



KENTUCKY
Small Grain
GROWERS' ASSOCIATION

2012

Annual Research Report





KySGGA
P.O. Box 90
Eastwood, KY 40018
1-800-326-0906
www.kysmallgrains.org

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Laura Knoth

Communications Director
Jennifer Elwell

Programs Director
Adam Andrews

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Wheat is Making Strides in Kentucky

Don Halcomb
Chairman, Kentucky Small Grain Promotion Council

When thinking about the primary crops grown in Kentucky, wheat probably doesn't make many people's lists. But it should. Wheat production is seven times greater than what it was 50 years ago. This tremendous growth is primarily due to the collaboration between farmers, the University of Kentucky's research and extension team, private crop consultants, and end-users.

For nearly 20 years, our farmer-led Promotion Council has dedicated \$1.8 million of checkoff toward wheat and small grains research. UK's Wheat Science Group has worked to develop varieties that perform well under Kentucky conditions, and agronomic practices continue to be fine-tuned for the highest profitability. Much of our research centered on intensive management and no-till practices for many years, and now we are looking at technology and methods that may be considered beyond standard thinking: the effects of climate change, optical sensor technologies for nutrient management, and exploring land hedging to protect against dramatic price fluctuations, to name a few.

Sharing results with growers has always been a primary objective of our association. All of the research project results can be found in this report and on our website, www.kysmallgrains.org. Growers may also attend the KySGGA-sponsored Continuing Education Series events hosted by the University of Kentucky in January and May. Both continue to bring in record crowds.

We have also worked to have our Kentucky-bred varieties released to farmers for their use. The second line of Pembroke seed is being increased this year and may be available for release in 2013. Farmers may save, sell and reproduce it for future sale, which is a direct result of farmers' checkoff investments.

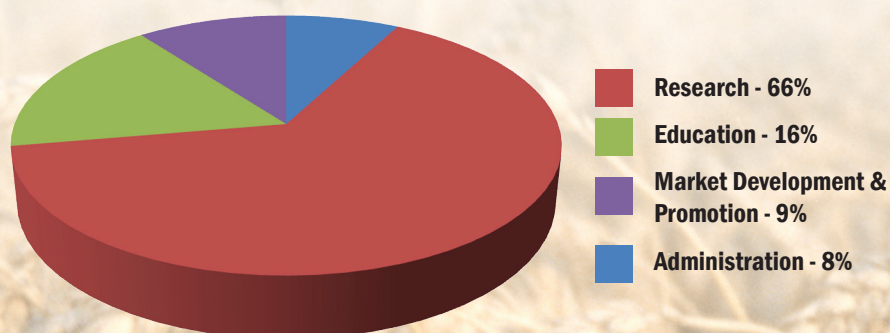
While 2012 was not a record production year, it will bring record cash receipts to the Commonwealth. This year's crop of 29.8 million bushels is valued at well over \$200 million. And we will continue to invest the growing checkoff contributions toward beneficial research, education and market development, to see Kentucky's wheat industry and opportunities for farmers grow.

