2015 Weather Challenges to Missouri Agriculture

Q&A

University of Missouri Extension
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Heavy rains throughout the spring and summer have created some struggles for Missouri's plants, crops and animals. We've compiled questions regarding the varied issues that have arisen with the oversaturation of fields and an overabundance of precipitation. This content will continue to evolve as additional questions and answers are added. Be sure to check the updated date at the top of the page for any changes, and check back frequently for updates.

These answers are our best, collective understanding of the question and the pertinent information.

**Animals**

**Feed**

*What are the allowable levels for vomitoxin in feed for various animal species?*

*This answer is developed from an excellent document prepared by Dwight Aakre and others with NDSU Extension Service at North Dakota State University. For more information, see [https://www.ag.ndsu.edu/pubs/plantsci/pests/pp1302.pdf](https://www.ag.ndsu.edu/pubs/plantsci/pests/pp1302.pdf).*

The U.S. Food and Drug Administration (FDA) has established vomitoxin (DON) advisory levels to provide safe food and feed. Unlike aflatoxin in corn, DON is not a known carcinogen. Human food products are restricted to a 1-parts per million (ppm) level established by the FDA. This level is considered safe for human consumption. The food industry often sets standards that are more restrictive. DON causes feed refusal and poor weight gain in some livestock if fed above the advisory levels. FDA advisory levels are as follows:

<table>
<thead>
<tr>
<th>Intended use</th>
<th>Grain and by-products</th>
<th>Vomitoxin levels</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human consumption</td>
<td>Finished wheat products, such as flour, bran and germ</td>
<td>1 ppm</td>
<td>The FDA does not set an advisory level for raw grain intended for milling.</td>
</tr>
<tr>
<td>Swine</td>
<td>Grain and by-products</td>
<td>5 ppm</td>
<td>Providing that these ingredients do not exceed 20 percent of the diet</td>
</tr>
<tr>
<td>Chickens</td>
<td>Grain and by-products</td>
<td>10 ppm</td>
<td>Providing that these ingredients do not exceed 50 percent of the diet</td>
</tr>
<tr>
<td>Feedlot cattle</td>
<td>Grain and by-products</td>
<td>10 ppm</td>
<td>Ruminating beef and feedlot cattle older than four months, providing that these ingredients do not exceed 50 percent of the diet.</td>
</tr>
<tr>
<td>Dairy cattle</td>
<td>Grain and by-products</td>
<td>10 ppm</td>
<td>Providing that these ingredients do not exceed 50 percent of the diet</td>
</tr>
</tbody>
</table>
products and by-products do not exceed 50 percent of the diet

| Other animals | Grain and by-products | 5 ppm | Providing that these ingredients do not exceed 40 percent of the diet |


Vomitoxin research on humans is prohibited for legal and moral reasons, but we do know the effects of vomitoxin on animals with similar body systems to humans (such as pigs and primates). Low levels of vomitoxin (0.05 to 0.1 mg per kg body weight) can cause vomiting in pigs. This would be similar to exposing a 175-pound person to 0.0003 ounces of vomitoxin (a VERY small amount!). In humans, scabby grain has been associated with food poisoning symptoms (nausea, abdominal pain, dizziness and fever) 30 minutes after consumption. Long-term and continuous exposure to even lower levels of vomitoxin might cause dangerous reduction in appetite, weight loss, damage to the gastro-intestinal tract and impair the immune system.

— Answer by Bill Wiebold.

Is wheat straw from plants infected with Fusarium fungi toxic to animals?

This answer is based on a document prepared by Ohio State University. For more information, see [http://corn.osu.edu/newsletters/2010/2010-19/mycotoxin-q-a](http://corn.osu.edu/newsletters/2010/2010-19/mycotoxin-q-a).

Yes. Straw from scabby fields does contain vomitoxin and other mycotoxins. Results from studies done at the University of Illinois (with laboratory tests done at North Dakota State University) confirmed that vomitoxin levels might exceed 2 ppm in wheat straw, even in fields treated with fungicide. As a result, the same caution exercised when handling and feeding scabby grain should be exercised when dealing with moldy straw. Get the straw tested before using it for silage or bedding. The risk of contamination is much lower when straw is used for bedding; however, you should still avoid straw with very high levels of vomitoxin because it is impossible to tell how much the animals will munch on the straw. Little information is available on hay, but wheat hay is much more likely to be consumed by animals than straw.

— Answer by Bill Wiebold.

Forages

Hay is flooded and contaminated with dirt and other stuff. Will this contamination affect the animals?

Perhaps. Most often animals will refuse forage covered with soil or other contaminants. The greatest threat will be when livestock are forced to eat forage they would otherwise refuse.
Will moldy hay affect animals? Is there something to decrease impact?

It can, but it is unusual. Often animals will refuse moldy hay if there are other sources of feed. Be most careful feeding moldy hay to horses because it can cause colic. Diluting the diet with other non-moldy feedstuffs can lessen the impact.

Lagoon

How do you handle a lagoon or pit that is full when there is no dry ground where it can be spread or crops that use the nutrients?

The full answer to this question depends on the size of operation and the type of permit.

