

JUNE 2019

# OREGON WHEAT

*An Official Publication of the Oregon Wheat Industry*

8

Does Wheat Cause Disease and Obesity?

13

General Considerations for Growing Malting Barley in Oregon

20

U.S. Wheat Farmers See Opportunity for Growth in Southeast Asia Markets



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**Cover:**  
*Up close and personal in June  
Wheat by Karissa Griggs*





Alan von Borstel  
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## Plenty to Keep us Busy

I just came in from a good day spraying my winter wheat. It is a really nice change from the past several years of drought to have to watch out for the wet spots. I haven't gotten stuck yet but have left some tracks in a few spots. I remember several years ago when the wind would not cooperate during the day so I started spraying at night. I climbed up the backside of a terrace to see nothing but ducks in my headlights. If it wasn't for the ducks I would have drove right into a terrace full of water. No, I did not turn into a duck fan. GO BEAVS!

I am not going to dive into the details of our April Legislative trip to Salem. I know Blake will be covering it in his column and there is no point depressing folks multiple times in the same issue. I would however like to thank all of the OWGL members that took the time to come to Salem and help lobby on the behalf of Oregon's wheat growers. It certainly feels like we are banging our heads against a rock at times, but I do know that those visits make a difference and we had some successes along the way. Thank you all for your time and effort, it is appreciated.

While we were in Salem, Bev Clarno, an Eastern Oregon farmer and former Sherman County resident was sworn in as Secretary of State. I and several other OWGL members took the opportunity to visit Bev in her office and congratulate her on her most recent accomplishment. Way to go Bev!

We also met with Caroline Lobdell and Tate Justesen from the Western Resources Legal Center (WRLC) located on the Lewis and Clark University campus in Portland. The mission of the WRLC is to provide skills and training for law students seeking careers representing farmers, ranchers, timber companies, water users, mining companies, oil and gas interests, and other businesses that provide the natural resources and productive land uses on which modern life depends. Their goal is to expose law students to, and stimulate their interest in, advocating for natural resource industries and landowners. WRLC seeks legal issues that allow students to build practical skills and learn environmental and natural resources law while advocating for natural resource entities. Persons or businesses interested in benefiting from WRLC's legal services are welcome to submit an application for consideration. This seems like a very



worthy endeavor and I encourage you to check them out on their website, [www.wrlegal.org](http://www.wrlegal.org).

In-between our visits to Washington, DC and Salem, the executive team made a trip to Orlando, Florida for the National Association of Wheat Growers (NAWG) annual meeting. At this meeting, OWGL Past President Brent Cheyne from Klamath Falls and Nicole Berg from Paterson, Washington were sworn in as Secretary and Treasurer of NAWG, respectively. Good job PNW.

In mid-March, along with my wife Judy and my son Nick, I had the opportunity to meet with Matt Lohr, Chief of NRCS, Ron Alvarado, NRCS Oregon State Conservationist, Dan Esposito, District Conservationist for Wasco County, and Josh Thompson, Conservation Planner for Wheeler Soil and Water Conservation District. We discussed a broad range of topics including: Rural broadband internet access, rural fire protection districts, Oregon Wheat Growers League, Transition Incentives Program (TIP), implementation of the Conservation Stewardship Program (CSP) and Environmental Quality Incentives Program (EQIP) in the new farm bill, CSP and EQIP enhancements, CSP and converting to no-till farming, RMA crop insurance coverage with cover crops, nesting restrictions and grazing CRP, foreign exports of soft white wheat and the importance of trade agreements, survival of the family farms, invasive weeds on public lands and concerns with cultural resources. This was a very productive meeting and I want to thank Jay Gibbs, John Day/Umatilla and Snake Rivers NRCS Team Leader in Heppner for arranging this meeting.

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After the NAWG meeting in Orlando, Judy and I took in the Commodity Classic Ag Show and visited SeaWorld and Disney World. I found it interesting how Disney disguised the long lines to the rides. At first glance it didn't seem too long of a line to get into the ride. But after working your way through the entrance you soon realized that you still had to zig zag your way through another room before getting to the ride. Once

you got to the new entrance, you realized once again, that you just entered another area of a long zig zagging line. This would go on many more times until finally reaching the front of the line. Does this remind you of anything? Think about the trade negotiations. We have to get these deals done and ratified by Congress. It could easily be argued that the lack of trade deals with Japan, Mexico and China are costing us upwards of a dollar per bushel. GET 'ER DONE!



## Wheat Growers do Salem (aka - Fires and Neonics and Cap & Trade, Oh My....)

### Blake Rowe, CEO, Oregon Wheat



Wheat growers from across Oregon joined with staff and our lobby team in Salem on April 2nd and 3rd for a League Board of Directors meeting, a reception for Legislators, and our "Wheat Day at the Capitol" event. We had an excellent couple of

days, sharing the concerns of wheat growers on major issues, like wildfires, pesticides, carbon cap and trade, paid family leave, and taxes, with key legislators and agency representatives.

We owe a huge collective thank you to the growers, who took the time to travel to Salem, study the issues, and engage and educate State Legislators on our concerns. The group included Alan von Borstel, Clint Carlson, Brent Cheyne, Ben Maney, Tom Duyck, Erin Heideman, Josh Duling, Ryan Thompson, Collin Crocker, Kevin Corn, Darren Padget, Logan Padget, Eric Orem, Brent Martin, Rodney Cheyne, and Jenny Freeborn. There is simply no substitute for looking a legislator in the eye and calmly explaining to them how an issue or bill impacts your family or your farm. Even when we don't persuade them to our position, they don't forget what matters to us.

We kicked off our time in Salem with a full-day League Board of Directors meeting. In addition to the standard administrative details like approving minutes of past meetings, a financial report (OWGL continues



to be in solid financial condition, on-budget, with solid reserves), and a legislative report from Amanda Dalton, we spent a major part of our time continuing to work on wildfire control and fire training issues. Senator Hansell joined us to report on his efforts to allow growers to deduct the crop value lost to wildfire and not covered by insurance, from a growers State taxable income (SB 784) and to provide some liability protection to people who volunteer to help fight wildfires, often the first responders in rural Oregon (SB 290).

Following Senator Hansell, we met again with leaders from OR-OSHA, to continue our discussions about what training should be provided to farm employees who may become involved in fighting wildfires. They indicated that they are moving towards the idea that there is a gap between the training requirements for structural fire fighters and the training given to full-time wildland firefighters. They are looking for a level of training appropriate for farm employees where firefighting might be part of an employee's duties, but it isn't the primary focus of their job. This approach may dovetail with a legislative effort by Rep. Findley to develop a shorter program

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# SAVE the DATE

## JUNE 2019

**JUNE 10, 2019** OWGL Board Meeting,  
Pendleton Convention Center

**JUNE 10, 2019** OSU – Hermiston– Irrigated  
Wheat Field Day, HAREC

**JUNE 11, 2019** OSU – Pendleton – CBARC  
Field Day

**JUNE 12, 2019** OSU – Moro – CBARC  
Field Day

**JUNE 10-13, 2019** USW – Whitefish, MT –  
Summer Board Mtg.

**JUNE 20, 2019** OSU – Morrow County  
Crop Tour

### - Continued from page 4

for rural fire districts in very sparsely populated areas where it is difficult to find enough volunteers willing to commit the time for the full firefighting training program. The Board was encouraged by this concept and agreed to continue to work with OR-OSHA as they develop the approach.

