Unmanned aerial vehicles advance agriculture

by Corey Moffet / camoffet@noble.org

Unmanned aerial vehicles (UAVs), more commonly referred to as drones in a majority of media outlets, have played an important role in U.S. military operations. These sophisticated flying machines have proven their utility in this arena, albeit at a huge price. Now the UAV industry is looking to expand into the civilian world, and the agricultural sector is expected to play a large role in this expansion.

Currently, the Federal Aviation Administration (FAA) is determining how unmanned aircraft systems (UAS) might be safely integrated into the national airspace system. The FAA uses the acronym “UAS” to include the UAV and all the associated support equipment, such as control stations, data links, telemetry, communications and navigation equipment. Often the image that comes to mind when thinking about UAVs or drones is something like the iconic Predator with its nearly 60-foot wingspan and a loaded weight of more than 1 ton. This type of UAV will occupy the same airspace routinely used by general and commercial aviation.

The challenge the FAA has in figuring out how to safely integrate these large UAVs into the national airspace is not trivial. However, agriculture can benefit from UAVs much smaller than the Predator. A system with a takeoff weight less than 55 pounds is classified as a small UAS by the FAA, and the agency has made it a priority to propose new rules governing their use. These UAVs are more of the scale and type that are legally flown now at elevations of 400 feet above ground level and lower by hobbyists for recreational purposes. Many of these UAVs, like the one pictured, can be easily disassembled and transported in a case the size of a large briefcase.

Like other classes of aircraft, small UAVs can be fixed wing or rotary wing. The fixed-wing aircraft tend to be more stable and require less power to stay aloft than the rotary-wing craft, but they are also less agile. Many UAVs use an autopilot system to sense their position and altitude, and...
make necessary corrections to stay upright and on path. Once this type of UAV is airborne, the operator has little or nothing to do with the flight. Flight plans are typically designed using software on a laptop computer, and the flight path is communicated over a data link to the UAV. When the flight is complete, the UAV returns to a spot the operator has designated for safe landing. Some rotary-wing aircraft can return to the very same spot where they began flight. Initially, UAVs will be useful for agriculture because of their ability to deploy meaningful sensors, making it easy for users to observe resources from a vantage point not previously feasible.

In some ways, UAV technology is positioned where personal computer technology was in the late 1970s. Computers at that time were large and very expensive, but they had proven useful in government and business. The personal computer was mainly of interest to hobbyists and produced few real-world benefits. Many believed the personal computer would remain a curiosity of this small group of enthusiasts. At that time, it would have been hard to believe that one day many families would own multiple computers or even imagine the now ubiquitous smartphones and tablets. The high cost and difficulty of using a personal computer in the 1970s were big adoption hurdles.

For the UAV today, the hurdles are regulatory (though for the small UAS, these should be overcome soon), cost and the lack of simple tools that can use sensor data to help producers make decisions. In crops such as corn and soybean, a number of tools are already available, and the development of similar tools for rangelands and forage crops will follow. If UAVs follow a similar path as the PC, low cost and useful tools will come—perhaps in ways we can’t even imagine now.

SAFETY

Precautions reduce heat illness

by Ugochukwu Uzoeghelu / ucuzoeghelu@noble.org

Summer heat can be dangerous. Heat illness is a serious medical condition resulting from the body’s inability to cope with a particular heat load. It is not a sign of weakness or frailty, and it can be a serious health risk even when the temperature is moderate. The most common heat-related illnesses are heatstroke, exhaustion, cramps and rash.

Any worker exposed to hot and humid conditions is at risk of heat illness. Some workers are at greater risk than others if they have not built up a tolerance to hot conditions. These can include new workers, temporary workers or those returning to work after a week or more off. The industries most affected by heat-related illnesses are agriculture, construction, transportation, utilities and landscaping services. According to the Centers for Disease Control and Prevention (CDC), crop workers are 20 times more likely to die of heatstroke than all other U.S. workers.

Common features of heat-related illnesses include fatigue, weakness, dizziness, faintness, nausea, headache, clammy skin and rapid pulse. Heatstroke may cause serious symptoms such as confusion, loss of consciousness, convulsions, coma and multiple organ damage.

