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New Rules Affecting Drone Use in Ag—A Summary of FAA Part 107 Rules

The FAA (Federal Aviation Administration) released permanent rules for non-hobbyist drone operation, referred to as Part 107, on Tuesday, June 21, 2016. These permanent rules go into effect on August 29, 2016. Part 107 covers a broad spectrum of commercial uses for drones weighing less than 55 pounds. The following are examples of possible drone operations to be conducted under the framework in this rule:

- Crop monitoring/inspection
- Research and development
- Educational/academic uses
- Other commercial uses

Highlights from the new rule include:

Pilot Certification

- A remote pilot airman (RPA) certificate with a small UAS (Unmanned Aerial System) rating which will require passing an initial aeronautical knowledge test at an FAA-approved knowledge testing center, or, operate under the direct supervision of a person who holds such a certificate.
- Vetted by TSA (Transportation Security Administration).
- Minimum age of 16.

Operations

- Operation requires a certified remote pilot in command (RPIC), however, a visual observer (VO) is optional.
- Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the remote pilot in command and the person manipulating the flight controls of the drone.
- Maximum flight altitude 400' above ground level (AGL).
- Operations within Class G airspace without air traffic control (ATC) permission.
- Daylight-only operations with appropriate anti-collision lighting.
- May not operate over any persons not directly participating in the operation.

Aircraft Requirements

- FAA airworthiness certification not required.
- Aircraft (>0.55lbs) must be registered with FAA.

Agriculture would be significant benefactors in drone applications. Other commercial uses pertain to security, defense, public safety, communication and environmental and transportation services. Industry experts estimate the recent rule changes will help generate more than $82 billion for the U.S. economy and create more than 100,000 jobs over the next 10 years.

For more information regarding the new drone rules, refer to the FAA's - *Summary of Small Unmanned Aircraft Rule (Part 107)* https://www.faa.gov/uas/media/Part_107_Summary.pdf

Source: *Kent Shannon, natural resource engineering specialist*

Gardening Tips for September

Ornamentals
- Plant evergreens now.
- Take cuttings of annuals to have vigorous plants for over -wintering.
- Plant spring bulbs except for tulips as soon as available. Keep tulips in a cool, dark place and plant in late Oct.
- Divide perennials, especially spring bloomers. Enrich the soil with peat moss or compost before replanting.
- Divide peonies now. Replant in a sunny site and avoid planting deeply.
- Lift gladiolus when their leaves yellow. Cure in an airy place until dry before husking.
- Begin forcing poinsettias to bloom at the end of month. Place plants in a cool, dark room or closet from 5 p.m. until 8 a.m. for about 8 weeks or until top leaves turn red.

Vegetables
- Sowing seeds of radish, lettuce, spinach, and other greens in a cold frame will prolong fall harvests.
- Pinch out the top of brussel sprout plants to plump out the developing sprouts.
- Keep broccoli picked regularly to encourage additional production of side shoots.

Fruit
- Pick pears before they are fully mature. Store in a cool, dark basement to ripen.
- Discard any spoiled or fallen fruits.
- Paw paws ripen in the woods now.
- Check along peach tree trunks to just below the soil line for gummy masses caused by borers. Probe holes with thin wire to puncture borers.

Turfgrass
- Begin fall seeding or sodding of cool season grasses. Seedbeds should be raked, dethatched, core-aerified, fertilized, and seeded. Keep newly planted lawn areas moist, but do not wet.
- If soils become dry, established lawns should be watered thoroughly to a depth of 4-6 inches.
- Cool season lawns are best fertilized in fall. Make up to 3 applications between now and December following University of Missouri soil test program and recommendations.
- It is not uncommon to see puff balls in lawn areas now.
- Newly seeded lawns should not be cut until they are at least 2-3 inches tall.

Miscellaneous
- Fall is a good time to add manure, compost, or leaf mold to garden soils for increasing organic matter content.
- Monitor plants for spider mite activity. Reduce their numbers by hosing off with a forceful spray of water.
- Seasonal loss of inner needles on conifers is normal at this time. It may be especially noticeable on pines.

The above tips are from the Missouri Botanical Gardens. For specific fall gardening questions contact Jennifer Schutter 660-665-9866.