Most operations in Missouri are “no-discharge” operations, which means they are not allowed to discharge effluent without incurring a potential notice of violation. For these operations, you are choosing between the lessor of two evils under these conditions. If your manure storage is about to overflow, it is better to land-apply manure under poor conditions then have a storage spill directly to a creek or other body of water.

Missouri Department of Natural Resources (MDNR) has a publication to help producers minimize damage from emergency land application under wet weather conditions ([http://dnr.mo.gov/pubs/pub2422.pdf](http://dnr.mo.gov/pubs/pub2422.pdf)).

If you are applying under emergency conditions, be sure to apply at low rates onto land that has cover (e.g. pasture and hay ground). Maintain separation distances between application area and sensitive features (see publication for guidance). Apply on areas with low slope that are not prone to flooding. Rigorously monitor the area during land application to ensure that no manure is running off the field. Keeping records to document extreme weather affecting your farm and your application practices is highly recommended.

If manure from an overflow of your storage or from land application on wet ground leaves your property or reaches a stream or other body of water, you are required to report the spill to your regional MDNR office.

— Answer by John Lory.
Field crops

Corn

How late will corn yield respond to nitrogen fertilizer?

There will be good response until at least tassel, probably 10 days after tassel. In six on-farm trials in 2010, rescue nitrogen was applied at the tassel stage and the average yield response was 34 bushels per acre. These fields had been fully fertilized but lost nitrogen due to wet weather. In three Missouri research station trials, a single nitrogen application at silking stage gave a yield response from 35 to 50 bushels per acre. No fertilizer was applied before the silking stage. In a Nebraska research station trial, a single nitrogen application at 10 days after tassel gave a yield response of 43 bushels per acre. No fertilizer was applied before 10 days after tassel.

— Answer by Peter Scharf.

What are the economics and availability of natural gas for corn drying assuming lack of heat units delays corn maturity?

With the late-planted 2015 corn crop, producers might be in a situation where they must harvest corn at a much higher moisture percentage than has occurred for the past several years. The cost of harvesting higher moisture corn will come either through discounts for the sale of high moisture corn to a grain elevator or through increased drying costs for on farm drying. For those interested in current LP prices, the U.S. Energy Information Administration (EIA) provides current pricing information on Missouri LP prices at: http://www.eia.gov/dnav/pet/PET_PRI_WFR_DCUS_SMO_W.htm. For those interested in the economics of drying corn, there are two spreadsheets available from MU Extension at: http://crops.missouri.edu/tools/. These spreadsheets can be found under the crop and fertility management section.

— Answer by Scott Brown.

Cover crops

What are the best cover crops for nitrogen fixation if planted on prevent-planting acres?

Hairy vetch, crimson clover, alsike clover, arrowleaf clover and Austrian winter pea are the most commonly used legumes for cover crops in Missouri. Arrowleaf clover and Austrian winter pea are less likely to overwinter than the others. Soybean might also be an option for short-term use.

Photosynthesis provides the energy needed to drive nitrogen fixation. As a result, no legume fixes significant amounts of nitrogen until plants become relatively large. Although rhizobial infection and nodule formation begins two to three weeks after planting, fixation during this period is limited by photosynthetic capacity (leaf area). Further, soil temperature regulates the
activity of the enzymes responsible for nitrogen fixation. The optimum soil temperature is around 75 to 80 degrees Fahrenheit. Nitrogen fixation ceases once temperatures drop much below 50 degrees Fahrenheit.

Most of the nitrogen fixed is stored in plant parts. Nitrogen accrual for the cover crop legumes mentioned above range from 40 to 150 pounds per acre annually under Missouri conditions. To capture most of this nitrogen, the biomass of the cover crop must break down and be released from the organic matter; it will not be available instantly.

— Answer by Rob Kallenbach and Bill Wiebold.

More resources about cover crops from the Missouri division of the USDA:

- Using cover crops for prevented planting acres (PDF)
- Cover crop practice standard (PDF)
- Cover crop appendix (XLSM)

The USDA Risk Management Agency provides prevented planting payments when cover crops are planted and the prevented crop is not in the Prevented Planting Standards Handbook. The table linked below shows cover crop impacts on determining PP eligibility and proper amount of PP payment. This aid must be used in conjunction with all applicable PP provisions and procedures. For more information, access the handbook at [http://www.rma.usda.gov/handbooks/25000/2015/15_25370.pdf](http://www.rma.usda.gov/handbooks/25000/2015/15_25370.pdf).

Economics

Given the poor growing conditions, does it make sense to continue spending money on inputs for grain crops?

Two considerations need to be taken into account to answer this question.

First, is the crop insured? If the crop is insured, you are under obligation to use “good farming practices.” Good farming practices incorporate the opinions and published materials of agricultural experts. So if you can find an expert opinion or published material indicating you should not continue rescuing the crop, you need to save that opinion to justify your action. Otherwise, you probably are obligated to attempt to optimize your production. If you choose to abandon the crop, you should call your insurance agent and ask for an adjuster’s opinion.