Annual Financial Report

From June 1, 2011 to May 31, 2012
Reviewed by Jones, Nale & Mattingly, PLC

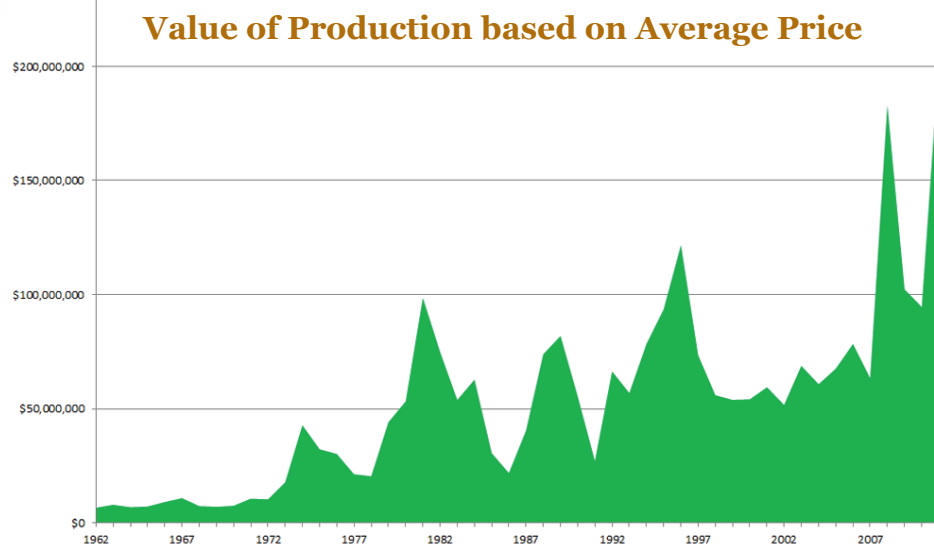
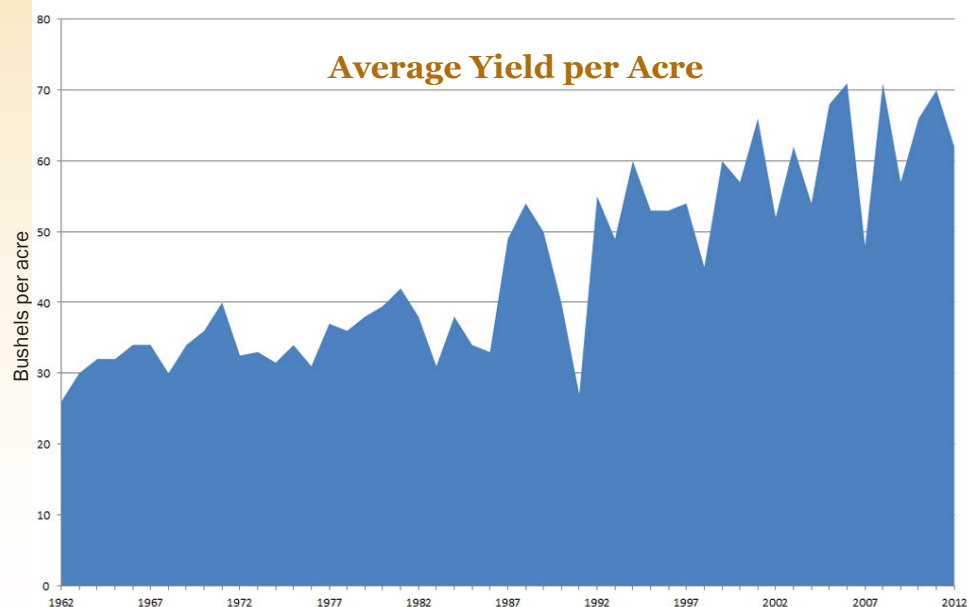
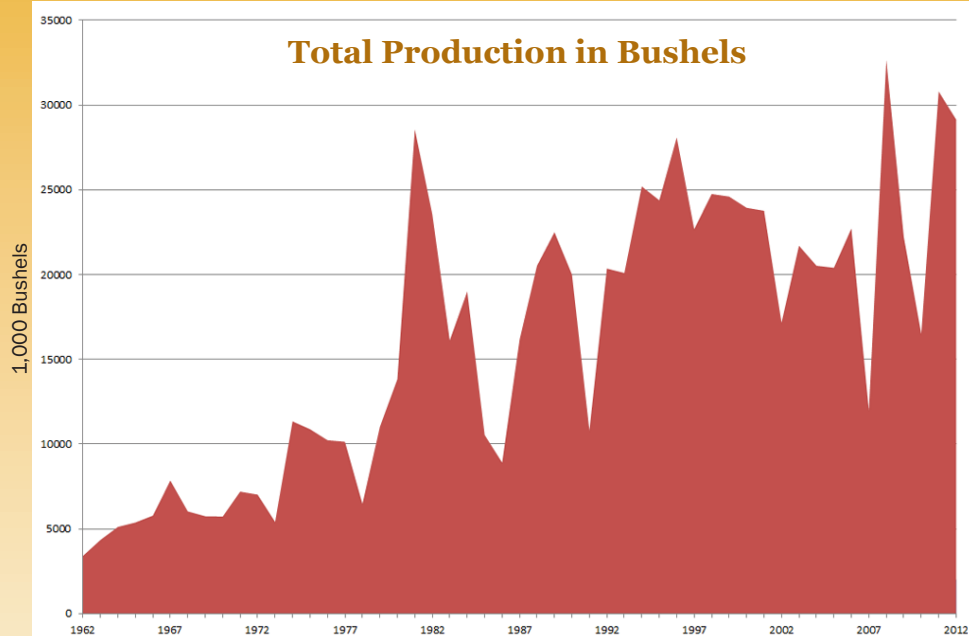
REVENUE		EXPENSES	
Checkoff Assessments	\$503,637	Market development	\$29,103
Producer refunds	\$20,846	Research	\$206,418
Net Checkoff Income	\$482,791	Education	\$49,502
Interest Income	\$954	Administration	\$25,996
Total Revenue	\$483,745	Total Expenses	\$311,019

Distribution of Expenses



Kentucky Wheat Production (1962 - 2012)

Source: USDA-NASS



Kentucky COMMODITY CONFERENCE

Friday, January 18, 2013
Holiday Inn University Plaza,
Bowling Green, KY

Agenda (all times CDT)

- 9 a.m. Registration
Trade Show Open
- 10:00 Marketing Session
- 12:00 Luncheon and Entertainment
- 2:00 Ky Soybean Association
Annual Meeting
- 3:00 Ky Corn Growers Association
Annual Meeting
- 4:00 Ky Small Grain Growers
Association Annual Meeting
- 6:00 Reception
- 6:30 Awards Banquet

Additional details and registration
information are available at
www.kysmallgrains.org.



UK Winter Wheat Meeting
January 8, 2013
Bruce Convention Center
Hopkinsville, KY

UK Wheat Field Day
May 14, 2013
UK Research & Education Center
Princeton, KY



Research REPORT

The Kentucky Small Grain Growers Association dedicates the largest portion of its budget to small grain research that may help increase grower success and profitability. The following report lists projects that are complete or continuing. Data and more in-depth results can be found at www.kysmallgrains.org.

Soft Red Winter Wheat Breeding and Variety Development

By David Van Sanford, University of Kentucky

The goal of the University of Kentucky wheat breeding program is to increase profitability of Kentucky's wheat production by developing and releasing improved wheat varieties with high yields and test weights, enhanced scab resistance and overall disease resistance, increased lodging resistance and increased profitability. Significant progress towards these goals requires long term, sustained effort and commitment. To date, more than \$750,000 has been directed to Van Sanford's wheat breeding research. This is an ongoing project.

2012 Results

Crossing: In greenhouse crossing this year we made a total of 480 successful crosses in which at least one parent had scab resistance. Sixty three-way F1's were sent to Idaho in April to plant a fast track increase that saves one year in development time. In the spring crossing cycle, we made 245 successful single cross F1's in which both parents had high yield and test weight with some level of scab resistance.

Field plots and headrows: Our plot total exceeded 13,000 for the first time ever in 2012. Plots and headrows were grown at four locations as shown on the map that follows. Virtually all of our headrows were grown at Princeton where we had good yields and high quality seed.

