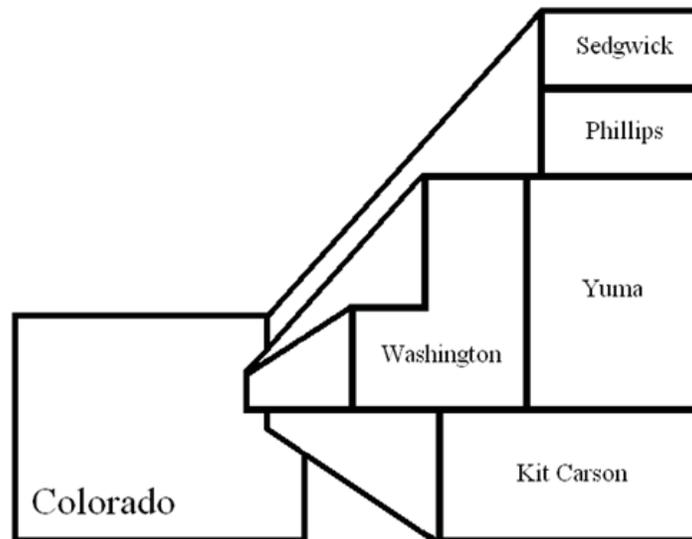


Golden Plains Area
AGRICULTURAL HANDBOOK



2016 | Volume XIII

Colorado State University Extension

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PLANT SELECT® PROGRAM IN THE GOLDEN PLAINS AREA

*Linda Langelo, Horticultural Program Associate, Colorado State University Extension,
Colorado Master Gardeners Jessica Rodriguez and Ellen Figueroa, and Emeritus CMG Rita Campbell*

Golden Plain Area Master Gardenersm Volunteer Demonstration Gardens

Golden Plains Area Master Gardenersm volunteers are fostering successful gardening by providing research-based information to area residents through Plant Select® demonstration gardens. Gardens are located at the Washington County Events Center in Akron and Phillips County Event Center. Other Plant Select® gardens are located in Julesburg at the Town Hall Office and Thompson Park.

Plant Select®

Plant Select® is a cooperative program administered by Denver Botanic Gardens and Colorado State University in collaboration with horticulturists and nurseries throughout the Rocky Mountain region and beyond. The purpose of Plant Select® is to locate, identify and distribute the very best plants for landscapes and gardens from the intermountain region to the high plains.

Several plants are chosen each year that thrive in the sunny, variable conditions of Rocky Mountain gardens. These can be plants that have grown here for years and have not yet attained the popularity they deserve, known as recommended plants. Introductions represent taxa that are discovered by our cooperators. Superior forms or hybrids carefully tested over time are known as originals. Plant Select® is at the vanguard of a bold, new plant palette that is revolutionizing the way we garden. Here are plants that thrive in both our varia-

ble winters and our hot summers. These plants are helping to forge a truly American style of horticulture.

To determine which of the recommended plants do the best in Eastern Colorado, Master Gardener Volunteers in the Golden Plains Area record success and failures in area demonstration gardens. Volunteers replant the plant varieties that do not survive. After three successful years a plant variety will be recommended for planting in the Golden Plains Area. The plants listed in the following lists have successfully endured a three-year period or more.

There is also a listing of vegetable varieties that have been tried in our area community gardens. This list has been narrowed to the best selections which have performed well in the Golden Plains.

In addition, there is information on the continued results of the Earth-Kind® Rose Demonstration Garden, tree recommendations for the eastern plains based on site visit observations along with added suggestions based on Dr. Jim Klett's CSU nursery trial work, CSU Annual and Perennial Trials of 2016 and Plant Select Top Performers of 2016.

Washington County Plant Select Garden

Colorado Master Gardener volunteers Jessica Rodriguez, Ellen Figueroa, and Rita Campbell planted at the Washington County Events Center in Akron, Colorado in June of 2004. Pea gravel is used for mulch on this garden.

*Turkish Veronica	Veronica liwanensis
Sunset Hyssop	Agastache rupestris
Colorado Gold™ Gazania	Gazania linearis
*Red Rocks™ Penstemon & Pikes Peak Purple™ Penstemon	Penstemon x mexicali & Penstemon x mexicali
Coral Canyon Twinspur	Diascia integerrima
*Prairie Jewel™ Penstemon	Penstemon grandiflorus
Sonoran Sunset Hyssop	Agastache cana ‘Sinning’
Snow Angel Coral Bells	Heuchera sanguine ‘Snow Angel’
Hopflower Oregano	Origanum libanoticum
Mojave Sage	Salvia pachyphylla
Snow Angel Coral Bells	Heuchera sanguine ‘Snow Angel’
La Veta Lace® Geranium	Geranium magniflorum
Corsican Violet	Viola Corsica
Ferman’s Red Sage	Salvia greggii
Wild Thing Sage	Salvia greggii
Mesa Verde® Ice Plant	Delasperma ‘Kelaidis’
Table Mountain® Ice Plant	Delasperma ‘John Proffitt’
Winecups	Callirhoe involucrata

All performed well except the Snow Angel Coral Bells and Corsican Violets. These plants prefer dry shade. They were chosen by a Colorado Master Gardener to see how they would perform with some shading of nearby plants. The Winecups have been growing steadily in this garden as the Hopflower Oregano. These plants continually are weeded out. The Penstemons reseed themselves and also need to be weeded.

In addition to the Washington County Event Center Garden, there is a new garden on the southwest corner with a windmill as a central feature. There are a handful of plants being trialed in this garden. The location is open to high winds.

The is a Tatarian Maple tree along with the Prairie Jewel Penstemon plants did well in the drought summer of 2012. Irises have been added along the outer edge of the garden to block some of the wind and suppress of the weeds. In 2014 the Tatarian Maple was knocked by equipment. It seems to still be growing. In 2015, we had a tremendous amount of weeds because of the heavy spring rains and early summer rains. Additional gravel is planned to help suppress the weeds.

The Windmill Garden is a garden only suitable for extremely hardy plants such as irises and penstemon.

