

AGRICULTURE

Golden Plains Area Newsletter

[Web Site: http://goldenplains.extension.colostate.edu](http://goldenplains.extension.colostate.edu)
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Dennis Kaan, Area Director
Area Community Development Agent
Washington County Office
(970) 345-2287

Ron Meyer
Area Agronomy Agent
Kit Carson County Office
(719) 346-5571

Todd Ballard
Agronomy, Weed Management
Sedgwick County Office
(970) 474-3479

Linda Langelo
Area Horticulture Agent
Sedgwick County Office
(970) 474-3479

Travis Taylor
Area Livestock Agent
Yuma County Office
(970) 332-4151

Joel Schneekloth
Regional Water Resource Specialist
Central Great Plains Research Station,
Akron
(970) 345-0508

Annie Overlin
Regional Range Management Specialist
Peaks and Plains Regional Office, Pueblo
970-545-1845

Dr. Brent Young
Regional Agriculture and Business
Management Specialist
Regional Engagement Center, Sterling
(970) 522-7207

Scott Stinnett
4-H Youth/Livestock Agent
Kit Carson County Office
(719) 346-5571

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AG BUSINESS

2021 Farm Bill Decision Webinar

R. Brent Young, CSU Ag and Business Management Specialist

The March 15th deadline for farmers to make their ARC/PLC decisions for the 2021 crop year is fast approaching. In an effort to provide growers with the most up to date information needed to make this important decision, CSU Extension and the USDA Farm Service Agency have teamed up to conduct a Farm Bill Decisions webinar.

The webinar will be held Tuesday, February 16th from 6:00pm to 8:00pm. Topics to be addressed are: the mechanics of ARC/PLC and the limitations of

outlook in 2021 for ARC-CO/PLC for the major program crops in Colorado, and a drought update.

The webinar is free but you must preregister at this weblink <https://zoom.us/meeting/register/tJA1cOqorjwpGtBxR2eSrxIbO9t58RskdorO>

For more information or to get a copy of the promotional flyer for this event, contact Brent Young at 970-522-7207 or email at brent.young@colostate.edu

Monday Night Marketing Webinar Series Coming in February

R. Brent Young, CSU Ag and Business Management Specialist

Many agricultural producers don't feel confident in their abilities to market the commodities they produce. In today's agricultural business environment of low commodity markets, high input costs and slim or non-existent margins, marketing skills are essential. In an effort to help farmers and ranchers improve their marketing skills, CSU Extension Ag Economist, Dr. Brent Young is offering a series of ag marketing webinars.

The Monday Night Marketing webinar series is two programs in one. The first meant to be an introductory course covering the mechanics of cash, futures, and options markets. This four week series is designed to meet the needs of agriculture producers who are new to commodity marketing and are looking for techniques to improve the prices they receive for their crops and livestock.

The final four sessions are a more advanced course that will focus on sophisticated marketing techniques and the development of a farm/ranch level marketing plan. These sessions are designed for producers who have a basic understanding of the topics presented in the introductory course.

The webinar format is interactive and will allow for live questions. Each webinar session will be recorded for review if you miss a session or for additional viewing to clarify concepts.

The webinars will be held from 7pm to 9pm, Mondays in February (8, 15, & 22) and March (1, 8, 15, 22, & 29). You can register for each session separately for \$15 or both sessions for \$25. To register online go to <https://mondaynightmkt.eventbrite.com>. For more information contact Brent Young at 970-580-2204 or email at brent.young@colostate.edu.

Financial Tools of the Trade

R. Brent Young, CSU Ag and Business Management Specialist

When most farmers and ranchers think of the term “Tools of the Trade” they probably think of that powerful tractor, or maybe that trusted horse, or possibly that versatile UTV. In today’s agricultural business environment of low commodity markets, high input costs and slim or non-existent margins, “Financial Tools of the Trade” might be as valuable as that tractor, horse or UTV

In an effort to help farmers and ranchers improve their understanding of financial tools of the trade and to provide a convenient means to produce accurate information, CSU Extension Ag & Business Management (ABM) Team has developed a series of Excel based financial statement templates. These templates can be found on the ABM website at <https://abm.extension.colostate.edu/financial-decision-tools/> .

A balance sheet is a statement of the financial condition of a business at a specific time. It shows what is owned by a business, what is owed, and the owner’s equity (or net worth) of the business. The balance sheet is often called a net worth statement, since it shows the owner’s value of the business if all debt obligations were paid in full.

The ABM balance sheet template is an Excel spread sheet that allows the user to add basic information about the agricultural business and people involved in one sheet. The financial data is then entered in a series of statements. The information from the statements are totaled and recorded on the appropriate line on the balance sheet. The template can be used to record both personal and business data and will produce personal, business, and combined balance sheets.

The profit summary for the business is called different names such as income statement, profit and loss statement, and operating statement. Regardless of the name, the purpose is to measure the net return of a firm's production over a specific accounting period (most likely a calendar year). Unlike the balance sheet, which considers only a point in time, the income statement

is a summary of economic events over a specified time period. While different periods are useful to different types of businesses (monthly, quarterly, or semi-annually), the standard accounting period usually used in agriculture is one year. The one year time frame is more useful in agriculture because it more nearly coincides with the agricultural production cycle.