Line development: Approximately 1300 F5 headrows were selected at Princeton, heads were cut and brought back to Lexington for threshing. Selection was based on height, maturity, and leaf disease symptoms. Progeny from these rows will be tested in unreplicated Preliminary Trials in 2013. 1300 lines is a significant increase from previous years.

Yield testing: In the 2012 10 breeding lines were entered in the state variety trial. The line furthest along in development and increase, KY03C-1237-32, was hit hard by spring freeze and a type of seed disease, common bunt, that was not controlled by the seed treatment. Three lines, KY03C-1237-39, KY03C-1237-11, and KY03C-1002-02 performed reasonably well in the test. Due to extensive freeze damage at Schochoh, none of our yield trials including the variety trial were harvested at that location.

Purification and Increase: Breeder seed increases of three KY lines were grown this year at Lexington. We have approximately 25 bu. each of KY03C-1237-39 and KY03C-1002-02. Both of these lines did well in the variety trial; KY03C-1237-39 will be increased this fall. About 550



New combine: The generous support of the KySGGA made it possible for us to purchase a new Wintersteiger plot combine which increased the efficiency of our program tremendously.

bu. of seed of KY03C-1237-32 were increased in cooperation with Pat Clements and Bernard Peterson. This increase was inspected by Kenny Hunter of KSIA and passed inspection at the Foundation seed level. This line will be increased for possible release in 2013.

Scab screening: Scab screening in the irrigated, inoculated Lexington nursery was very effective this year. Data from this nursery in combination with the data from our greenhouse screen has allowed us to identify a number of resistant lines with good yield and test weight potential. The non-irrigated fungicide x variety trials at both Princeton and Lexington were too dry for scab to develop, so we did not get good data from these tests.

Breeding Line Increase - 2012

Line Seed Available	
KY03C-1237-32	550 bu.
KY03C-1237-39	25 bu.
KY03C-1002-02	25 bu.
KY03C-1237-11	1.5 bu.

Additional data can be found at www.kysmallgrains.org.



Making Greenseeker Work in Kentucky

The Greenseeker is a real-time, on-the-go sensor/applicator that senses the health of the wheat crop at the time nitrogen is applied and then simultaneously adds the precise amount of nitrogen that is determined to be needed by the machine. The sensing and application technology part of the machine has been very accurate and reliable.

The weak part of the process has been the algorithm (formula) that is placed in the software of the machine to tell it how much nitrogen to add based on the plant health Normalized Difference Vegetation Index (NDVI) readings.

Basic field research conducted by Murdock and his team has resulted in reliable algorithms for use on field application in Kentucky.

A detailed summary of this research can be found on the KySGGA web site.

Improving Nitrogen Application Technology Under Kentucky Conditions

By Lloyd Murdock, University of Kentucky

The objective of this experiment is to determine if the algorithms for variable rate nitrogen applications found from small plot research in Kentucky will result in improved nitrogen applications and yield when plant sensors are used on a commercial applicator in a large wheat field.

Three-Year Summary

This is the third year the VRN technology using the Greenseeker has been scientifically tested on a field basis. The results have been positive for VRN in every field.

When wheat was planted after corn over the 3 yields in 4 comparisons, the average yield increase was about 3.5 bu./A with an increase in N rate of about 18 lb./A of N. This resulted in a **\$15/A return to the technology**.

When wheat was planted after soybean over the 4 fields and only one year the yield increases were about 18 bu./A with an increase of about 24 lb./A N. This resulted in a **\$95/A return to the technology**.

Conclusion

1. The NDVI readings provided by the Greenseeker will represent the N status of the wheat crop at Feekes 6.

2. The Kentucky algorithm accurately recommends the additional N needed at Feekes 6.

3. The recommendations made by this Greenseeker/Kentucky algorithm are more consistently accurate than experienced agronomists using present scientific knowledge.

4. The N applied in the wheat field using the Greenseeker/Kentucky technology is better distributed within the field according to need.

Thanks

Special thanks to Hunt Farms, Walnut Grove Farm, Seven Springs Farm and Phillip Needham for allowing us (UK) to be a part of these trials and to the Kentucky Small Grain Growers Association.

PEMBROKE

Certified Seed, No Strings Attached

Pembroke Varieties are developed by UK Wheat Science Group and released by KySGGA. Farmers, not KySGGA, profit from the release. Royalties go to UK to improve wheat technology. Buyers fully own the technology. Once you buy the certified seed, you own it - ALL OF IT. No strings attached.



KENTUCKY
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UK Ag
RESEARCH



SAVE IT

RESELL IT

REPRODUCE IT



Crop sensor identifies soil spatial variability and indicates where in the field how much fertilizer is needed

By Ole Wendroth, University of Kentucky

During this past year of ongoing winter wheat research at Hillview Farms (Trevor Gilkey) in Princeton, KY, we continued our on-farm studies on improving the application of nitrogen fertilizer using crop sensors. These crop sensors do something similar to what the human eyeball does, but the sensors can do it much more precisely: With our naked eye we can see during early spring where in the field the wheat shows a lighter green and where the green color is darker. In very simple terms, the lighter the green of the wheat crop is, the more nitrogen needs to be applied because of a deficiency situation.

Why isn't the color of the green everywhere the same in the field if it has been fertilized with the same rate of nitrogen everywhere in the field in the previous year?

Soils store a tremendous amount of nitrogen which is not readily available for plant uptake but is stable as part of the huge organic pool in soils. Every year, the microbes in the soil mineralize a small amount of this nitrogen to make it available to plants. The mineralized rate is different because of spatial differences in the growing conditions. Microbes like warm temperatures and moist conditions. They are not productive under dry conditions, and they do not like excessive moisture because that means air deficiency. Farmers know that soil type and water dynamics, especially at the end of winter, are different over the same field. Therefore, even though fields are managed uniformly, the nitrogen and crop growth dynamics can be different in different parts of the field, and therefore the nitrogen needs of the crop differ across the field.