The Phillips County Event Center

Holyoke, Colorado started a Plant Select® Garden in 2010. The following is a list of plants found in the garden:

Hot Wings® Tatarian Maple	<i>Acer tartarium</i> ‘GarAnn’
Sunset® Hyssop	<i>Agastache cana</i> ‘Sinning’
Colorado Desert Bluestar	<i>Amsonia jonesii</i>
Panchito Manzanita	<i>Arctostaphylos x coloradoensis</i>
Blue Chip	<i>Buddleia Lo & Behold</i>
Korean Feather Reed Grass	<i>Calamagrostis brachytricha</i>
Winecups	<i>Callirhoe involucrate</i>
Leadwort	<i>Ceratostigma plumbaginoides</i>
Alpine Willowherb	<i>Epilobium fleischeri</i>
Kannah Creek® Buckwheat	<i>Erigonium umbellatum</i> var. <i>aureum</i> ‘Psdowns’
Red Yucca	<i>Hesperaloe parviflora</i>
Silver Horehound	<i>Marrubium rotundifolium</i>
Little Trudy® Catnip	<i>Nepeta</i> ‘Psfike
Avalanche White Sun Daisy	<i>Osteospermum</i> ‘Avalanche’
Red Rocks Penstemon	<i>Penstemon x Mexicali</i> ‘Psmyers’
Cheyenne® Mock Orange	<i>Philadelphus lewisii</i>
Oregano	<i>Origano vulgare</i>
Platinum® Sage	<i>Salvia daghestanica</i>
Turkish Veronica	<i>Veronica liwanensis</i>
Orange Carpet® Hummingbird Trumpet	<i>Zauschneria garrettii</i>

The best performers in this garden for drought tolerance have been Silver Horehound, Red Yucca, Platinum® Sage and Colorado Desert Bluestar. The grasses listed as Korean Feather Reed Grass have needed some supplemental water through 2011 and 2012. As a shrub Cheyenne Mock Orange is not only hardy but has wonderful blossoms in spring. However, it did suffer without supplemental watering in this garden during 2012. There are two of these shrubs and one is in partial sun and the other in full-sun. Both did suffer from drought stress late in summer. The Buckwheat species, as in all the other gardens did extremely well in the drought along with a low ground cover shrub Panchito Manzanita. The Orange Carpet® Hummingbird Trumpet groundcover suffered through the drought. It produced substantially less flowers. The Alpine Willowherb also did not flower as well

along with Little Trudy® Catnip. In 2014 during the November cold snap several plants suffered during the following spring and summer. Alpine Willowherb, Orange Carpet® Hummingbird Trumpet, Avalanche White Sun Daisy and some of the Platinum® Sage all had severe dieback or did not generate new growth in spring. During the wet spring and early summer of 2015, the Cheyenne® Mock Orange and Silver Horehound have had severe dieback. However, the Turkish Veronica has expanded. Oregano was placed in the garden in 2012 and is seeding itself to help fill in areas. During 2015, some of the oregano and winecup needed to be thinned. The leadwort, one of the plants not labeled Plant Select is seeding itself in other areas of the garden as are the Sunset® Hyssop and Silver Horehound.

High and Dry Demonstration Gardens in Washington County

The High and Dry Demonstration Garden at Washington County was planted in response to the continuing drought in Northeast Colorado. The garden was initiated by the previous Extension Horticulturist, Joanne Jones. Rita Campbell, a Colorado Master Gardener and Joanne Jones planted this demonstration garden. These are plants which are both xeric and native. This garden explores the possibility of becoming established and surviving with only natural rainfall. The results from this garden will serve as an ongoing study about which plant species thrive on little, or no supplemental water.

The initial preparation of the garden was to measure a 400 square foot area and design the layout. Other than some grass cuttings for mulching around the roots, there were no other amendments added to the soil. The garden soil is a sandy loam. This garden is on a slight slope at the curve of the walking path around the fairgrounds.

Prior to planting of the High and Dry Garden, the plants were housed in a greenhouse. The plants were planted Saturday, June 10th, 2006 and watered well the same day. After this initial watering, there was no rainfall. Approximately three weeks after their planting they were given some supplemental water. The soil was not amended with any organic matter to help with water retention and no mulch was initially provided around the root zone. The plants were attempting to adapt to their new environment.

Most of the plants were not responding well to the drought even as xeric plants. It appeared that we would have only had a third of the plants we started with. Jian-Kang Zhu from the University of Arizona states in his research of drought tolerance in plants that xerophytes have a thicker cuticle layer in the epidermis as a coping mechanism for drought. He adds that the water status of a plant is a function of water uptake by roots and loss via stomata and cuticle. No matter how well plants manage to absorb and conserve water, prolonged drought will damage cells sooner or later. Water deficit leads to the accumulation of toxic oxygen free radicals in plant cells. The toxic radicals have to be removed, for survival and continued growth. Stress proteins are made by metabolites such as trehalose, mannitol, praline, or glycine betaine.

However, Wraith, Baker and Blake in their research from Montana State University studied the varying ability of water uptake after drought in barley genotypes. The periods of water deficit in this study were 10 to 14 days, less than our period of drought in this demonstration garden. When the barley was watered at the soil surface it took the roots two to three days to resume water uptake. And after subsequent rewetting periods, the roots resumed a quicker period of water uptake. To solve the lack of moisture at the soil surface level, grass cuttings were acquired and used as mulch for the plants. Some plants are significantly damaged by the lack of supplemental water. With the current amount of snow during this winter season, this will help both insulate and provide needed moisture for these xeric and native plants.

Without the second supplement and other subsequent supplements, very little seems as though it would have remained in the High and Dry garden, only demonstrating that because of a severe drought their root systems were not able to maintain the proteins to uptake water.

Among the hardiest of plants were buffalo grass, blue grama, western and Utah serviceberry, slender wheatgrass, aspen fleabane, James' buckwheat, sulphur-flower buckwheat, Rocky Mountain Fescue and Iris species.

The various species of penstemon which did the best were firecracker and Rydberg's and bluemist. The other species had varying degrees of success. Those penstemon are listed in order as best survival to least from Grand Mesa penstemon, littleflower, sidebells's, whipple's and upright blue beardtongue as the worst.

The complete list of plants chosen in this High and Dry Garden are listed as follows:

Indian ricegrass, <i>Achnatherum/Oryzopsis hymenoides</i>	Fivepetal Cliffbush, <i>Jamesia Americana</i>
Netleaf Horsemint, <i>Agastache urticifolia</i>	Dotted Blazing Star, <i>Liatris punctata</i>
Nodding Onion, <i>Allium cernuum</i>	Oregon-grape, <i>Mahonia repens</i>
Western Serviceberry, <i>Amelanchier alnifolia</i>	Colorado Four O'clock, <i>Mirabilis multiflora</i>
Utah Serviceberry, <i>Amelanchier utahensis</i>	Prairie Jewel® Penstemon, <i>Penstemon grandiflorus</i>
Big Bluestem, <i>Andropogon gerardii</i>	Firecracker Penstemon, <i>Penstemon eatonii</i>
Small-leaf pussytoes, <i>Antennaria parvifolia</i>	Grand Mesa Penstemon, <i>Penstemon mensarum</i>
Golden columbine, <i>Aquilegia chrysantha</i>	Pineneedle Beardtongue, <i>Penstemon pinifolius</i>
Fringed Sage, <i>Artemisia frigida</i>	Littleflower Penstemon, <i>Penstemon procerus</i>
Blue Grama, <i>Bouteloua gracilis</i>	Rydberg's Penstemon, <i>Penstemon rydbergii</i>
Buffalograss, <i>Buchloe dactyloides</i>	Sidebells's Penstemon, <i>Penstemon secundiflorus</i>
Bluejoint reedgrass, <i>Calamagrostis Canadensis</i>	Upright Blue Penstemon, <i>Penstemon virgatus</i>
Bluebell bellflower, <i>Campanula rotundifolia</i>	Whipple's Penstemon, <i>Penstemon whippleanus</i>
Curl-leaf Mountain Mahogany, <i>Cercocarpus ledifolius</i>	Shrubby Cinquefoil, <i>Potentilla floribunda</i>
Tufted Hairgrass, <i>Deschampsia caespitosa</i>	Squaw apple, <i>Peraphyllum ramosissimum</i>
Slender Wheatgrass, <i>Elymus trachycaulus</i>	Pawnee Buttes® Sand Cherry, <i>Prunus besseyi</i>
Aspen Fleabane, <i>Erigeron speciosus</i>	Golden Currant, <i>Ribes aureum</i>
James' Buckwheat, <i>Erigonum jamesii</i>	Wax Currant, <i>Ribes cereum</i>
Sulphur-flower Buckwheat, <i>Erigonum umbellatum</i>	Western Coneflower, <i>Rudbeckia occidentalis</i>
Rocky Mountain Fescue, <i>Festuca saximontana</i>	Little Bluestem, <i>Andropogon scoparium</i>
Woodland Strawberry, <i>Fragaria vesca</i>	Canada Goldenrod, <i>Solidago Canadensis</i>
Common Gaillardia, <i>Gaillardia aristata</i>	Scarlet Globemallow, <i>Sphaeralcea coccinea</i>
Sticky purple Geranium, <i>Geranium viscosissimum</i>	Swamp Verbena, <i>Verbena hastata</i>
Scarlet Gilia, <i>Ipomopsis aggregate</i>	

Vegetable Varieties Recommended for the Plains

Varieties which are bolded have produced well no matter what the season's extremes.

Tomato	Better Boy, Early Girl , Tomato Primo Red
Tomato – Heirlooms	Cherokee Purple, Mortgage Lifter, Giant Beefsteak
Swiss chard	Bright Lights , Fordhook Giant, Magenta Sunset , Neon
Squash winter	Spaghetti , Acorn -Honey Bear , Sugar Hubbard , Red Kuri, Butternut Hunter, Royal Ace PM
Squash – Heirloom	Waltham Butternut
Squash summer.....	Black Beauty, Emerald Delight, Delta, Patty Pan
Spinach	Malabar- a vining spinach , New Zealand, Hellcat
Radish	Easter Egg
Potato	Yukon Gold
Pepper – Hot	Anaheim, Big Chile, Jalapeno
Pepper – Sweet	Red Bell, Green Bell, Mini Red Bell
Peas	SugarSnap
Lettuce- Leaf	Baby Star, New Red Fire, Merlot , Cimmaron
Lettuce- Small Heads	Little Gem , Devil's Tongue –loose head/red leaves
Lettuce- Romaine	Defender
Kohlrabi	Express Forcer Hybrid
Onions	Yellow –Walla Walla Sweet and white variety – Snow White
Garlic	Chesnok Red
Eggplant	White-Casper; Black-Big Dragon, Black King, Black Beauty
Cucumber	Burpless Varieties, General Lee, Armenian
Corn – Sweet	Yellow Corn-Golden Bantam, Honey & Cream
Carrots	Danvers Half Long
Cabbage	Chinese Varieties
Broccoli	Pacman
Brussel Sprouts	Jade Cross
Beets	Kestrel, Detroit Dark Red, Bulls Blood, Chioggia
Beans – Bush Varieties	Trefino
Beans Pole – Heirloom	Kentucky Blue

Earth-Kind® Roses Demonstration Garden

By Linda Langelo, Horticulture Agent

Texas AgriLife Extension Service designates select rose cultivars as Earth-Kind® Roses through the Earth-Kind® Landscape Program. Any rose cultivar that gains this designated title has been through eight years of research and field trial data. A seven-member team of doctorate individuals include horticulturists, plant pathologists, soil scientist and an entomologist select the roses. No pesticides, chemical or organic materials are ever applied to the roses during the trial and research period of eight years. The idea is to have landscape roses which are low-maintenance, remain beautiful through-

out the season and the homeowner can be environmentally-responsible in caring for the landscape. This is similar to the idea of growing natives in your landscape. The idea being the reduction of the homeowners' input of resources. By making this one change, homeowners can conserve water, fertilizer and reduce their impact on the environment.

In Sedgwick County at the courthouse, we trialed some of the Earth-Kind® Roses since 2013. We are trialing four polyantha roses listed as follows:

- Cecile Brunner
- La Marne
- Marie Daly
- Sea Foam

The requirements for growing Earth-Kind Roses successfully are placing them in a full day of direct sun or at least eight hours. They must have good air movement around the leaves to prevent foliar diseases. Good drainage is also recommended. They do well in a variety of soil types including poorly aerated, highly alkaline clay soils. To help your roses in any soil type, add three inches of plant-derived compost. Watering from the soil level with drip irrigation keeps water off the leaves and conserves water by lessening the amount to evaporation. Also watering from the ground level keeps the leaves clean of “salty” water and here in Sedgwick County we add salt to improve the water quality, but we would add to burning the foliage of the roses if overhead watering were done. Lastly, mulching roses is also recommended which keeps the weeds down, conserves more water, can add nitrogen as it breaks down and mitigates the drastic temperature fluctuations in the soil. Mulch acts as an insulator like a blanket on the soil. Mulch should only be placed around the roses at a depth of 3- inches. Placing the mulch too deep can become a barrier to needed oxygen in the soil.

The Earth-Kind Rose bed which we have at the southwest side of the building follows most of the recommended requirements for their success. They get plenty of air movement, but they do get only about 6 hours of direct sun and about an hour of indirect sun. They also received plenty of compost before planting. There were signs of thrips after they were initially planted. We suspect thrips came in on these plants. Other than the initial insect problem there was some dieback after the first winter. We did purchase roses from

what we thought was a reputable grower. Be sure to purchase healthy roses. We ordered on-line, so we had to totally rely on the grower to pick healthy product. We pruned out the dead stems and they bloomed well through the first season. They have received regular watering from the ground level.

In the second growing season, we went into the winter after a brutal cold snap in November 2014. The daytime temperature started at 75 degrees and ended up at minus 7 in a matter of a few hours. This kind of a drop is not enough for plants to acclimate to the change. The roses looked like they were frozen in place. We had a significant amount of dieback going into the spring and the new growth was slow to appear. Of the Earth-Kind Roses that we did trial, Cecil Brunner and La Marne were the hardest hit with significant dieback. It mid to late June before new growth appeared. This was partly due to a wet and cold spring which continued into late May. Overall, other than the initial thrips, these roses have had no other disease or pest issues.

In both 2015 and 2016, the roses were slow to start growing due to the colder springs. They ended in the fall blooming until a hard frost and had no disease or insect issues.