On the ABM website you will find the income statement decision aid. Just like the balance sheet tool it allows the user to provide basic and personal data as well as cash receipts, cash expenses and depreciation, capital sales and purchases, payables and receivables, and inventories. This data is then transferred to the income statement. One useful feature of this decision aid is the ability to record data from two different sources. For example you could use information from your farm/ranch financial records and your Schedule F tax form.

Cash flow statements summarize the cash inflows (receipts) and outflows (expenditures) of a business over a specific time. The accounting period is usually one year divided into 12 monthly periods. The cash flow statement can be used in either of the following ways: as a long-range projection or forecast of future operations (called pro forma or planning analysis), or as a historical (after the fact) record containing actual financial data. The cash flow decision aid allows the user to input beginning checking account balance, minimum desired checking account balance, operating loan interest rate, and any operating loan balance carry over from previous year. Once inflows and outflows are entered, the spreadsheet automatically calculates the operating loan balance and accumulated interest. This function allows the user to contemplate an unlimited number of scenarios and see the changes in operating loan balances and interest charged.

The final financial decision aids allows a user to input five years of balance sheet and income statement data to conduct a financial analysis of the farm/ranch business. Financial analysis allows producers to assess the business’s financial health and chart its progress. The

analysis identifies any strengths and weaknesses and where action may be necessary to correct a problem. Management can use the information to assist in decision making and goal setting to compare business performance to previous years and similar operations.

Financial analysis will help (1) measure and identify the financial strengths and weaknesses of a business; (2) provide an "early warning system" of developing financial problems; (3) assist managers in decision-making; (4) help lenders and creditors evaluate credit risk (worthiness) when acquiring a loan; and answer basic financial questions such as how well will I be able to pay my bills on time without disrupting normal operations? How do my profits compare to my neighbors

or similar operations? How did profits this year compare with profits in past years? How efficiently am I using my land and other assets to generate revenues?

“Tools of the Trade” in agriculture can take on many forms from tractors to balance sheets. Be sure to check out the financial tools of the trade developed by the CSU Extension ABM Team online at <https://abm.extension.colostate.edu/financial-decision-tools/>.

If you have questions about this topic or any other agricultural business management issue, please feel free to contact me at 970-522-7207 or by email at brent.young@colostate.edu

LIVESTOCK

Cull Cows - An Opportunity

Scott Stinnett, CSU Extension 4-H Youth Development / Livestock

For many producers facing possible drought, culling of the herd to decrease cow numbers is a reality. For other producers, this could create an opportunity if the resources are available.

Cows are culled for many reasons. The most common reasons for culling include age, being open or not meeting management criteria like being late calvers. Other culling reasons include bad udders, bad feet, injury or illness such as lump jaw, prolapse, or eye cancer¹. Culled cows and heifers present three different opportunities for increasing value and producing income.

Open females can present an opportunity for a producer through adding value by rebreeding. Heifers who did not breed in their first breeding season or first calf heifers who did not rebreed after calving, are especially suited for added value rebred through breeding and then marketing as bred cattle. A study by the University of Nebraska at the Gudmundsen Sandhills Laboratory and the West Central Research and Extension Center showed that of the young females who did not breed for a spring calving season and were then rebred in the late fall had an overall pregnancy rate of 86.1%². Other studies have

reported similar rates of rebreeding success for older females. Beginning in 2015, a three-year study by the Noble Research Institute on its Oswalt Ranch showed an 85% pregnancy rate when rebreeding open cows with an overall average age of 6.2 years old, with sub-groups ranging from an average of 4.7 to 10.1 years old³. These studies provide further evidence of opportunities for females who were culled for being open having a good chance of being rebred. Using this approach, a producer could purchase open cull females on a per pound basis, add value by breeding and market them as bred females.

Another option for adding value to cull females is with cow-calf pairs. Open cows brought to market with a calf at side present themselves already with added value. When these pairs are brought to market at the beginning of the calving season, the calf is usually very young and is reliant on the cow for milk and not old enough to be weaned. Two approaches can be applied to this scenario. One is to early wean the calf and market the cow as quickly as possible. The goal in that approach is to recapture most of the initial investment in the pair by selling the cow and then continue growing the calf to a more marketable size and weight. Selling the calf later at a larger size and weight will hopefully cover the

remaining initial investment and the costs of raising the calf after weaning and also make a profit. The other approach would be to try and rebreed the cow and let the calf grow without early weaning. The calf can be sold at a normal market weight and size after weaning and the cow can be now sold as a bred female. If the cow is found to be open after attempting to rebreed, then the first method can be applied to this new scenario.

Purchasing culled females as slaughter animals and marketing them again as slaughter animals can prove profitable. The key to this scenario is to be able to identify females who can increase value with weight gain and improved body condition score (BCS). It is possible to increase the value of cull cows by 25 to 45 percent or more⁴. Cull cows at the market who are healthy and youthful but thin are the ones to identify. Slaughter animals are sold by weight. Thin and lightweight cattle that are healthy can be fed to increase their weight and body condition score. When they return to the market, they have increased their value with the added weight and body condition score. If the cost of gain is kept below the increased value from the cow's weight gain, a profit can be made.

Like all cattle enterprises, good budget analysis using market information is important to develop a break-even price and estimate profitability. It is essential to risk management, but caution should be used when these opportunities present themselves before a possible

drought.