Second, from an economic perspective, the question involves weighing the benefit against the cost. Costs you have already sunk such as fertilizer and seed are not important in this decision. The question becomes: Am I expected to get more money in increased production than I spend in rescuing the crop? For example, assume that you have lost a lot of nitrogen and your corn crop is suffering as a result. It has been recommended that you add another 100 pounds of nitrogen to the crop and this will cost you $64 per acre. You expect the value of the crop at harvest to be $4 per bushel. If the additional nitrogen is expected to increase your yield by 16 bushels ($64 divided by $4) you should add the nitrogen. Even if you will lose money on the crop
as a whole (considering the cost of inputs already used), you should make the additional investment if you expect the benefit to exceed the cost.

— Answer by Ray Massey.

Fertilizer

Is foliar applied fertilizer an effective alternative if fields are too wet to apply other forms?

Foliar applied fertilizer is not going to supply enough nitrogen (N), but it is better than nothing. Results from 2010 MU Extension study:

<table>
<thead>
<tr>
<th>N source</th>
<th>N rate</th>
<th>N timing</th>
<th>Application method</th>
<th>Yield response</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoRoN</td>
<td>7.5 pounds N per acre (label rate), twice</td>
<td>V10, V13</td>
<td>Broadcast foliar</td>
<td>13 bushels per acre</td>
</tr>
<tr>
<td>Urea + Agrotain</td>
<td>20 pounds N per acre, twice</td>
<td>V10, V13</td>
<td>Broadcast dry</td>
<td>34 bushels per acre</td>
</tr>
</tbody>
</table>

For more information on the study, see [http://aes.missouri.edu/pfcs/research/prop308c.pdf](http://aes.missouri.edu/pfcs/research/prop308c.pdf).

— Answer by Peter Scharf.

Please provide information of aerial application of fertilizer service providers.

Unfortunately, aerial applicators have shifted heavily toward fungicide application at this time. It will be difficult to acquire aerial application of fertilizer. If it is possible, it will only be possible if a large number of acres are lined up.

— Answer by Peter Scharf.

Has this year’s weather increased the amount of soil tests we need to take to prepare for next season?

No.

— Answer by Peter Scharf.

Forages

Alfalfa has not been cut for hay in a timely fashion. What are the consequences for quality and winter survival? Should management change from normal?

If alfalfa is cut after 10 percent bloom, it will be stemmy and too low quality for dairy feed. However, it will have the quality to meet maintenance requirements for dry cows and pleasure
horses. If fed with an energy supplement, lower quality alfalfa can also work for beef stockers and replacement heifers.

At this point in the year, there is no consequence for winter survival. Management should include cutting and baling the current crop of alfalfa to enable growth for the next cutting.

— Answer by Craig Roberts.

Late harvest and heavy leaching from rain have caused low-quality hay. What are some possible solutions for low hay quality?

The first step in dealing with over-mature or rain-damaged hay is forage testing. Forage testing results provide the information needed to accurately balance animal rations.

Low-quality grass hay can be baled and treated with ammonia in a procedure known as ammoniation. Ammonia treatment should only be applied to low-quality grass hay. Ammonia breaks linkages in the fiber that prevent forage digestion; the result of ammonia treatment is increased fiber digestibility and high energy.

According to research at the University of Missouri, ammonia treatment also degrades ergovaline and other ergot alkaloids produced by the tall fescue endophyte. Ammonia-treated fescue is far less toxic than untreated fescue.

The procedure for ammoniation can be found at http://extension.missouri.edu/p/AGW1003. Take note that this bulletin shows bales stacked as two on the bottom and one on top. Some of our producers have stacked four on the bottom and three on the top. Also, please be aware that this bulletin does not account for changes in cost of anhydrous ammonia over recent years.

Another option is to provide grain or grain by-product supplements to meet the nutritional needs of the animals. There are lots of good supplemental feed options, but the best results require knowledge of forage nutritive value.

Another option is to treat the low-quality hay with calcium hydroxide or calcium oxide. Recent work at MU showed that these treatments can be successful for those with the equipment to do it. For more information, see https://www.ag.ndsu.edu/news/columns/dairy-focus/dairy-focus-improve-low-quality-forages/.

Lastly, fertilize cool-season grass hay fields in mid-August autumn. Good quality cool-season grass pastures this autumn can be used to supplement poor quality hay. A strip grazing program, where a few days of grass and a few bales of hay are fed at the same time, can stretch the good quality pasture while using some of the hay. For the best results, move stock to a new strip of grass and provide a new bale or two when the original hay bales are 80 percent consumed.

— Answer by Craig Roberts and Rob Kallenbach.

What are the recommended scouting methods to quantify the risk from ergot poisoning in hay, pasture and other forages?
There are no hard and fast rules for scouting ergot or determining thresholds. We first recommend walking the field and looking for sclerotia in the seed heads. Sclerotia are chocolate-colored ergot bodies that look like mouse droppings. Be sure to walk the entire field. If sclerotia are present, they will appear in the seed heads of nearly all pasture grasses and small grains in June and July. For more information, watch this video: http://extension.missouri.edu/news/DisplayStory.aspx?N=1908

In our judgment, if 20 percent of the seed heads contain sclerotia, the field should be considered highly toxic. But this is merely our judgment based on years of experience.

— Answer by Craig Roberts.

How do you repair hoof damage to wet soils?

The best repair for cool-season grass fields damaged by hoof traffic is to implement good grazing practices. Avoid grazing hoof damaged pastures until the regrowth reaches 8 to 10 inches in height. Once the pastures recover, be careful to not allow stock to graze the pasture to a height of less than 3 inches.