Why is it important to quantify the different nitrogen demand across the field?

The farmer does not want to over-apply nitrogen. Besides the economic loss, over-applied nitrogen is often lost from the system through either nitrate leaching out of the soil profile or nitrous gas emissions to the atmosphere. Applying too little nitrogen means an economic loss to the farmer as well as results in low yields where actually higher yields could have been produced efficiently.

Crop sensors such as the Green Seeker can be used in different modes: One mode is called real-time. While the crop sensor runs

across the field mounted on the sprayer, it directly communicates with the computer on the sprayer which changes nitrogen rates according to the sensor measurements and a so-called algorithm. Real-time sensing and fertilizing has been economically successful and several farmers use it meanwhile.

Alternatively, the crop sensing can be accomplished between the first and second split in a flexible system. In this case, sensor data can be processed first before the nitrogen is applied. The nitrogen prescription algorithm can be more specific according to different conditions in the field. In other words, the same sensor signal can mean a different optimum nitrogen rate depending where we are in the field. Would this mean for the farmer an extra pass over the field? Not necessarily. Sensor measurements could for example be taken during herbicide application prior to the second nitrogen split.

Research during past years at Hillview Farms has shown that wheat yields do not respond uniformly to nitrogen. The same applied rate caused different sensor signals and different yields across the field. This result is a major motivation for keeping application algorithms flexible. This year, a first step was made in this direction in one of Trevor Gilkey's fields. Different amounts of nitrogen fertilizer were applied during the first split. These different rates should simulate different nitrogen supply conditions and levels of crop nitrogen deficiencies that should be compensated with the second split.

Overall, the experiment was strongly

influenced by an unusually mild winter and late spring draught. It was obvious that the same rate of nitrogen applied across two 120 ft. wide and 1400 ft. long strips caused different sensor signals depending on the location in the field, supporting our hypothesis of non-uniform response in this field. We worked together with Adam Hendricks from Wheat Tech, Inc. who is an expert in agricultural computers and who converted the fertilizer prescription into an application map uploaded to the computer on the sprayer.

The uniform calibration of sensors that would be applied in a real-time system, hence, sensing and fertilizing in the same pass, yielded 1% better than a uniform application rate. The flexible response system that requires two separate passes for crop sensing and nitrogen application resulted in yields 5% higher than the uniform rate and 4% higher than the real-time system. One very important outcome of field experiments over several years is the fact that wheat yields vary tremendously in space across the same field even when the field has been managed uniformly. However, this variation can already be seen early in the year to a certain extent from crop sensor measurements.

In future experiments, we will include landscape topography in the use of crop sensors and will expand the flexible sensing concept to an entire field. The support from the Kentucky Small Grain Growers' Association and the UK Agricultural Experiment Station, and the great cooperation of the Farmer Trevor Gilkey are appreciated very much.

Performance of Small Grain Varieties in Kentucky

Bill Bruening with the University of Kentucky Small Grain Variety Testing Program evaluates wheat and barley varieties that are commercially available or may soon be available to farmers. Annual variety performance testing provides current, unbiased information: yield, test weight, heading date, plant height, winter hardiness, lodging and disease reaction. During the 2011-12 growing season, 104 wheat entries were evaluated across Kentucky at seven test locations.

For the full results online, visit www.uky.edu/Ag/wheatvarietytest/ or request a copy from your county extension office.

Tracking the Source of Aphid-Vectored Virus in Wheat

Primary Investigator: James D Harwood, Katelyn A Kowles and Douglas W. Johnson, University of Kentucky

The purpose of this research is to gain insight into patterns of movement of Barley Yellow Dwarf (BYD) virus-infected aphids into and surrounding Kentucky winter wheat fields to aid in the development of conservation biological control. BYDV causes \$30 million in annual losses in Kentucky, and is the primary reason for routine pesticide applications. This project tracks the movement of migrant aphids throughout the winter wheat growing season using unique aphid traps designed specifically for this research. This is part of a larger project that encompasses extensive field sampling, laboratory work, and molecular techniques to reduce the reliance on chemical inputs in Kentucky agriculture. All research takes place at the University of Kentucky Research and Education Center in Caldwell County, Kentucky, in which natural weed strips surrounding the fields are being evaluated to provision biological control service.

In the 2011-2012 season, 36 traps (Figure 1) were placed around 3 replicated fields to monitor aphid movement into and out of wheat fields. When the traps were removed, the aphids were counted and identified on the inside and outside of the field. Additionally, aphids were hand collected from the field and screened for BYDV to quantify virus incidence. Approximately 1,800 aphids were trapped and identified from the aerial traps, being dominated by individuals immigrating into winter wheat fields. Additionally, regardless of the prevailing winds, aphids were consistently

moving into the wheat fields from the western and southerly direction. This pattern is consistent for aphids emigrating from (Figure 2) and immigrating into (Figure 3) the fields, and is shown most dramatically at the end of April when there was a significant spike in aphid numbers. This increase is also shown in total aphid counts, monitored using sweep net samples (Figure 4), where total catch peaked at the end of April then dropped due to adverse weather conditions in 2012. Interestingly, there was no significant difference in incidence of BYDV between the control fields and those with bordering weed strips (Figure 5).

These results are important when working in conservation biological control because it forms the sound ecological framework whereby insect behavior and migration patterns can be accounted into pest management decisions. Weed strips, or trap crops, are therefore most likely to be of benefit when migration patterns are taken into account. Additionally, large field studies such as the one used in this research, require data from multiple years. The above-average temperature during the 2011-12 winter made conditions extremely favorable for BYDV, leading to no significant difference between the field manipulations. However, in the 2010-2011, with the same field set-up and more normal weather patterns, revealed significantly different results. One further year of data from these aerial traps will allow spatial and, most importantly – temporal, quantification of the movement patterns of aphids and BYDV.