Resources

¹Greer R.C., R.W. Whitman, and R.R. Woodward. (1980). Estimation and probability of beef cows being culled and calculation of expected herd life. *Journal of Animal Science*, 51(1), Pages 10–19, <https://doi.org/10.2527/jas1980.51110x>

²Da Silva A.G., Musgrave J.A., Adams D.C., Nollette J., Applegarth A., Funston, R.N. (2016) Economics of rebreeding non-pregnant females. 2016 Nebraska Beef Cattle Report, 11-13. <https://beef.unl.edu/documents/2016-beef-report/Nebraska-Beef-Report-2016-complete.pdf>

³Lira S. & Biermacher J.T., (2019). You can retain, feed and rebreed open cows profitably - sometimes. *Noble News & Views*. 37(9), 1-3. <https://www.noble.org/news/publications/ag-news-and-views/2019/september/you-can-retain-feed-and-rebreed-open-cows-profitably-sometimes/>

⁴Peel, D.S., & Doye, D. (2008). Cull cows grazing and marketing opportunities. Oklahoma Cooperative Extension Service Fact Sheet AGEC-613. Stillwater, Oklahoma. <https://extension.okstate.edu/fact-sheets/cull-cow-grazing-and-marketing-opportunities.html>

How long-term forecasts can help with stocking decisions

Retta Bruegger, CSU Regional Extension Specialist, Range Management

On the plains 75 miles east of Denver, researchers at the USDA-ARS Rangeland Resources and Systems Research Unit have been painstakingly measuring yearling weight gains since 1940. Over these 8 decades, they've measured these gains on light, moderate, and heavy stocked pastures during the summer grazing season. Now, new research correlates these gains with long and short-term climate and weather, like El Niño/La Niña. This gives new insight into how forecasts can be used to reduce uncertainty when dealing with drought. For more information on utilizing these tools to combat drought get the entire CSU Extension Fact Sheet at the following link. <https://extension.colostate.edu/topic-areas/agriculture/early-warning-for-stocking-decisions-in-eastern-colorado-3-115/>

Drought, Plan Your Response

Travis Taylor, CSU Extension Livestock Agent

The vast majority of Colorado producers find themselves facing some form of a drought situation. Cow/calf producers should have a well-developed plan to minimize drought effects on the operation. A plan that ties to the economics and grazing resources under the ranches control. The cow herd can be thought of as the “Factory Unit,” but without the forage input and land to put the factory on, producers have limited viable options for economic success. Drought plans should

involve a series of trigger points to help the operation make strategic and thought out positions when dealing with drought. This allows producers to make calculated decisions that take into account forage and soil health, tax situation, cow herd genetics, long term recovery and ranch profitability. Emotions can drastically affect the decision making process during drought, by responding to preset trigger points ranches can respond without having the desperate “all or nothing” decisions. Measuring parameters need to be established to determine trigger points. The easiest measureable parameter for most operators is the amount of precipitation or rainfall through the winter and spring. Just as important is the timing of moisture. Moisture after the cool season grass species growing season does little to improve range stocking rates. It is certain that the amount and timing of rainfall immensely impacts the forage produced in a given year. With this in mind, trigger points need to be established accordingly. For example a ranch may normally receive 50 percent of its annual rainfall by July 1, but at that date this year rainfall is only thirty percent of normal. A significant decrease may trigger the ranch to early wean calves to decrease cow forage and nutritional demands.

Another example would occur if on October 1 the ranch has received only 50 percent of its expected rainfall. This could trigger one or more of the responses that no replacement heifer calves are kept, or

all cows over nine years would be sold. Such moves should be seen as an opportunity to increase the productivity and efficiency of your cowherd. Other actions that could be associated with trigger points may be to cull cows below a body condition score of 4, or cull the cows that weaned calves weighing in the bottom 25 percent of the heard the past two years. Actions taken during drought plans should target efficiency such as reducing average cow age, shorting calving period, or removing cows with higher maintenance requirements.

It is important to have a number of trigger points and reasonable responses. The longer a drought continues the more aggressive producers need to be to reduce grazing pressure on the ranch. Producers that sell prior to a necessary drought liquidation phase, and when indicators tell them to do so, usually receive higher prices for their cattle. This gives those same producers a better position financially to re-stock and land more time to recover. It is important to remember that feeding your way out of a drought is expensive. Seedstock producers may attempt to do this to preserve the valuable genetics that they have developed, but in a commercial situation it can be costly to maintain the core herd genetics during periods lasting over a year. During multi-year droughts it may become imperative to remove all grazing from the rangeland, and available hay and alternative forage most likely will be expensive in such a situation. Ranches that have a responsive drought plan, are proactive, and understand managing to stockpile standing forage during wet years are better able to react to a drought. It is economically important to have plans, record important information, and be responsive when facing drought to make sound decisions and decide on the spur of the moment. The Colorado State University Extension ABM team has created some decision tools to help producers that can be found at <http://www.wr.colostate.edu/ABM/decision.shtml> website. The “Buy Hay or Sell Cows” and the “Strategies for Cattle Herd during Drought” spreadsheet tools can assist producers with making the right financial decisions for their operations.

Prepare for Calving Season

Scott Stinnett, CSU Extension 4-H Youth Development / Livestock

Preparing for calving season usually comes during an already busy time of the year. No matter if you calve in winter, spring or fall, gathering all the items needed for a successful calving season is a bit daunting. Here are some things to keep in mind as you prepare for calving season.

Contact your veterinarian. Review with them your herd health plan for the calving season and let them know when your calving season should start and how long it may last. Work with them to determine any pre-calving vaccinations of bred females and ordering any medications to have on hand for calving season. Be sure and get an afterhours contact number for your veterinarian or their clinic in case you have an emergency during calving.