— Answer by Rob Kallenbach and Craig Roberts.

Are there short-season, summer-annual forages that can be planted this late to produce some hay? What about silage?

Yes. Small grains (rye, oats, wheat) and/or annual ryegrass could be planted in late summer for hay or silage. Turnips and other Brassica species can be planted for forage too, but they are difficult to store as hay or silage.

— Answer by Rob Kallenbach and Craig Roberts.

Are preservatives or chemical dryers helpful for preserving silage, haylage or hay?

These products can either be used for speed drying (desiccants) or allowing the safe storage of moist hay (preservatives). Given the cost and hassle of applying these products, most are used for legume hay.

For more information on preservatives, visit http://ohioline.osu.edu/agf-fact/0013.html.

For more information on desiccants (as well as bit on preservatives), visit http://extension.psu.edu/plants/crops/forages/hay-and-silage/harvest-management/chemical-conditioners-for-hay and http://www.uwex.edu/ces/forage/pubs/preserv.htm.

— Answer by Rob Kallenbach and Craig Roberts.

If hay is recently cut, will the stand survive typical 90 degrees and higher summer temperatures?
For tall fescue and many other cool-season grasses, stand decline should not be much greater than normal. Cool-season grasses often go through a summer dormant period. Over the years, many tall fescue-based pastures and hayfields have been through several wet and drought cycles. For fields of smooth bromegrass, leaving a 4-inch stubble would be advisable as that species elevates its growing point as it matures.

Although this might be a tough year for many legumes, harvesting now would help them more than leaving the forage standing. Legume stand thinning might occur, but that would be due to the wet weather and grass competition, not because of the harvest timing.

— Answer by Rob Kallenbach and Craig Roberts.

Hay is flooded and contaminated with dirt and other stuff. Will this contamination affect the animals?

Perhaps. Most often animals will refuse forage covered with soil or other contaminants. The greatest threat will be when livestock are forced to eat forage they would otherwise refuse.

— Answer by Craig Roberts and Rob Kallenbach.

Will moldy hay affect animals? Is there something to decrease impact?

It can, but it is unusual. Often animals will refuse moldy hay if there are other sources of feed. Be most careful feeding moldy hay to horses because it can cause colic. Diluting the diet with other non-moldy feedstuffs can lessen the impact.

— Answer by Craig Roberts and Rob Kallenbach.

Should additional nitrogen fertilizer be applied to cool-season grass pastures in July after hay is made?

Given what we expect regarding the nutritive value of hay this year, we would recommend fertilizing (mainly with nitrogen) cool-season grass hay fields in mid-August. Fertilizing before mid-August typically does not help much because dry conditions and warm temperatures in summer limit cool-season grass growth. Good quality cool-season grass pastures this autumn can be used to supplement poor-quality hay. Strip grazing programs, where a few days of grass and a few bales of hay are fed at the same time, can stretch the good quality pasture while using some of the hay. Move stock to a new strip of grass and provide a new bale or two when the original hay bales are 75 percent consumed.

— Answer by Craig Roberts and Rob Kallenbach.

Grain sorghum

Will grain sorghum yield response to late application of nitrogen?
MU Extension has no data for this question, but Jason Kelley from Arkansas Extension says early boot is the latest stage at which he’d apply nitrogen.

— Answer by Peter Scharf.

**Herbicides**

Atrazine was applied to corn land, but the corn was never planted. With all the rain, will the atrazine be diluted enough to plant something else this year? What about planting a forage this fall?

You must follow the planting interval restrictions listed on the label. Please follow this link for additional information: [http://ipm.missouri.edu/ipcm/2013/5/What-if-You-re-Going-to-Switch-Replant-Options-Following-Pre-emergence-Corn-Herbicides/](http://ipm.missouri.edu/ipcm/2013/5/What-if-You-re-Going-to-Switch-Replant-Options-Following-Pre-emergence-Corn-Herbicides/)

— Answer by Kevin Bradley.

**Roots**

Are crop roots permanently damaged from water-logged soils? Will crops be more prone to lodging?

Roots require oxygen for growth. Because water in soil pores replaces oxygen, roots will not grow into water-logged soils. However, many field crops have the ability to produce aerenchyma in their roots. This is tissue with large air spaces. Rice plants produce this tissue, so oxygen reaches roots when submerged in water. It takes days for crop plant roots to adjust to water-logged conditions and even if aerenchyma forms, root growth will be slow.

Several root rot fungi favor water-logged soils. In some incidences, plants might not survive heavy fungi infection.

As water drains from soil, oxygen will return. Crop plant roots will resume growth. Roots compete with above ground parts for sugars and other nutrients. The competition increases to roots disadvantage with increased plant size and during grain filling. Plants might be vulnerable to lodging until adequate anchorage is established.

Hot temperatures increase water evaporation from leaves. Plants with reduced root systems will likely exhibit symptoms of drought stress on hot days.

Stomata of newly flooded plants will close. If this happens while air temperatures are hot, the newly flooded plants are vulnerable to heat stress and death. If the plant survives, plants will adapt and stomata function should return to near normal after 24 to 48 hours.

— Answer by Bill Wiebold.
Seed

What is the availability and costs of germination and vigor testing for soybean held to next spring?

