating parameters such as engine speed, hydraulic oil temperature, fuel level, and much more in real time to manage individual vehicle efficiency.

Accurate machine comparisons

Producers are able to accurately compare the performance of multiple machines in real time,



ensuring that the most efficient machine settings are used across their entire fleet. They can receive data from each field, helping them track operating costs and make informed decisions for improving operating efficiencies.

Maintenance alerts

This feature alerts producers when planned maintenance is due so that it can be scheduled for the most convenient time. If partnered with their dealer, the dealership's service technician can not only receive machine maintenance alerts, but can also receive fault code alerts. Service issues can be quickly resolved so the machine stays running and maximizes field productivity.

Maximizing outputs

Producers are able to compare and contrast the results from different fields and with different operators. By analyzing this data, they can then ensure that best practice is replicated across the entire farm to maximize productivity and profitability.

Ultimate machine security

Producers can enhance machine security with geo-fences and curfews. Producers can predefine working areas for their machines and receive alerts if they leave this area and can set curfews so that they are alerted if their machines are used outside of the predefined working hours.

Peace of mind

When equipment is parked somewhere overnight, it provides an alert if the equipment is moved.

Optimizing fleet management

Monitor different machine CANBUS parameters in real time. Farm managers can use this information to proactively optimize each vehicle's settings using a simple messaging service, which is used to send the operator information on how they can implement the ideal machine settings to improve performance.

Interactive messaging

By using the online portal, farm managers can instantly communicate key data or instructions to operators, who can respond using predefined messages, to ensure safety when working.

Full compatibility

Most telematics technology is fully compatible with all makes of machines and can be retrofitted with older machines, as well as in multi-branded fleets.

Always in touch

Whether in the farm office, in their car, or on vacation, producers will be able to stay in touch with their machines and their operators 24 hours a day, 365 days a year. ■



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Idaho Indemnity Funds Update



By Dave Ogden, ISDA—May 2015

EACH year brings some changes to the Idaho licensed warehouses, commodity dealers, and seed buyers. A list of currently licensed companies can be found on the ISDA website at: www.agri.idaho.gov under the Warehouse program link, or you may call 208-332-8660 for phone verification that a business is licensed.

At March 31, 2015 the Idaho Commodity Indemnity Fund (CIF) had a balance of \$11,959,000. The Idaho Seed Indemnity Fund (SIF) at March 31, 2015 had a balance of \$6,544,000. Assessment collections

have ceased on the CIF until the balance drops below \$10 million. Assessments are still being collected on the SIF, and the fund balance is increasing by about \$250,000 per year. So it will be several years before the SIF reaches its

maximum of \$12 million.

We strongly encourage producers to sell to licensed companies in order to have the protection of the indemnity funds in the event a company becomes insolvent. The funds will cover up to 90% of the crop value based on criteria in the Idaho code.

In the past year we have seen additional interest from new companies in Idaho grain and seed crops. We continue to make every diligent effort to make sure each licensed company meets the Idaho licensing requirements so that Idaho producers can sell to them with confidence that they will be paid for their crops. ■



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Beer Institute Pushes for Federal Tax Relief via 'Fair BEER Act'

Submitted by the Beer Institute

ALMOST all of the barley produced in the United States is grown under contract with the major American brewers, making those brewers an important partner for barley farmers. Because of this, it is important for barley farmers to know about legislation currently being considered to reform the federal excise tax on beer.

Earlier this year, a bipartisan group of Senators and Congressmen introduced the Fair Brewers Excise and Economic Relief Act of 2015, or Fair BEER Act. This reform legislation creates a graduated tax structure for brewers, simplifying the tax code for the folks who brew America's favorite adult beverage. According to beer industry group the Beer Institute, the federal tax on beer is a major contributor to the total tax burden on beer, with an estimated 40 percent of the retail price of a cold one going toward taxes of various forms.

Here are five key points about the Fair BEER Act:

It's fair to all beer consumers.

The Fair BEER Act simplifies and reforms the federal beer tax in an equitable, comprehensive way for all companies that brew or import beer. The beer aisles of America are packed with brands from beer companies ranging from national brewers and beer importers to large regional companies and small single-location brewpubs and microbreweries. The Fair BEER Act legislation gives relief to all of these players. Many agree that Congress should not pick winners and losers in the marketplace through unfair tax legislation. Under this bill, regardless of the beer brand or style a consumer picks up, the invisible federal tax they pay on that pint, six-pack or case will be equitable.

A simpler graduated tax helps small brewers the most.

The vast majority of brewers in the U.S. are small businesses who would have their federal excise

tax reduced from \$7 per barrel to zero under the Fair BEER Act. The legislation would eliminate the federal excise tax for brewers who produce up to 7,143 barrels. For every barrel between 7,143 and 60,000, brewers would pay \$3.50 a barrel. For every barrel between 60,001 and 2 million, brewers would pay \$16 per barrel. And after 2 million barrels, brewers would pay \$18 per barrel. A brewer with annual output of 7,000 barrels would save \$49,000 per year.

That's enough money to hire a full-time employee, invest in new equipment, cover the cost of more ingredients or market the brewery. Comparatively, the big players would save just pennies on the barrel.



The Fair BEER Act protects beer workers and suppliers.

The Fair BEER Act protects brewing jobs across the country – whether it's a job in a large brewing company that pays average annual wages and benefits of \$88,000, or jobs in small breweries and brewpubs that offer employees an average of \$43,000 per year. When the federal tax on beer was doubled in the 1990s, about 60,000 jobs were lost in the industry. A similar tax hike would be devastating to this dynamic, innovative industry. Barley farmers rely on brewers and their long-term contracts. The Fair BEER Act protects the supply chain, including grain producers.

It completely removes federal excise taxes for the smallest breweries.

Today, more than 90 percent of all federally-permitted brewers produce fewer than 7,143 barrels. That first production threshold in the Fair BEER Act was designed by Congress to meet existing federal definitions of small brewers as laid out by the U.S. Department of the Treasury's Alcohol and Tobacco Tax and Trade Bureau in a September rule easing paperwork requirements. By completely removing their federal excise tax, Congress is encouraging growth and removing barriers to the marketplace for new entrants.

Breweries employ a lot of Americans. Beer is a major business in the United States,

A bill all Americans can celebrate.

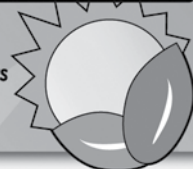
BeerInstitute.org/BeerTax



contributing nearly \$250 billion to the economy and supporting jobs for about two million Americans. Jobs inside of breweries are at the top of a network of supplier jobs such as barley farmers, package manufacturers, distributors, and even sales clerks in grocery and convenience stores. The Beer Institute estimates that every job in the brewery supports another 45 jobs in other industries like agriculture, marketing, manufacturing, transportation, warehousing, financial services, grocery, restaurant and retail. ■

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Field Days Vital

By *Cindy Snyder*

IF there was ever a year to attend a field day, 2015 is shaping up to be that year.

Between weather stress (both hot and cold), drought stress, disease stress and insect stress; grain growers are facing a plethora of management challenges.

“It’s really important for producers and consultants to be aware of the latest varieties, discuss current conditions and prepare for harvest,” explained Juliet Marshall, University of Idaho Extension Cereal Pathologist.

That’s true in any year, but particularly now when barley yellow dwarf virus was followed by stripe rust in southern Idaho; abnormally warm temperatures in March gave way to frost damage in late April; and growers began irrigating grain in March.

University of Idaho (UI) puts out variety trials in 14 different locations across the state to see how new lines perform under different climatic conditions and soils. “Everything changes every year,” Marshall said.

A variety that performed well five years ago, may not be doing as well today after several dry winters or in the face of stripe rust. Marshall thinks that variability growers are used to seeing between crop seasons is becoming even more erratic. Weather is just one factor. Changing crop rotations have created ideal conditions for the development of pest problems that never used to be a problem such as fusarium head blight or wireworms.

Not only do growers have to decide which variety will yield the most under their production system and also has superior quality characteristics and a dynamite disease package, but they have to choose which company to work with. National companies like Dow, Bayer Sciences, Syngenta, Monsanto, and Limagrain Cereal Seeds are now offering wheat varieties. Established local companies are phasing out old varieties and introducing new varieties more quickly thanks, in part to new breeding techniques like the double haploid system.

That’s why Russ Suchan tries to make time to attend wheat variety field days each summer. The Minidoka County wheat grower has both dryland and irrigated production. Keeping up with the latest varieties and updated disease packages helps him refine his planting decisions.