Arranging calving season labor can often be a last-minute task. If your operation is large and you have several employees, or it is a family operation encompassing multiple households, it is a good idea to start working out the cow checking schedule. A common rule of thumb is a check every 3 hours. Make sure contact numbers are known by everyone in case of emergency including your veterinarian's number. Also educate anyone who is new to working calving season on the stages of calving and signs of dystocia.

Cow calf operations vary widely in the types of calving facilities that are used. Some use calving pastures close to home or ranch headquarters while others have specific calving lots or paddocks and utilize sheds and calving pens. No matter the facilities, all need some attention to certain things. Removing trash and hazards from the calving areas to prevent injuries to cows and calves. Repairing fences and facilities to good working order. Ensuring proper drainage around buildings, windbreaks and calving areas. Checking all head catches, working alley and chute gates are in working order.

Checking all lighting both inside and outside of calving facilities. Testing warming boxes, huts or rooms to make sure they will work when needed. Have on hand an extra supply of supplemental feed and bedding in case of inclement weather.

Calving supplies should be gathered in a central location to make them easy to find for anyone during a calving emergency. Calving supplies may include: OB sleeves, OB lube, OB chains or straps, calf puller, sanitizing solution (ex. chlorhexidine), navel dip, esophageal feeder, colostrum or colostrum replacer, calf bottles, milk replacer, flashlights with fresh batteries or spotlights with good charging or power cords, ropes and halters, calf sled or calf carrier of some type, ear tagger and tags, and straw or other bedding on hand.

Record keeping is an important part of calving season. Be sure to have those record keeping items gathered whether it be a classic "red book" or notebook with pens. Some operations are using tablets and smart phones with record keeping applications loaded on them to keep an electronic record.

Being prepared for calving season just make sense. It makes handling those typical calving season problems easier and may help prevent some others. For more information on this subject or any other livestock questions, contact your local Colorado State University Extension office.

All of the Great Plains Area Extension Offices have a limited supply of red calving books. Stop by to get yours today!

Nitrate Testing

Ron F. Meyer, CSU Extension Agronomist

The Colorado State University Extension Office located in Burlington is offering nitrate testing for both feed and water. Other offices, Wray, Akron and Julesburg, are testing feed. Minimum samples

needed for testing include 1 gallon for feed and 1 pint for water analysis. Nitrate analysis costs \$5 and takes approximately 5 minutes per test.

AGRONOMY

Chemical Fallow vs. Cover Crops

Todd Ballard, CSU Extension Agronomist

When a cash crop is not present in your field, two options are available for managing the land until the time is right to resume crop production. Chemical fallow allows for aggressively reducing the weed seed bank. Cover crops contribute to soil organic matter while shading out weeds. Both have drawbacks as well. Chemical fallow continues the trend of selecting for herbicide resistant weeds. Cover crops use some of our limited water resource. With either choice, property taxes and rent continue to be charged.

Following an herbicide label for plant back restrictions allows for applying a wider selection of herbicides during chemical fallow than during crop growth. Rotating among these options is one way to limit the buildup of herbicide resistant weeds in your fields. For grass control, acetyl coa enzyme (ACCase) inhibitors will be more commonly used in the coming years during wheat and grain sorghum production. Coaxium wheat varieties are already available. Several sorghum seed companies will soon be releasing hybrids resistant to ACCase inhibitors as well. Limiting the use of these herbicides during chemical fallow will preserve their efficacy for a longer timeframe. S-Metolachlor, topamezone, and asulam can all be used in chemical fallow to control grass.

Two frequent weeds of concern in our area are kochia and Palmer amaranth. I am currently continuing a study started by John Spring to test the efficacy of multiple herbicides and tank mixes for controlling kochia. The study includes atrazine, metribuzin, mesotrione, sulfentrazone, isoxaflutole, and dicamba. Palmer amaranth has been common in irrigated fields for several years. Recently it has been observed with increasing frequency in dryland production. Pyroxasulfone has been successful in controlling Palmer amaranth in sunflower production (Meyer, 2020).

Cover crops are more commonly used in areas with thirty or more inches of rain on an annual basis than here. A rapidly emerging cover crop like oats can shade out weeds before they are competitive. Legume cover crops like sunn hemp contribute to the soil profile nitrogen content. Cover crops with a large tuber like Daikon radish reduce soil compaction. The choice of which cover crop to use depends on the field issue you are trying to address. A cocktail of many cover crops is an option to consider too. All cover crops will contribute to soil organic matter and reduce soil erosion. Care must be taken with cover crops to minimize the water that is lost to evapotranspiration (Cropwatch, 2012). Extensive water uptake by a cover crop in a dryland system will not leave adequate water for the next crop to emerge.

Grain Bin Safety

Safety Precautions

RF Meyer, CSU Extension Agronomist

Whenever possible, don't enter a grain bin. If you must enter the bin, as a farm owner/operator you should:

- Break up crusted grain from the outside of the bin with a long pole. When using a pole, check to see that it doesn't come into contact with electric lines.
- Wear a harness attached to a properly secured rope.
- Stay near the outer wall of the bin and keep walking if the grain should start to flow. Get to the bin ladder or safety rope as quickly as possible.
- **Always have another person, preferably two people, outside the bin who can help if you become entrapped.**
- Grain fines and dust may cause difficulty in breathing. Anyone working in a grain bin, especially for the purpose of cleaning the bin, should wear an appropriate dust filter or filter respirator.
- Always stay out of grain bins, wagons and grain trucks when unloading equipment is running.
- If it is necessary to enter the bin, remember to shut off the power to augers and fans. It is a

good idea to lock out any unloading equipment before you enter a bin to prevent someone from unintentionally starting the equipment while you are in the bin.

