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Excess Nutrients Can Cause Nutrient Deficiencies in Crops

As producers strive to maximize yield, whether it is in a crop field or a garden, it is tempting to add more fertilizer than the crop can use. Macronutrients are required in large amounts for plant growth and include nitrogen (N), phosphorous (P), potassium (K), calcium (Ca), magnesium (Mg) and sulfur (S). Micronutrients are essential for plant growth but are needed in smaller amounts and include zinc (Zn), manganese (Mn), iron (Fe), copper (Cu), boron (B), and molybdenum (Mo). Over application of one or more nutrients can reduce yield by causing other nutrients to become unavailable either in the soil or in the plant itself.

Excessive P levels in the soil can occur when there is over application of commercial fertilizer or animal manure. High P levels are rarely toxic to plants but can interfere with the uptake and plant utilization of the micronutrients Zn, Fe and sometimes Mn. A micronutrient deficiency can occur in the plant, even when there are adequate levels in the soil.

Excessive potassium (K) levels in the soil can occur when there is over application of commercial fertilizer or animal manure. Adding wood ashes to soil can also lead to excessive K levels in the soil. Soils with a low cation exchange capacity (CEC) are more likely to encounter an issue with excessive K levels. Excessive K levels in the soil can suppress Mg and possibly Ca uptake.

Excessive calcium (Ca) can occur when too much lime or gypsum is added at one time which disrupts the balance of other nutrients. High Ca levels interfere with the uptake of K, Mg, and P as well as several micronutrients including Fe and Mn.

Because micronutrients are needed in small amounts, overapplication of these nutrients can readily lead to toxicity within the plant. Excessive micronutrients can also interact, tying up one or more essential nutrients resulting in plant deficiencies.

To avoid over application of nutrients the following steps are recommended.

1. Start with soil testing
2. Apply fertilizer based on need, not assumptions
3. Use tissue testing to confirm deficiencies
4. Manage manure and organic amendments wisely
5. Maintain optimal soil pH
6. Make in-season corrections judiciously
7. Implement site-specific fertilizer management

Adding excessive fertilizer should be avoided. Excessive soil nutrients can reduce the uptake and utilization of other nutrients. The additional fertilizer adds to the cost of production but does not return any additional product. Also, excessive fertilizer can contaminate water when it moves off site through runoff water, or infiltrates

through the soil to ground water.

More information can be found in the MU Extension Guide When More Is Less: How Excess Nutrients Can Cause Deficiencies in Crops. <https://extension.missouri.edu/publications/g9069>

Source: *Valerie Tate, field specialist in agronomy*



Changes with New Tax Legislation

The One Big Beautiful Bill Act became law on July 4, 2025. The Act is 887 pages and will impact all taxpayers. It includes provisions to extend or modify current law and also new additions to tax code.

The acronyms for One Big Beautiful Bill Act are many including OB3, OBBBA, OBBB, BBB and likely more. For the purposes of this article the acronym used will be OB3. This article will cover a few of the items in the OB3 Act and future articles will cover additional items. The articles will not cover all provisions of the legislation.

There are several extensions and revisions for individual tax provisions.

Individual Income Tax Rates: the OB3 Act permanently extends the income tax rates and brackets enacted by the Tax Cuts and Jobs Act (TCJA was signed into law 2017). Also, the OB3 Act adds an extra year of inflation adjustments to the end of the 10% and 12% brackets, increasing the income at which the 22% bracket begins.



Standard Deduction: The standard deduction for 2025 was scheduled to be \$15,000 for singles and \$30,000 for married filing jointly and then in 2026 revert to half those amounts, indexed for inflation. There are changes with the OB3 Act by making the increased standard deduction permanent, while also providing an increase in the deduction to \$15,750 for singles and \$31,500 for married filing jointly beginning in 2025.

Personal Exemption: In 2017, taxpayers could generally take a personal exemption of \$4,050 for themselves, spouse, and each dependent. The TCJA suspended the personal exemption for 2018 through 2025. The OB3 Act permanently repeals the personal exemption, but it adds a new temporary deduction for seniors.

Temporary Deduction for Seniors: For tax years 2025-2028, the OB3 Act provides seniors (those 65 years of age

and older) with an additional \$6,000 deduction. If seniors are married, each spouse who is 65 and older is entitled to the deduction, as long as filing jointly and meeting the income requirements. The senior deduction begins to phase out for taxpayers with incomes of \$75,000 (single) or \$150,000 (married filing jointly). The deduction is available for seniors who take the standard deduction and for those who itemize deductions.

Child Tax Credit and Other Dependent Credit: The OB3 Act permanently creates an enhanced child tax credit of \$2,200 (beginning in 2025) for qualifying children under age 17. This amount is adjusted for inflation after 2025. The OB3 Act also permanently retains the current higher income phase-out thresholds (\$200,000 for singles and \$400,000 for married filing jointly).

Qualified Business Income Deduction: The OB3 Act makes permanent the 20% qualified business income (QBI) deduction for sole proprietors and pass-through businesses (partnerships and S-corporations). This includes the 199A (g) deduction for agricultural cooperatives and its patrons. There was an increase in the income limit ranges for phasing out the deduction. For single filers the phaseout range is \$197,300 - \$247,300. For joint filers the phaseout range is \$394,600 - \$544,600. These thresholds are indexed for inflation starting in 2026.

The OB3 Act includes a new minimum \$400 deduction for taxpayers with at least \$1,000 in "active" qualified business income. Both amounts will be adjusted annually for inflation. To qualify for this minimum deduction, the taxpayer must materially participate in the business.