Roses are a high maintenance plant. They need to be dead-headed. Their blossoms need to be cleaned out of the bed every day to prevent fungal diseases such as black spot. They are heavy feeders. They prefer ground level irrigation. To have a rose type that can do well with less input, helps to conserve water and reduce pesticides in our soil.

I would recommend giving them a try. There are other types of roses other than polyantha shrubs which are dwarf and medium. There are small shrubs and climbers within the list of choices. Plenty of different types to add to your landscape.

Recommended Trees for the Golden Plains Area

This is a listing of some underused trees that would do well here based on trials in the Colorado State University Arboretum by Jim Klett Ph.D., CSU Ornamental Specialist, published in **Dependable Landscape Trees**. Added in this list

are my tree suggestions based on area wide county site visit observations.

***Acer nigrum* ‘Greencolumn’** Greencolumn Black Maple, Maple Family, Aceraceae

No pest or disease problems; good heat tolerance. 40 high x 35 wide

***Amelanchier x grandiflora* ‘Autumn Brilliance’** Autumn Brilliance Serviceberry, Rose Family, Rosaceae

Some tendency toward suckering, but overall outstanding specimens with a fall color mix of orange, red and purple, lasting two weeks. No disease and pest problems observed in the arboretum trees. 25 high x 30 wide

Catalpa speciosa Northern Catalpa, Bignoniaceae Family

Tolerates hot weather, drought tolerant and grows in a wide range of soils including alkaline. Early summer flowers, white with purple markings. Fast-growing tree which can attract powdery mildew, leaf spot and verticillium wilt. 40 to 60 high x 20 to 40 wide.

***Gleditsia triacanthos inermis* ‘Shademaster’** Shademaster Thornless Honeylocust

Minor insect problems; a 1979 specimen has stayed in good health in the CSU arboretum. 45 high x 40 wide, Pea Family, Fabaceae Family

Heptacodium miconioides Seven-son flower Plant Select Introduction

Can be a small shrub or tall tree to 25 feet. Fast-growing and very adaptable to many soils. Flowers are white with moderate to dry water requirements. Has exfoliating bark. Member of the Honeysuckle Family. 25 high x 15 wide. Caprioliaceae Family, Honeysuckle Family

***Malus sargentii* ‘Select A’** Firebird Flowering Crabapple (white flowering)

Highly resistant to mildew, apple scab, fireblight and cedar apple rust. 8 high x 7 wide, Rose Family, Rosaceae

***Malus* ‘Thunderbird’** Thunderbird Flowering Crabapple (pink flowering)

Resistant to fireblight. No pest problems have been observed. 16 high x 10 wide, Rose Family, Rosaceae

Ostrya virginiana American Hophornbeam, Ironwood

Gray-brown bark attractive; some minor leaf spot in recent years.

40 high x 30 wide, Betulaceae Family, Birch Family

Phellodendron amurense Amur Corktree,

No disease or insect problems; no cultural problems such as chlorosis and dieback. 45 high x 45 wide, Cork Tree Family, Rutaceae

***Prunus x* ‘Accolade’** Accolade Flowering Cherry, Rose Family, Rosaceae

This tree is fruitless. When these trees suffer from stress they attract borers and gummosis. One out of three samples in the arboretum have suffered from stress. The others are in good health. 50 high x 25 wide

Quercus macrocarpa Bur Oak, Beech Family, Fagaceae

Adapts to different soil types, urban conditions and dry conditions. Difficult to transplant, but once established will be a long-lived, slow-growing tree with no pest or disease problems except slight injury from galls. 55 high x 45 wide.

Quercus muchlenbergii Chinkapin Oak, Yellow Chestnut Oak, Beech Family

Adaptable to alkaline soils, no chlorosis or dieback, no problems with pests or disease. Recently planted in **Plant Select®** multi site trials throughout Colorado and has done well. 50 high x 60 wide

***Syringa reticulata* ‘Summer Snow’** Summer Snow Japanese Tree Lilac

No disease or insect problems. Yellow fall color. 18 high x 14 wide, Oleaceae, Olive Family

Syringa pekinensis ‘Peking Tree Lilac’

Light creamy white flowers with a light fragrance appear in early summer. Winter hardy plants and have adapted well to alkaline soil. 25 high x 20 wide, Oleaceae, Olive Family

***Tilia cordata* ‘June Bride’** June Bride Littleleaf Linden

The best *Tilia* cultivar. Minor pest problems such as aphids and sooty mold. 30 high x 25 wide. Malvaceae Family

***Tilia americana* ‘Redmond’** Redmond American Linden

Overwintering feature of red buds and twigs; attracts aphids and sooty mold follows – inconsistent with each season. 50 high x 40 wide. Malvaceae Family

***Tilia cordata* ‘Chancole’** Chancellor Littleleaf Linden

Pyramidal growth habit that is very attractive and uniform, no dieback or chlorosis and minor problems with leaf spot and aphids. Malvaceae Family

Ulmus parvifolia, Chinese or Lacebark Elm

Resistant to Dutch elm disease. This has been proven to be a pest-free tree. 40 high x 50 wide. It has exfoliating bark. Ulmaceae Family

Ulmus x 'Mortan Stalwart' Commendation Elm

A mix of many elm species; resistant to Dutch elm disease with some leaf minor and leaf tatter. 25 high x 25 wide. Ulmaceae Family

Ulmus x Frontier Frontier Elm

Resistant to Dutch elm disease. Prefers moist, rich soils but adaptable to poor soils; full sun; very tolerant of urban conditions and drought tolerant. Fall color is red-purple-burgundy and summer leaves are glossy, dark green. 35 high x 25 wide. Ulmaceae Family

Ulmus x 'Triumph' Triumph™ Elm

Excellent disease and pest resistance to Dutch elm disease, Elm Yellows and Elm Leaf Beetle; arching branches with aggressive roots to be planted away from sidewalks; adapt easily to extremes in pH, moisture, wind and heat. 50 high x 40 wide – elliptical form. Ulmaceae Family

Xanthoceras sorbifolium Yellowhorn (white flowers with red & yellow centers)

This does have pea-sized edible seeds. Looks good all summer. No pest problems; likes colder climates. Soapberry Family, Sapindaceae Family

Plant select: Clear Creek® Golden Yellowhorn

Spring white flowers with yellow centers turning maroon and leathery seedpods through winter; can be large tree or small shrub to 22 feet; moderate to xeric water requirements.

One final note when selecting trees for your landscape based on Morton Arboretum and the Arbor Day Foundation:

The more closely related tree species are, the more likely they are to be vulnerable to the same pests and damage. Keep the

following 30/20/10 rule in mind when making tree selections. In your community, plant trees with no more than 30 percent of species within the same family, no more than 20 percent should be from the same genus, and no more than 10 percent should be the same species.

Colorado State University Annual Trials 2016

By Dr. Klett Ph.D.

Best of Show – *Argyranthemum 'Pure White Butterfly'*™ Proven Winner

Continuous white blooms. Looked fresh during summer heat. No deadheading required.