He planted two new varieties this year based partly on information he gleaned from previous field days. He chose WestBred 9668, a hard red spring variety, because it looked like it would have better protein and an updated disease package compared to the variety he had grown in the past. Because of past lodging problems, he chose to plant WB6430, a soft white

winter variety that is shorter than the variety he had grown before.

Wheat is the primary crop on his farm so Suchan makes attending the variety trials a priority. “I’m just trying to make money and stay in business,” he said.

Royle Thomson attends field days to gather information that he shares with his customers, who may not find time to attend themselves. Thomson likes to see firsthand how written information about new varieties compares to the actual plant stands and development.

“I attend field days to broaden my knowledge of different seed varieties and see what’s new, and then put that information on the growers’ plates,” he said.

He introduced Simon, a soft white winter wheat variety developed in Washington, to his Golden Valley Warehouse customers several years ago. The variety is not widely grown in Idaho but it’s done well in Cassia County.

Finding varieties that do well is important, but finding out which ones don’t yield well or don’t have the quality characteristics that end users want is equally important. “With many new varieties being introduced from Europe and Canada, it helps to see how they perform in a growing region before investing in seed. The number of new varieties has increased quite a bit, you’ve got more choices,” Marshall said. “It’s important to know what will be available down the line.” ■

See the 2015 Schedule of Crop Tours and Field Days on page 14.

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2015 Schedule of Crop Tours/Field Days

DATE	TIME	EVENT/LOCATION	CONTACT
June 3	1:00 pm	Ritzville	Aaron Esser; (509) 659-3210
June 8	9:00 am	Hermiston Wheat Field Day	Ken Frost; kenneth.frost@oregonstate.edu
June 8	5:00 pm	Pendleton-Ruggs Wheat Tour	Mike Flowers; mike.flowers@oregonstate.edu
June 9	7:30 am	Pendleton CBARC Field Day	Valtcho Jeliakov; valtcho.jeliakov@oregonstate.edu or Stephen Machado; (541) 278-4416
June 16	N/A	Pomeroy Wheat Tour	Hannah Kammeyer; hanna.kammeyer@oregonstate.edu
June 17	9:30 am-11:00 am	Arbon Valley Field Day	Reed Findlay; (208) 236-7310 or rfindlay@uidaho.edu
June 17	1:30 pm-3:00 pm	Rockland Valley Field Day	Reed Findlay; (208) 236-7310 or rfindlay@uidaho.edu
June 18	9:30 am-1:00 pm	Rupert Field Day	Joel Packham; (208) 878-9461 or jpackham@uidaho.edu
June 18	7:30 am-1:00 pm	UI Weed Field Day Moscow, ID.	Dr. Donn Thill; (208) 885-6214 or dthill@uidaho.edu
June 22	8:00 am-11:00 am	Tammany Crop Tour at Henricksen Farm, 2810 Powers Ave, Lewiston, ID.	Doug Finkelnburg; (208) 799-3096 or dougf@uidaho.edu
June 23	3:30 pm	Walla Walla Cereals Field Day, Walla Walla, WA.	Wayne Thompson; (509)240-5018
June 23	8:00-1:00 pm	UI Snake River Pest Mng. Tour Kimberly, meet at R&E Center, registration at 8:00 am, tour at 8:30 am, sponsored lunch	Don Morishita (208) 423-6616 or don@uidaho.edu
June 24	N/A	Thresher Artisan Wheat Field Day, Fort Hall Convention Center, ID.- BY INVITATION ONLY	Brett Wilken; (208) 785-0698 or bwilken@thresherwheat.com
June 24	8:00-1:00 pm	UI Snake River Pest Mng. Tour Aberdeen, meet at R&E Center, registration at 8:00 am, tour at 8:30 am, sponsored lunch	Pamela Hutchinson; (208) 397-4181 or phutch@uidaho.edu
June 25	12:00 n-4:00 pm	Parma, ID / Malheur Co., OR, Wheat & Barley Field Day, hosted lunch.	Dr. Olga Walsh; owalsh@uidaho.edu or Bill Buhrig; william.buhrig@oregonstate.edu
June 30	7:00 am-12:00 n	Prairie Area Crop and Conservation Tour, hosted breakfast, Craigmont Community/City Hall. Pesticide & certified crop advisor credits offered.	Ken Hart; 208-791-2515 or khart@uidaho.edu
July 8	7:30 am-5:00 pm	Precision Ag. Technology Farm Tour, begins at UI Kambitsch Farm, off US 95 near Genesee. Hosted lunch at Blair Farms. Please reserve your seat on the Tour bus in advance.	Kristy Borrelli; 208-885-1220 or kborrelli@uidaho.edu and Doug Finkelnburg, 208799-3096 or dougf@uidaho.edu
July 9	8:00 am-12:00 n	UI Parker Farm All Station FD, Moscow, ID.	Dr. Donn Thill; (208) 885-6214 or dthill@uidaho.edu
July 9	4:00 pm-5:30 pm	Bonneville County Cereals Field Day at Marc Thiel's, 2550 S 45th W, Idaho Falls, ID.	Derek Reed; (208) 390-7191 and derekreed33@gmail.com or Juliet.Marshall@uidaho.edu
July 14	8:00 am	Spillman Farm Field Day, Pullman, WA.	Ryan Higginbotham; (509) 641-0549
July 14	N/A	InteGrow Malt Field Day- BY INVITATION ONLY	
July 15	9:00 am-1:00 pm	UI Aberdeen and Limagrain Cereals Field Day, Aberdeen R & E Center, Aberdeen, ID.	Dr. Jianli Chen; (208) 397-4162 or jchen@uidaho.edu and Juliet.Marshall@uidaho.edu
July 14	N/A	Anheuser Busch Field Day- BY INVITATION ONLY	
July 21	3:00 am-6:00 pm	Soda Springs Cereals Field Day	Kyle Wangemann and Juliet.Marshall@uidaho.edu
July 22	10:00 am-1:00 pm	Direct Seed Field Day, Gallup Farm, 1922 Swan Valley Hwy, sponsored lunch	Gordon Gallup; (208) 251-9552 or gogallup@hotmail.com
July 28	8:30 am-12:00 n	Prairie Area Crover Crops Tour, Lewiston County Extension Office, Nezperce, ID, Registration at 8:30 am with Continental breakfast, 9:00 am tour departs. Pesticide & certified crop advisor credits offered.	Ken Hart, 208-791-2515 or khart@uidaho.edu
July 30	10:00 am-12:00 n	Ashton Field Day	Lance Ellis; (208)624-3102 or ellis@uidaho.edu



Don't Risk Blending Last Year's Sprout Damaged Wheat in 2015

By Cindy Snyder

YOU walk into a grocery store to pick up a loaf of bread. Will you choose the loaf that is dark brown and full of holes, or the one that is golden brown with a uniform shape and no holes?

Would it matter if you knew the first loaf had been made from flour milled from wheat harvested after last August's historic rainfall?

The impact from sprout-damaged grain continues to be felt months after growers waded through that soggy harvest. Elevators that accept wheat for flour millers continue to test every load, which includes running a falling number test, to determine whether the wheat can be milled or if it is feed quality.

The falling number test measures the time in seconds it takes for a stir rod to fall through a column of gelatinized starch. It's an indication of enzyme activity.

Any falling number test above 300 indicates no sprout damage, a test between 200 and 300 indicates some sprout damage, below 200 is considered severe damage. Some of the falling number tests done last fall at Grain Craft were as low as 105 seconds.

Baking is a complex chemical process and the presence of enzymes, even in small quantities, can have an overwhelmingly negative impact on the finished product. At a hands-on workshop this winter at the University of Idaho Wheat Quality Lab in Aberdeen, elevator managers conducted falling number tests. In one case, a falling number test on a sound batch of kernels had a result of 365; indicating excellent quality.

Then University of Idaho staff added one kernel of highly sprouted



Dennis Capson, Scouler Grain shakes flour slurry in preparation for the LFN test.

Adding just that one single grain, reduced the falling number test on the resulting batch by 100 seconds and rendered the sample "feed grade."

wheat to 2,500 kernels of sound wheat. Adding just that one single grain, reduced the falling number test on the resulting batch by 100 seconds and rendered the sample "feed grade." A few end users of soft white wheat have approved falling numbers as low as 250. However, hard wheat end users are still requiring a minimum falling number of 300 seconds.

Not only does that show how sensitive flour

JOIN US **JUNE 17 AT 8:00 AM (MDT)** for a webinar on "Why Low Falling Number Wheat Cannot Be Blended" with guest presenter Reuben McLean from Graincraft.