Our last meeting on the fire issues was with representatives of SAIF to discuss their interest in, and possible support for, developing training materials for farm employees who may be called upon to fight fires as part of their job duties. This discussion was good, but we concluded that this was an area SAIF was not interested in pursuing.

After the Board meeting, we moved quickly into the evening's legislative reception. Over the course of two-plus hours, our growers and staff were able to engage with more than 15 legislators (hard to get an exact count as folks move in and out through the evening). Topics ranged from legislative issues to how wheat is grown, markets and trade, conservation, the new Farm Bill, century farms, sustainability, and many other issues.

Wednesday found the growers and staff split into three teams to meet with fifteen key legislators, six senators and nine representatives, including several Committee Chairs and Vice-Chairs, legislators who represented key swing votes on committees or issues, and new legislators who needed to hear more about the importance and concerns of Oregon's wheat growers. Priority issues for our visits included the importance of neonicotinoids as a wheat seed treatment, problems with possible cap and trade legislation, and concerns about maintaining our competitiveness in world wheat markets.

Finally, the League hosted a cake reception in the Capitol Galleria through the lunch hour, passing out over 300 pieces of cake to Legislators, staff, and visitors, along with a chance to meet a grower and pick-up some general information about Oregon



Wheat. Many compliments and happy faces from the crowd who enjoyed a slice on us.

Oregon Wheat Day at the Capitol was a productive day filled with effective lobby visits, good public relations and continued education efforts. Thanks again to the growers who gave so graciously of the time to attend, to Sally Christensen and Shanna Hamilton for all the planning and support to make the event successful, and to Amanda Dalton and the Dalton Advocacy staff for representing us so effectively in Salem.







# Gluten

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# Does Wheat Cause Disease and Obesity?

**Dr. Friedrich Longin, State Plant Breeding Institute, University of Hohenheim**

**Nutrition.** A flood of currently published books claims wheat is bad for health. But too often the respective authors ignore or misinterpret the cereal's scientifically proven benefits: an approach that does more harm to humans who really suffer from wheat-caused diseases.

Bestsellers such as *Wheat Belly* or *The Grain Brain* set out to convince readers that eating wheat products is really bad. According to them, the grain makes you fat, age faster, be prone to dementia, diabetes and numerous other diseases. Their sole solution? To renounce wheat in the diet completely. Many consumers take this advice seriously with millions now following the no-wheat trend – above all in the USA and Australia, but also in Europe.

## “Gluten free” is a huge trend

Nowadays, more and more people ask just how harmful wheat really is. After all, some of these books are written by doctors. The fact is that over 90% of humans profit from a diet containing a reasonable proportion of wheat wholemeal. This is confirmed in independent results from a very wide range of nutritional research organizations.

Large-scale human trials also confirm that people consuming enough wholemeal cereal products (e.g. around two slices of bread daily) have much less risk of diabetes, cardiovascular diseases, respiratory illnesses and similar ailments.

## What makes wheat so valuable

- natural fibre
- minerals (e.g. selenium, zinc)
- essential amino acids
- vitamins

## Basic foodstuff wheat

Globally, we realize there's a big challenge ahead: a growing population must be fed from a decreasing area of farmland. Wheat joins rice and maize as the world's most-grown crops. And there's good reason for this because wheat's cultivation requires relatively little water with approx. 900 L (litre) needed per kilogram grain produced. Compare this with the average 5000 L needed for a kilo of cheese. And even that's nothing compared to the 20,000 L required for 1 kg of coffee beans. On top of this, wheat grain is comparatively easy to store.



And the staple food bread can be simply created from just wheat flour and water.

## Only very few suffer from wheat-linked diseases

There are three scientifically-recognised diseases that can be caused through dietary wheat:

### 1. Celiac disease

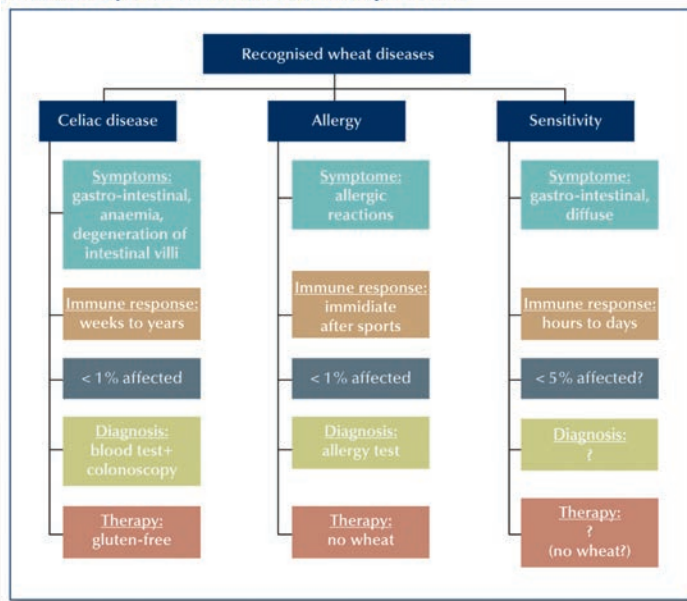
Best known is the possible reaction to gluten, an important component of wheat grain. There's no doubt that gluten influences incidence of celiac disease which is an inherited autoimmune disorder that leads to a chronic condition of the small intestine. This features lifelong oversensitivity to gluten and is present in approx. 0.5 to 1% of the population. Classic symptoms are gastro-intestinal problems, deficiency symptoms and tiredness. Mostly, the diagnosis is obvious. Where specialised blood tests prove positive, a colonoscopy follows. Patients with celiac disease have a greatly reduced number of, and less characteristically formed, intestinal villi. This leads to the symptoms. If the diagnosis is clearly celiac disease there is only one therapy – a lifelong gluten-free diet which, in effect, means less than 20 mg gluten may be consumed daily. This amount represents a cubic cm of bread. Scientists are currently testing whether oats might cause celiac disease. So far, the answer tends to be “no.” However, patients should wait a little longer for definite results in this case.

### 2. Wheat allergy

Here there are two different characteristic forms. But typical allergy symptoms through to anaphylactic shock are attributable to both. For some, wheat allergy



## Diseases proven to be caused by wheat



emerges only in association with sport activities. The wheat allergy is caused by different wheat proteins. However, less than 1% of the population are affected in this way. Classical allergy tests are available, and therapy is straightforward: a lifetime avoiding allergy, e.g. diets with no wheat content.

### 3. Wheat sensitivity

Symptoms of wheat sensitivity are very diffuse: from gastro-intestinal problems over simply feeling unwell, through to tiredness and other signs. Companies that produce products with spelt flour are also often involved in these discussions because, repeatedly, customers that report problems following consumption of wheat products claim these are less marked when spelt is used instead of wheat. So far, it hasn't been clarified exactly what is responsible for the sensitivity. There is therefore naturally no clear diagnosis technique. The classical approach starts with exclusion of food allergies, celiac disease and irritable colon syndrome. Then, it is tested if a wheat-free diet under medical supervision effectively reduces the symptoms. The lack of diagnostic techniques means that it's difficult to arrive at precise figures for this disease. Expert estimates run between 0.5 and 8% of the population. Neither is there clarity regarding therapy. Alone a reduction in wheat consumption appears to be effective. But does this apply only to soft wheat? Again, the picture is unclear.