Best New Variety – *Lantana 'Lucky'*™ Red from Ball Flora Plant

Flowers were abundant and had many citrus tones but predominately noted for good dark red. Blooming started early and does not cycle in and out of flowering like other Lantana.

Best Novelty – *Begonia 'Jurassic'*™ Red Splash from Ball Ingenuity

Fantastic foliage gave this plant a great interest. Foliage was a dramatic red and silver with large jagged edges. Good for shady areas.

Best Angelonia - *'Archangel Dark Rose'* from Ball Flora Plant

Dense compact branching with abundant flowers which were large florets. Very prolific. Second year in a row – 2015 and 2016.

Best Begonia- *Begonia boliviensis 'Unstoppable Upright Fire'* from Dummen Orange

Dark foliage makes a great contrast with the bright orange flowers. Large flowers were semi-double and abundant on vigorous plants. Good for containers.

Best Begonia- *Begonia semperflorens 'Big® Red Bronze Leaf'* from Benary

Extreme vigor and prolific flowering. Excellent uniformity and good for sun or shade.

Best Calibrachoa - *'Superbells Pomegranate Punch'* from Proven Winners

Flowers had a unique color combination that helped with its high rating. Plants had a uniform growth habit.

Best Canna- *Canna 'Toucan Scarlet'* from Proven Winners

Dramatic combination with brilliant scarlet flowers. Plants are about five feet and very uniform.

Best Celosia-Celosia ‘Kelos® Fire Scarlet’ Improved from Beekenkamp

Deep burgundy foliage and flowers in small scarlet plumes. A beautiful color and textural combination. Plants are compact and uniform.

Best Coleus-Coleus ‘Under the Sea® Pink Reef’ from Horticulture

Unique foliage was eye-catching because of a combination of vibrant pink/rose leaf color and a very interesting leaf shape with ruffled edges. Foliage color held up well to sun without fading. Plants controlled vigor and a nice dense canopy.

Best Combo – ‘Kwik Kombo Shooting Star Mix’ from Syngenta

Dark purple Angelonia were combined with golden yellow verbena that made a beautiful contrast of light and dark. Never slowed down during the heat of the summer.

Best Dahlia- ‘XXL Sunset’ from Dummen Orange

Hugh blooms captured attention. Plants were vigorous and did not have any mildew late in the season.

Best Geranium (Interspecific) - ‘Calliope® Dark Red’ from Syngenta

Impressive overall visual effect with robust plants and large flower heads. Intense color held strong enough in the high light of Colorado. Growth habit was exceptionally uniform.

Best Geranium (Zonal) ‘Brocade Fire Night’ from Dummen Orange

Coral colored flowers appeared bright against dark foliage created by a heavy reverse zonation. Plants were uniform and covered by flowers.

Best Impatiens- ‘Big Bounce™ Lilac’ from Selecta

This is a multi-year winner due to its dependable vigorous plants which continually were covered in flowers. Plants had a perfect mounding growth habit.

Best Ipomoea- ‘Sweet Caroline Bewitched After Midnight™’ from Proven Winners

Uniform plants had foliage of dark purple with shades of bronze that created mix of color for added interest. Stood out due to its large leaves that stood upright and unique leaf shape which adds texture.

Best Lobelia- ‘Suntory Lobelia Compact Blue’ from Suntory

Looked great all season. Most fade in heat of summer. Had a dense mound of flowers even into September. Compact habit and very floriferous.

Best Marigold- ‘Little Duck Organe’ from Ameriseed

Flowers were extra-large and the orange color “popped” against the dark green foliage. Plants had a compact growth habit with dense foliage and had a uniform appearance.

Best New Guinea Impatiens- ‘SunStanding Salmon’ from Dummen Orange

Despite the name, this variety had impressive flower power even in the shade. Salmon color flowers were very attractive and looked good as they faded with age. Plants were vigorous and grew tall but had uniformity.

Best Pentas- ‘BeeBright™ Pink’ from Syngenta

Bright pink flowers had uniform flowering and were good for pollinators. Plants liked the heat and tolerated the cool nights. Abundant flowering created a good overall appearance.

Best Petunia (Veg Mound) ‘Purple Sky’ from Dummen Orange

Plants were covered by a blanket of deep purple flowers that continued to bloom strong into September. Growth habits uniform and showy.

Best Portulaca- ‘Colorblast Double Cherry’ from Westoff

Plants were floriferous and very vigorous with a spreading growth habit. Flowers opened significantly earlier in the day compared to others in the trial.

Best Salvia- ‘Mirage Cherry Red’ from Darwin Perennial

Prolific bright cherry red flowers were large and made a great hummingbird attractant for the garden. Abundant branching and good growth habit.

Best Scaevola- ‘Scalora™ Pearl’ from Westoff

Great vigor and the biggest in its class. White flowers numerous and showy. Flowering began early in the season and kept well into September. Strong mounding habit that works well in baskets.

Best Sun Impatiens- Sun Impatiens x hybrid ‘SunPatience® Compact Coral Pink’ from Sakata

Beautiful soft coral colored flowers on top of foliage for maximum visibility. Flowers are abundant and plants are uniform and appear to have no problem in the full sun.

Best Verbena - ‘Endurascape™ Pink Bicolor’ from Ball FloraPlant

Out-performed all other Verbenas. The large pink and white bicolor flowers were very abundant. Flowers were held high above the foliage and the plants were self-cleaning.

Best Vinca- ‘Mega Bloom™ Polkadot’ from Ameriseed

Great uniformity and large blooms. White flowers had a small pink eye giving it a “polkadot” effect which added interest. Plants were full and had a good foliage color.

● **Best Zinnia-** ‘Zahara® XL Fire Improved’ from PanAmerican Seed

Uniform plants were low maintenance and required no dead heading as the new flowers seemed to “bury its dead”.

**Native Plant Garden within Community Garden in Burlington
Collaboration with NRCS in Kit Carson County and Extension**

The NRCS is committed to a three-year project which has started as of spring 2016. Their goal was to sample the new Flow-Hives from Australia. These hives are non-invasive because you can see through them and know when the honey is going to be available. There is a spigot attached to the hives so that you can turn the Flow Key™ when the honey is ready. This is meant to be no lifting, no mess, no expense

honey extraction. To attract bees to the hives, the NRCS designed and implemented a native plant garden. To do this properly, they needed to supplement a spring, summer and fall food supply to the bees. Something must always be in bloom. The list below is what was planted:

Species	Scientific Name	Bloom Time
Alfalfa	<i>Medicago sativa</i>	Early Mid Late
Small burnet	<i>Sanguisorba minor</i>	Early Mid
Western Yarrow	<i>Achillea lanulosa</i>	Early Mid
Maxmilian sunflower	<i>Helianthus maximiliani</i>	Late
Purple coneflower	<i>Echinacea angustifolia</i>	Mid Late
Blue Flax	<i>Linum lewisii</i>	Early Mid
Purple prairie clover	<i>Dalea purpurea purpurea</i>	Mid Late
Black-eyed Susan	<i>Rudbeckia hirta</i>	Mid Late
Yellow sweetclover	<i>Melilotus officinale</i>	Mid Late
Showy milkweed	<i>Asclepias speciosa</i>	Mid
Rocky Mountain Penstemon	<i>Penstemon strictus</i>	Early Mid
Plains coreopsis	<i>Coreopsis tinctoria</i>	Early Mid
Large Beardtongue	<i>Penstemon grandiflorus</i>	Mid

Colorado State University 2016 Trials for Top Performing Perennials

By Dr. Jim Klett

According to Dr. Klett: "The following seven perennials were recently selected by the Perennial Trial Garden Subcommittee as being superior after 3 years of growth and two winters. Plan to utilize these in your designs and home gardens in 2017 and I think you will be happy with the results."