Figure 1. Aerial trap for sampling of aphids immigrating into and emigrating from Kentucky winter wheat.

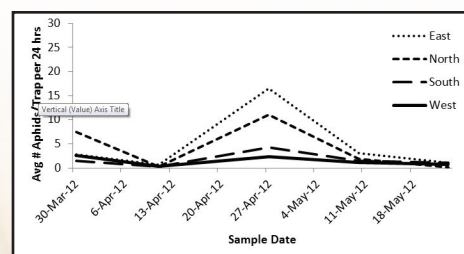


Figure 2. Mean number of aphids/trap/day captured emigrating from winter wheat fields in Kentucky.

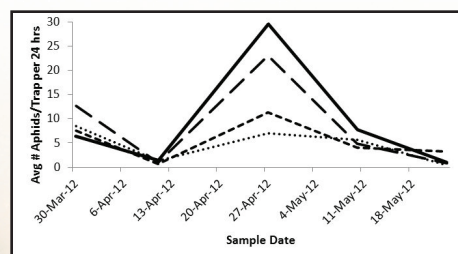


Figure 3. Mean number of aphids/trap/day captured immigrating into winter wheat fields in Kentucky.

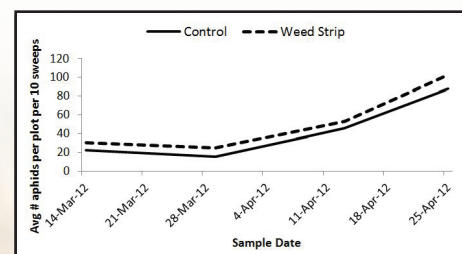


Figure 4. Mean number of aphids per sweep net, measured throughout the growing season. Data are presented for aphids in control fields and weed-strip fields. Differences shown are not significant.

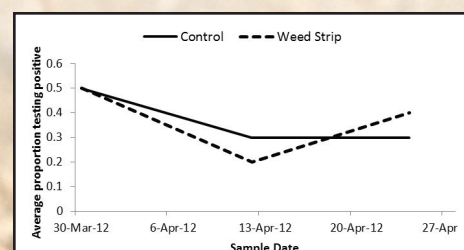


Figure 5. Mean number of aphids screening positive for BYDV in Kentucky winter wheat. Data are presented for control fields and those surrounded by unmanaged weed strips.



By Carol L. Spence

The following story appeared in the Spring 2012 University of Kentucky *mAGazine* regarding the KySGGA funded-project *Impact of Climate Change on Wheat Production in Kentucky*. Reprinted with permission.

Don Halcomb doesn't want to be the proverbial frog in a pot. He looks across his fields and tries to picture what his Logan County farm will look like in the future. He wants to have a good plan in place, but he needs some help to do it.

Halcomb grew up on this land. He remembers a time when he was 5 or 6 years old when his family grew corn to be fed to their cattle and pigs, which were then sold at the stockyards. The only crop they sold off the farm in any great volume was wheat.

"In my lifetime," the 58-year-old farmer said, "the crop rotation has changed unbelievably. We don't have any livestock. All the grains we grow are sold to someone else, and we're growing half our acres in soybeans that we didn't even grow when I was a child. That whole crop rotation has changed in my lifetime, and I think it could change again."

You see, Halcomb is concerned about the effects of climate change.



"The things I've read, it seems to me it's pretty well fact that the global average temperatures are increasing," he said. "I don't really need to hear the argument about why it's happening, as much as the documentation that it is happening, and therefore, I need to learn how to adapt to the change."

Which brings him back to that frog in a pot.

"You know the old story about how to boil a frog? You start him out in cold water, and you let it simmer. He never realizes he's boiled until it's too late," he said. "I think that's where we are with a lot of issues, because the annual change is very small, but I think the impact over time could be large."

Trained to Doubt

George Wagner and Paul Vincelli are skeptics. As scientists in the College of Agriculture, their profession demands that they question and dig deep to find answers. When it comes to the question of whether the earth's climate is changing, they doubt no more. What's convinced them? The scientific evidence and the consensus of nearly 98 percent of the world's most expert climate scientists.

"There are more than 10,000 refereed papers on the subject. I know what it means when climate scientists publish paper after paper after paper in refereed journals about the topic. I know that each one of those is a monumental task to get it through a review process by experts," said Vincelli, who as an extension professor in Plant Pathology has 35 published papers in peer-reviewed research journals to his credit.

"But it doesn't stop there," said Wagner, who is a professor in Plant and Soil Sciences. "Science never stops questioning the original hypothesis, so it keeps getting polished even after it's published. And that's why it's so significant to me that 97 to 98 percent of expert

Change by DEGREES

scientists agree that climate change is real. That's an incredible consensus."

Despite that consensus, the subject of climate change can raise some hackles. College of Agriculture Dean Scott Smith acknowledges the sensitivity of the issue, but also recognizes the importance of additional discussion and research.

"Our role is not to take sides on all the related policy issues, but we owe it to our stakeholders to conduct the research that will keep them competitive in ever-changing world markets, and always variable weather," he said.

To that end, Vincelli pulled together a team of specialists representing all areas of the College to create a Cooperative Extension publication titled "Climate Change—A Brief Summary for Kentucky Extension Agents." The publication and accompanying training sessions for agents are promoting discussion in the Extension Service about climate-related changes that could affect Kentucky and how producers can prepare.