Rueben will discuss why sprout-damaged wheat cannot be blended the way that low-protein wheat can be. Sprout-damaged wheat contains a powerful enzyme that degrades wheat starch to simple sugars; it only takes 1% or 2% sprout-damage kernels to taint the rest of a good crop. If sprout-damaged wheat were to slip into commercial channels it could imperil Idaho's position with both domestic and export customers for several years.

Log onto: <http://connect.cals.uidaho.edu/wheat> on **June 17 at 8:00 AM (MDT)** to hear from industry expert Reuben McLean, Graincraft, about "Why Low Falling Number Wheat Cannot Be Blended"

To learn more about why Low Falling Wheat cannot be blended, check out the educational video posted on the Idaho Wheat Commission webpage: www.idahowheat.org

quality is to enzyme activity, but also how difficult it is to blend sprouted wheat with sound wheat to produce an end product with acceptable quality characteristics.

Blending sprout damaged wheat isn't like blending wheat with different protein levels. Millers know that blending protein is a one-to-one relationship meaning that a blend of 12 percent and 13 percent protein 50-50 will result in a batch of 12.5 percent protein.

"It's not one-to-one with sprout damaged wheat," explained Reuben McLean, manager of quality for Grain Craft's Blackfoot mill. "If you blend a 300 (falling number test) with a 200 fifty-fifty, you may end up with anything from 150 to 300 on the resulting blend."

Elevators will be testing every load again this fall and it won't take very much sprout damaged grain to ruin a truckload of good grain.

Growers still holding some sprout damaged grain from last year who try to blend it off with sound grain this year are taking a huge risk. First, elevators will be testing every load again this fall and it won't take very much sprout damaged grain to ruin a truckload of good grain. Second, since climatologists are already warning of likely monsoonal moisture

during grain harvest again in 2015, do you want to risk ruining a load of sound wheat?

McLean knows that quality standards may seem arbitrary, that a miller or a baker should be able to use lower quality grain for flour production. But quality standards are consumer driven, he points out.

"It goes full circle," he explained. "Growers, elevators, flour millers and bakers all play a critical role in meeting quality expectations of the consumer. We are all consumers and maintain certain expectations for the products we buy." ■



Know Before You Grow

Seed Trade Law and its Impact on You

By Cathy M. Wilson, PhD

A Seed Law Parable

A few months ago Farmer John and Farmer Ben were enjoying their usual cup of Joe at the café on the outskirts of town. John expressed his frustration at not finding seed of Best One. Ben leaned in and said, “I know this guy over in the next county that has some brown-bagged seed of Best, you oughta call’ em.” John replied “Hmm, maybe I’ll do that. But there are some things I want to check out first.” “What’s there to check out?” Ben replied with a hint of irritation in his voice. “Well, I seem to remember from cereal school that Best One was one of those new ones that is PVPed and they made a point of it having Title 5, whatever that is. I just

think I should know some things before I buy.” Farmer John is one smart dude.

PVP Title V

With the release of the variety UI Stone, the University of Idaho adopted the policy of releasing varieties covered by Plant Variety Protection (PVP) with Title V of the Federal Seed Law specified in the PVP application. PVP protects plant breeder’s intellectual property rights. If the developer chooses to specify “sale only as a class of certified seed” the seed is required to be certified and is enforceable under Title V. Federal Seed Law, the PVP Act and US Plant Patent law protect varieties from the practice known in the business as “brown-bagging.” Brown-bagging is the practice of growing a protected variety and

entering into seed commerce with another entity without the legal rights necessary. Many growers don’t realize that they can save seed back of PVP protected varieties for their own use. However this is not allowed if the variety is protected with a US or International patent. Both bodies of seed law prohibit selling seed of a protected variety to another party and Title V requires that the variety is sold only as a class of certified seed. Note too that in this context “sale” has a very broad definition that covers selling, trading or giving to another person or entity.

The guy from the other county can’t legally sell Best One to Farmer John without the written permission of the developer or their designated licensee. In the case of UI Stone, the University of Idaho holds the PVP with Title V, prohibit-



“Idaho’s wheat industry is built on honesty and integrity. Our job is to help growers understand

the complexities of the seed laws and encourage compliance with them. Idaho Wheat Commission’s position is to remain neutral in seed law litigation.”

Blaine Jacobson, Executive Director, Idaho Wheat Commission

ing selling or offering for sale or advertising, by variety name, seed not certified. The University of Idaho designated Limagrain Cereal Seeds as the licensee with exclusive marketing rights. Licensing a private seed company to market a university developed variety is very beneficial to both the university and the wheat producers. The licensed seed company has a vested interest in producing the seed quantity and quality the market demands, developing a market plan and building a market network to make the university variety widely available to all Idaho growers regardless of who they deliver their grain too. Land grant universities are not in the commercial seed business. University of Idaho determined it more effective, efficient and provided better access to new varieties, when the production and marketing was licensed to the professionals. The Idaho Wheat Commission agrees with that philosophy and collaborates with the University to find the best partner for each variety released. The private seed company (Licensee) agrees to pay a royalty on variety sales to the University of Idaho which is reinvested into wheat breeding programs. Royalties help off-set the high costs associated with innovation and application of technology in variety development. Idaho grain producers benefit from having the best genetics, adapted to their location and increased availability and access to these genetics. The Licensee is accountable for sub-licensing the variety for seed production to seed growers or dealers and for the recovery of the royalty as stated in the sub-license. This relieves the PVP holder from these necessary, and

THE FLOW OF LEGAL AUTHORITY TO REGULATE SEED TRADE

FEDERAL SEED LAW

- Aligned with International Seed Trade Law and International Plant Breeder’s Rights law
- Governs foreign seed trade & interstate seed trade for the purpose of preventing misrepresentation of seeds
- Title V Sec. 501 “Sale of Uncertified Seed of a Protected Variety”

FEDERAL PLANT VARIETY PROTECTION (PVP) ACT

- Aligned with International Plant Breeder’s Rights law
- Title V of Federal Seed Trade law is aligned with Section 111 “Infringement of Plant Variety Protection” (July 2013 revision)

IDAHO STATE SEED LAW

- Title22, Chapter4 “Pure Seed Law” is in alignment with Federal Seed Law to regulate labeling of seed, seed dealer licensing and seed arbitration
- Title22CH4-416-e “Prohibitions” is in alignment with Federal PVP Law and regulates the labeling, advertisement, and sale of Certified seed
- Senate Bill 107 enacted “Seed and Plant Certification Act of 1959, designated the Regents of the University of Idaho, through the College of Agriculture, as the seed certifying agency for the State and gave further authority for the Regents to designate an agent to administer and conduct the certification program

IDAHO CROP IMPROVEMENT ASSOCIATION (ICIA)

- Designated as University of Idaho’s agent to administer the Seed and Plant Certification program
- Authority to establish seed certification program procedures, processes, and rules meeting at least the minimum standards of the Association of Seed Certifying Agencies (AOSCA), in alignment with Idaho State Seed Law
- Association governed by a board of ten directors. Ex-officio director is Department Head of Plant, Soil and Entomological Sciences, College of Agriculture and Life Sciences, University of Idaho
- Executive Vice President/Secretary is appointed by the Board

GRAIN CERTIFICATION REGULATION IN IDAHO

- Application and amplification of General Certification Standards specifically for grain
- Regulates the land requirements, field inspections, and seed standards to meet certification standards

PROTECTION OF PLANT BREEDER’S RIGHTS

- Federal Seed Law Title V Sec. 501, PVP Act, Idaho State Pure Seed Law, and Idaho Crop Improvement are integrated to provide the law which allows for enforcement and prosecution of violators of the laws

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“It is in the best interest of growers to have intellectual property associated

with variety development protected under either PVP Act or US Patent. Variety development is expensive and will become more so as the latest genetic tools are utilized. Whether universities or private companies, intellectual property must be protected to allow developers to recover costs, make a reasonable profit, and encourage further investment in variety development.”

**Joe (Potlatch) Anderson,
 Secretary/Treasurer, Idaho Grain Producers Association**

time consuming, responsibilities. The university can focus on what they do best and benefit from what LCS does best. That is a good collaboration.