- Children should never be allowed to play in or around grain bins, wagons or truck beds.
- Where possible, ladders should be installed inside grain bins to for an emergency exit. Ladders are easier to locate inside a dusty bin if there are brightly painted stripes just above or behind the ladder.
- It only takes 25 seconds for a 6 ft., 180 pound man to become submerged in grain.
- It takes 625 pounds of force to remove a 180 pound man submerged in grain from the neck down.
- If you become trapped in a bin of flowing grain with nothing to hold onto but you are still able to walk, stay near the outside wall. Keep walking until the bin is empty or grain flow stops. If you are covered by flowing grain, cup your hands over your mouth, and take short breaths until help arrives.

Source: University of Illinois Extension,
University of Minnesota Extension

Pesticide License Renewal Credits (Private and Commercial)

Ron F. Meyer, CSU Extension Agronomist

Anyone who purchases restricted-use pesticides must have a Private Pesticide Applicator license which is issued by the Colorado Department of Agriculture. Private Applicator license study guides and exams can be obtained either from the Colorado Department of Agriculture (<https://ag.colorado.gov/plants>) or some Colorado State University Extension offices. This exam is also available on-line. Once a pesticide license is received, it is active for 3 years before renewal is needed. Renewal

can be achieved by either retaking the exam or attending a recertification course and earning credits. Recertification courses offer credits which can be substituted for retaking the exam. Licenses that expire prior to obtaining recertification credits will require re-taking the private pesticide exam.

Recertification credits are currently offered on-line from a number of approved sources. Seven core credits are required for private pesticide recertification. A few of

these on-line pesticide license renewal sources are available at the following websites: <https://cepep.agsci.colostate.edu> and <https://pested.com/product-category/online-courses/colorado/core-co/>. There are various charges for these credits and both sites are approved by the Colorado Department of Agriculture. Remember to renew your license before the expiration date or re-testing may be required.

Commercial pesticide license credits are also available on-line, and more details can be found at the above two websites, also. After the proper credits have been earned licensee's need to apply to renew their license. So, get

the credits first, then renew the license before expiration. License renewal applications can be found on the Colorado Department of Agriculture's website: (<https://ag.colorado.gov/cec-workshops-for-qualified-supervisors-and-certified-operators>). This site can also be used to access new applicator license applications and testing requirements. Commercial pesticide licenses are only required if an operator charges others a fee for pesticide applications.

Questions regarding pesticide renewal or licensing in Colorado can be directed to the Colorado Department of Agriculture in care of John Scott, johnw.scott@state.co.us.

Remote and Proximal Sensing

Todd Ballard, CSU Extension Agronomist

Remote and Proximal Sensing

Collecting imagery of field conditions has been a popular concept with mixed results for at least ten years. The use of satellites to collect the imagery is called remote sensing. The use of sensors closer to your field that are mounted on planes, helicopters, or drones is called proximal sensing. The selection of which sensor to use depends on how often, how detailed, and which bands you are interested in collecting imagery. Passive sensors collect imagery only from what is reflected from sunlight or energy released from the object being studied. Active sensors will add their own energy to an object being studied.

Taxpayer Funded Satellites

NASA provides free access to much of the data collected by the Landsat series of satellites. Landsat 8 is currently the newest satellite in this series. It collects images over any given area on the surface of earth once every sixteen days. The data has limited geographic precision by providing reflectance data on pixels ranging from 15 to 100 m depending on the band. The bands used to calculate normalized difference vegetation index (NDVI) are all provided on a 30 m pixel. The primary use of this satellite is to make county wide or larger estimates of production. Waiting sixteen days to acquire data is too long to address pest problems and adjust irrigation plans. Thirty m pixels are too large to make well informed

management zone decisions for things like spray boom section control. If cloud cover is heavy when an image is taken, the next opportunity is a long wait.

Private Satellites

Private satellites can provide images up to every twelve hours and on a detail as small as two m. This level of detail overcomes many of the limitations of Landsat satellites. While acquisition cost of images per acre can be low, the catch is individual images (tiles) cover several sections (frequently 400). To justify acquisition of these images, several neighbors, a coop, or a large acreage operation would need to contribute to the cost of acquisition. Observing a drop in NDVI within a day's time is fast enough to take preventative action by scouting for the issue. Watching for trends over time in NDVI or NDWI overlaid with yield monitor data contributes to the development of management zones.

Manned Aircraft

Collection of imagery from manned aircraft can cover a better customized area than private satellites. This allows for a producer to collect imagery from discontinuous fields. Cost is still incurred by flying from field to field, but this can be minimized by a good flight plan and including neighbors in the data collection plan. The detail of these images can be as great as from drones. The area covered in a day is far superior to drones. Scheduling is more flexible than satellites as well.