Employers should establish a complete heat illness prevention program to mitigate heat illness. The program should include providing workers with water, rest and shade; and gradually increasing workloads and allowing more frequent breaks for new workers and workers who have been away for a week or more to allow them to build heat tolerance. Other preventative steps can include modifying work schedules, planning in advance for emergencies, and training employees about the symptoms of heat-related illnesses and how to prevent them. In addition, workers should continuously be monitored for signs of illness.

Here are some steps to prevent heat-related illnesses and fatalities:

- Drink water every 15 minutes, even if you are not thirsty.
- Rest in the shade to cool down.
- Wear a hat and light-colored clothing.
- Learn the signs of heat illness and what to do in an emergency.
- Keep an eye on fellow workers.
- Take it easy on your first days in the heat so your body can become acclimated.

Employees who are new to working in the heat or returning to work from an extended leave should have a work schedule that allows them to gradually get used to the heat. The same is true for all workers on the first hot day or during a heat wave.

Remember: water, rest and shade – taking these precautions can mean the difference between life and death.

The Heat Equation

Source: U.S. Department of Labor, Occupational Safety and Health Administration
Buying or selling land is seldom a simple matter. When improvements exist on the land, questions arise concerning what portion of the transaction price is allocated to each improvement. Sellers and buyers often use different values depending on each one’s individual tax situation. The reason for the attention given to allocation is that land cannot be depreciated, but many improvements used for business can be.

For the purposes of this article, the assumption is made that a land acquisition does not constitute the purchase of a total business or business entity. Those acquisitions can be much more complex and have specific tax reporting requirements. For brevity, this article will not discuss such business acquisitions or business entities.

When a buyer purchases land with improvements, e.g., a corral and fencing, the purchase price can be allocated between the land, the corral and the fencing. Fair market values (FMV) should be used to determine the basis or cost for each asset. Farm machinery and equipment, and agricultural fencing have a seven-year cost recovery period. If the buyer then sells the land after three years, the sales price needs to be divided among the land, corral and fence. Assuming the sales price is more than the original purchase price, the gain is taxed differently for the land than for the corral and fence.

The gain on the land is taxed at capital gain tax rates (0 percent if an individual is in the 10 or 15 percent tax bracket; 15 percent if an individual is in the 25, 28, 33 or 35 percent tax bracket; and 20 percent if an individual is in the 39.5 percent tax bracket). The gain on the corral and fence that is due to the depreciation taken is taxed at ordinary tax rates, which are generally higher than capital gain tax rates. The rest of the gain between the original purchase price of the corral and fencing, and the higher sales price qualifies for capital gain tax rates. Following is a theoretical example.

John and Mary purchase land with a corral and fencing for $300,000. The land and improvements are used in their ranching business. They determine the FMV of the corral is $20,000, and the perimeter and cross fencing has a FMV of $30,000. At the fourth year after purchase, John and Mary receive an offer for $360,000 and decide to sell. During the three years of ownership, they did not add any additional improvements, deduct any soil and water conservation expenditures, or exclude any cost-sharing payments for conservation improvements. John and Mary agree with the buyers that the FMV of the corral is $24,000 and the FMV of the fencing is $36,000. The FMV of the land is $300,000.

How you allocate the purchase price in the year of purchase will have tax implications when the land is sold. All the gain that is due to depreciation is recaptured as ordinary income. This ordinary gain is taxed at regular rates based on an individual’s tax bracket. On the other hand, the gain on depreciable assets above the initial purchase price is taxed at capital gain tax rates, which are typically lower. Professionally qualified appraisers can help you allocate fair market values for land and improvements. For experts in your area, please visit www.asfmra.org or www.appraisalinstitute.org.

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## Wheat alternatives expand winter pasture choices

**by Jim Johnson / jpjohnson@noble.org**

### The vast majority of the winter pasture in the Southern Great Plains is wheat. There are many reasons for this, including culture, the opportunity to harvest and sell grain, and government and insurance programs. However, there are numerous other cool-season annual species that can also be used, alone or in mixtures, for winter pasture forage grazing.

Rye is popular on sandy soils or for overseeding into bermudagrass. Rye germinates easily and can be drilled or broadcast-planted at seeding rates and dates similar to wheat. Rye produces forage earlier in the fall but also matures earlier in the spring compared to wheat. Rye will continue to grow at temperatures as low as 40 degrees Fahrenheit, while wheat growth typically ceases at 45 degrees Fahrenheit. Rye forage quality is similar to wheat, but palatability may be slightly lower. Rye tends to reseed if given the opportunity to set seed.