Shattering Records

In a report issued at the end of last year, the National Oceanic and Atmospheric Administration stated that 2011, with its 12 weather-related billion-dollar disasters, broke the old record set only four years ago, when there were nine such disasters.

Very few will argue that the weather pendulum seems to have swung to the extremes. Speculation on the effects of atmospheric warming by the world's scientists covers everything from rising sea level,

to drought, flooding, and wildfires. The Intergovernmental Panel on Climate Change is the leading international scientific body on the subject. In their latest report they stated that multiple stressors such as limited water resources, loss of biodiversity, forest fires, insect outbreaks, and air pollution are reducing resilience in the agricultural sectors. What will all this mean to Kentucky agriculture—the biggest driver of the commonwealth's economy?

Rebecca McCulley and David Van Sanford, both professors in Plant and Soil Sciences, are heading up the College's new Climate Change Working Group. The group includes Wagner and Vincelli and specialists in the diverse fields of animal and plant sciences, entomology, soil, forestry, sociology, economics, and geography, as well as climatologists from Western Kentucky University. Their goals are to identify the most pressing research and outreach issues related to climate change and agricultural production, to set priorities for action, and to generate ideas for enabling Kentucky producers to deal with changing environmental conditions.

Three Degrees of Separation

McCulley, whose area of expertise is forages, has already seen some of the impact of environmental changes through research funded by the U.S. Department of Energy's National Institute for Climate Change Research. At the College's Spindletop Farm, McCulley uses infrared radiant heaters and a plus-precipitation treatment to study the effects

an increase in air temperature of three degrees Celsius and/or a 30 percent increase in rainfall will have on forages.

Rebecca McCulley uses infrared heat lamps to raise the ambient air temperature over her forage research plots by three degrees. The result so far? More crabgrass, which might not be a bad thing.

"We saw pretty dramatic changes in the plant community composition faster than I would have guessed we'd see," she said. "We've seen substantial increases in annual C4 (warm season) grasses, which are typically considered weeds here in Kentucky. Crabgrass is a big one."

Four years ago, as she was beginning this project, McCulley would have predicted a reduction in forage yield from hotter temperatures. But now that she's seen these so-called "weeds" turn on under her heat lamps, she's beginning to think pastures will just look different, but the overall quantity of forage production may not go down.

"And we haven't seen major change in the quality of that material either," she said. "My colleagues here in the forage group tell me (crabgrass) is actually a pretty high quality material and cattle will eat it. So far, you never see crabgrass advertised as forage. There is no seed industry for it or breeding focused on it, but I think my research suggests maybe there should be something done on crabgrass in the future. It could fill a useful niche."

Our Own Backyard

The members of the working group believe that atmospheric warming will affect Kentucky agriculture over the next two or three decades. Some of those effects are good, some not so good.

"A 2008 report by Purdue University forecasts wetter springs and drier summers, as climate change progresses," Vincelli said. "So it will be harder maybe to plant, but more importantly, droughts are expected to increase in the region. At a time when you need the water most, we're less likely to get it."

Looking down the road, Halcomb considers the idea that he may have to replace corn with another crop that uses less water in the middle of the summer during extended hot weather.

"We ought to be researching crops that are more tolerant of heat and use water more efficiently," he said.

Halcomb is in a position to encourage that type of work. He is the chair of the Kentucky Small Grain Growers' Association's Promotion Council, and he convinced the association to request proposals for climate change research. The association granted \$5,000 to McCulley, Van Sanford, and graduate student Katie Russell for a study examining the impact of climate change on wheat production in Kentucky. Van Sanford, a wheat breeder, explained that the study will include a literature search and assessment of the likely impact of climate change on wheat production and

yields in Kentucky. Additionally, the group will host a workshop featuring key climate change scientists. That event will take place February 20 and 21.

"We intend to invite several preeminent scientists in the field, so they can help us decide what the level of our activities should be, given the resources that we have," he said.

Van Sanford is also among more than 50 principal investigators from U.S. universities working on a \$25 million Agriculture and Food Research Initiative project, "Breeding Barley and Wheat for Changing Environments." He and his UK team are looking at nitrogen use efficiency in wheat.

"I think we need to be cognizant of climate change and be prepared for variability. This research also dovetails well with the situation in Kentucky and with a lot of the wheat growing regions of the U.S., where farmers have to be very concerned about how they manage their nutrients, not only for their own economic reasons, but for environmental reasons," he said.

Capacity for Change

Looking into a climate crystal ball is iffy at best. No one can definitively say what the climate will be like in the future. But current data does point toward possible scenarios. There is a potential for increased yields for soybeans and reduced corn yields. Cool-season forages might diminish, but warm-season grasses could flourish. Planting times and growing seasons could change, affecting crop selection and rotation. An increased incidence of crop failure and more variability in crop performance from year to year is possible, which would require more emphasis on risk management. Farmers could face increased pressure from diseases, pests, and weeds. And livestock production during the summer months would likely decrease because of the possibility for extreme heat.

The UK Ag team believes the potential is there to adapt to change and even turn things around. Van Sanford has been encouraged by the conversations he's had with growers.

"They can get excited if they think about other crop opportunities or planting date flexibility, things like that," he said. "Farmers are all very forward thinking individuals. Successful farmers pretty much have to be."

"My overall thought is it's time," Halcomb said. "It's certainly time for Kentucky to have the discussion, and we ought to be able to do some research to see how to adapt."



Katie Russell and David Van Sanford are examining the impact of climate change on wheat production in Kentucky.



Managing Giant Ragweed and Marestalk in Wheat

By James Martin, University of Kentucky

Giant ragweed and marestalk are examples of weeds that emerge in wheat. While they may sometimes interfere with wheat harvest, the greatest concern is their impact on double-crop soybeans following wheat harvest. Marestalk is especially difficult to control since most populations are tolerant to glyphosate.