Estate and Gift Tax Exemption: The OB3 Act permanently increases the estate and gift tax exemption (basic exclusion) beginning in 2026, to \$15 million per person, indexed for inflation each year after. The basic exclusion for 2025 remains at \$13.99 million.

Source: *This article contains information written by Kristine Tidgren, Iowa State University, Center for Ag Law and Taxation*

Source: *Mary Sobba, field specialist in ag business*



Prussic Acid in Frost-Damaged Forages

When nighttime temperatures begin to drop below freezing, cattle producers must be aware that certain plants when damaged by frost, drought, or tissue disruption can produce hydrocyanic acid or prussic acid. Ingestion of prussic acid containing forage can potentially be life-threatening. Below are some factors to keep in mind to reduce the incidence of prussic acid poisoning in livestock.

Several important forage plants can produce prussic acid. These include sorghums, sorghum-sudangrass

hybrids, and johnsongrass, although wilted cherry tree leaves can also contain toxic levels of prussic acid.

Stress conditions such as drought or frost damage increases prussic acid levels in leaves. Remember also leaves contain higher levels of prussic acid than stems. Since prussic acid dissipates over time, it is recommended to not graze frost damaged plants for two weeks after frost damage or killing frost.

New growth from these plants can also contain toxic levels of prussic acid. For this reason, it is recommended to let sorghum-related plants reach a height of 18 to 24 inches before allowing livestock graze these plants. If plants regrow due to extended warmer weather and/or rain, the new regrowth is extremely toxic until it reaches 18 to 24 inches in height.

The forage is assumed to be safe to graze two weeks after frost damage, provided there is no new growth emerging from the plants. Once killed by frost, plants are assumed safe after dried which is usually about a week. These plants can be harvested for hay and the prussic acid will dissipate, so hay is considered safe. It is suggested, however, to wait about a week after a killing frost to cut for hay to help ensure the prussic acid has dissipated.

Prussic acid toxicity is similar to nitrate toxicity and plants that do not produce prussic acid can harbor toxic levels of nitrates. If in question, test plants for nitrates before grazing or harvesting. Nitrates do not dissipate in dry hay but are lowered during fermentation associated with haylage or silage production.

Much more detail can be obtained on prussic acid toxicity in livestock in Extension guides published by MU Extension, Oklahoma State University, Kansas State University, South Dakota State University and North Dakota State University.

Source: *Gene Schmitz, field specialist in livestock*



Drones can More Efficiently Measure the Health of Corn Plants, Study Finds

Researchers at the University of Missouri have found a mix of drones and AI can help farmers measure the health of their corn more efficiently.

Instead of relying on handheld devices — which are slow and impractical for larger fields — the researchers surveyed corn fields in mid-Missouri using drones equipped with special cameras to capture images and data. By analyzing the images and data using artificial intelligence, the team was able to accurately estimate chlorophyll levels — a key indicator of corn health.

The drone's special cameras capture different wavelengths of light that plants reflect, such as near-infrared light and red-edge light, which are invisible to the human eye but closely linked to plant health.



After combining these drone images with soil data, the Mizzou researchers used a type of AI known as machine learning to quickly predict the chlorophyll content in the corn leaves of the entire field with great accuracy.

The study was led by Fengkai Tian, a Mizzou doctoral student who works in the lab of Jianfeng Zhou, an associate professor in the College of Agriculture, Food and Natural Resources.

“The goal of our lab is to use innovative technologies to improve the efficiency of agricultural systems,” Zhou, who is also the co-director of research for Mizzou’s Digital Agriculture Research and Extension Center, said. “Nitrogen application has been one of the biggest challenges facing corn farmers. We want to help farmers increase their yields while using fewer chemicals that can impact the environment. Precision agriculture can help farmers apply nitrogen at the right time to the right location in the right amount.”

Because corn demands a lot of nitrogen to grow, knowing the specific chlorophyll content of each plant helps farmers decide when and how much nitrogen-rich fertilizer to apply to each of their crops. Too much nitrogen is expensive and harmful to the environment, while too little can hinder crop growth.

Tian is hopeful that drones can give farmers a tool to make more informed decisions surrounding crop management — and ultimately maximize crop yield while saving time and money and protecting the environment.

“Going forward, farmers could potentially contract with agriculture technology companies who can fly the drones and process all the data so the farmers can benefit from the technology without having to be

experts in it themselves,” Tian said.

Tian added that while this study focused on corn, which needs a lot of nitrogen to grow, the innovation of combining drone imagery with machine learning can eventually help inform farmers about the health of other crops that are less nitrogen-dependent, including soybean and wheat.

“Estimating corn leaf chlorophyll content using airborne multispectral imagery and machine learning” was published in Smart Agricultural Technology. The study was a collaboration between Mizzou and the Agricultural Research Service, the chief scientific research agency for the United States Department of Agriculture.

Zhou’s interdisciplinary research team includes experts in statistics, computer science, artificial intelligence, mechanical engineering and plant sciences, reflecting Mizzou’s land-grant mission and positioning the

university as an epicenter for innovation in precision agriculture.

Source: *Brian Consiglio, MU CAFNR news team*

Trivia:

Ice cream cones made from waffles were first invented in Missouri at the St. Louis World’s Fair in 1904 when an ice cream vendor ran out of cups to serve the ice cream. The vendor asked a waffle vendor to roll waffles to supply the ice cream, and hence the birth of the waffle cone.

MU Field Day

Oct. 18 - Chestnut Roast, Horticulture and Agroforestry Farm, New Franklin, MO
10:00 a.m. to 3:00 p.m.

<https://centerforagroforestry.org/event/2025fest/>