Drones

When I attended the 2014 International Conference on Precision Agriculture, there was a multitude of drone vendors. After two years of learning about the cost of operating drones the excitement faded. The operational costs include:

- 1) Labor
 - a. Battery recharge
 - b. Data collection and processing
 - c. Drone field setup time and travel
- 2) Maintenance
 - a. Crashes are expected
 - b. Batteries have a limited number of recharges
- 3) Recurring software license fees

The largest area I have been able to cover in a single drone flight is about 130 acres. When arriving at a field it takes thirty-five to forty minutes to setup, launch, fly 130 acres, and return to the takeoff site. The next step is to check that image collection occurred properly. After that you can move on to the next imagery collection site. Unless 5G or Wi-Fi exist in your field you will need to upload the data at the end of the day. Another limitation is the time required to charge batteries. After a flight down to twenty percent of the battery life, it takes about two hours to bring a battery up to full charge. To achieve a 130-acre flight, with a hexacopter requires two batteries to be on board. The battery charger I had that holds four batteries is sequential. Even though it held four batteries, it would only charge one at a time. Acquisition of multiple battery chargers is an additional expense to keeping your drone in the air. After the daily flight work is complete and data uploaded, there are still several steps required to make the data meaningful. All the time required to collect and process the data adds up to labor costs.

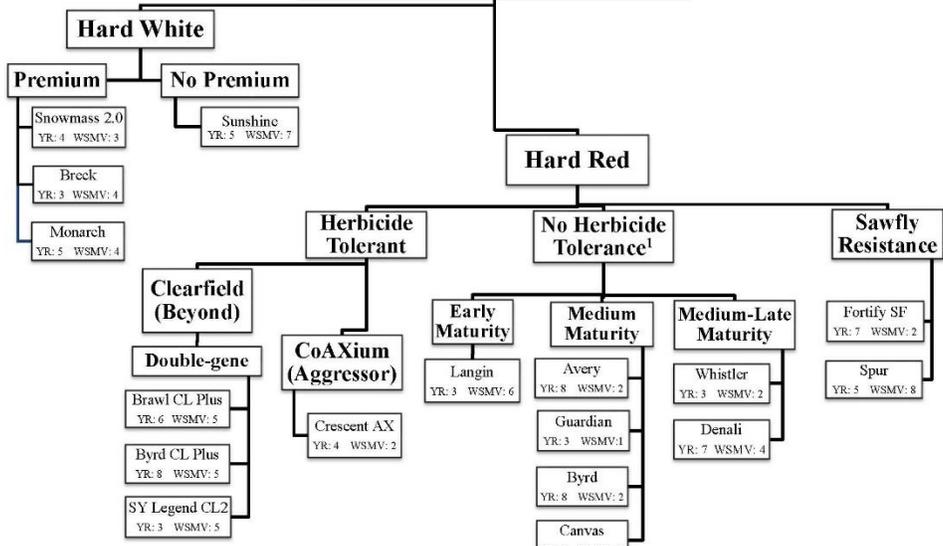
Equipment cost is not fixed. When a drone vendor came to sell their product at my office, they said there was a “crash guarantee. If you put a piece of plastic in the air enough times, it will eventually crash.” In three years of flying drones, I experienced several crashes. The damage ranged from none to breaking an arm, motor, and sensor mount off a Matrice 100. The most common crash in my early flights was bending a propeller on the headland weeds. As I gained more experience and confidence with taking over for manual landings, this became less of an issue. The most damaging crash was a battery that quit

when 10% life was showing. I also witnessed a vendor lose a drone when the motor suddenly quit at 200 ft above ground level. That drone was never found. Looking for a drone with less than one square foot of surface area on any given edge in a heavily lodged 36-acre field is close to hopeless.

Overcoming the limitations requires regulatory changes and advances in science. From a regulatory perspective, drones are currently limited to four hundred feet above ground level (AGL) and within visual range with limited excursions beyond visual range. Battery life also limits drones to visual range when flown at four hundred feet. To safely remove these two regulations, flight transponders are necessary to communicate drone’s location to low flying aircraft. Batteries will need to be replaced with hydrogen fuel cells. The advances needed in science are to create more scouting tools. The tools will be a mix of new indices and machine learning to find specific issues.

On a more optimistic level for drones, they are versatile on the type of image data they can collect. Changing the sensor mounted on your drone can collect any wavelength you are interested in reviewing. A basic sensor is a visual range camera. The bands they collect are labeled red, green, and blue. Depending on the manufacturer, the range of wavelengths collected by each band may extend beyond the actual color label. These sensors are essentially just for a visual scan of the field. The next level up will include near infrared. These sensors are useful to create NDVI and NDWI readings. Sensors beyond four bands are much less commonly used on drones. Mid wave infrared can be used to collect leaf temperature data. Sensors with up to thirty bands are referred to as multispectral. These sensors can be used to develop new indices to measure field conditions. If a researcher is interested in a comprehensive review of electromagnetic reflectance, hyperspectral sensors are available. These sensors will let you choose which wavelengths are useful when designing a multispectral camera. If you choose to use a hyperspectral camera, be aware the data volume will be in the order of terabytes. Storage and processing demand will be large when analyzing the data. Geiger counters can be used as drone mounted sensors as well. The potential agriculture application of a drone mounted Geiger counter is measurement of potassium fertility. Potassium is about 0.012% potassium 40. If Geiger counter numbers decrease after harvest, the reduced radioactivity is a result of potassium removed by the crop.