The Kentucky Small Grain Growers Association supported a 3-year project using wheat as an option for managing marestalk and giant ragweed. These studies evaluated the effect of seeding rate of wheat on the heights and number of marestalk and giant ragweed plants in late May to early June.

What we learned:

The vegetative cover that wheat provided throughout the winter and early spring helped control of marestalk and giant ragweed by limiting the number of plants when compared with the fallow areas.

The fact there were no differences in number of weeds due to seeding rate indicated the low seeding rates used in these studies were still sufficient to help suppress weed emergence.

There was a strong trend in fewer giant ragweed and marestalk in narrow rows than in the wide rows.

In many cases wheat also improved weed control by limiting size of surviving weeds, especially giant ragweed. However, row spacing had very little effect on height of giant ragweed and marestalk.

Methods, tables and figures can be viewed at www.kysmallgrains.org. Martin is continuing to study marestalk control with wheat herbicides.

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Winter Barley Breeding and Research at Virginia Tech

By W.S. Brooks and C.A. Griffey, Virginia Polytechnic Institute

The Virginia Tech barley breeding program is significantly diverse with breeding efforts focused on development and improvement of yield potential of winter barley cultivars and a major focus on incorporation of value added traits geared towards development of new markets. As a result, two winter hulled (Thoroughbred and Price) and three winter hulless (Doyce, Dan and Eve) barley cultivars were released from the program.

Most recently, 'Atlantic winter barley also was released from the Virginia Tech barley breeding program. Significant progress continues to be made in the development of high value winter barley lines. This season (2011-2012), approximately, 46 advance barley lines were evaluated in replicated yield tests at locations in Maryland, Virginia, North Carolina, Kentucky, and Delaware. Subsequently, yield potential of 25 hulled and 25 hulless sister lines each derived from the same four populations along with parents and check cultivars were evaluated in replicated yield test at Blacksburg and Warsaw to determine genetic yield potential of hulless versus hulled sister lines.

In addition, Virginia Tech barley breeding program is involved in a collaborative winter malt barley breeding research effort targeted at local brewing industries in the mid Atlantic and south Eastern regions.

A barley-based ethanol market continues to provide potential as an initial market for winter barley in the Eastern United States. This will not only create an important market for barley throughout the Eastern United States, it will provide valuable by-products including carbon dioxide, fuel pellets, high protein feed ingredients for domestic animals and eventually enriched food products for human consumption. Owing to the rising cost of feed ingredients, animal producers are considering alternative options; therefore barley specifically aimed at the feed market could provide that low cost option for producers.

The Virginia Tech breeding program will continue to work with interested parties in evaluating the potential of barley for these and other diverse purposes. Through these efforts, the quality and value of winter barley has increased greatly during the past two years.

Hedging Opportunities against Declines in Land Values

By Cory Walters, University of Kentucky

Long term farm financial strength stemming from investment decisions is a primary concern of all producers, bankers, and the entire agricultural industry. For producers, land represents the primary location to store wealth. On average 75% of Kentucky producers assets are parked in land (Kentucky Farm Business Management Data, 2012). However, differences in land as a percent of wealth also exist between producers with a minimum of 13% and maximum of 100% (KFBM, 2012). Declines in land values have the potential to severely undermine long term financial strength of the farm (causing liquidation in the extreme case) with negative impacts to the entire agricultural industry.

In order to understand land value hedging opportunities we must first understand the land value market. We explore a variety of topics within the land value markets: supply and demand of land, financial impacts from farmland value

declines by farm ownership, and investment opportunities outside traditional methods.

Initial results indicate that once farmland values start to decline the drop will likely be swift. This is because the current run up in land values is due to both more buyers and fewer sellers. Once we have fewer buyers and more sellers a significant negative shock will take place. On average Kentucky producers are in a position to withstand declines in farmland values due to strong financial statements. However, capital is still lost. This loss may be offset through investing in a relatively new set of financial instruments, called Exchange Traded Funds (ETF). There exists ETF's tailored to the agricultural industry that would result in financial gain from declines in agricultural asset values. We are currently exploring how ETF's would work for Kentucky producers attempting to minimize financial loss from farmland value declines.



Development of Chia as a New Grain Crop for Kentucky

By David Hildebrand, University of Kentucky

In our evaluation of promising renewable oil sources that can be produced on a large scale economically we find that *Salvia hispanica* is the most promising oil source. Plants have high vigor and production potential with few inputs. Even though no existing *S. hispanica* lines could previously produce seed in Kentucky or most of the US, we have developed many new successful *S. hispanica* lines, and a patent application has been submitted.

Preliminary field trials indicate that competitive seed and oil yields can be obtained with efficient mechanical planting and harvesting and low production costs. *Salvia hispanica* seed oil is the highest source of omega-3 fatty acids known, and this provides superior edible and industrial uses than other renewable oils. We have been able to convert *S. hispanica* oil into forms valuable as renewable chemicals including lubricants and biodiesel, and an IP disclosure has been submitted on this process.

Salvia hispanica is particularly adapted for growth and high yield potential in Kentucky and other areas where corn grows well. Both corn and *S. hispanica* were originally domesticated in Mesoamerica and like corn *S. hispanica* grows and produces better in the US corn belt than in Mesoamerica. Our new early flowering *S. hispanica* lines will allow us to exploit this opportunity. Further no large scale processing of *S. hispanica* seeds into oil for wide scale use of the oil in edible and industrial markets has been established yet. Small scale production of *S. hispanica* oil for very high value

nutraceutical uses such as ω 3 oil capsules is well established.