#### Possible causes of wheat sensitivity:

- Amylase-Trypsin Inhibitors (ATI)

Science investigates several hypotheses on cause of wheat sensitivity. One is that Amylase-Trypsin Inhibitors (ATI) could be triggers for this sensitivity. ATI are proteins naturally occurring in wheat and other raw materials. They are

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believed to intensify already present inflammatory diseases, while having no effect where people are in good health. Apparently, there could be a genetic predisposition here. Only a small percentage of the population is affected. But findings so far are based only on trial results from cell cultures and animal experiments. Studies with humans are still ongoing. First claims that newer soft wheats contain more ATI than old wheat types such as einkorn, are scientifically unsupportable. In fact, there exist varietal differences in soft wheat ATI content that are caused by genetic influence, but also strongly influenced by the growing environment. The environmental effect is not surprising because, after all, ATI are wheat grain proteins and it is well known that protein content is very dependent on cultivation locality, plant variety and fertilizer application.

#### - FODMAPs: what are they?

One hypothesis is that wheat sensitivity is based on a group of difficult-to-digest carbohydrates and polyvalent alcohols, the so-called FODMAPs (Fermentable Oligo, Di- and Mono-saccharides And Polyols). This group is present in numerous food materials, including wheat. The FODMAP content is especially high, however, in onions, beans and cabbage. In wheat, the most important FODMAPs are fructan and raffinose. These can be produced through the incomplete degradation of starch to glucose. Hereby, it should be emphasized that fructan is often described as positive, being trigger of the so-called prebiotic effect, often advertised for yoghurts, etc. Apparently, however, a small percentage of the population has a problem with digesting these FODMAPs. FODMAPs are partly absorbed in the small intestine, the remainder moving into the large intestine where fermentation takes place through the resident bacteria population. Where grain products are consumed, this process often produces flatulence and other gastro-intestinal problems. But scientific evidence that FODMAPs trigger wheat sensitivity is completely missing so far. However, it does appear that irritated bowel syndrome patients suffer a worsening of their condition through the presence of FODMAPs. It is estimated that up to 15% of the population have an irritated bowel problem, whereby most show symptoms, although no definite diagnosis results.

#### - Where are FODMAPs to be found?

First precise investigations indicate differences in FODMAP content of whole meal flour from einkorn, durum, spelt and wheat. Einkorn appears to have the most FODMAPs, closely followed by wheat, spelt and durum. Emmer, in particular, has a statistically demonstrable smaller FODMAP content than wheat.

However, the manner of dough and bread preparation has a far greater influence on FODMAP content in the end product. Traditional longer periods of kneading and addition of

yeast or sourdough lead to almost complete breakdown of FODMAPs. Nowadays, though, many bakeries

wheat produce their breads in the shortest possible time, and without sourdough. Such modern baking techniques could also be a ground for the higher proportion of people with wheat sensitivity. When in doubt, it therefore pays to ask a baker how long his or her dough is left to rise before it is baked. The longer the rising period, the less the content of FODMAPs and acrylamide with therefore more room for positive contents. Also, an ever-increasing number of additives is involved, including pure gluten. Especially for whole meal bread, where encouraging rising can be problematical, the baker will add highly purified gluten from wheat. For all these reasons, research into the area of wheat sensitivity is urgently required.



### Limited real knowledge about wheat

The authors of *The Grain Brain* & Co make as good as no reference to the above diseases. Instead, the books concern themselves with numerous generalizations on obesity, diabetes and further diseases whereby hard facts are either minimal or completely missing.

#### A non-wheat diet alone won't make you slimmer

The correlation "eat lots of wheat = become very fat" is wrong. In countries with the greatest consumption of wheat, Kazakhstan, Algeria and Iran, the proportion of population medically seen as obese is substantially smaller than in the USA or EU, where very much less wheat is eaten.

While wheat can certainly make the consumer fat, this is only in the way that all types of food can lead to overweight when more is consumed than required by the body. Reducing obesity by foregoing wheat in the diet, as reported by the bestseller authors, can be simply due to the reduced intake of carbohydrates, which is in fact a central component of almost all dieting ("low carb"), usually coupled to recommended increases in sport activities, and has, therefore, nothing directly to do with wheat.



### Does wheat breeding produce harmful substances?

Another claim is that plant breeding encourages content of toxic materials in wheat. There's no argument that plant breeding is behind many changes. Even the very first crop growers improved plants through selection. Modern wheat varieties are a good deal more resistant to disease and deliver increased yields under continuously changing climatic conditions. But new protein cannot be created by breeding. Instead, conventional breeding tries only to unite, through natural crossing and selection, positive characteristics from different lines into a new variety. It should also be pointed out here that worldwide there's not a single genetically modified wheat variety in commercial production. Also, the gluten content of modern wheat varieties is less than that of older varieties and of "ancient wheats" such as einkorn or emmer.

### Wheat has existed almost as long as humanity

It is often heard that in their evolution humans haven't had time to adapt themselves and their digestion to cope with wheat, and that, this is why people may become ill. This is completely wrong: wheat has been a central source of carbohydrate in our diets since the Neolithic revolution more than 11,000 years ago. And humans consumed wild wheats long before even then. Grain plant types were widespread in the savannahs of the fertile "half-moon" region, the cradle of agriculture and human civilisation. Talking of adaptation, we humans have been confronted with consumption of milk and dairy products over a substantially shorter period. And still very much shorter in evolutionary terms are adjustment times for tropical fruits or technically modified food such as fat or sugar reduced products.

### Science supports wheat

The authors of *Wheat Belly* & Co. mix snippets of fact with their own interpretations and, often wrong, causal associations. Additionally, clear scientific information goes unmentioned or is wrongly interpreted. A serious problem with this populist demonising of wheat is that it particularly damages the case for people who really are suffering from wheat-caused diseases. The approach taken by the bestsellers means those affected have less chance of being taken seriously in their daily life by society, medicine and gastronomy. The situation also leads to a surfeit of anxiety among many consumers about food in general and wheat products in particular. Happily, very few people suffer from any of the three scientifically-recognised wheat diseases and thus most can eat foods based on wheat with no worries. In fact, where wholemeal is used for the products, they are doing something positive for their health.



## FIVE FACTS ON GLUTEN

### Gluten is.....

a mix of proteins. It is present in all wheats, i.e. also in spelt, durum, emmer, einkorn and khorasan as well as the wheat brands Kamut and 2ab wheat. In a somewhat modified form, gluten is also found in rye, barley and oats.

### Gluten is good for...

airy, fluffy, bakery products and al dente pasta. When water is added to flour the gluten creates a fine network during mixing. In this network starch grains are held so that they can combine with water. When dough "rises" (yeast or sourdough fermentation) this gluten-starch network also helps hold the air in the bakery product which in turn gives a loose and moist crumb. The baking quality of a flour is dependent on the amount and the composition of the gluten.