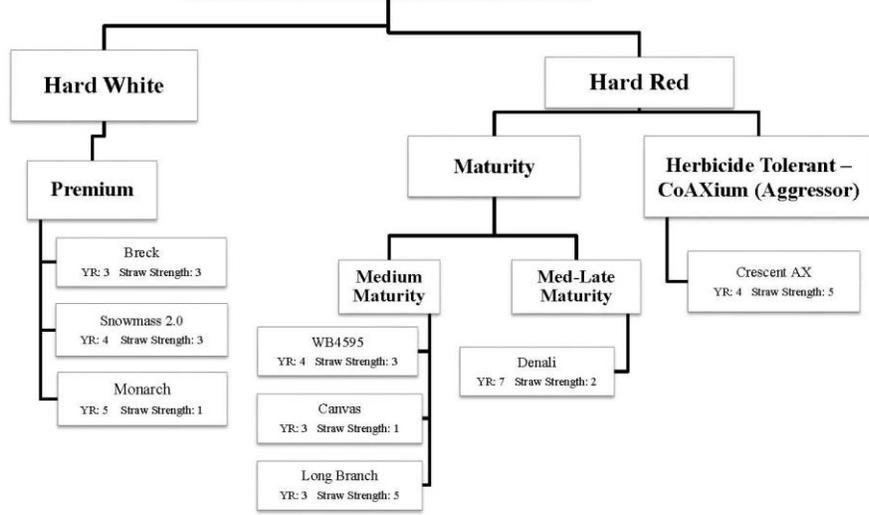
2020 Dryland Wheat Variety Decision Tree



¹No tolerance to Beyond® (Clearfield® system) or Aggressor® (CoAXium® system) herbicides

YR=Stripe rust rating (1=resistant, 9=susceptible)
WSMV= Wheat streak mosaic virus rating (1= resistant, 9= susceptible)

2020 Irrigated Wheat Variety Decision Tree



Straw Strength (1=very good, 9=very poor)

YR = Stripe rust rating (1=resistant, 9=susceptible)

HORTICULTURE

Colorado Reforest Grant Program

Linda Langelo, CSU Extension Horticulture Agent

There is some funding available to the Town of Haxtun and the Town of Akron for a limited number of trees destroyed by the derecho earlier this year. As the area Colorado State University Extension Horticulturist, on behalf of the town I investigated the amount of damage and applied for funding from the Colorado Reforest Grant Program which is specifically for towns devastated by natural disasters. Currently, I was awarded funding from two grants. The Colorado Reforest Grant Program awarded \$2,234 for trees and Heginbotham Trust matched the amount for a total of \$4, 470.

The grant was written based on the need, adding tree diversity to the community and education on tree planting and care. The tree list is comprised of trees that will add diversity to the town and stand as demonstrations to residents, newcomers, and visitors of what can do well here. These trees will be part of a tree tour anyone can take. The property owners applying will be asked to place the tree in the front of the property to be part of a tree tour.

Applications are available in the town halls of Haxtun and Akron until February 19, 2021. Please contact Karie Wilson in Haxtun at (970)774-6104 and Lori Baer in Akron at (970)345-2624. With the application, there are certain requirements to obtain a tree. The Colorado State Forest Service and the Colorado State University Extension is dedicated to your success on this project.

These requirements are as follows:

- 1) Demonstrate that you lost a tree in the derecho. A photo would be helpful.
- 2) You must be the property owner.
- 3) You must be willing to sign a three-year commitment and follow a timeline in the application.
- 4) Follow the instructions of a home Mason Jar Soil Structure test to match the soil requirements of your property to the soil requirements of the appropriate tree.
- 5) Watch a virtual tree care class before the tree planting.

Within the application there is a timeline of when the trees will be delivered, where to pick them up and other deadlines for planting and a tree inspection. I hope that you will be a part of the reforestation of Haxtun and/or Akron.

Every applicant will receive a book titled **I Can Name 50 Trees Today** by Bonnie Worth written in a Dr. Seuss style. We hope that you will read the book to your children or grandchildren. If there are any interested classes in the Haxtun/Akron School District interested in learning about trees and participating as volunteers in the project, please call Linda Langelo at (970)768-2761 or reach out to me on Facebook on Garden the Plains

Vines for Your Fence

Linda Langelo, CSU Extension Horticulture Agent

There are both perennial and annual vines that can hide your fence or add to the fence in your landscape. There are some choices that are stunning but not drought tolerant. If you are looking for something pleasing along the fence line Black Eyed Susan is a bright and cheery annual vine. Black Eyed Susan vine, *Thunbergia alata* does need to be grown in afternoon shade because we live in a hot, dry climate. It needs well-draining soil rich in organic matter with a neutral pH. Color choices are "Alba" offers white flowers with purplish brown centers; "Bakeri" boasts pure white blooms; Suzie hybrids may be orange, yellow or white.

Purple hyacinth bean, *Dolichos lablab*, an annual, is one you can grow in full sun in our hot, dry climate. Placing this vine in the shade will risk fungal diseases on the leaves. There is no deadheading with this vine. This vine needs regular watering, but the soil needs to be well-drained. Once you have grown the vine, you can collect the seed pods and save the seed and replant the next season.

Morning glory, *Ipomoea mauritiana* is another annual vine that comes in a range of colors of pink, purple, blue, and white in several various patterns. Morning glory will seed itself wherever you plant it. So, if you really like it, then it will be around for a long time. This vine needs full sun and well-drained soil, but poor soils. An added benefit is that butterflies and hummingbirds are attracted to it. It is a great vine for either a chain-link fence or lattice.