Missouri Crop Improvement Association can run accelerated aging tests in our Columbia lab at any time, provided we have germinator space available. However, we recommend testing later this winter or early next spring to give a more accurate representation of the quality and vigor of the seed after it has been exposed to individual storage conditions. A standard warm germination test is $14.25 and an accelerated aging test is $19.25.

Standard cold tests would be another option, but we do not offer that test in our lab due to lack of demand.

Regardless of the test method, vigor test results should be viewed in conjunction with standard warm germination test results to give an idea of maximum germination potential under both ideal and high-stress conditions.

— Answer by Richard Arnett.

Soybean

When is it too late to plant soybean?

It is difficult to answer this question because nature doesn’t work in a straightforward manner. Soybean maturity is controlled by photoperiod (modified by temperature). I wrote about planting soybean in mid-July in this article: http://ipm.missouri.edu/IPCM/2015/6/What-to-Expect-from-Ultra-Late-Planted-Soybean/. Risk from frost and low yield are two risks involved, but both of these vary among years and are highly dependent on summer and fall weather.

— Answer by Bill Wiebold.

Farmers have soybean seed treated with fungicides and/or insecticides. Because of prevent planting, the seed will not be used for planting, but dealers are not accepting returns. What should farmers do with treated seed?

The Missouri Department of Agriculture has released the following statement related to proper disposal of treated seed: http://agriculture.mo.gov/news/2015/Weather_Conditions_Prompt_Reminder_for_Proper_Disposal_Storage_of_Treated_Seed.

Storing soybean seed from one year to the next is not easy to do. Temperature and moisture are enemies of stored seed, and soybean seed is susceptible to germination and vigor loss during storage. Storage facilities that ensure cool temperatures and low humidity are the best opportunity for safe soybean seed storage. As temperature and humidity increase, the risk of vigor loss also increases.
Vigor and germination are two different, but important, components of seed quality. Germination percentages on seed tags or performed in seed analysis labs are measured using nearly ideal germination temperatures. Sometimes they are called warm germination percentage. Seed tags are required to display them. However, seeds are often planted in less than ideal conditions including cool soil temperatures. There are several tests that attempt to predict emergence from stress environments. These tests are often called vigor tests, and several tests include some exposure to cold temperature. The best test of soybean seed vigor is called accelerated aging. This test includes exposure to warm, humid conditions. Seed, especially seed stored in poor conditions, can exhibit adequate germination percentage but test poorly for vigor. This seed should not be planted in stress conditions that are common in spring.

— Answer by Bill Wiebold.

If you plant soybean, knowing it will likely freeze before they are able to harvest, when is the best stage to bale?

If possible, harvesting at the early pod stage gives the best compromise between yield and nutritive value. If a frost is imminent, then harvesting at that time would be better than waiting.

— Answer by Craig Roberts and Rob Kallenbach.

Should soybean seed be inoculated with rhizobium when planting next year?

Inoculation of soybean seed with rhizobium is not necessary unless soybean will be planted in a field in which soybean had not been planted for three years or if the field had been flooded for at least a month. Rhizobium bacteria require oxygen to live in soil (without a host), so flooding might reduce numbers. Success from inoculating with new highly potent rhizobium strain can be difficult because of the large number of naturally occurring bacteria. Wild rhizobium will often out compete applied rhizobium because of number differences.

— Answer by Bill Wiebold.

Soybean plants in water-logged soils have turned yellow. Is the damage permanent?

Probably not. Rhizobia infect soybean roots through root hairs. Root hairs occur near the tips of actively growing roots. Roots will not grow in the absence of oxygen, so few nodules will form in water-logged soils. Nitrogen fixation requires oxygen for energy. For these reasons, nitrogen fixation might be reduced to near zero in water-logged soils. Once water drains from soil and oxygen returns, nitrogen fixation should begin. Risks of permanent damage or reduced yield increase with length of yellow symptoms or the age of the plant. Yelllowing because of slow nitrogen fixation is more harmful during seed filling than vegetative growth.

— Answer by Bill Wiebold.

Weeds

Should farmers manage weeds in prevented planting fields to reduce weed seed bank?
Farmers should do some form of weed control in prevented planted fields to prevent weeds from producing seed, if possible.

— Answer by Kevin Bradley.

**How should large weeds be controlled in prevented plant acres?**

There are a few options. One would be tillage prior to seedhead and viable seed production. A second option would be to try to establish a cover crop now to achieve some sort of cover over the soil to prevent weed encroachment. The third option would be through the use of herbicides. As a lot of money has already been spent for weed control on many of these fields and we have to be aware of herbicide carryover to next year’s crop with any applications made at this point in the season, the question of which herbicide program to use becomes much more complex. Standard burndown type of programs that include glyphosate + dicamba or glyphosate + 2,4-D or glyphosate + Sharpen should be considered. These would be some of the cheaper choices and would not cause problems for corn or soybean planted next season.

— Answer by Kevin Bradley.