Source: *Jennifer Schutter, horticulture specialist*

The Basics of Fertilizer

A fertilizer is a chemical or natural substance that is applied to the soil or plant tissue to supply nutrients for healthy plant growth. Fertilizers are designed to provide mineral elements to plants not adequately supplied by the soil. A soil test is strongly recommended to accurately determine what nutrients are already available in the soil before applying fertilizers. Soil test results provide nutrient levels, and recommendations on what and how much fertilizer is needed to optimize plant growth based on yield goals.

There are 17 essential plant nutrients required for proper plant growth and development. An element is considered an essential plant nutrient when plants cannot complete their lifecycle without it, no other element can replace it or perform the same function, and it has a direct effect on plant growth or metabolism. Carbon (C), hydrogen (H), and oxygen (O) constitute about 90% of plant dry mater and are obtained from water and air. The remaining 14 nutrients are mineral elements and can be divided into primary, secondary, and micronutrients. Nitrogen (N), phosphorus (P), and potassium (K) are the primary nutrients and are needed in the largest quantities compared to other nutrients. Calcium (Ca), magnesium (Mg), and sulfur (S) are secondary nutrients which are required by the plant in lesser quantities. Secondary nutrients are still considered macronutrients and are still essential for good plant growth. Zinc (Zn), manganese (Mn), iron (Fe), boron (B), copper (Cu), molybdenum (Mo), chlorine (Cl), and nickle (Ni) are micronutrients, essential nutrients that are required by plants in very small amounts. Plants may differ in the amount of essential nutrients needed for optimal growth and production, but all are required for specific plant function. If there is a deficiency in any essential nutrient, plants will be unable to adequately complete their lifecycle and will express deficiency symptoms.

Fertilizers can be broken down into two main groups: organic and inorganic (chemical). In this instance, organic fertilizers are represented from naturally derived sources such as living plant or animal sources. Chemical or synthetic fertilizers are manufactured and are typically associated with lower cost. From the stand point of the plant, the type or source of fertilizer makes no difference, as long as the plant is able to get the nutrients it needs. The majority of synthetic fertilizers consist mainly of macronutrients and are

often formulated to be rapidly available to the plant. While on the other hand, organic fertilizers tend to have higher amounts of micronutrients and the macronutrients are likely to be in forms that are not readily available to plants. For example, nitrogen in an organic fertilizer is slow in becoming available to plants because it has to be reduced by micro-organisms to inorganic forms, ammonium and nitrate, before it can be absorbed by the plant. For this reason, organic fertilizers are usually considered to be time -release and inorganic fertilizers tend to be fast acting.

Both organic and inorganic fertilizers have certain situations in which they are better suited. Because organic fertilizers release nutrients slowly they work well with plants that live for multiple seasons, like perennials, woody trees, and shrubs. Organic fertilizers also help increase the soil organic matter content, which improves soil structure and overall soil health. Because organic fertilizers are slower to release, they will not quickly correct a nutrient deficiency and are unlikely to provide adequate nutrients to high need crops. Organic fertilizers are also dependent on soil microorganism to break them down to release nutrients and are therefore most effective when soil moisture and temperature are adequate for the microorganisms to thrive. Inorganic fertilizers tend to be lower in cost and are well suited for short-season, high need crops such as vegetables. Inorganic fertilizers are often found in water soluble forms and can be a source of water pollution if not used correctly. Inorganic sources of nitrogen move easily through the soil and can often leach from the site of application. If a high level of nitrogen is not needed immediately, slow-release fertilizers are recommended to reduce the risk of leaching, particularly on more course soil types.

By law, all fertilizer products must be labeled with three numbers, such as 12-12-12 or 7-0-0 or 15-30-15, indicating the fertilizer grade or analysis. The three numbers specify the minimum percentage by weight of nitrogen (N), phosphate (P_2O_5), and potash (K_2O) in the product. The percent of phosphate and potash is used to represent the amount of phosphorus and potassium in the product, respectively. A 50-pound bag 12-12-12 would contain 6 pounds of each N, P_2O_5, and K_2O. This would be considered a complete fertilizer because it contains all three macronutrients, N, P, and K. It is also a balanced fertilizer because all three nutrients are in equal amounts. A 7-0-0 fertilizer would be considered incomplete because it contains only nitrogen. Incomplete fertilizers work well when a soil test indicates a need for only one or two nutrients. A 15-30-15 would be considered a complete fertilizer because it contains all three components; however, it would not be considered balanced because it has a different fertilizer ratio. Manufactures may also choose to guarantee the amount other nutrients, such as boron, sulfur, zinc, etc. in the fertilizer. This may be done by adding additional numbers on the product label and identifying what nutrients are added in the ingredients.