WINDWALKER® Big Bluestem from Plant Select®

Andropogon gerardii 'POO3S'

This is an ornamental grass with great multi-season interest with beautiful soft blue foliage that changes to a dark maroon lavender that persists even into winter. The plant adds impressive height to the border with a narrow growth habit that reaches about 6' tall. This is a great choice for a xeriscape area, as it can thrive with little or no supplemental irrigation. Avoid overhead watering and over fertilization to maintain compact plants and prevent lodging.

Alexander's Great Brunnera from Terra Nova Nurseries, Inc.

Brunnera macrophylla 'Alexanders Great' PP25,789

This is a unique Brunnera of "monster" growth proportions which is an excellent choice to add structure to the garden. The large size also helps show off the heavily silvered leaves resulting in a dramatic statement for the garden. It makes a great foliage plant for shady areas but also has a good display of blue flowers that creates a light, airy appearance. It can be used as a very attractive groundcover that is about knee high, but also makes a striking specimen. This is one of the few perennials that was selected for the "Too Good to Wait" award in 2015 and did not disappoint during the 2016 season. Make sure to give this plant ample space to show off its naturally uniform mounding habit and beautiful flowers.

Carnival Rose Granita Heuchera from Darwin Perennials

Heuchera × hybrid 'Carnival Rose Granita' PPAF

One of the best in the Carnival Series, Rose Granita is unique among *Heuchera* in that the foliage reflects light and even seems to glow at times. Its foliage has a composite of pink, purple and green, combined with a silver overlay that seems to change with the angle of the sun as well as the season for a truly mesmerizing

appearance. Beautiful from a distance, this plant only gets more impressive up close as the leaf variation starts to come into focus. Use in mass plantings or as a small specimen in the shade. The plants have a very uniform growth habit and a light pink flower that complements the foliage nicely.

Forever Purple Coral Bells from Terra Nova Nurseries, Inc.

Heuchera 'Forever Purple' PPAF

Aptly named, Forever Purple's leaves are a deep, rich purple color that is maintained all season without fading. The best and most vibrant purple leaved *Heuchera* currently on the market sports glossy foliage that seems to make the color "bounce" off the leaf. It is grown mostly for attractive foliage which also has fluted edges. Plants have vigor and a very uniform growth habit. It would make a choice for shady areas or combos.

Summerific® Cherry Cheesecake Rose Mallow from Walters Garden/Proven Winners

Hibiscus × 'Summerific®' Cherry Cheesecake'

Saucer sized flowers are a stunning contrast of rich cherry-red and bright white which gives a very tropical or exotic feel to the landscape. This selection is rated highly for its ability to produce huge flowers evenly over the entire plant. Plants are uniform and healthy with foliage that reaches all the way to the ground. Be patient with this hibiscus as it comes up very late in the spring, but well worth the wait when the showy flowers start to open in late July.

Crazy Blue Russian Sage from Darwin Perennials

Perovskia atriplicifolia 'CrazyBlue' USPP25639

Besides the prolific blue flowers, this entry is noted for a very attractive growth habit that is smaller than the species and is not susceptible to lodging even with overhead irrigation. Growth habit improves with age and with time makes a very attractive compact mound of silver gray foliage. Plants appear dense with good branching and have a very long bloom period. This selection thrives in a dry location and maintains a slightly more compact habit.

Glamour Girl Garden Phlox from Walters Garden/ Proven Winners

Phlox paniculata 'Glamour Girl'

This variety is described as "One of the best garden phlox introduced in a very long time". The period of bloom is impressively long and provides the garden with abundant vibrant salmon colored flowers. Flower color did not fade and the plants create a very upright and uniform overall appearance with no lodging. This selection seems to be fairly mildew resistant when compared to other garden phlox in the trials.

Plant Select® 2016 Top Performers

Fort Collins, CO (December 20, 2016) Plant Select®, the country's leading source of plants selected to thrive in High Plains and Intermountain regions, is pleased to announce the 2016 top performing plants as reported by our Demonstration Garden Partners.

Fifty-three public gardens in Colorado, Wyoming, Utah, Idaho and Montana participated in the

Plant Select® Demonstration Garden Partner performance surveys in 2016. These gardens display

Plant Select® winning plants, providing communities with educational opportunities to discover the plants that grow best in their local environments. To qualify as a partner, each garden must

- Display good garden design with regular garden maintenance
- Have a well-planned educational program
- Provide clear and legible signage with proper plant names
- Be open to the public year around
- Be at least one-year-old before applying

Plants were evaluated on winter hardiness, bloom and foliage quality, and overall appearance and performance on a scale of 1-9. The results are as follows:

Grand Winner: top performer overall

This year's overall winner is Blonde Ambition blue grama grass (*Bouteloua gracilis* 'Blonde Ambition' PP22,048). Introduced in 2011, this ornamental selection of native blue grama grass was developed by David Salman, founder of High Country Gardens, and owner of Waterwise Gardening, LLC. It received an overall score of 8.3 and was evaluated in 82% of the gardens reporting. This is the second year in a row for Blonde Ambition as grand winner.

The following are the top performers in each of three elevation ranges. Scores are based on reports from a minimum of half the gardens in each range. Score and number of gardens reporting follow the winning plant name.