**How should you control large weeds in corn and soybean fields?**

In corn, there are really no legal options for most post-emergence herbicide applications at this time. Once corn reaches about 30 inches or so in height, our options for weed control become very limited. Making an off-label herbicide application at this point to large weeds will more than likely not provide adequate control of that weed, and you also run the risk of disrupting kernel set and overall corn ear damage. In soybean, although it is certainly not ideal, there are options of glyphosate (in Roundup-ready soybean) plus group 14 (PPO) herbicides. Some of the more common trade names include Prefix, Cobra, Flexstar and Ultra Blazer to name a few.

— Answer by Kevin Bradley.

**Wheat**

**What is the best way to prepare this season’s wheat for planting this fall?**

There are questions about the advisability of saving seed from this year's crop for planting this coming fall. With the high levels of scabby kernels and the overall lower quality of grain, this is not a good year to consider saving seed for planting. If this alternative is still being considered, there are certain steps to take in making the decision of whether to use saved seed for planting. For more information on evaluating winter wheat seed quality for possible planting use, see [http://ipm.missouri.edu/IPCM/2015/7/Winter-Wheat-Disease-Update/](http://ipm.missouri.edu/IPCM/2015/7/Winter-Wheat-Disease-Update/).

— Answer by Laura Sweets.
What is vomitoxin?

This answer is developed from an excellent document prepared by Dwight Aakre and others with NDSU Extension Service at North Dakota State University. For more information, see https://www.ag.ndsu.edu/pubs/plantsci/pests/pp1302.pdf.

Vomitoxin is a common name for the chemical deoxynivalenol (DON). This mycotoxin is produced by the causal agent of Fusarium head blight (scab), Fusarium graminearum (Gibberella zeae).

I explain Fusarium head blight in more detail in the following article: http://ipm.missouri.edu/IPCM/2015/6/Wheat-Disease-Update/.

— Answer by Laura Sweets.

Where can you have grain or plants analyzed for vomitoxin and other toxins? What do tests cost?

The MU Veterinary Medical Diagnostic Lab provides a Summary List of Services and Fees at http://vmdl.missouri.edu/VMDLSchedOfFees.pdf.

The test we are interested in is toward the end and called “Mycotoxin screen in feedstuffs (aflatoxin B1, ochratoxin A, vomitoxin, zearalenone; quantitative)” under Toxicology. It is $75.

— Answer by Tim Evans.

Is grain or leaf dust from wheat infected with Fusarium fungi hazardous for humans to breathe? What about contact with the skin?

This answer is based on a document prepared by Ohio State University: http://corn.osu.edu/newsletters/2010/2010-19/mycotoxin-q-a.

Vomitoxin is not found “freely floating” in the air. However, it is present in dust particles from wheat chaff and grain in elevators, bins, seed houses, grinding facilities, etc. A dust mask should be worn whenever handling contaminated grain. Read the article by Jepsen and Fleming, Dust Mask Protection from Wheat Dust, (http://corn.osu.edu/newsletters/2010/2010-19/dust-mask-protection-from-wheat-dust) for information on the health effects associated with the inhalation of dust particles.

Although mycotoxins are of the greatest concern when ingested with contaminated food products, some toxins, including vomitoxin, can be absorbed through the skin. And remember, vomitoxin might not be the only toxin present in moldy grain. Gloves (preferably latex/nitrile) should be worn and handlers should wash hands and other exposed skin thoroughly after handling molds grain. The biggest danger is touching your mouth with hands that have touched scabby grain.

— Answer by Bill Wiebold.
What is the process to make a crop insurance claim for vomitoxin-contaminated wheat?


— Answer by Bill Wiebold.

Horticulture

Fruit

Uneven ripening is apparent in blackberries. Did the wet weather cause this?

Certainly the cool temperatures and lack of sunshine are prolonging the harvest season. Also, there was likely some winter damage on some of the less cold-tolerant blackberries grown in the state. Blackberries have primary buds and many have smaller secondary, or even tertiary buds. The primary buds set first fruit (that is the earliest to ripen) and the largest fruit. If low winter temperatures or spring frost injury occurs, the primary buds can be killed and then the secondary buds begin to grow and set a later, smaller crop.

— Answer by Michele Warmund.

Ornamental plants

How do you control leaf spot on ornamental plants?

Fungi cause most leaf spot diseases on ornamental plants. Following an Integrated Pest Management approach, the first step is to try to keep the leaves as dry as possible. This year that has been nearly impossible. In more normal years, it means watering at the surface (e.g. drip irrigation) or, if overhead watering is necessary, watering early in the day so that the leaves dry quickly.

Ultimately, the application of fungicides is necessary to keep leaf spot to a minimum. Newer generation fungicides have systemic action and can’t be washed off the surface of the leaves like older, heavy-metal based fungicides could. Chlorothalonil and thiophanate-methyl are examples of fungicides that control a fairly broad range of foliar diseases.

— Answer by David Trinklein.

Vegetables

Does this wet weather contribute to increased blossom-end rot in tomatoes?

Blossom-end rot is a physiological disorder caused by a lack of calcium. Calcium is taken up and moved through the tomato plant via mass flow, which is heavily dependent on water. When it
rains a lot, the soil becomes saturated to the point of limiting the amount of oxygen to the tomato plant’s roots. This, in turn, adversely affects the integrity of the root surface, and makes it more difficult to take up water. Like tobacco, tomato displays water wilt quite readily when plants stand in water for any length of time.

— Answer by David Trinklein.

How should you control and manage early blight in tomatoes?