If you are looking for an evergreen vine Virginia creeper, *Parthenocissus quinquefolia* is one that

gives a brilliant fall red color. However, the birds will carry the seeds everywhere. It is listed as an invasive plant. As a vigorous grower it is aggressive and not considered a low-maintenance plant. With full sun, this vine gives a great fall color, but if you need something tolerating partial shade this will thrive. It needs well-drained soil and grows in all soil types. It does tolerate extreme heat and once established needs to be watered occasionally. There is one new cultivated variety Engelmann's Ivy, *P. quinquefolia* var. *engelmannii* is much less aggressive. Another cultivate variety has white variegations on the leaves and is called "Monham". While yet another has a yellow variegation with white called "Variegata".

Climbing Hydrangea, *Hydrangea petiolaris* makes an elegant vine producing fragrant lace-cup flowers. This is also a vine that can be used as a groundcover. It does well in partial shade in hot, dry climates. But remember the more sun, the better vines flower. This vine does require about an inch of water a week in well-drained soil. Fertilize in the spring and after the flowers have bloomed. It does fine in zone 5, but sudden frosts may damage flower buds

Silver Lace vine, *Polygonum aubertii* is a vigorous deciduous to semi evergreen vine that gets to be 12 to 20 feet tall. It grows best in full sun, but can grow in light shade with moist, well-drained soil. It does tolerate the occasional drought. It grows in zone 4. Though this is an easy plant to get established, but it can be invasive.

Teach a Child to Garden

Linda Langelo, CSU Extension Horticulture Agent

If for some reason you were not able to teach your child how to start gardening, then maybe in 2021 growing season you can. Here are some very simple ways to engage your child:

- Ask if they are interested in learning about gardening.
- Share with them every step in the process.
- Start at the beginning of looking through catalogues and selecting seeds.
- Show them how to grow squash, watermelon, and cantaloupe in a container.
- Provide a calendar that is separate for gardening tasks.
- Mark dates on the calendar for starting certain seeds, frost free dates and so on

Above all, give them responsibility. Naturally, the responsibility you assign each child will differ with their age. Responsibility to do certain small tasks you know they can handle such as watering the newly planted squash seeds and marking the calendar when they have watered them. That way everyone knows. Make clear and simple explanations for why you are doing certain tasks when you are doing them. Children are inquisitive and imaginative. Encourage these qualities by helping them explore. What happens when you do not plant the onion bulb in deep enough or with the basil end facing the soil surface. Let them plant one onion bulb incorrectly and use a stake to mark it. Watching and wondering what will happen is half the fun. When the onion sprouts along with the others is when you explain geotropism to them.

Giving them the opportunity to explore and encourage their curiosity which can engage them further with gardening. By doing these things you are giving your children a hand in every aspect of



Photo credit: Linda Langelo, Sherry Brandt with Kylie and Carlie.

the family garden. When I was only eight years old, my grandmother told me about the importance of working in fertilizer and sometimes coffee grounds around her roses. She showed me how and then gave me the responsibility to get it done. Your child may not grow up have a career in horticulture like I have had, but they may have gardening as a hobby for the rest of their life. When times get tough, they know how to grow their own food.

For more information to help assist you in this endeavor, here is a link to a CSU article by a CSU Master Garden in Larimer titled “Growing Food and Growing Gardeners” : <https://extension.colostate.edu/topic-areas/yard-garden/growing-food-and-growing-gardeners/>

At the bottom of the article posted above are CSU Fact Sheets to help you with growing vegetables. In 2021 growing season, Grow and Give will continue. Consider taking part if you did not in 2020. For more information go to the following link:

<https://cmg.extension.colostate.edu/grow-give/>

Also, get in contact with your local Extension Office or Master Gardeners in your area.

If you need more assistance with gardening activities here is a short list of links for different age levels:

<https://kidsgardening.org/garden-activities/>

<https://garden.org/>

INVASIVE SPECIES 101

Join us for a 4 session speaker series to educate and inform landowners on invasive species terminology, identification, treatment, and latest trends. Sessions will be held virtually from 6:00–7:30 pm on the following dates from late March until early May. Free, registration required.

March 24 – Invasive Species – Understanding the Issues
Alicia Doran, Invasive Species Management Coordinator, Jefferson County

April 7 – Intro to Integrated Pest Management
Steve Sauer, Boulder County Weeds Supervisor, Boulder County Parks and Open Space

April 21 – Weed Identification and Management
Casey Cisneros, District Manager, Larimer County Weed District

May 5 - Colorado's Aquatic Nuisance Species
Robert Walters, Invasive Species Specialist, Colorado Parks and Wildlife

Register: <http://bit.ly/Inv spp>
Presented by the Front Range Invasive Species Campaign



DROUGHT 2021

"IDEAS AROUND THE TABLE"

A Drought Management Virtual Series



Watch recorded video presentations at your leisure starting Feb. 18th then join a question and answer "Round Table" session with the following presenters on Feb. 25th starting at 5 p.m. MST

2021 Weather Outlook

Don Day - Day Weather

Annual Forage Options During Drought

Dr. Jerry Volesky - University of Nebraska

Grassland Endurance: Management for/with Drought

Julie Elliott - NRCS Rangeland Management Specialist

Living Dry: Lessons Learned

John Welch - Past CEO of Spade Ranches, TX and Owner Welch Cattle Co.

Sponsors: Yuma and Yuma County Conservation Districts

To register email travis.taylor@colostate.edu

**Videos Posted
February 18th**

**Zoom "Round Table" session on
February 25**



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