Protecting the Investment in Seed Development

Obviously the seed company and the developer are not going to allow the variety to be “brown bagged” because it defrauds the licensee and the developer of rightful return on the intellectual property associated with their investment in developing the variety. Idaho growers are eager for access to the latest genetics and most realize those new genetics have an unprecedented investment cost to them. Investment in new genetic technology and new varieties will only continue for markets where the developers, universities or private companies, can be assured of a return on their investment. Any producer knows they can't keep farming if they never make a profit; breaking even doesn't work. Many but not all licensees manage a PVP variety by sub-licensing seed production and marketing rights to their network of collaborators. Collaborators are held account-

able to the provisions in the sub-license. UI Stone foundation seed is only released to sub-licensed partners for production of Registered or Certified seed for commercial sales.

Back to the Parable of Farmer John

Farmer John has had time to do his homework and is now ready to drive over to the next county to meet with Guy. John approaches Guy with a few questions. “So do you have the right to grow BEST? It is PVP Title 5, you know.” Guy breaks into a wide grin, “Yup! I've got a sub-license from the seed company to grow it. I just keep records and pay them the royalty.” Guy did have freedom to operate (FTO) and grow a certified crop, he could keep some for his own use as allowed in the PVP ACT and sell it to others but he is also obligated to collect and remit the royalty to the license holder. “So far so good,” John is thinking, “problem solved”. But there was one more question to ask, “Guy, what class of certified seed will I be buying? Registered or Certified?” Guy suddenly gets that “deer-in-the-headlights” look on his face. With a look of incredulity, John asks, “You did get your fields certified by the Idaho Crop Improvement Association, didn't you?” Guy responds evasively saying he called to set up inspection but found out that his field didn't meet the requirements for growing a class of certified seed. He had barley on it two years ago and the rules specify three years with no cereals on the field. Farmer John replies, “Didn't you know you can get an exemption from some specific rules, if you have an inspection made within 15 days of planting.” Guy was kinda quiet and crestfallen. He shook his head. “I didn't know that.” John, a bit exasperated now, thought “I've wasted enough time on this wild goose chase, I'm out of here.” Turning toward his truck, he said, “Dang! That's too bad for you, I'll have to find my seed elsewhere.” Best One was PVP and Title V. Even though Guy had a sub-license to grow the PVP variety and sell it, the seed wasn't certified and if he did sell, trade or give it to another entity, he would be in violation of Federal Seed Law Title V Sec. 501.

The Evolution of Seed Law

It can be a bit daunting for growers to wade through the complexities of seed law. Three different bodies of seed law came together to influence the outcome of the story above. The development of modern seed law began with Dutch merchants trading seed around the world. The first issues tackled by seed law were fairly simple; seed purity, identity and germination. Seed buyers wanted to know, “Am I really getting what the seller says I am buying?” As technology and scientific advancements have developed along

Know Before You Grow



1. Is the variety protected under a US or International Plant Patent?
2. Is the variety regulated under PVP?
3. Is it also regulated by Title V?
4. Do you intend to save seed back from the grain crop?
5. Do you intend to give, sell, or trade this seed to another person or entity?
6. If the answer to 4 & 5 is “yes” then determine how you can have the legal right to take these actions.
7. If you need legal advice; consult an expert in seed trade law and US plant patent law.
8. Review ICIA Seed Certification Regulations for Grain.
9. Determine if you need to apply to ICIA for certification of your field and crop.
10. Do you need a seedling inspection of the field? Make necessary arrangements before planting.

with the globalization of the seed trade, a wide body of law has developed to regulate interstate, national, and international seed commerce. Various satellite partners, like certified and approved seed testing services, offer documentation of the claims made by seed growers and seed dealers. The purpose of seed law is to promote fair seed trade practices and promote the integrity and reliability of the seed business.

Federal Seed Law is primarily concerned with US seed commerce, but it also is aligned with International Seed Law and International Plant Breeder's Rights law. The US law recognizes International patents and plant protections from other countries. In the hypothetical case above, it is specifically Title V, of the Federal Seed Law that is relevant. Idaho State Seed Law is aligned with Federal Seed Law. State code specifies how certain requirements of the Federal and State laws will be met. The alignment of our State Seed Law with Federal law, and Federal law with International law, is a prerequisite for the thriving seed production business in the south central and south western part of Idaho. Idaho is known throughout the world for producing the highest quality seed, with the best germ and purity.

State code designates the University of Idaho through the College of Agriculture and Life Science, as responsible for seed certification in the state. The code further gives the Regents of

the University of Idaho the right to designate an agent to carry out their responsibility. The Regents designated the Idaho Crop Improvement Association (ICIA) as their agent and invested ICIA with authority to create rules and processes for seed certification that must meet the minimum standards of the Association of Official Seed Certifying Agencies of which they are a member.

Know Before You Grow

Federal Seed Law, Federal PVP ACT, State Seed Law, and the rules of the Idaho Crop Improvement Association all impacted Farmer John's decision above. Like Farmer John, seed and grain producers, seed buyers, and seed sellers are obligated to know and comply with these laws and rules. Enforcement and prosecution are provided for in the Federal Seed Law, Federal PVP Act, State Seed Law and the Idaho crop Improvement Association Standards for certified grain production. Know before you grow! Don't be surprised like Guy and find yourself in a bad situation.

There is plenty of room to operate within the law. When growers have a philosophical difference of opinion on protection of plant breeder's rights, there are many good standard public release varieties, not subject to plant variety protection laws, available for producing good quality brown-bagged seed crops. There is a market niche for



“Federal and state seed laws protect public and private plant breeder's intellectual property rights,

which encourages continued investment in research to develop new wheat varieties with enhanced traits that can solve production problems and increase yield.”

Donn Thill, UI Associate Dean and Director of Idaho Agricultural Experiment Stations

inexpensive, decent genetics; not the best, but predictable and very affordable. Someone will make money filling this market niche and they can do it legally when they know, understand, and follow the laws and rules that govern seed commerce in Idaho, the US, and the world. ■



Precision Nitrogen Management

By Olga Walsh, Cropping Systems Agronomist and Extension Specialist, University of Idaho, Parma Research and Extension Center

Urgent need for improved efficiency

AT least half of all food production in the world is possible only because of the use of fertilizers containing nitrogen (N), phosphorus (P), and potassium (K). Human population is expected to reach 9 billion in the next 35 years, which means that food, and grain production in particular, has to increase by at least 70 percent to address human nutritional needs. Such projected intensification requires improvements in efficient use of resources, including fertilizers. Sound nutrient management decisions will allow for increased crop productivity and crop quality, while minimizing soil nutrient depletion, and sustaining soil and environmental quality. Previously, the most common solution to food shortages was to simply expand arable land. Yes, grain production has more than doubled in the past 50 years, but the agricultural land has increased by less than 10 percent.

Other substantial challenges that production agriculture is facing include loss of productive cropland to urbanization and other human uses, desertification, salinization, and soil erosion. And we can certainly expect further significant land losses resulting from climate change. We all must face the reality that we will be challenged to produce more and more food while utilizing the same or a reduced amount of land. Steady progress in plant breeding and genetics are most certainly resulting in much higher crop yields which is promising. On the other hand, fertilizer (and water) use efficiency will have to be increased accordingly to accommodate these high-yielding crop varieties and keep up with the rapidly growing population.

Nitrogen importance

We can all agree that nutrients must be managed in a comprehensive manner, and every one of the essential crop nutrients must be balanced for proper crop nutrition and development. After all, according to one of the key agronomical postulates - Liebig's law of the minimum - crop yield is proportional to the amount of the most limiting nutrient. No doubt, that N application will have little effect on crop yield if other factors (other nutrients or water) are the most limiting. In practice,



Dr. Olga Wash, University of Idaho, Cropping Systems Agronomist at Parma R & E Center, teaching students how to use the GreenSeeker technology in field plots.

if water is not most limiting, the balance between plant-available N and the rate of N loss, ultimately determine the sustainability of production for most cropping systems. Misusing N results in substantial economic losses to growers and has serious negative environmental effects. Growers are encouraged to soil sample their fields annually prior to seeding in order to have a complete picture of their soil condition. Soil testing, however, does not tell us everything we need to know about N. Soil testing for ammonia-N and nitrate-N (plant-available inorganic N) is typically used to identify N deficiencies. Levels of both inorganic fractions vary extensively depending on soil moisture, growing conditions, and time and depth of sampling. Further, soil testing for inorganic N does not account for N released from organic matter throughout the growing season.