Top performers in the 3000-5500' elevation range

1. Blonde Ambition blue grama grass: 8.8/25
2. Hot Wings® Tatarian maple (*Acer tataricum* 'Garrann' PP15,023): 8.1/21
3. Red yucca (*Hesperaloe parviflora*): 8.1/19
4. Turkish veronica (*Veronica livanensis*): 8.1/19
5. Orange Carpet® hummingbird trumpet (*Zauschneria garrettii* 'PWWG01S'): 8.1/18

Top performers in the 5501-7000' elevation range

1. Hot Wings® Tatarian maple (*Acer tataricum* 'Garann' PP15,023): 8.4/11
2. Turkish veronica (*Veronica livanensis*): 8.3/12
3. Little Trudy® catmint (*Nepeta Psfike*' PP18,904): 8.2/12
4. Blonde Ambition blue grama grass (*Bouteloua gracilis* 'Blonde Ambition' PP22,048): 8.1/15
5. Apache plume (*Fallugia paradoxa*): 8.1/13

For more information about the Demonstration Garden Partner program: <http://plantsselect.org/learn/demonstration-gardens/>

High resolution images of the top winners can be found here: https://www.dropbox.com/sh/eoyzifylsx7zrxz/AAC_5iWrhiVSZEIEt6XnxR_9a?dl=0

Top performers over 7000' elevation

1. Fernbush (*Chamaebatiaria millefolium*): 9.0/2
2. Cheyenne® mock orange (*Philadelphus lewisii* 'PWYO1S'): 8.7/3
3. Winecups (*Callirhoe involucrata*): 8.5/2
4. Kannah Creek® buckwheat (*Eriogonum umbellatum* v. aureum 'Psdwns'): 8.5/2
5. Denver Gold® columbine (*Aquilegia chrysantha*): 8.3/3

2015 Grasshopper Survey

Mike Winks, PPQ Officer

USDA APHIS PPQ Field Operations

To conduct the survey, rangeland habitat only, not cropland, is surveyed on a 5 square mile grid. A surveyor will make a stop in typical range habitat, making sure to step 50-100 feet off the road and not in a bar ditch as these can skew the numbers and types of grasshoppers found. The surveyor will calibrate their eye to the size of the 1 square foot survey hoop or toss the hoop on the ground until they can estimate the area accurately. Then, walk slowly towards the visualized area approximately 20 feet ahead, count the number of grasshoppers that jump, fly or escape its boundaries, subtracting from the count any grasshoppers that enter the area selected, once the count has begun. The area may need to be brushed by hand to make sure that all grasshoppers have been counted, especially small nymphs. The total number of grasshoppers from the visualized area is written down. These steps are repeated until 18 counts have been

made in total. An arched pattern about 250 ft. in diameter seems to work the best to insure that a diverse area is surveyed. The 18 counts are added and that total is divided by 2. This figure provides the number of grasshoppers per square yard.

These survey counts are depicted on our survey maps and can be used to help land managers, better manage their rangeland. The nymphal survey is most helpful to range managers who are considering treatments in that current season as some of the chemicals that can be used for grasshopper control are insect growth regulators and must be applied when grasshoppers are in the younger instars. The adult survey can be a helpful tool in anticipating next year's populations as the current year's population will be laying the eggs that may be problematic the following year.



United States
Department of
Agriculture

Colorado 2016 Nymphal Rangeland Grasshopper Survey

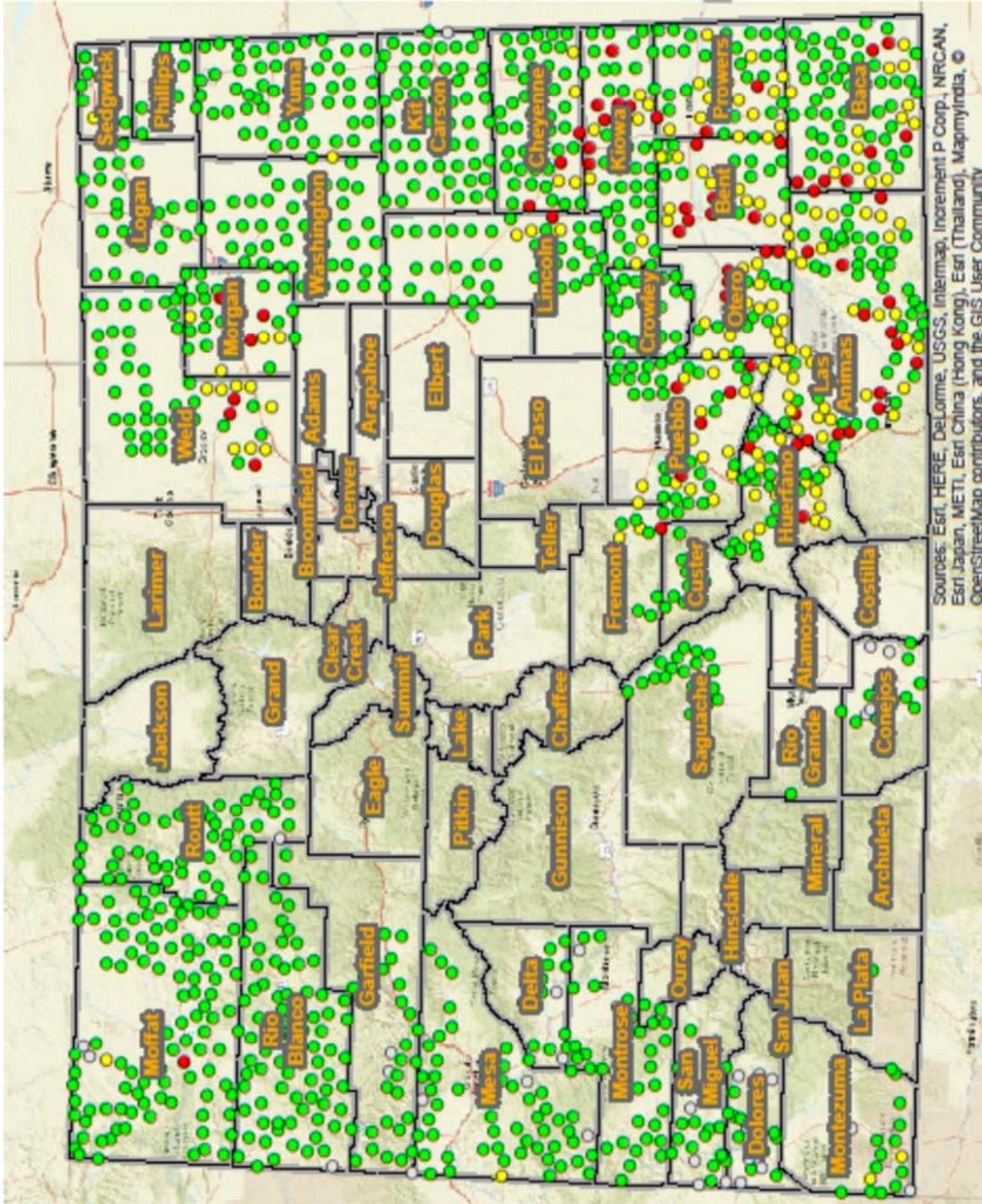


Sources: Esri, HERE,
DeLorme, USGS, Intermap,
Increment P Corp., NRCAN,

Colorado

Grasshopper Survey 2016

- GH_Counts
- 15 plus
 - 9 to 14
 - 1 to 8
 - 0
 - County



Sources: Esri, HERE, DeLorme, USGS, Intermap, Increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Data Source: USDA and ESRI

USDA APHIS PPH
3950 N Lincoln Street Aurora CO 80011
Coordinate System: Spherics ARC INFO Lambert Azimuthal Equal Area
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The U.S. Department of Agriculture's Animal and Plant Health Inspection Service collected the data displayed for internal agency purposes only. These data may be used by others, however, they must be used for their original intended purpose.