### Gluten is in...

lots of products. For instance, beer, soya sauce, some confectionary, frozen convenience meals, soup concentrate and sauce cubes, some cold meats and sausages, and cosmetics too. Thus, doing without gluten is not at all easy.

### Wheat needs gluten because...

it confers a whole range of product quality advantages for baking and pastries.

For the wheat grain itself, gluten mainly acts as a store for nitrogen compounds required during germination/sprouting.

### Without gluten, slimming would ...

be in fact more difficult. That a gluten-free diet helps in slimming is a further factually inaccurate claim. On the contrary, patients with celiac disease actually gain weight when switched to gluten-free products. This is because they are able once again to digest and metabolise all the nutrients from their diets. In fact, everyone would tend to gain weight if on a gluten-free diet, although for a completely different reason: gluten-free bakery products have usually higher fat and sugar contents and lower fibre to help compensate for the missing gluten.

# Twenty-Eight Years of Success-the Sherman Station Endowment

**Wally Powell, Chair, Oregon Wheat Commission**



## Van

Each column is, a story; and as the story develops, another story or two will come back into focus. Care should be taken for fear of disappearing into the past, forgetting to complete the original thought. Not that this is known to happen.

So, while this column is related to Van Rietmann introducing me to the Sherman Station grower liaison committee; this column really shouldn't be a dive into Van buying a fifteen-foot JD 750 drill, then deciding he and I would spring seed something like fifteen hundred acres before the end of April. That was a great story, as are many involving Van, but that is not this story.



**Endowment Donor Board**

I began attending liaison meetings with Van in the mid-1990's, and I thank Van for the introduction. I thank Ernie Moore, and his family, for their contributions to the Sherman Station as well. Ernie and I will agree and disagree on politics; but we share the same intent when working to serve the Sherman Station. The same would apply to Chris Kaseberg, Tom McCoy, and all the others. The area served by the Sherman Station is fortunate to have these people.

## Sherman Station Endowment

As it turned out, there was a sub-committee within the committee at Sherman Station focused on management of the Sherman Station Endowment. Over the years, growers had contributed financial resources to the Endowment with contributions varying in size dependent on resource capacity of the individual. I believe John Logan from Gilliam County



provided in excess of \$200,000 through his will. Mid-Columbia Producers and Morrow County Grain Growers supported

the Endowment at initiation, each contributing \$20,000. Many may remember the board attached to the old building at the Station showing the various contributions and the levels of contribution.

## Station Funding

There are many differing funding streams that come together in support of Sherman and Pendleton Stations:

- The taxpayer, through the Oregon State Legislature, contributes funding to Oregon State University (OSU); with some of those funds flowing to CBARC.
- Research staff spend a significant amount of time chasing grant funding to cover part of their salary, and other overhead requirements.
- Growers are assessed .05 per wheat bushel grown; with some of these funds flowing to CBARC research programs.
- Growers contribute to either the Sherman, or Pendleton Station Endowment; with those funds being used to support purchase of needed equipment and buildings.

All the funding streams are vital to the long-term health of research focused on wheat production; but the stream I admire the most is the Endowment. The endowments are not the most significant in terms of funds allocated yearly, but these are funds freely given by growers. These are gifts dedicated to advancing research on the Columbia Plateau.

## Some facts:

- The Sherman Endowment is the largest of the endowments held for the various stations across the state. The Sherman Endowment fund currently is slightly in excess of \$1,000,000.





- The Sherman Endowment has now contributed in excess of \$400,000 to the Sherman Station. 28 years since founding-\$400,000

- Gifts are not

spent. Gifts are invested, then the return on the gifts is dedicated to supporting infrastructure on the station; whether that be buildings or equipment, new or repaired.

- While OSU can propose an expenditure, only the grower committee can dispose.
- Funding decisions are in the hands of the grower committee.

- Over the recent past, the Sherman Endowment has supported repair on a drill, purchase of a new tractor, and enclosure of a building in order have an all-weather shop. Call me for the full list, it is amazing. Or better, call Ernie, he has been there from the beginning.

This all started, according to Ernie, with a premise put forth by Jack Hay from Wasco County. How many of the original committee imagined the success that would flow from Jack's idea (besides Jack)?

So, that is a very short story on an Endowment long on success. I couldn't be prouder of the wheat growers involved in the effort. As we begin a funding drive for the Endowment at Pendleton Station; we should take heart from the Sherman experience. Money will flow, a little here, and a little there, then one day, the treasurer says, "there is \$1,000,000 in the investment pool, and we have contributed \$400,000 to Pendleton Station". Wow.



## General Considerations for Growing Malting Barley in Oregon

**Dr. Patrick Hayes, Professor, Dept. of Crop and Soil Science, Oregon State University**



*Overview of barley and malting barley:*

Currently, 70% of the barley grown in the US is used as malt in beer, 22% for feed, 3% for food, 3% as malt for whiskey, and the remaining 2% for seed. During the malting and brewing process, the barley kernel provides protein, starch, and enzymes to help break down the starch into fermentable sugars. Any barley can be malted, but

the malting and subsequent brewing processes are most efficient and productive when the barley meets a set of specific quality parameters. In order to meet these quality parameters, barley varieties are rigorously

tested for their malting quality in a multi-year testing program across a range of geographic and environmental conditions. In addition to variety evaluation conducted at research institutions, most malting-specific barley varieties undergo testing and approval by the American Malting Barley Association (AMBA). AMBA approval ensures a variety will likely meet industry-standard malting specifications and has advantages for obtaining crop insurance. However, varieties without AMBA approval

can and have been grown and malted successfully.

When considering growing barley for malting, producers should contact the intended maltster and determine what variety(ies) the maltster is interested in receiving. At present there is not a vigorous open market for malting barley as most is grown under contract. Those maltsters interested in working directly with a producer, after specifying the variety, will most likely specify maximum protein and skinned/broken kernels as well as minimum kernel plumpness and germination values for the raw grain. Growing a desired variety to specified quality parameters may be economically rewarding for the producer. In general, malting barley fetches a premium compared to feed barley, though direct price comparisons of malting barley to feed barley are not readily made due to the limited market for the latter.