Nitrogen management is complicated

There are two major reasons why N management is not straightforward: 1) N is very mobile in both soil and plants; and 2) high levels of temporal and spatial variability exist in the

vast majority of agricultural systems. Available soil N and crop yield potential are the two key elements that determine a crop's N need in any particular field for any specific growing season. This is why both soil N and yield potential are

critical to calculate optimum N fertilizer rates. Developing accurate N recommendations is difficult because of the great variability of both available soil N and yield potential across time and space. This is exactly why growers do not achieve the same yields in the same field from one year to the next, even when choosing the same variety, seeding time/rate and nutrient applications. Temporal variability, the collective environmental effects of rainfall amount and pattern, and soil and air temperatures, is the major cause for crop

yield variations. Simply put, temporal variability reflects changes from one year to another and impacts both crop yield potential and crop's N need. Temporal variability is difficult to foresee and quantify, which is why N recommendations are commonly based on the previous years' data. In reality, the likelihood of the actual N requirement being the same two years in a row is only 1%. So when we use historical data to

Ultimately, crop sensors enable growers to address field variability and apply the right amount of fertilizer, in the right place, at the right time.



Close up of the hand-held GreenSeeker remote sensing instrument.

manage this year's crop, we have only a minor chance to get things right.

Precision sensors for improved N management

The concept of precision nutrient management developed from understanding that it may be advantageous to adjust agricultural inputs according to variability in growing conditions. This entails management decisions being made using real-time knowledge of crop's need for N. Precision sensors, in combination with reference strips, provide an effective alternative for N management. Crop management practices that help to improve N use are those designed to offset conditions known to contribute to N loss from plant-soil systems. One of the major N losses occurs when all N is applied prior to or at seeding time. Because the crop is just beginning to develop, not much N is taken up by the plants and there is a very high risk of N being lost to the environment. In order to manage N effectively, we must not only apply the needed N fertilizer but also ensure that the application is done at the time the crop needs it most.

This often means that N fertilization is split



Arjun Pandey, reading plant stress in winter wheat plots using the GreenSeeker remote sensing instrument.

into 2 or more fertilization events throughout the season. Crop sensors have three distinct advantages over traditional crop scouting and visual evaluation: 1) they are much more consistent and unbiased, 2) they provide quantitative information (measurable data) vs qualitative information (descriptive data), and 3) they operate within the regions of electromagnetic spectrum where human eyes are not able to function. Numerous crop sensors are available to growers today, including, but not limited to, GreenSeeker® (Trimble, Sunnyvale, CA), Crop Circle® (Holland Scientific, Lincoln, NE), and OptRx® Crop Sensors (AgLeader Technology, Ames, Iowa). Most crop sensors are marketed as a part of a crop management platform that includes software and guidelines for data interpretation and developing fertilizer prescriptions. Ultimately, crop sensors enable growers to address field variability and apply the right amount of fertilizer, in the right place, at the right time.

Crop sensors operate by detecting (sensing) the optical characteristics of plants associated with vigor and health. Sensors project light of various wavelengths (such as red and near infrared) on to plants and captures light reflected back from the plant, precisely measuring the amount reflected light. This gives us a clear idea of how healthy the crop is. This methodology capitalizes on the fact that healthier plants contain more chlorophyll, green pigment, a key element in photosynthesis, the process plants use for converting sunlight into metabolic energy. Unhealthy, stressed plants contain lower levels of chlorophyll and, thus, absorb less red light.

How to "translate" sensor measurements

Plant stress detected by crop reflectance signatures can be expressed in many different ways. One of the most simple and most widely

used methods is vegetative indices, such as Normalized Difference Vegetative Index (NDVI). The NDVI is an effective graphic indicator of the amount of green vegetation produced by plants from the time of seeding until crop evaluation. NDVI can be used to "translate" sensor measurements and to convert them into precise N fertilizer recommendations. Because everything is understood in comparison to measurements from something else, a non-limiting N reference has to be established in each field annually. The non-limiting N strip is used as the reference for the rest of the field when scanning the whole crop with a precision sensor. If differences in NDVI readings are not detected between the reference and the rest of the field, it is unlikely that addition of N fertilizer will result in yield boosts. Furthermore, region-specific and crop-specific formulas (algorithms) developed by university researchers in collaboration with crop consultants and growers, enable development of precise N recommendations based on crop yield potential and the crop's need for N.

Precision crop sensor work in Idaho

University of Idaho's team of researchers and support personnel are currently in the process of developing algorithms that would work well in Idaho growing conditions. The initial work has started this year in wheat at several experimental locations throughout the southwestern and southeastern Idaho. The team is led by Olga Walsh, University of Idaho's Cropping Systems Agronomist and Extension Specialist, Parma Research and Extension Center. The team hopes to expand precision agriculture research in various crops across the state in the next few years. This will enable development of sensor-based N guidelines for crops important for Idaho's agricultural industry. The group has also succeeded in securing support and funding from Idaho Wheat Commission to begin the initial work involving Unmanned Aerial Vehicles (UAVs). In partnership with a Nampa, ID company, Take Flight Aviation LLC, the team will work on developing an effective system for rapid scanning of agricultural fields for crop stress associated with nutrient and water limiting conditions and pest/disease infestation. The preliminary study involves spring wheat extension nurseries coordinated by Juliet Marshall, University of Idaho's Cereal Cropping Systems Specialist and Pathologist, Aberdeen Research and Extension Center. This project will be presented at Parma Cereal Field Day scheduled to take place at Parma Research and Extension Center on June 25, noon to 4:30. ■



Changing Idaho Wheat Exports

*By Shawn Campbell, Assistant Director,
US Wheat Associates West Coast Office*

EACH year Idaho wheat farmers go through the same cycle. Plant their crops, hope it rains, watch the crops develop, hope it stops raining, and then harvest. Though this cycle has been improved upon since the start of this millennium, its basic structure has remained unchanged. The same cannot be said for Idaho's wheat exports.

The fact of the matter is that Idaho is exporting more wheat. At the start of this decade 45 percent of Idaho's wheat crop was exported. Today this has grown to 48 percent. What kind of wheat being exported has changed as well. Soft White, the staple of Idaho wheat production, made up 75 percent of Idaho wheat exports fifteen years ago. Today it has dropped to 66 percent. Exports of both Hard Red Winter and Hard Red Spring

have grown.

Portland exporters once sourced a significant amount of their Hard Red Winter from Colorado, Nebraska, and South Dakota. Thanks to better varieties in Idaho and the other PNW states that demand has shifted west. The same is true for Hard Red Spring. Exporters value PNW grown Hard Red Spring for its quality and high dark hard vitreous kernel content, allowing them to meet the stringent purchase specifications of the Asian markets.

Where Idaho's wheat goes has shifted as well. At the start of the millennium the East Asian markets made up 40 percent of the exports, the Middle East 32 percent, Southeast Asia 22 percent, and other buyers 6 percent. However, over the past fifteen years supplies of cheap and low quality wheat have grown in the Black Sea Region, pricing Idaho wheat out of many price sensitive markets.

Today East Asia continues to dominate Idaho wheat exports, buying 46 percent. The main source of the growth has been China, though Japan and Korea have increased small amounts as well. Southeast Asia now buys 28 percent, thanks to economic growth and a rising middle class demanding a greater variety of food. Latin America, formerly not even a major market for Idaho wheat, now buys 12 percent, thanks to growing demand for high quality wheat. The growth in Black Sea wheat has resulted in the Middle East's share of Idaho exports falling to 11 percent.

While the world wheat market continues to change, Idaho wheat farmers continue to gain value through the export of their wheat to countries all around the world. This success isn't just happenstance, it's thanks to the long-term marketing efforts of both the Idaho Wheat Commission and the U.S. Wheat Associates. ■

Idaho Data for 1997-2001

	HRS	HRW	HW	SW	HAD	Total
Idaho Crop and Export Data:						
5 Yr Ave Production (TMT)	512.1	251.2	23.0	2013.8	0.0	2800.1
% of Idaho Crop Exported	39%	46%	0%	47%	0%	45%
5 Yr Ave Exports (TMT)	199.7	115.6	0.0	946.5	0.0	1261.8
% of Pacific Exports From Idaho	6%	6%	0%	19%	0%	12%
% of Total US Exports From Idaho	3%	1%	0%	19%	0%	5%

Idaho Wheat Exports (TMT):