Oats will out-produce wheat on heavier, wetter soils. Oats can be broadcast but will do better if they are drilled. The bushel weight of oats is only 32 pounds per bushel. Planting rate is typically 2 bushels per acre. Oats can be planted in the fall, like wheat, but can also be planted early in the spring. Oats have vigorous seedling growth so they can make high fall forage yields. However, oats are less tolerant than wheat to cold temperatures and can freeze out in winter. Oat forage quality is similar to wheat, but oats probably have the highest palatability of all the small grains.

Barley is often overlooked for forage, but it will perform similarly to wheat. Planting rates, dates, fertility needs, production and quality are all basically the same as wheat. The big advantage for barley is that it does better on salty soils than any other small grain.

Triticale is an interspecific cross of wheat (Triticum aestivum) and rye (Secale cereale). Its production timing is about midway between wheat and rye, and planting rates and dates are similar to wheat and rye, as would be expected. However, just like a mule is superior to its parents, triticale has superior forage production compared to wheat or rye. Triticale can easily produce 50 percent more forage than wheat or rye.

Annual ryegrass is not a small grain, but it is a cool-season annual grass. It does well on heavier, wetter soils. Annual ryegrass is planted at 5 to 20 pounds per acre, depending on if it is mixed with other small grains or if it is planted as a pure stand. Annual ryegrass can be planted from early fall through late winter. Most of its forage production occurs late in the spring. The lateness of annual ryegrass forage production works well with the earliness of rye forage production to provide a long grazing season of fall, winter and spring grazing. However, when overseeded into bermudagrass, the lateness of annual ryegrass production is often at the expense of bermudagrass during its production season. Annual ryegrass tends to reseed if given the opportunity to set seed.

There are other forages that can be added to small grains to potentially increase diversity, forage productivity and forage quality; add nitrogen to the soil; break compaction; or increase soil health.

Hairy vetch is a legume that is often used on sandy soils. It can be planted in mixtures with other winter forages or overseeded into bermudagrass in the fall. Planting rates vary from 5 to 10 pounds per acre. Most of the production from hairy vetch will come in the spring. There are also other vetches, such as cahaba, chickling, common and woolly pod, but these are used much less than hairy vetch. Hairy vetch tends to reseed if given the opportunity to set seed.

Austrian winter pea is a legume that can be planted with winter pasture mixtures. Austrian winter pea does well on silty soils. Planting rates vary from 15 to 30 pounds per acre. Like vetch, most of the production will come in the spring.

Turnips and rape are members of the brassica family that can be added to small grains for additional forage and diversity. Seeds of these are very small, so planting rates can be as little as 0.5 pounds per acre. Turnip and rape seed can be broadcast ahead of the drill or mixed with the small grain seed. Other brassicas that are sometimes used are Ethiopian cabbage, collards, kale, mustard and radishes.

There are many clovers, but I have not listed them in this article because their production is typically too late in the spring/summer to be a major component of a winter pasture system. In addition to the forages listed in this article, there are others, like safflower, which we are experimenting with and may find a place for in winter pastures in the future.
Nature manages native plant communities

by Mike Porter / mdporter@noble.org

Several things drive native plant communities: sunlight, soils, water, herbivory, fire and rest. They may be called processes, factors, cycles, tools, practices, etc., but whatever the semantics, native plant communities require them. These things are interconnected and codependent. Without appropriate amounts of each, native plant communities change and decline. These are the means by which nature maintains plant communities, and we could learn a few things by paying attention. Most people understand the importance of sunlight, soils and water, but fewer recognize the importance of herbivory, fire and rest to native plant communities.

Sunlight is the primary energy source for most forms of plant life. Plants without adequate sunlight generally decline or die. We may not have any control over the amount of sunlight reaching our spot on Earth, but we can influence its impacts. Excessive grazing removes too much leaf material that is necessary for capturing sunlight. This weakens plants, reduces their root biomass and provides other plants competitive advantages. An appropriate balance of rest (absence of disturbance) and disturbance (e.g., grazing, fire, etc.) is necessary to allow plants to regrow leaves so they can adequately capture sunlight and store energy reserves. Inadequate fire frequency or long periods of rest release or encourage woody plants, which overtop grasses and forbs, and capture their sunlight. This can be good or bad depending on goals.