We recommend an Integrated Pest Management approach to early blight control that begins with crop rotation. Tomatoes should never be planted in the same spot in a garden until three years have passed. Also, rigorous garden cleanup at the end of the year can help to reduce the incidence of residual inoculum. Next, keep the foliage as dry as possible by applying water via drip irrigation. Applying mulch to the soil can help prevent water from splashing soil that contains the inoculum of the disease on the lower leaves of the plant. Finally, chlorothalonil can be very effective as a preventative spray. Some growers rotate or tank mix it with a fix-copper product such as Kocide.

— Answer by David Trinklein.

How should you control or manage water wilt of vegetable plants?

Trying to drain the area of standing water if at all possible is about the only thing that can be done if water wilt exists. Prevention for future years is a more realistic way to manage it. Areas prone to cause water wilt should be amended with organic matter to help build soil structure and improve drainage. Planting on berms can also help. For very poorly drained soil, consider raised-bed gardening.

— Answer by David Trinklein.

Soil

How should ruts be repaired in crop fields?

Dr. Mark Hanna, an extension agricultural engineer in Iowa State University’s Department of Agricultural and Biosystems Engineering provided this response to our request for information after a wet fall in 2009. Although the topic focuses on combines at harvest, the recommendation are appropriate.

“Wet conditions have caused ruts to form in some fields as combines work to harvest crops. About three-fourths of combine mass and virtually all of loaded grain tank weight are carried on the combine’s front axle. With good yields, grain tank extensions, and a 12- row head, front axle load can be 18 to 20 tons. Compacted soil created beneath the rut might interfere with subsequent crop rooting. In addition, ruts deeper than about two inches can interfere with maintaining seed depth during planter operation next spring unless they are leveled.
Soil loosening by using tillage to relieve compaction requires soil to be dry enough so that soil shattering is effective. Because soil moisture has re-filled the top 12 to 24 inches of the soil profile, deep tillage with a chisel plow or subsoiler this fall or next spring will use fuel and time but is unlikely to loosen soil effectively between tillage shanks. The full soil moisture profile in upper layers will however aid freeze/thaw cycles to help loosen soil during winter depending on air temperatures and snow cover.

Ruts deeper than planting depth will need to be leveled before planter operation. A good strategy might be to wait until a week or two before planting next spring and use a light tillage pass such as with a field cultivator, light disk, harrow or soil finisher. If only a portion of the field is rutted, consider tillling only that area to avoid re-compacting subsoil in other parts of the field. Waiting until warmer weather next spring allows potential for some drying of the top two or three inches of soil and avoids further compaction of wet, plastic soil on the surface that would be done with a tillage pass this fall. If compaction effects are observed during the 2010 growing season and soil is dry after harvest, tillage next fall might be considered deep enough to break through the compacted layer.”

— Answer by Bill Wiebold.

**What is fallow field syndrome?**

Sometimes, but not in every incidence, crops planted in a field in which no crop was planted (or died from flooding) the previous year grow and perform poorly. The Missouri crop most often affected is corn. Visual symptoms appear similar to phosphorus deficiency, and often the symptoms appear in fields that test high for P.

The cause of fallow field syndrome (FFS) is unknown, but it might be related to beneficial fungi called mycorrhizae. These fungi grow in and around roots and increase phosphorous uptake, and are dependent on host plants to complete their life cycle. If plants are not grown in a field, mycorrhizal growth and spores are substantially reduced. Plants grown the next year might be slow to be infected because of the relatively low number of spores in the soil.

Planting a cover crop in prevented planting fields might decrease the potential for FFS next year. Almost any cover crops species, except members of the radish family, will be helpful.

— Answer by Bill Wiebold.

**Trees**

**Conifers**

*Evergreen trees are dropping needles. Is this due to rainy weather? Any management recommendations?*

When a tree experiences a severe environmental stress, such as flooding, waterlogged soil or drought, during the growing season, it is common for it to drop its foliage and go into a
quiescent, or false dormancy, phase. Waterlogged soil is probably more problematic for tree roots because it does not allow for normal respiration of the roots. It’s like trying to breathe underwater; it’s not possible. The longer a tree’s root system remains in this situation, the greater the risk of mortality.

The best approach to managing flood-stressed trees is to enhance their vigor by following proper tree-maintenance practices and eliminating additional stresses. Pruning (removal of dead branches and corrective pruning) should be delayed until the dormant season. Aerating the soil (by professional arborists) can help enhance vigor, but they are not rescue treatments for severely injured trees. Trees developing substantial dieback and decline symptoms or those possessing defects that decrease their structural integrity, which makes them more prone to windthrow and structural failure, should be removed from the landscape immediately. Also, keep in mind these waterlogged soils are excellent for soil-borne pathogens like Phytophthora to move freely in the soil from diseased trees to healthy ones. However, there is no good solution for this situation.

— Answer by Hank Stelzer.

Deciduous

Deciduous trees are having premature leaf color change. Will this affect vigor or survival? Any management recommendations?

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— Answer by Hank Stelzer.

Flood response

What are the best practices to identify and mitigate flood damage to trees?