*Barley production in Oregon:*

Oregon barley is grown on 30,000 - 35,000 acres, producing around 2.3 million bushels of barley valued at roughly 6 million dollars. The principal barley producing districts in Oregon are the South East, primarily the Klamath Basin, (38%), North Central (35%) and North East (23%). Oregon barley production peaked in 1957, at over 600,000 acres. Principal causes of the decline in Oregon are (1) the limited market for malting barley due to infrastructure and supply-chain considerations, 2) low prices for feed barley, and (3) the popularity of

- Continued on page 14



**Investigator:** Dr. Patrick Hayes. Professor. Dept. of Crop and Soil Science, Oregon State University

**2018-2019 Grant Title:** Oregon Barley Variety Development and Deployment

**2018-2019 Grant Funding Level:** \$35,000

**Grant Summary:** We continued development and statewide testing of malting, feed, and food varieties with an emphasis on facultative and winter growth habit malting types. We released the winter 2-row malting variety Thunder; there is contracted production in Oregon (2019 crop). We continued our program of strategic variety testing in representative Oregon environments. Typically, these are yield trial plots on Experiment Stations; however, on-farm small-plot tests are used when possible or necessary – for example at the Kevin Melville farm near Enterprise (2018 harvest). We are expanding our focus on on-farm strip plots of available or near-available varieties in order to generate sufficient grain for product assessment and to generate data under grower-relevant production scales – for example at the Bates Ranch near Condon, in partnership with the Western Rivers Conservancy. In that project, we tested five varieties in ~ three-acre strips embedded within a ~ 500 acre field of Wintmalt. Grain from the test strips was malted at OSU and will be used for research brewing and sensory analysis at OSU. We initiated transfer of imidazolinone herbicide-tolerance from the WSU variety “Survivor” to Oregon-adapted varieties. We anticipate producing 350 doubled haploids from two crosses. Seed of the herbicide-tolerant doubled haploids will be increased in New Zealand in preparation for multi-location testing in Oregon in 2020. We leveraged funding from the USDA competitive grants program to develop multi-use naked varieties for organic systems. The OSU variety Buck is in on-farm trials and seed increase, as are the OSU germplasms #STRKR and BBB528. In the following article, we feature our malting barley related research with excerpts from our recent OSU Extension Service Bulletin *Growing Malting Barley in and Around the Willamette Valley* by Betsy Verhoeven, Scott Fisk, Ryan Graebner, Laura Helgersen, Brigid Meints, and Pat Hayes EM9233. Please access the complete bulletin: <https://catalog.extension.oregonstate.edu/em9233>.

#### - Continued from page 13

imidazolinone herbicide-resistant crops. Currently, about 10% of Oregon barley is used for malting, most of which comes from the Klamath Basin. Aside from a small amount of seed production, the remaining barley acreage in Oregon is sold for feed. This is often a break-even or money-losing proposition but fills an essential rotation slot for growers. This rotational advantage, however, cannot be exploited if there are imidazolinone herbicide residues in the soil.

#### *Oregon craft brewing and malting:*

According to the Brewers Association, over a million barrels of craft beer were produced in Oregon in 2017. Data are not available on how much of the malt in these craft beverages is made from Oregon-grown barley, and this traceability doesn’t often appear on product labels. However, the largest regional supplier of malt – Great Western Malting Co. – has a “Pure Oregon Malt”, suggesting that the “grown and made in Oregon” branding concept is of importance to some users. Geographic provenance is more easily tracked by craft maltsters, but their current production is limited. Patterns of malting barley production are functions of climate, soil, competing crops, demand, and the infrastructure for grain storage and shipping. The largest buyer and processor of malting barley in the Pacific Northwest (Great Western Malting Co.) is located across the Columbia River in Vancouver, Washington. While Great Western Malting presents a large-volume marketing opportunity, historically their needs have been for significant acreage in any production region, rail delivery to the Vancouver plant, and local storage until the grain is needed. Currently, the Klamath Basin of Southern Oregon/Northern California is the only region in Oregon that has consistently met these requirements. However, the Grande Ronde Valley recently emerged as a malting barley production area for Great Western. Therefore, interested growers are encouraged to contact Great Western Malting regarding contract opportunities.

The emergence of a craft malting industry has generated new opportunities for malting barley production in the state. Mecca Grade Estate Malt (Madras, OR) and Gold Rush Malt (Baker City, OR) represent budding malting operations. Mecca Grade is self-sufficient in barley, while Gold Rush contracts for barley in the local vicinity (NE Oregon). Outside of Oregon, Skagit Valley Malting (Burlington, WA), LINC Malt (Spokane, WA), and Mainstem Malt (Walla Walla, WA) may be able to accommodate custom malting. The capacity of these operations and whether they purchase the grain, distribute and sell or



simply malt it, varies. Interested growers should contact malting operations to determine contract specifics prior to planting malting barley. Growers are also encouraged to make every effort to develop a local option for the sale of feed barley in case malting quality parameters are not met. It is possible situations arise where grain quality is compromised such as late season precipitation causing in-field sprouting, soil fertility variability causing excessive protein levels or drought conditions resulting in thin grains. Local grain elevators may not take feed barley, thus partnering with local livestock or dairy operations, or shipping feed barley to eastern Oregon or California by rail/truck may be the best options.

There are opportunities for developing new malting enterprises in Oregon, given the large number of craft brewers and distillers throughout the state and the capacity to meet these needs with local production. However, the investment required to start a malting facility is substantial, and the return on that investment needs to be carefully considered. Key considerations will be the malt batch size, grain storage, and the malting system. Those interested in investing in a malting system are encouraged to participate in a malting short-course, such as the Malt Academy offered by the Canadian Malting Barley Technical Center and the Advanced Craft Malting Course offered by Hartwick College.



## Longtime Friend of Oregon Wheat Passes.



William "Bill" Leroy Hulse of The Dalles, Ore., and long-time resident of Dufur, Ore., passed away of natural causes on March 11, 2019. Bill was born in Moro, Ore., on August 4, 1920 and started his wheat and cattle ranching career as a youth on Tygh Ridge. By the time of his first marriage Bill owned his first piece of property.

He eventually owned several pieces of land throughout northern Wasco County where he and his family lived just west of Dufur.

Bill believed not only in running a solid business to support his wife and family, but also in contributing to his community. Many young people learned the value of hard work and how to love the farming life on his ranch.

Bill took on many challenging jobs in the community in addition to his position as Judge with the Wasco County Court during the climax of the notorious commune known as Rajneeshpuram. Bill was actively involved on the school board, the fair board, the board of his beloved Dufur Christian Church, and the Oregon Wheat Grower's League. Bill served as League President in 1968, sat on the Oregon Wheat Commission from 1970 to 1980 and served as Commission Chair from 1974 to 1976. He was also a key part of the creation of US Wheat Associates in January of 1980, serving as the organization's first Vice-Chairman. He took over as Chairman in 1981 and helped them through a difficult period after the USW President resigned in August of that year. The USW Board named Bill as the Interim President and he stayed in Washington, D.C. for several months until a search for a new executive was completed.

Getting involved with the Oregon Wheat industry was natural for Bill. As with many of the visionary and dedicated Oregon Wheat leaders of the past, today's growers owe him a debt of gratitude for his years of service.

A longtime friend, John McManigal shared this memory with us;

*"Sometime back in either the late 70's or early 80's, he came to a local Wheat League meeting. The price of wheat had cratered, and Bill was back from a recent trip to Washington D.C. with both state & national wheat industry leaders. He told us a story about meeting with some USDA officials. When the subject of the terrible prices came up, one of the USDA people exclaimed that he didn't see what the problem was; he suggested that wheat farmers should just raise their asking price. He was serious, and the industry group looked at each other in disbelief. Being the excellent story teller that he was, he had the room in The Dalles laughing.*

*When you die at 98, there aren't many left who remember your accomplishments. I know the Oregon wheat industry benefited in many ways from Bill's long service.*

*Bill was a great friend & neighbor. He will be missed."*



# First Leaf Emergence Force of Three Deep-Planted Varieties of Winter Wheat

L.K. Lutcher, S.B. Wuest, and T.R. Johlke

Farmers sometimes plant deep to reach moisture adequate for germination and emergence. The coleoptile of deep-planted wheat remains underground. The first leaf protrudes through the tip of the coleoptile and usually emerges 10 to 12 days after planting. Emergence may be jeopardized by below-surface buckling of the first leaf. Buckling usually occurs at multiple locations along the longitudinal axis of the first leaf and is often referred to as the “accordion effect.” Buckling occurs when its exerted force cannot overcome the density or strength of overlying soil. It is an especially frustrating problem when rainfall occurs after planting and before emergence—a situation that frequently results in formation of an impenetrable soil-surface-crust.