Without irrigation or moving soil, we do not control how much precipitation falls on our patch of Earth or the type of soil available on it; however, through proper management of disturbance and rest, we can influence soil health and the effectiveness of rainfall. Inadequate rest caused by excessive grazing removes most plant and mulch cover on the soil, which causes much of the rainfall to flow off the land rather than soak into the ground where it is more available to plants. Absence of plant and mulch cover exposes the soil surface, which increases erosion, evaporation and soil temperatures.

Herbivory involves many forms of plant consumption, whether it be by mammals, birds, insects, crustaceans, mollusks, etc. Although fungi and bacteria are not animals, they also consume plant parts through decomposition. Plant communities require herbivory and decomposition for recycling nutrients and providing space for new leaves so plants can continue to grow on a site. Inadequate herbivory causes a plant community to change and typically decline.

Most upland native plant communities in temperate zones throughout the world require certain fire frequencies. Prairies and meadows depend on fire for long-term existence because without fire, plant succession changes them to woodlands or shrub lands. Even most upland shrub and tree communities depend upon fire. Fire favors certain species over others and, without fire, species composition changes, e.g., Eastern red-cedar replaces oaks and hickories in Cross Timbers woodlands; yaupon replaces diverse shrubs, grasses and forbs in Post Oak Savannah woodlands; shrubs and trees replace grasses and forbs in Pineywoods understory; etc. Fire recycles nutrients and provides space for new growth. Fire temporarily improves palatability and forage quality of many plants, which can allow them to be appropriately impacted by and appropriately benefit herbivores. Some plant species depend on fire for germination.

Adequate rest from disturbances such as fire, herbivory, mowing, haying and herbicides is necessary to maintain and improve native plant communities. Prolonged excessive disturbance changes species composition, generally favoring less productive and less diverse species that tolerate such disturbance.

Land stewards should try to understand and manage fire, herbivory and rest to successfully and efficiently manage the resources under their watch.
Cool storage reduces produce losses

More often than not, new market gardeners are so focused on growing and marketing (primarily growing) that they fail to plan adequately for what happens between the two—post-harvest handling and storage.

It doesn’t take long for harvested produce to start deteriorating. All the qualities growers and consumers look for in produce, including weight, texture, flavor, nutritive value and appeal, begin to decline. There is a rule of thumb for perishable crops: every hour lost before cooling to proper storage temperature results in a loss of one day of shelf life. The bottom line is that cool storage extends the market window for produce and reduces loss due to spoilage—both contributing factors to a grower’s profitability.

Commercial walk-in coolers are cost prohibitive to all but large-scale market gardeners. With the recent introduction of the CoolBot, an electronic controller used to supercharge off-the-shelf window air conditioners, small-scale market gardeners can now transform an ordinary portable building into an efficient walk-in cooler.

I recently had the opportunity to examine such a cooler at the farm of Niels and Carla Maness near Perkins, Okla. They farm about 7 acres of mixed vegetables, which are marketed at the farmers’ market in Stillwater, Okla. Being the busy people that they are, they opted to have a local portable building company (Better Built Barns, www.okbarns.com) custom-build their cooler. The freestanding building measures 10 feet by 12 feet and is equipped with skids. It is framed with 2-inch by 6-inch lumber and is very well insulated. It is also equipped with an electrical service box and a waterproof light fixture. The building cost them $4,000 delivered. Niels estimates he could do the job himself for about $2,000. The CoolBot and air conditioner cost an additional $600.

If you are in the market for a custom-built, walk-in cooler or thinking about building your own, there are several things to consider before opening your wallet.

When sizing the structure, take into account the amount of produce you will need to store at any one time, now and in the near future. Also consider container size and stacking arrangement.

In Oklahoma, due to our extreme heat and stormy weather, choose 2-inch by 6-inch construction. A 6-inch wall can hold more insulation than a 4-inch wall, and the heavier construction is more resistant to storm damage.

To prevent condensation in the walls, floor and ceiling, the structure must be equipped with a vapor barrier. Condensation can reduce the effectiveness of the insulation and cause dry rot in wood studs and joists.

Foam boards can be added to the interior surface of the studs, ceiling and floor joists for additional insulation—the thicker the board, the greater the R-value.

Several materials can be used to cover the interior and exterior of the cooler; however, most plans call for the use of ⅝-inch exterior grade plywood or wafer board to cover the interior and the same material or siding to clad the exterior.

To make the structure as airtight as possible, all joints must be sealed (caulked) and the interior walls painted.