The most promising lines from the 2009 field trials were grown out in sufficiently large scale field production trials on a UK farm in Lexington in the 2010 and 2011 growing seasons to establish good production practices and select top yielding lines. Our top lines have yielded well over 1,000 lbs/acre under good growing conditions in 2010 with machine harvesting and > 2,700 lbs/acre in small plots with hand harvesting.

In the 2011 field studies 4 lines were increased in large blocks, $\frac{1}{4}$ - $\frac{1}{2}$ acre at the UK Spindletop farm. The average yield was ~ 600 lbs/acre with machine harvesting. The issues contributing to the very low yield include shattering of most of the seed in most of the plots due to high winds, combine settings, lodging, weed competition, etc. Many of the plots were treated with Basagran + Poast can give partial weed control but also appear to damage chia some. Pigweed and foxtail were particularly abundant in the chia plots. The lines do not show complete determinacy and do not dry down for effective combine harvest until killed by frost or a burn down herbicide treatment. Major goals of the further breeding work in addition to total yield are reduced shattering and lodging as well as better determinacy and uniform seed set. Suitable and properly adjusted combine equipment will also facilitate commercialization of chia as a viable crop for Kentucky farmers.



What is chia?

Chia, or *Salvia hispanica*, is an annual plant native to central and southern Mexico and Guatemala. The seeds are gaining in popularity as a health food as chia is among the highest sources of omega-3 fatty acids and soluble fiber.

Chia currently sells for about \$10 or more per pound.

The University of Kentucky is working to develop lines that will produce seed under Kentucky conditions to allow growers to take advantage of the growing market.



Survey of the Tissue Nutrient Status of Winter Wheat in Kentucky

By Edwin Ritchey and Jesse Gray, University of Kentucky

Plant tissue analyses are more reliable indicators for some secondary and micronutrient deficiencies than soil tests since Mehlich 3 soil tests have not been calibrated for wheat yield response to sulfur (S), boron (B), copper (Cu), manganese (Mn), or zinc (Zn) in Kentucky. Tissue sampling at the latest acceptable stage (initial flowering) gives the best picture of the general nutritional status of the plant. At this plant growth stage most of the nutrient uptake has occurred. This study was initiated in 2011 and repeated again in 2012. Samples were collected as wheat was reaching maturity, to determine if there were any secondary or micronutrient deficiencies present in wheat grown in western Kentucky.

A few tissue samples were reported as being below the sufficiency range for N, K, and Zn in both years. However this was a low percentage of the total samples collected. Several of the samples that were below the sufficiency range for K also had low soil test samples.

This indicated that these soils may have benefited to a fertilizer application prior to planting wheat. The samples that had adequate soil fertility status might have had uptake issues during the growing season due to high/low soil moisture status, or other environmental influences. Wheat is not known to respond to Zn applications in Kentucky. Of the samples that were reported as below the sufficiency range for Zn, only a few would have received a Zn recommendation if using the guidelines for corn fertility, which is more responsive to Zn than wheat.

At the present time it does not appear that S is limiting wheat yield for the areas sampled in this two-year survey. Fertility recommendations should continue to be based on soil tests. Even with two vastly different growing seasons current soil fertility programs appear to be adequate at present. The nutrient status of wheat will continue to be monitored as deficiency symptoms appear.

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2012 Research Report

Kentucky Wheat Yield Contest Winners Announced

The University of Kentucky has announced the winners of the 2012 Kentucky Wheat Yield Contest.

The top wheat yield in Kentucky, 115.41 bu./A, was achieved by Clark Farms in Graves County. Clark Farms planted AgriPro Branson seed in 7.5-inch rows in mid October and used conventional tillage practices.

The top no-till yield was 108.51 bushels per acre submitted by Blake Edwards, of Green County. Edwards planted Dyna-Gro 9042 in 7.5-inch rows the first week of November.

Full results of the contest including herbicide, fungicide, and insecticide information can be found at www.kysmallgrains.org.

State and Area winners will be recognized at the Kentucky Commodity Conference on January 18, 2013 in Bowling Green, Kentucky. Each will receive a trophy and monetary prize from the Kentucky Small Grain Growers Association. Growers should keep in mind for future yield contests that a \$2,000 prize will be awarded if the highest yield was produced with Pembroke seed. See the ad on page 5.



Clark Farms of Graves County. Photo courtesy of the Kentucky Soybean Board.

Gifts of Grain

Kentucky Small Grain Growers Association Establishes Research Endowment Fund at University of Kentucky

The Kentucky Small Grain Growers Association (KySGGA) has established a research endowment fund at the University of Kentucky (UK) to ensure the advancement of production research crucial to Kentucky's grain farmers.

"To date we have directed nearly \$2 million toward small grain research, and we expect that sum will continue to grow in the future," said Don Halcomb, chairman of the Kentucky Small Grain Promotion Council. "Establishment of this research fund, however, will guarantee that small grain research will continue to be a priority at the University of Kentucky. Our leadership has been extremely pleased with the quality of research conducted at UK, and growers have benefited greatly from the results. The fund will work only to improve our successful partnership."

Individual growers and businesses may donate to the fund, and KySGGA will match the sum of donations up to \$50,000. In addition

to cash, growers and businesses may make an above the line deductible donation of grain. Donations should be made directly to the University of Kentucky College of Agriculture for the Kentucky Small Grains Growers Association Research Endowment. Checks can be mailed to:

University of Kentucky College of Agriculture
Marci Hicks, Director of Development
E S Good Barn
1451 University Drive
Lexington, KY 40546-0097

For more information on how to make a gift of grain, contact Marci Hicks at 859.257.7200. For more information about the fund, please contact KySGGA Executive Director Laura Knoth at 800.326.0906 or by email at laura@kysmallgrains.org.