Japan	75.3	55.5	0.0	150.3	0.0	281.1
Philippines	47.3	0.0	0.0	146.5	0.0	193.8
Pakistan	0.0	0.1	0.0	167.2	0.0	167.3
Korea	21.0	20.5	0.0	113.9	0.0	155.4
Egypt	0.0	0.0	0.0	138.6	0.0	138.6
Yemen	0.0	0.0	0.0	89.6	0.0	89.6
Taiwan	33.2	15.6	0.0	22.2	0.0	70.9
Indonesia	3.2	5.8	0.0	28.0	0.0	37.0
Bangladesh	0.0	3.4	0.0	28.0	0.0	31.4
Thailand	9.3	3.0	0.0	17.7	0.0	30.0
Eritrea	0.0	0.1	0.0	10.6	0.0	10.7
North Korea	0.0	4.1	0.0	6.4	0.0	10.5
China	2.9	0.1	0.0	3.8	0.0	6.8
Ethiopia	0.0	0.4	0.0	4.9	0.0	5.2
Malaysia	3.0	0.0	0.0	1.6	0.0	4.6
Sri Lanka	0.0	0.5	0.0	4.0	0.0	4.5
Singapore	1.1	0.0	0.0	3.2	0.0	4.3
Afghanistan	0.0	0.0	0.0	3.8	0.0	3.8
Russia	0.0	2.6	0.0	0.0	0.0	2.6
United Arab Emirates	0.0	0.0	0.0	2.5	0.0	2.5
Chile	0.0	0.2	0.0	2.2	0.0	2.4
Vietnam	0.5	0.3	0.0	1.4	0.0	2.2
Iraq	0.0	1.2	0.0	0.0	0.0	1.2
Peru	0.0	0.6	0.0	0.5	0.0	1.1
Mongolia	0.2	0.7	0.0	0.0	0.0	1.0
Colombia	0.1	0.6	0.0	0.0	0.0	0.7
Kuwait	0.3	0.0	0.0	0.3	0.0	0.6
Mozambique	0.4	0.2	0.0	0.0	0.0	0.6
New Zealand	0.0	0.0	0.0	0.4	0.0	0.4
Zimbabwe	0.3	0.0	0.0	0.0	0.0	0.3
Sudan	0.2	0.0	0.0	0.0	0.0	0.2
Tanzania	0.1	0.0	0.0	0.0	0.0	0.1
Ecuador	0.1	0.0	0.0	0.0	0.0	0.1
Kenya	0.1	0.0	0.0	0.0	0.0	0.1

Idaho Data for 2009-2013

	HRS	HRW	HW	SW	HAD	Total
Idaho Crop and Export Data:						
5 Yr Ave Production (TMT)	586.6	388.4	231.8	1618.6	27.7	2853.1
% of Idaho Crop Exported	50%	45%	0%	56%	0%	48%
5 Yr Ave Exports (TMT)	293.3	174.8	0.0	906.4	0.0	1374.5
% of Gulf Exports From Idaho	0%	0%	0%	100%	0%	0%
% of Interior Exports From Idaho	0%	0%	0%	100%	0%	2%
% of Pacific Exports From Idaho	6%	7%	0%	19%	0%	11%
% of Total US Exports From Idaho	4%	2%	0%	19%	0%	5%

Idaho Wheat Exports (TMT):

Japan	84.8	60.9	0.0	174.7	0.0	320.4
Philippines	63.7	2.1	0.0	148.9	0.0	214.7
Korea	23.3	17.0	0.0	163.1	0.0	203.4
Indonesia	16.7	10.2	0.0	63.5	0.0	90.4
Yemen	0.0	2.1	0.0	85.8	0.0	87.9
Taiwan	34.6	16.5	0.0	22.7	0.0	73.8
Guatemala/El Salvador	10.5	21.5	0.0	30.2	0.0	62.3
Thailand	15.9	7.3	0.0	31.3	0.0	54.4
Mexico	0.1	0.0	0.0	52.2	0.0	52.3
Chile	1.7	9.4	0.0	26.8	0.0	37.8
China	18.2	0.2	0.0	19.3	0.0	37.7
Egypt	0.0	1.5	0.0	29.9	0.0	31.4
Sri Lanka	1.0	0.8	0.0	16.0	0.0	17.8
Malaysia	6.7	1.5	0.0	6.6	0.0	14.8
Vietnam	5.3	0.3	0.0	7.0	0.0	12.7
Bangladesh	0.0	0.1	0.0	11.4	0.0	11.5
Afghanistan	0.0	0.0	0.0	11.0	0.0	11.0
Iraq	1.8	7.7	0.0	0.0	0.0	9.5
Singapore	1.1	0.0	0.0	7.9	0.0	9.0
Peru	0.3	7.0	0.0	0.7	0.0	8.0
Saudi Arabia	1.9	5.1	0.0	0.0	0.0	7.1
Iran	0.0	0.9	0.0	4.2	0.0	5.1
Colombia	0.8	0.8	0.0	2.7	0.0	4.3
Pakistan	0.0	0.0	0.0	3.4	0.0	3.4
Spain	1.9	0.0	0.0	0.0	0.0	1.9
Nigeria	0.0	0.0	0.0	1.9	0.0	1.9
Italy	1.6	0.0	0.0	0.0	0.0	1.6
Burma	0.7	0.0	0.0	0.9	0.0	1.6
Ecuador	0.0	0.2	0.0	1.2	0.0	1.4
Trinidad	0.0	0.0	0.0	1.3	0.0	1.3
Ethiopia	0.0	1.2	0.0	0.0	0.0	1.2
Oman	0.3	0.5	0.0	0.0	0.0	0.8
North Korea	0.0	0.0	0.0	0.3	0.0	0.3
Malawi	0.2	0.0	0.0	0.0	0.0	0.2
Sweden	0.0	0.0	0.0	0.1	0.0	0.1
United Arab Emirates	0.0	0.0	0.0	0.1	0.0	0.1



Snow Mold Research Requires Tenacity and Perseverance

By Tim Murray, WSU Plant Pathology;
edited by Cathy Wilson, IWC staff

SEVERAL different species of fungi cause damage to wheat and other plants buried under snow in the winter. Collectively they are called Snow Mold and are a serious challenge for wheat producers where snow covered but defrosted soils persist most of the winter.

The organisms causing snow mold diseases are adapted to life on plants in the wet, cold conditions between the soil surface and snow where temperatures hover around 32 degrees. Four different organisms are adapted for life under the snow, but Speckled or Gray Snow mold caused by *Typhula species* is the most important in the Pacific Northwest (PNW). Pink Snow mold, caused by *Microdochium nivale* is also frequently observed. Snow scald and Snow rot are uncommon in the PNW.

All snow molds require persistent snow cover to begin the disease process. Speckled Snow mold and Pink Snow mold are most damaging when snow cover persists for 100 days or more. Snow covered unfrozen soil, which remains so until snow melt, increases the severity of the disease. If the soil is frozen when the snow cover occurs, the diseases do not develop to damaging levels as long as the soil remains frozen until snow melt.

Snow molds emerged as a PNW problem late in the 1940s. Various approaches have been used to manage the problem including snow removal, seeding date changes, crop rotation and foliar fungicides. But growing resistant cultivars has been the most successful and cost-effective method of dealing with snow mold. Resistance to Speckled and Pink Snow molds are correlated, so either mold can be present when doing selections for resistance.

Several sources of snow mold resistance were identified in studies conducted by USDA researchers in the 1960s. Wheat varieties Sprague, John, Andrews, and Eltan in WA and Blizzard, Bonneville, Boundary, and Survivor in ID incorporated this source of resistance. Additional snow mold resistant varieties have been released since, but all are based on the resistance genes found in these early varieties.

A new regional collaborative snow mold project began in 2013. PNW researchers Tim Murray, WSU Plant Pathologist, Arron Carter, WSU wheat breeder, Dan Skinner,



Tetonia15-2: Winter wheat with Snow mold disease in Tetonia, ID, field plots. A large section of the plants are killed by Snow mold.

USDA-Agriculture Research Service (ARS) plant physiologist, and Juliet Marshall, University of Idaho Extension plant pathologist, developed a project focusing on using new sources of genetic resistance and improved methods of selecting resistant lines.

Intercrosses to incorporate new genetic resistance

New more effective resistance genes have been sought out. Snow mold is a severe problem in Hokkaido, Japan. Two Japanese snow mold resistant lines, Münstertaler and PI 173438 were identified and crossed with PNW resistant and susceptible agronomically adapted varieties.

Three genes for snow

mold resistance and molecular markers associated with them have been identified in Münstertaler. Populations from crosses between Münstertaler x Xerpha, carrying resistance genes from Münstertaler and susceptible genes from Xerpha, were screened using molecular markers to select for individuals carrying the Münstertaler resistance genes. In 2011-12 and 2012-13, selected lines were field screened for resistance to snow mold near Waterville and Memuro, Japan. Unfortunately, the disease was so severe in Japan only a few plants survived, still the populations could be rated for resistance to snow mold.