Door width can vary depending on the producer’s needs. A well-made, insulated door can cost several hundred dollars but will pay for itself in energy savings and reduced maintenance costs. Gluing foam board insulation to the interior surface of the door will increase its R-value.

Niels and Carla couldn’t be more satisfied with their cooler. It is enabling them to keep their produce in peak condition and keep their customers satisfied.

EPDs benefit terminal production systems

by Robert Wells / rswells@noble.org

Surprisingly, I still find that many producers do not use expected progeny differences (EPDs) as a primary selection tool for their bull. Many select their next herd bull based only on physical appearance or a perceived ability to perform, or low birth weight. In other words, does he have a well-balanced body with plenty of muscling, yet look like he will be easy on calving? Several purebred breeders have said that the only question most of their customers have is “Is the bull calving ease?” These buyers typically complain that EPDs are confusing to use or that they don’t work. With some basic knowledge, however, utilizing EPDs can be easy and beneficial to all cattle operations.

Typically, when a producer reports that EPDs don’t work, it is usually because they selected a bull with the wrong expectations for a particular EPD. The first thing one must determine is in which direction, higher or lower, a particular trait is desired.

The following is a brief list of some EPD traits and the typical target direction for terminal production systems. Each breed association has numerous other EPDs they measure. The inclusion or exclusion of traits does not necessarily imply significance of a particular trait. However, the following list is common among most breeds and is important to consider in a terminal production system. A terminal production system does not retain and develop replacement heifers, and typically sells off the ranch to the next segment of the industry or retains ownership through the feeding phase.

**Performance EPD Traits**

**Calving Ease, Calving Ease Direct (CE, CED):** A high CE score will indicate less potential for dystocia or calving problems. This trait takes into account both calf birth weight and calving score data, which ranges from one to four. The higher the value, the better. Use this EPD instead of just the birth weight EPD since it takes into account other factors such as frame size of the calf and relative difficulty of the calving process.

**Birth Weight (BW):** Lower numbers are more desirable. Birth weight EPD is an indicator trait in pounds of calving ease in heifers. The differences between two bull BW EPDs is the average expectation of difference in pounds of calf weight. The genetic relationship between birth weight and calving ease is high (0.76); however, it is not perfect. This is the reason CE is a better indicator for calving ease than birth weight.

**Weaning Weight (WW):** Typically for most terminal production systems, a higher value is more desirable. A production system developing and retaining its own replacements would typically want to moderate this trait. This indicator is measured in pounds and is an indication of the sire’s ability to pass on growth to his offspring.

**Yearling Weight (YW):** Typically for most terminal production systems, a higher value is more desirable. However, a production system developing and retaining its own replacements would typically want to moderate this trait. This indicator is measured in pounds and is an indication of the sire’s ability to pass on growth between weaning and a year of age to his offspring.

**Carcass EPD Traits**

**Marbling (Marb):** This is the difference between marbling scores of progeny for one sire compared to another. Typically, a higher Marb EPD value is more desirable in a terminal production system.

**Fat Thickness (Fat, BF):** This is the measure, in inches, of the 12th rib external fat difference from one sire compared to another. Typically, a moderate value is better, depending on the breed of choice.

**Ribeye Area (RE):** This trait is measured in square inches and is the difference in ribeye area of a sire’s offspring relative to another sire of the same breed. Smaller-framed breeds would benefit from larger values, while larger continental breeds will want to moderate this trait but remain above breed average.

EPD values are not directly comparable across breeds. However, across-breed EPD adjustments can be made to compare a particular bull in one breed to another bull in a different breed.

Remember, single trait selection is dangerous and can have unintended consequences. Furthermore, recognize that selection for extremes in a specific direction for any trait can change mature cow size or production efficiency over time. Select multiple traits that have economic significance for your operation, and develop a plan to use them to meet market goals of the ranch.
EVENTS

Fall Cattle Seminar
Time: 1 p.m.-5 p.m.
Date: Aug. 26, 2014
Location: Noble Foundation Kruse Auditorium
No Registration Fee

Integrity Beef Alliance Meeting
Time: 5:30 p.m.-8 p.m.
Date: Aug. 26, 2014
Location: Noble Foundation Pavilion
No Registration Fee

For more information or to register, please visit www.noble.org/agevents/ or call Jackie Kelley at 580.224.6360. Preregistration is requested.