When purchasing fertilizers be sure to compare prices. Figure the actual cost of the fertilizer by the per pound of plant nutrient. If a soil test indicates multiple nutrients are required, it may be cheaper to purchase a couple of fertilizers. For example, if a soil test calls for a higher amount of N and lower amount of P and K, it may be cost effective to use a complete fertilizer like 12-12-12 to meet the P and K requirements and an incomplete fertilizer like 7-0-0 for the remaining nitrogen needs.

For more information on fertilizers, contact your local extension office or see this guide sheet *http://extension.missouri.edu/p/MG4*

Source: *Wyatt Miller, agronomy specialist*

Missouri Farm Economy Listening Sessions

In July 2016, University of Missouri Extension partnered with the Missouri Department of Agriculture to tour the state, visiting seven sites to listen to farmers, ranchers and community leaders about their take on the current financial situation and current opportunities and challenges facing the industry. Nearly 400 people came to discuss the latest topics in Missouri agriculture. The main findings have been compiled in this article which will be utilized to support industry and program changes.

The following comments and recommendations were made by Missouri farmers and ranchers:

Young Producers Face Challenges:

- Encourage younger generations to return to the farm.
- Considering 2012-2014 commodity prices being typical, the ability of young generations to return to family farms depends on the existence of Beginning Farmer Programs.
- Young producers struggle with down payments. This may be solved by established farmers investing without ownership in young producers' farms.

Policy has great Influence:

- Uphold the Renewable Fuel Standard to ensure greater corn demand for ethanol.
- Cease excessive federal government regulation controlled by urban citizens.
- Support keeping chemicals on the market.
- Add value to the dairy industry with a Missouri cheese plant. Dairy is struggling with 2/3 of the milk check covering only feed costs.
- Pass TPP (Trans-Pacific Partnership) - with more beef exported, more corn could possibly be exported.
- Advocate for the importance of foreign markets.
- Increase tools to manage and protect from volatility in markets here and abroad.

Education Is Important:

- Establish agricultural education programs for county

commissioners & other regional leaders.
- Establish farm finance continued education classes.
- Educate producers about state and federal loans, USDA-FSA and other federal program paper work, tax paperwork and efficient record keeping.
- Work to increase timely, unbiased information to share directly to producers.
- Bridge the knowledge gap between consumers and agriculture to reduce the challenges of expanding farms.

Land and Lending:

- Better communication is needed for low cash rent prices to landlords who don't understand after the high commodity prices seen in 2012-2014.
- Spend appropriately with lenders supervision; sensitive analyses help evaluate each situation.
- Make available credit at reasonable prices.
- Stop converting pastureland into cropland. There are challenges to getting cattlemen to turn crop ground back into pasture and build fence with no short-term profit.
- Eliminate land market monopolization by big producers.
- Pay off debt when prices are high and times are good.
- Remember each financial situation is unique.
- Increasing land values due to urban pressure hinders expansion in some areas.
- May see large number of acres come to market.

What producers are doing:

- Diversifying operations to reduce the effects of economic downfall by entering niche markets such as agritourism, organic production and farmers' markets
- Seeking programs that establish consumer trust such as the Agricultural Stewardship Assurance Program (ASAP).
- Seeking alternative solutions to keep their farms:
- Working full-time/part-time off the farm
- Planting waxy corn
- Completing custom hire work instead of hiring out
- Avoiding equipment purchases and limiting inputs
- Reevaluating family living costs
- Focusing on strengths in operation
- Knowing break-even points / recognizing the profit margin
- Facing new challenges with technology
- Balancing higher yields and higher costs.
- Keeping up with ever-changing advances in technology.

Source: *Darla Campbell, ag business specialist*