In the next two years, field testing was expanded in the PNW with hopes of getting a good field screen, but conditions were not favorable for development of snow mold. Several commercial varieties (Table 1) and the population carrying resistant genes were able to be rated at Tetonia in 2014 (Fig. 1).

Developing Screening Methods

The objective of growth chamber screening methods is to eliminate susceptible lines before valuable field resources are wasted on them.

Wheat populations of Münstertaler (an Austrian variety) x Xerpha, Finch x Eltan, and IDO444 x Rio Blanco may carry new resistance genes for snow mold and their associated molecular markers. The natural occurrence of snow mold in field tests, severe enough to be useful in selection of resistant lines, has always been unpredictable. Growth chamber testing allows screening throughout the year independent of the weather. Plants without the

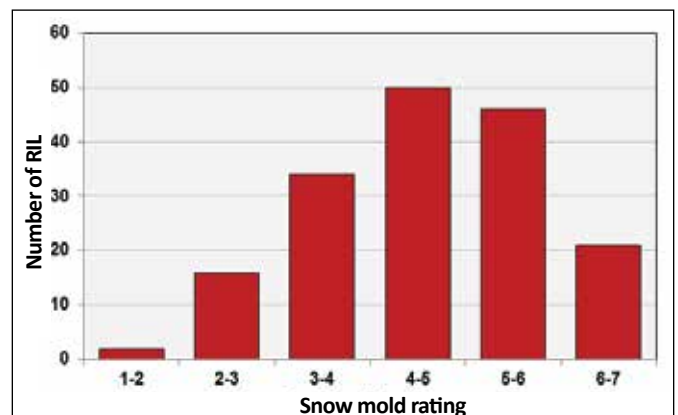


Fig. 1. Snow mold ratings for the Recombinant Inbred Lines (RIL) rated in the Tetonia, ID field screening trial in 2014.

Table 1. Ratings of winter wheat varieties following snow mold at the Tetonia Research and Extension Center, Tetonia, ID 2014 (J. Marshall).

Variety	Class	Spring Rating
AP503 CL2	HW	8.5
Bearpaw	HW	8.0
Bobtail	SWW	7.5
Brundage	SWW	8.0
Bruneau	SWW	9.5
Curlew	HW	9.5
Deloris	HW	5.0
Eltana	SWW	7.0
Garland	HW	7.0
Golden Spike (W)	HW	8.0
Greenville	HW	7.5
Judee	HW	7.5
Juniper	HW	8.5
Juniper/Deloris	HW	9.0
Juniper/Promontory	HW	9.0
Kaseberg	SWW	9.5
Keldin	HW	8.0
Ladd	SWW	8.0
LCS Artdeco	SWW	6.0
LCS Azimut	HW	9.5
LCS Biancor	SWW	8.0
LCS Colonia	HW	9.5
LCS Evina	HW	8.0
Lucin-CL	HW	9.0
Madsen	SWW	7.0
Madsen/Eltan	SWW	8.5
Manning	HW	8.5

Table 1. Ratings of winter wheat varieties following snow mold at the Tetonia Research and Extension Center, Tetonia, ID 2014 (J. Marshall).

Mary	SWW	8.5
Moreland	HW	10.0
Norwest 553	HW	6.0
Ottoa	SWW	9.0
Promontory	HW	9.5
Rosalyn	SWW	8.5
Skiles	SWW	5.0
Stephens	SWW	7.0
SY Ovation	SWW	8.0
SY 107	SWW	7.0
SY Clearstone CL2	HW	9.5
UI Silver (W)	HW	9.0
UI SRG	HW	9.0
UICF Brundage	SWW	7.0
UICF Grace	HW	8.0
Utah 100	HW	10.0
WB-Arrowhead	HW	8.0
WB-Arrowhead / Keldin	HW	7.0
WB-Junction	SWW	7.5
Weston	HW	7.5
Whetstone	HW	5.0
Yellowstone	HW	8.0

The plot was sown on 17 September 2013 using a head-row planter in plots 3' long. Each entry was replicated two times.

Survival ratings reflect percentage of the plot surviving and plant vigor, and ranges from 0 to 10, where 0 = no survival and 10 = 100% survival with vigorous plants.

methods to handle large numbers of plants. Scaling up and getting consistent results has proven more difficult than expected. The team continues to work diligently to find the right combination of factors for a successful growth chamber screening test.

Another indicator for plants with potential snow mold resistance is related to carbohydrate metabolism, in particular, fructans. Fructans are metabolized for energy to help plants survive under winter snow. Fructans accumulate in higher concentrations and remain higher in snow mold resistant varieties.

Dan Skinner and graduate student Erika Kruse are using new lab techniques to efficiently screen breeding populations for fructan levels, while studying carbohydrate metabolism in relation to cold-hardening. Kruse has planted several varieties in field plots this fall (2014) and is sampling at regular intervals to analyze plants for fructan composition. If fructans are found to be tightly linked with snow mold resistance, fructan levels may be an indirect selection method for snow mold resistant breeding lines.

Identifying Molecular Markers for Resistance Genes in Wheat

To speed-up the identification of molecular markers for snow mold resistance genes, a technique known as genotyping by sequencing is being explored. Every individual in a population of plants is sequenced and compared to each other using sophisticated software to identify differences at single points in the DNA. These differences are called single-nucleotide-polymorphism (SNP) molecular markers. SNP markers are more breeder-friendly compared to older molecular marker systems. They are more abundant than older markers, increasing the probability of finding useful molecular markers. The Finch x Eltan population has already been sequenced. Kruse will be sequencing the doubled-haploid populations of PI173438, later this year.

Molecular markers must be validated against known genotypes that are resistant and susceptible to snow mold, based on what is observed in field screening. The major hurdle to overcome is getting good data to identify the genotypes that express a snow mold resistant phenotype in the field. To do that the plants have to be challenged by snow mold and snow mold won't grow unless the right environmental conditions exist. Expanded field testing to four locations for crop year 2015, will hopefully, yield good field infection and good resistance scores in at least one location. Research will continue on growth chamber screening methods, too. The overall goal is accelerating development of snow mold resistant varieties having the new resistant genes from Japanese germplasm to help PNW producers reduce yield loss due to snow mold infection. ■



Tim Murray, PhD, Washington State University, Plant Pathologist, Team Lead



Juliet Marshall, PhD, University of Idaho Extension, Plant Pathologist



Dan Skinner, USDA-Agriculture Research Service, Plant Pathologist

resistance genes can be culled from the population saving valuable time and field resources.

The PNW research team is working to adapt growth chamber screening methods for snow mold resistance to overcome uncooperative weather in the PNW. Growth chamber space is limited and a large number of plants must be screened to find the few plants carrying the new snow mold resistance genes. Another

barrier is plants with these resistance genes have to be exposed to cold temperatures before the genes become activated. It was a significant breakthrough when the team identified the specific conditions required for "cold-hardening". The discovery made it feasible to screen wheat for snow mold resistance in growth chambers. The next challenge faced was to scale up the growth chamber screening



Idaho Barley Commission

Promoting Higher Water Use Efficiency in Idaho Malting Barley Production



*by Dr. Howard Neibling,
P.E., University of Idaho
Extension Water Management
Engineer*

WE are now being required to produce crops in a more efficient and “sustainable” manner.

This requirement is driven by a number of factors: large retail customers are demanding documentation of the “sustainability” of the food products they sell, a series of below-normal irrigation water supply years, a series of higher than normal crop water use years and increasing demand for limited water resources. Our water supply experiences of the past few years may be a preview of more serious conditions to come. Although the timing and severity of water supply reduction will vary with location, general trends indicate that future supplies will be limited to some degree. Therefore, adoption of changes in irrigation equipment design and management that conserve water while maintaining crop yield and quality will help minimize the long-term impact on irrigated agriculture.

Historically, the manner in which irrigation water was applied to fields was limited by equipment design and available technology. This resulted in irrigation that generally met crop need but had limited flexibility to address short term higher or lower than normal crop water need, creating conditions that favored disease development or periods of water stress. Current technology allows application of irrigation water to crops in a way that can give increased flexibility to meet environmental extremes while reducing the amount of water applied. Future technological advances will both

enhance this ability and make the technology more cost-effective.

The prime consideration in any proposed change in irrigation systems or management is that current crop yield, quality, and commodity profitability at a minimum be maintained, or ideally enhanced. This can be quantified for different alternatives by the use of a term “Water Use Efficiency”. This term is usually defined as the quantity of crop produced per unit irrigation water applied. As used here, this definition is modified as “the quantity of a crop of specified quality that can be profitably produced per unit applied water”. Moving irrigation system design and water management toward higher water use efficiency practices will help reduce power costs, improve crop uniformity and stretch our limited water supply.