**Stand establishment is a function of the force exerted by emerging seedlings. This report contains information about a preliminary project that quantified the first leaf emergence force of deep-planted winter wheat.**

## Methods

### Research Location, Germplasm, and Seed Selection

This project was conducted in a laboratory at the Soil and Water Conservation Research Unit (USDA-ARS) located 5 miles south of Adams, Oregon.

Varieties were selected because they are genetically diverse and part of a valuable germplasm resource for Pacific Northwest wheat breeders. They used to be grown in some parts of eastern Oregon but are no longer popular. Two of them are still used in the Horse Heaven Hills area of south-central Washington. Please keep in mind that this work is preliminary in nature and is intended to provide basic information to those who may be interested in

### Stature, height, and coleoptile length of varieties used in the emergence force experiment.

Variety	Stature	Plant Height (cm)	Coleoptile Length (mm)
Farnum	Standard-Height	88	93
Finley	Standard-Height	90	75
Norwest 553	Semi-dwarf	72	53

*Plant height and coleoptile length are traits influenced by genetic make-up and environmental factors.*

developing new lines of hard red **and** soft white wheat—varieties that can emerge from a deep planting depth and under unusually tough conditions.

Ninety-six seeds of each variety were weighed individually. Seeds of near-average weight were used for research described in this report.

### Planting Containers, Seedzone Details, and Emergence Force Data

A generic, thin-walled plastic bag was compressed into the bottom of a planting cone to plug drainage holes. A 4-inch layer of moist soil was placed on top of the plastic and packed, using a wooden dowel, to a bulk density that was approximately equal to that created by a rod-weeder. A single wheat seed was pressed, crease-side-down, into the moist soil. One inch of moist soil was



**Accordion effect on the first leaf of a wheat seedling that failed to emerge from a deep planting depth during a year when seedzone moisture was limited.**



**Before buckling emergence force and diameter measurements near the base, in the middle, and below the tip of the coleoptile of Farnum, Finley, and Norwest 553.**

Variety	Emergence Force (psi)	Coleoptile diameter (mm)		
		Base	Middle	Tip
Farnum	61.9 a	1.5 a	1.4 a	1.2 a
Finley	65.9 ab	1.5 a	1.5 b	1.3 ab
Norwest 553	69.3 b	1.6 b	1.7 c	1.4 b

*Numbers followed by the same letter, within columns, are statistically similar. (For example, Farnum's Emergence Force of 61.9 is statistically similar to Finley's 65.9 (both noted with the "a"), but Farnum's 61.9 isn't statistically similar to Norwest 553's 69.3).*

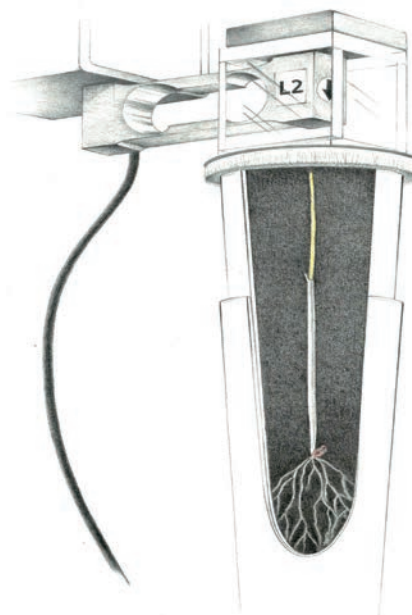
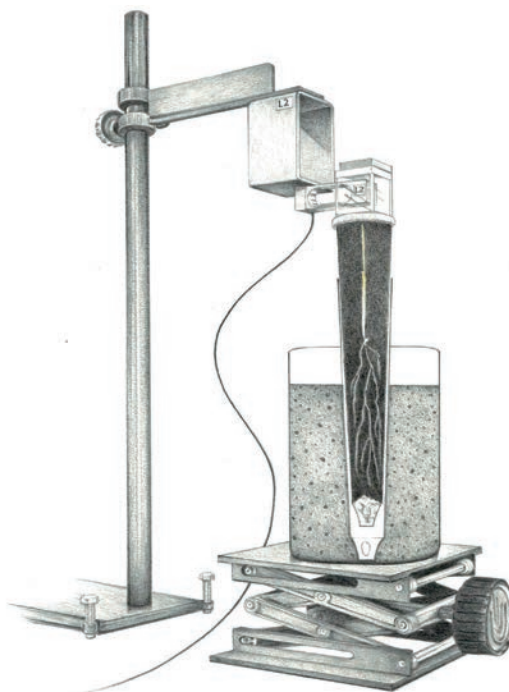
placed on top of the seed followed by another 3 inches of sieved and air-dried soil.

Each planting cone containing soil and seed was inserted into another (empty) cone held upright in the center of a bucket filled with sand. Each bucket was raised from the laboratory bench, using a scissor jack, until the soil surface at the lip of the planting cone was almost in contact with a rough, circular pad glued to the bottom of a small open-ended plexiglass box. The plexiglass box was used to connect the rough-surface-pad to a small load cell. The load cell was made stationary by attachment to a piece of aluminum tubing connected to a 1-inch diameter steel rod welded to a heavy duty wrought iron base plate. The weight of the plexiglass box and rough-surface-pad was the baseline load cell reading. The baseline reading was reduced by an amount equal to the upward force of the emerging first leaf.

### Results

The average, maximum emergence force (just before buckling) of semi-dwarf Norwest 553 was either equal to or greater than taller (standard-height) varieties used in this experiment. This outcome is interesting because Norwest 553 has a shortened coleoptile. Its length is significantly less than that of Farnum and Finley. The consequence of a shortened coleoptile is the need for an increased distance of elongation of the first leaf. It seems reasonable to assume Norwest 553 would emerge with less force because its longer below-surface first leaf might be more susceptible to buckling. Our data contradict this assumption. Can this be right? Did we do something wrong?

Emergence is affected by coleoptile length. There is no question about that. Wheat breeders use a coleoptile length screening protocol to evaluate



**Load cell configuration and bench-top method used to collect data from the emergence force experiment. Illustrations by Hiroko Cannon of Pendleton, Oregon.**

experimental lines that may be good choices for farmers who plant deep. There is a limit to what can be accomplished from this kind of protocol, however, as coleoptile length is only one small piece of the

**- Continued on page 18**

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puzzle. Good quality, “top-notch” research shows that coleoptile length accounts for only 28% of the variation in emergence from deep planting depths. What are those other important factors or mechanisms? **Nobody knows.** We wonder if the diameter of the coleoptile might be one of those unknown factors. We didn’t have the time or resources to figure that all out—not this time, but we did learn there are differences among the varieties used in this experiment. Take a look at the numbers in the second table. What do you think? Maybe this is something worth looking into. Is it possible that the greater-than-average diameter of the Norwest 553 coleoptile provided added support or stability to its emerging first leaf?