It is really hard to determine if a tree dies from waterlogged soils or something else, such as a pathogen. Standing water is somewhat easier because you can see the water covering the landscape. Probably the best mitigation is soil aeration to assist in drying out the soil surface.
One other thing to keep in mind. Contrary to popular belief, the majority of a tree’s root system resides in the upper 12 to 18 inches of the soil profile. A lot of these roots are what are called fine roots and are responsible for water and nutrient uptake. These fine roots ‘turn over’ or regenerate every one or two years. Waterlogged soils force these fine roots to reside closer to the soil surface. Then, if we experience a severe drought the following year, the tree can experience severe drought stress. This happened recently; 2010 and 2011 were very wet years. Then in 2012 we experienced what the experts called a flash drought; severe dry soil conditions coupled with extremely high temperatures. Although trees are fairly resilient and can suffer the occasional defoliation, repeated environmental stresses will eventually lead to tree death.

— Answer by Hank Stelzer.

What are some examples of flood tolerant and intolerant trees.

_Tolerant:_ Acer rubrum - red maple; Fraxinus nigra - black ash; Fraxinus pennsylvania - green ash; Larix laricina - Eastern larch; Salix nigra - black willow; and Taxodium distichum – baldcypress

_Intolerant:_ Acer platanoides - Norway maple; Acer saccharum - sugar maple; Aesculus flava - yellow buckeye; Asimina triloba - common pawpaw; Carpinus caroliniana - American hornbeam; Carya ovata - shagbark hickory; Cercis canadensis - Eastern redbud; Cladrastis kentukea - American yellowwood; Crataegus lavallei - lavalle hawthorn; Fagus grandifolia - American beech; Juglans nigra - black walnut; Juniperus virginiana - Eastern red cedar; Liriodendron tulipifera - tulip tree; Magnolia ? soulangiana - saucer magnolia; Malus spp. – crabapple; Nyssa sylvatica - black gum; Ostrya virginiana - American hop hornbeam; Picea abies - Norway spruce; Picea glauca - white spruce; Picea pungens - Colorado spruce; Pinus banksiana - jack pine; Pinus resinosa - red pine; Pinus strobus - Eastern white pine; Prunus serotina - black cherry; Quercus alba - white oak; Quercus muehlenbergii - chinkapin oak; Quercus rubra - red oak; Sassafras albidum – sassafras; Sorbus aucuparia - European mountainash; Tilia spp. – linden; Tsuga canadensis - Eastern hemlock; and Ulmus pumila - Siberian elm

— Answer by Hank Stelzer.

Industry

How is this wet weather affecting the timber industry in Missouri?

The last few months of wet weather have taken their toll on the timber industry in Missouri. Loggers do not like to spend their time recovering stuck equipment. More importantly, landowners do not want rutted roads and compacted soil. However, since the average wood basket is about a 50-mile radius around a given mill, you can imagine it is somewhat hit-and-miss. Anecdotal feedback I have received points to mills in northern Missouri and along the Missouri and Mississippi Rivers who harvest trees from woods on glacial till soils most severely impacted. The more prudent mills hold what are called wet weather timber contracts on parcels of land with more stable soils and located next to hard surface roads.

— Answer by Hank Stelzer.
Turf

Compaction

Lawn mowing and other management practices are compacting lawns. What are the best ways to correct compaction in lawns?

Core aerification is the best management tool for compaction. We usually recommend early fall or early spring for home lawns. With this year, early fall (September) will be ideal coming off of a tough summer. This can be timed with fall overseeding and that first fall application of fertilizer.

— Answer by Brad Fresenburg.

Weeds

How should homeowners manage rapidly growing weeds in lawns?

Weed management should not vary from the usual recommendations. What we will see more of are post-emergent applications for crabgrass and other summer annuals since pre-emergence applications will not carry the full season due to excess rain. Follow product labels and try to apply when weeds are small. Many homeowners will want to control weeds late in the summer prior to fall seeding; however, there are no products labeled for late season annual weed control, especially crabgrass well beyond the tiller stage. Frost in fall is the best control for summer annuals. Seedbed preparation in the fall with a power rake will setback annual weeds enough to get turfgrass seed established without the use of an herbicide. If conditions have totally favored the weeds with very little turfgrass remaining, then Roundup might be the best solution and total renovation of the lawn justified.

— Answer by Brad Fresenburg.

Other

Food preservation

What is the window for maintaining food in a fridge or freezer when the electricity goes out and you’re able to add ice or dry ice?

For information on food maintenance, please see Quality for Keeps: Freezer Problem Solver: http://extension.missouri.edu/explorepdf/hesguide/foodnut/gh1506.pdf.

— Answer by Dave Baker.

Weather

Does the current wet weather pattern translate into predictions for wet fall weather?
No. The wet pattern Missouri has experienced since May has no bearing on the upcoming autumn weather pattern.

Preliminary precipitation data from Missouri for the period May 1 to July 14, 2015 indicate an average statewide precipitation total of 19.46 inches, which already ranks this year as the sixth wettest May through July period on record for Missouri.

**Missouri**

- May 2015: 7.26 inches
- June 2015: 7.30 inches
- July 1 to 14, 2015: 4.90 inches
- Total: 19.46 inches (So far, sixth wettest May to July on record and the wettest since 1993).

Links to May and June 2015 weather summaries for Missouri:


— *Answer by Pat Guinan.*