Practices that are available for current adoption include:

- Programs to reduce water losses due to leaks and poor system maintenance
 - Equipment designs to minimize evaporation wind drift and runoff losses.
 - Design changes to assure capacity to deliver adequate water throughout the growing season
 - Improved irrigation scheduling methods to create and maintain optimum plant growth conditions with minimal water applied throughout the growing season.
- Emerging:
- Cost-effective equipment to measure and record the size and timing of individual irrigation events
 - Variable-rate irrigation technology to apply water to only productive portions of fields

Maintenance programs to reduce water losses

In a 2012 University of Idaho study of 30

wheel and hand lines (922 sprinkler heads), the average water loss due to mainline, lateral and sprinkler head leaks was 16% of system capacity, and the average loss due to worn or improperly-sized nozzles was another 13%. Combined losses of 29% represent non-productive water application that also provides local areas of chronically wet soil and foliage for disease initiation. Other costs due to these losses include higher pumping cost, lower system pressure and poorer water application uniformity. Typical payback period is 1-2 years. In many cases, electric utility or other agency cost share is available to help defray the cost of replacing or repairing worn or damaged components.

60% of the 30 center pivots measured had application uniformity lower than the industry standard for sprinkler package replacement. This poor uniformity creates local areas of excess water application (more disease-prone), inadequate application (water stress), and variable crop quality. Typical payback period is 1-2 years.

Equipment design to minimize evaporation, wind drift and runoff losses

In 2013 and 2014 joint University of Idaho/Washington State measurements funded by the Bonneville Power Administration, sprinkler package designs which apply water near or in the crop canopy delivered almost twice the water to the soil surface on hot, windy days when the sprinklers were in the crop canopy (Figure 1). Seasonal water savings were 20-30% relative to the existing sprinkler packages (typically rotator, wobbler etc. mounted about 5-7 feet above the ground). Additional benefits may include reduced lodging and the ability to keep developing grain heads drier and therefore minimize head disease conditions. Although this approach of mounting sprinkler heads

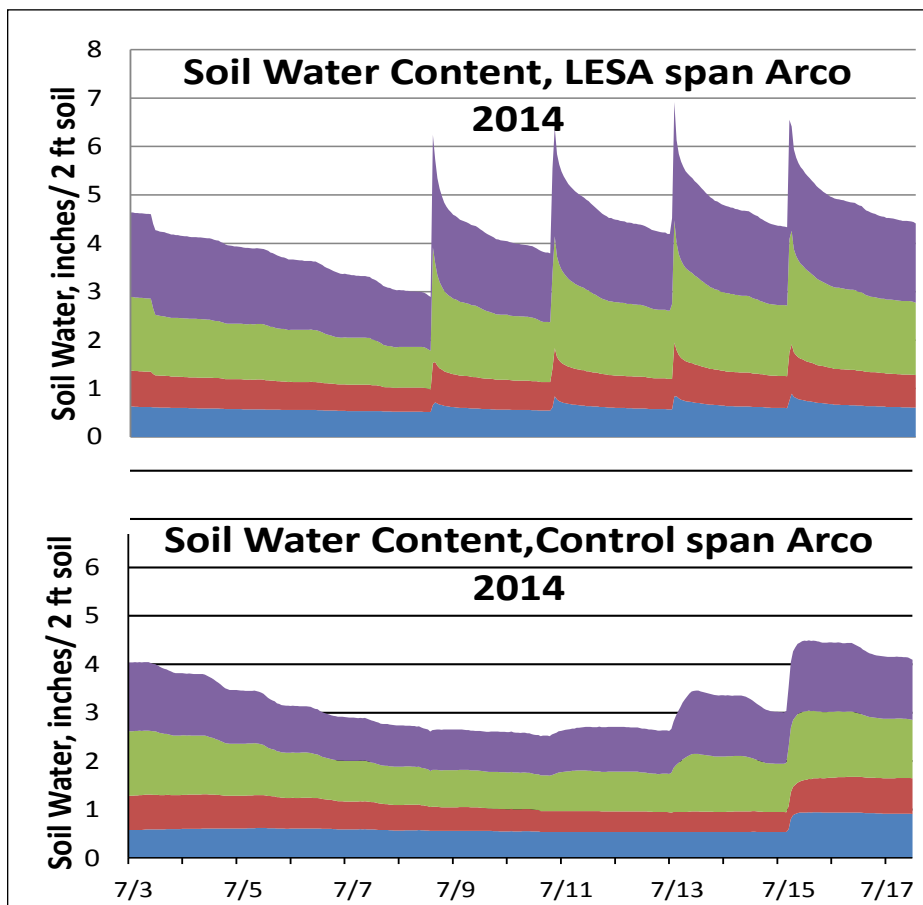


Figure 1. Measured change in soil moisture in spring wheat under the LESA pivot span (top) and existing span (bottom) for the 7/3 to 7/17/14 period at Arco, Idaho. Purple is water in the 0-6 inch depth, green, 6-12", red, 12-18", and blue, 18-24". Note the lack of re-wetting response under the existing span for the 2 mid-week irrigations and the difference in total water in the soil between the 2 spans when water applied was the same.

about 1 ft above the ground saved considerable water, it is most effectively used on sandy or other high-infiltration soils where surface runoff is not an issue. Extreme care must be taken if this approach is used on silt loam or other low-infiltration soils, or on fields with slopes in excess of about 1%. Additional testing is underway this year to determine the soil and slope limits for use of this practice. Application efficiency (water pumped that gets into the soil) is currently estimated at 90-92%. This compares to 60-70% for hand and wheel lines and 80-85% for traditional low pressure center pivots.

Subsurface drip irrigation (SDI) has been effectively used in some regions of the US for over 20 years to grow a number of crops with less water. Surface drip irrigation has been effectively used in Western Idaho for a number of years to grow onions and other high value crops. Although the application efficiency (95%) is the highest of any irrigation system, it is currently the highest - cost alternative and has some additional problems such as rodent damage that can

be overcome if water supply becomes sufficiently limited.

Equipment design to assure capacity to deliver adequate water throughout the growing season

Historically, center pivots were designed to deliver about 80% of the peak water use, with the balance coming from stored soil water. This minimized pump and mainline cost but reduced flexibility to meet periods of abnormally high water use or to meet normal mid-season water use without excess irrigation before mid-season to fill the crop root zone. Unfortunately, the period when excess water could be applied coincided with the crop stages in small grains where a dry canopy and soil surface helped reduce disease pressure. Additionally, crop water use in a number of recent years has been well above the long-term average. An increased design application rate would allow more flexibility in meeting crop demand without increasing disease pressure.

Variable-rate irrigation technologies are currently available but limited in field-scale usage. This equipment has the potential to improve product uniformity by custom-applying water to various soil conditions, and to adequately irrigate a field with reduced total water applied by not irrigating areas such as rock piles or other non-productive areas. Technology is rapidly changing in this area which should improve its cost effectiveness.

Improved irrigation scheduling methods

All irrigation scheduling methods seek to determine when and how much water should be added to meet crop need without incurring water and nutrient losses to deep percolation. New sensor / data logger and computer-based technologies allow near real-time evaluation of irrigation needs from the convenience of the irrigator computer or smart phone. This convenience helps overcome the barriers to adoption of these methods. In a 2014 side-by-side comparison of barley fields scheduled by sensor / computer methods and traditional farmer irrigation (funded by Anheuser-Busch), water savings averaged about 16%, with savings ranging from a low of 9% to a high of 23%. Sensor-based and computer based schedules agreed in all cases tested. An additional aspect of irrigation scheduling is the scheduling of the last irrigation. Based on 2000-2003 work funded by Coors, typically, 1-2 pivot irrigations can be saved when water is cut off with a full root zone at soft dough (one irrigation after soft dough on shallow or low-water holding soils). This work is currently being updated by funding support from MillerCoors LLC. Equipment being tested this year (work funded by Anheuser-Busch) will automatically integrate the date and amount of irrigation into computer-based scheduling methods and also provide a grower record for required "sustainability" records.

New computer scheduling software will be helpful in refining irrigation cutoff. A free computer-based method has been developed by WSU and jointly tested with WSU and UI. You Tube videos to assist with scheduler signup and initial field setup are available at <http://www.uidaho.edu/extension/drought/irrigationscheduler-mobile-how-to-videos>. If you have difficulty accessing the videos, contact Howard Neibling at hneiblin@uidaho.edu for a copy. ■

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