## Concluding Remarks

Visual, in-the-field emergence ratings in previous certified seed buying guides from Washington State University and the Washington State Crop Improvement Association are “high” for Finley and “moderate” for Farnum and Norwest 553. Discrepancy between our maximum force data and the emergence rating for Norwest 553 may be attributed to differences in the speed of emergence. This possible explanation is consistent with observations of “slower” but “reasonable” emergence by farmers who have experimented with deep planting of this particular variety.

**Norwest 553 does not tolerate the cold, and it is not a recommended variety.** Its genetic attributes are valuable though, and it is a good one to consider when making crosses for new and improved kinds of wheat.

This report is a synopsis of a more extensive article recently published in volume 59 of the Crop Science journal. This project was supported by Morrow County and Morrow County wheat producers. Thanks for reading. Don’t hesitate to contact Larry Lutchter or Stewart Wuest if you have comments or questions or if you believe follow-up field testing is worthwhile.



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# Oregon Growers Among Winners for 2018 Wheat Yield Contest

The National Wheat Foundation's (NWF) National Wheat Yield Contest offers growers the opportunity to compete with farmers from across the U.S. and improve their production practices through new and innovative techniques. In November, NWF announced the national winners for the 2018 National Wheat Yield Contest.

Two Oregon wheat growers took national awards, including Larry Carroll, first place in the spring wheat irrigated category and Lawrence Pedro, third place in the winter wheat irrigated category.

"A special congratulations to Phillip Gross (WA) for being the high yield winner for the third year in a row," stated Foundation Board President Wayne Hurst. "Phillip's entry topped the 200 bushels per acre level for the first time ever in the contest. It's great to see growers who have entered and won in previous years continue to take part in the contest. We also welcomed several new applicants this year, many of whom won."

The contest recognizes winners in two primary competition categories: winter wheat and spring wheat, and two subcategories: dryland and irrigated. In 2018, contest entrants were required to submit a 2.5 lbs sample of their grain for quality testing and only wheat graded #1 or #2 was eligible for an award.

"NWF would like to thank each grower for enrolling in the National Wheat Yield Contest and thank our sponsors for helping to make the contest available to wheat growers in the U.S. We received a record-breaking 318 total entries this year and hope that this number will continue to grow," Hurst said.

Official rules and entry details for the 2019 contest are available at [www.yieldcontest.wheatfoundation.org](http://www.yieldcontest.wheatfoundation.org)



## The Objectives for Wheat Yield Contest Have Evolved

**1)** Improve the overall quality & marketability of the US crop

Educate & communicate to growers' importance of quality in marketing wheat **(2)**

**3)** Develop best management practices to achieve yield and quality

Quality measurement to be simple and quick **(4)**

**5)** Quality measurement should be consistent across regions

## Congratulations to the Oregon Winners!

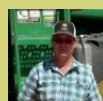
### Spring Wheat Irrigated 1st place



**Larry Carroll, Holzapfel Ranch**  
Hermiston, OR  
(Morrow County average 31 bu/ac)

- Yield: 158.93 bu/ac
- Above Cty Avg: 412.68%
- Water: 20 inches - sprinkler
- Variety: WestBred Espresso (HRS)
- Seed Treatment: CHS Dryland Blend
- Quality: 1DNS, 64.2 Test Wt; 14.8 Protein; 397 Falling Number
- Seed Dealer: Bryan Allstott

### Winter Wheat Irrigated 3rd place



**Lawrence Pedro (Kathy)**  
Hermiston, OR  
(Umatilla County average 59 bu/ac)

- Yield: 194.41 bu/ac
- Above Cty Avg: 229.51%
- Water: 18 inches - sprinkler
- Variety: WestBred WB4303 (HRW)
- Seed Treatment: Cruiser Maxx Vibrance
- Nitrogen: 300 lbs. • Sulfur: 50 lbs.
- Quality: 1HRW, 61.7# Test Wt; 12.1% Protein; 293 Falling Number

# U.S. Wheat Farmers See Opportunity for Growth in Southeast Asia Markets

## Catherine Miller, USW Programs and Planning Coordinator

Every year, U.S. Wheat Associates (USW) invites farmers (selected by state wheat commissions) to participate in a “Board Team” trip overseas to follow their wheat and learn from customers about the quality characteristics needed in those markets. In February the first USW Board Team of 2019 traveled to Southeast Asia—one of the largest and fastest growing wheat import regions. Stops in the Republic of the Philippines, Singapore and Indonesia gave the team the opportunity to visit important markets and learn more about how wheat-based products are re-shaping consumer demand.

The 2019 USW Southeast Asia Board Team included Joe Anderson of Lewiston, Idaho, representing the Idaho Wheat Commission; Wally Powell of Condon, Ore., representing the Oregon Wheat Commission; Philip Volk, of York, N.D., representing the North Dakota Wheat Commission; and team leader Catherine Miller, USW Program and Planning Coordinator.

In Manila, Republic of the Philippines, the team met with traders, millers and bakers. Each meeting focused on the importance of high-quality wheat to create high quality end-products. The team visited a flour mill, as well as an industrial cracker facility. The team found a common theme that consumers here are looking for more convenience and shifting from traditionally rice-based staple foods to more wheat and grain-based meals. This is a huge market driver for a variety of cookies, crackers and bread products.



***In the Philippines, the team enjoyed a meeting and tour with Wellington Flour Mills. They were joined by company President Ty Weevens (center, front row), whose grandparents originally start the family-owned mill, along with a few cousins who are also a part of the mill's operations.***



***Lunch with grain traders in the Philippines.***

“One of our lunches with USW staff and four different mills was one of the highlights,” said Powell. “It was so beneficial to spend that time with them and share a meal.”

One of the highlights in Manila was attending the 10th International Exhibition on Bakery, Confectionery and Foodservice Equipment and Supplies, known as “Bakery Fair 2019,” hosted by the Filipino-Chinese Bakery Association Inc. While visiting different exhibits, labeling on some of the flour bags stood out to Anderson: “They said ‘Certified U.S. Wheat.’ That shows the success USW has had building a preference for our wheat, and I’m proud of that.”

In Singapore, the team members next visited a bakery training and supply company. They also had briefings from USW/Singapore regional staff member, who demonstrated how producer-funded USW activities are carried out in the region and how USW works together with local USDA Foreign Agricultural Service (FAS) staff to represent U.S. farmers.

Next, the team traveled to Jakarta, Indonesia, where they met with the largest flour mill in the world, as well as three competing milling companies. The contrast in bakeries between the Philippines and Indonesia, where small-medium end-user enterprises (SME’s) dominate 67 percent the market, was quite clear.

“This was one of the biggest surprises for me, especially since these SME’s sometimes only use one 25 kilogram bag of flour per day,” said Anderson.

The team toured three of those bakeries in Jakarta. SME’s vary from home-based bakeries to medium



scale businesses with a store front. The at-home bakeries were truly unique, and the importance of these niche producers really resonated with the group.

In such a rapidly growing wheat foods market, there are fears that “Indonesia will run out of milling capacity within the next few years if markets keep growing at the present pace,” according to one milling executive. One reason: the cost of production is a limiting factor; logistics alone make up 10 percent of variable costs.

At another flour mill, the group learned more about current market trends. In Indonesia, about 50 percent of flour in the market goes to instant noodle production. Currently, noodle production is met largely with flour from Australian white wheat. However, the team was told there is at least a window of opportunity for U.S. hard red winter wheat, especially given the recent production challenges that have significantly bumped up Australian wheat import prices.

“It was clear that the uncertainty of low margins and where the price of wheat will be next year was an overall concern for all markets” said Volk. “This just proves that overall U.S. wheat quality needs to be consistent from year to year.”

## Conservation Farmer of the Year Leaves a Legacy



Charles “Chuck” Alfred Nelson, farmer, husband and grandfather, was called home on April 17, 2019. He was born August 8th, 1950 to the proud parents of Norman and Jean (McElhinny) Nelson. Knowing how to make an entrance, he was one of the first babies born in the newly built Pioneer Memorial Hospital in Heppner, Oregon.

Being ever-present in the community, Chuck was an active member of the local 4-H chapter, Lexington Grange, and the United Church of Christ (Ione Community Church).

He was an unforgettable friend within his small close-knit class of 12. After graduating from Ione High School in 1968, Chuck pursued higher education at Oregon State University. While in college he continued his passion for community involvement. In the spring of 1972, Chuck graduated college with a B.A. in agronomical crop science and began his next adventure.

Following his tour in the Army after college, Chuck returned to Morrow County to join the family farm with his father on property outside of Lexington and Ione. Chuck married the love of his life, Ann Lisa Maness, in the Ione United Church of Christ on June 19, 1976.

While running the farm, Chuck worked extensively with the Oregon Wheat Growers League. He served on the board of directors for six years as the Morrow County Wheat President. With his leadership and incredible insight, Chuck served on various committees including the Federal Programs and Marketing Committee and was the Oregon Grains Commission Chair for numerous years.

His beloved family shared that one of his proudest moments was winning the Conservation Farm of the Year, awarded in 1992. This soil conservation program was promoted by OWGL for decades, with the support of the local wheat grower’s organization and Oregon State University Extension Service in each County. Many state and local businesses and citizens volunteered time and donated to the success of the program.

The passing of our fellow wheat growers and former leaders is never easy, but we know our industry was made better by having Chuck on our team.



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**JULIE NELSON**

Born: Moscow, Idaho

College: University of Idaho

The Oregon Wheat Commission welcomes new Administrative Assistant, Julie Nelson! As Administrative Assistant, Julie will be working with local elevators to maintain assessment records, make meeting and travel arrangements and help with the day to day operations of the Commission.



Julie comes to OWC from years of experience at various organizations including: Office Manager at a Yacht Club, Assistant Project Manager for an identity protection agency, Office Manager at a Consumer Electronics Standards Organization, and Office Coordinator at a Dutch startup firm selling Class 3b lasers for the agricultural industry.

Julie is married to her Viking hero, Joel, who stands 6'9" and looks much like "The Mountain" in Game of Thrones. They have two wonderful adult children. Joshua is the eldest and lives with them, he has Asperger's, which is the high functioning end of the autism spectrum. Four years ago, he graced the family with a beloved grandson Sebastian, who is also autistic. Their daughter, Heather, is just a couple years younger and lives in Spokane where she is a firefighter.

Joel is a retired Master Control Operator for the Fox Network in Portland. While they enjoy living in the city, they take every chance available to head to the mountains for camping. One of their favorite spots is up on Mt Hood (out of cell phone range; have tent will travel!)

Please help us welcome Julie to the team!



June National Soul Food & Dairy Month this delicious recipe checks both of those boxes!

## Chicken-Broccoli Mac & Cheese with Bacon

<https://www.myrecipes.com/recipe/chicken-broccoli-mac-cheese>

Recipe by Cooking Light

**\*Pro Tip:** A little bit of turmeric enhances the color here; it's a bit of a trick that makes you perceive the sauce as cheesier than it actually is.



- 6 ounces uncooked large or regular elbow macaroni
- 3 cups prechopped broccoli florets
- 3 bacon slices, coarsely chopped
- 12 ounces skinless, boneless chicken breasts, cut into 1/2-inch pieces
- 1 teaspoon kosher salt, divided
- 1 tablespoon minced fresh garlic
- 1/8 teaspoon ground turmeric
- 1 1/4 cups 1% low-fat milk
- 1 cup unsalted chicken stock (such as Swanson)
- 1/4 cup plus 1 teaspoon all-purpose flour
- 5 ounces sharp cheddar cheese, shredded (about 1 1/4 cups)

### How to Make It

**Step 1:** Preheat broiler to high.

**Step 2:** Cook pasta according to package directions, omitting salt and fat. Add broccoli to pan during last 2 minutes of cooking. Drain.

**Step 3:** While pasta cooks, place bacon in a large ovenproof skillet over medium-high heat; cook 4 minutes or until browned, stirring occasionally. Remove bacon from pan with a slotted spoon; reserve 1 1/2 teaspoons drippings in pan. Sprinkle chicken with 1/4 teaspoon salt. Add chicken to drippings in pan; cook 4 minutes. Sprinkle with garlic; cook 2 minutes, stirring occasionally. Sprinkle with turmeric; cook 30 seconds, stirring frequently.

**Step 4:** Combine remaining 3/4 teaspoon salt, milk, stock, and flour, stirring with a whisk. Add milk mixture to pan; bring to a boil, stirring frequently. Cook 2 minutes or until thickened. Add pasta mixture and 2 ounces cheese; toss to coat. Sprinkle with remaining 3 ounces cheese and bacon. Broil 2 minutes or until cheese melts and just begins to brown.





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IT IS WET, AND IT IS MUDDY.  
SLUGS ARE IN THE FIELD.  
GAME ON.**

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**Because you can't sit on the sidelines.**

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# ALBAUGH CUSTOMIZED SEED TREATMENT TECHNOLOGY

Seed treatment performance and coverage brought to you by Albaugh  
Customized seed treatment solutions based on your needs  
and micro-climate brought to you by your Seed Retailer.



## Albaugh is Delivering Value Through:

1. **Innovation:** Addressing current and future critical gaps by crop segment through enhancements to current inventions
  - BIOs<sup>TM</sup> Insecticide 100 providing New and Novel Wireworm Solutions
  - CoAXium<sup>TM</sup> Wheat Production System driven by Aggressor<sup>TM</sup> herbicide
  - Customized seed treatment offers
  - Collaboration that delivered an enhanced chickpea seed treatment offer for growers
2. **Performance:** Delivering products today that address customer & market needs proven performance against competitive seed treatment offers
3. **Value:** Delivering robust customized seed treatment offers based on proven performance



Refer to the product label for complete use directions and instructions. BIOs<sup>®</sup> and Resonate<sup>®</sup> are trademarks of Albaugh, LLC.  
Always use and follow label directions. EPA Reg. No. 84059-14-42750 AD No. 100616, EPA Reg. No. 42750-133 AD No. 110316