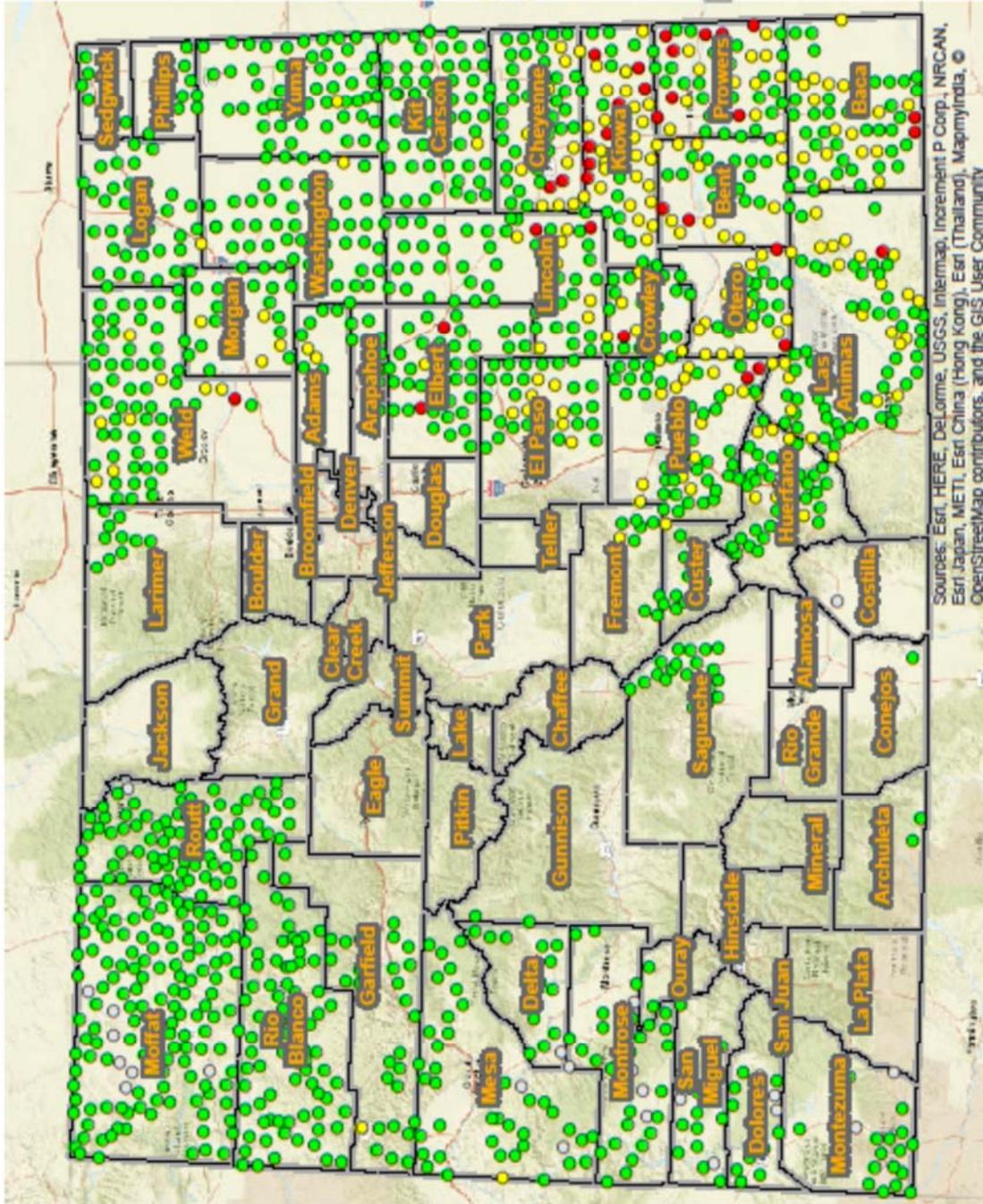
Colorado 2016 Adult Rangeland Grasshopper Survey



Colorado

Grasshopper Survey 2016

- GH_Counts
- 15 plus
 - 9 to 14
 - 1 to 8
 - 0
 - County



USDA APHIS PPH
 3850 N Lincoln Street Aurora CO 80011
 Coordinate System: SpineARC INFO Lambert Conformal Equal Area Datum: SpineARC INFO Unit: Meter
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The Relationship between Planting Dates and Some Sunflower Head-Infesting Insects Infestation and Damage in the Eastern Plains of Colorado

Assefa Gebre-Amlak, Ron Meyer, Brian Talamantes, Joel Schneekloth, and Paul Ode, Colorado State University

Introduction: The banded sunflower moth, *Cochylis hospes* Walsingham, the sunflower head moth, *Homeosoma electellum* (Hulst), and the red sunflower seed weevil, *Smicromyx fulvus* LeConte are the major head/seed pests of cultivated sunflower in Colorado.

Integrated pest management (IPM) including pest monitoring, cultural practices, use of economic action threshold for appropriate timing of chemical treatment are recommended for these insect pests in sunflower production.

Manipulation of planting time provides a method of economically managing some sunflower insects by avoiding egg laying by pests during vulnerable growth stages (e.g. Oseto et al. 1989). A three-year study in the northern Great Plains has shown the highest damage by banded sunflower moth in sunflower planted early in the season; planting sunflower later in the season in southeastern North Dakota and northwestern Minnesota has been shown to reduce most damage without affecting achene weight and oil content (Oseto et al. 1989).

In Colorado, however, local field research data on effect of planting dates on sunflower insect insects including sunflower moth, banded moth and red sunflower seed weevil are not available. Identifying planting dates that have low infestations of these insects will help reduce unnecessary pesticide applications and target specific planting dates and associated pests as a part of integrated pest management.

Objectives of the study

- Determine seasonal presence and populations of sunflower head and banded moths with pheromone traps in the Eastern Plains of Colorado.
- Determine the relationship between different planting dates and sunflower head infesting insects (sunflower moth, sunflower moth and seed weevils) and identifying dates that result in low infestation under dryland sunflower production systems.
- Identify individuals or groups of sunflower head-infesting insects associated with different planting dates (early or late) and apply integrated pest management.

Materials and methods

The three major sunflower head infesting insects (sunflower

moth, sunflower moth and seed weevils) and impact of planting dates on these pests and associated damage were studied in two Colorado locations, Akron (CO) and the Julesburg area (CO).

Pheromone trap based monitoring of sunflower moth and banded sunflower populations and emergence and flight periods were studied for three years between July and September in 2014, 2015 and 2016 respectively. A single pheromone trap was used for each species in each location and number of moths in the traps were counted and removed from traps on weekly basis.

In addition, the relationship between different sunflower planting dates and some major sunflower head infesting insects were studied. In this study, four planting dates (between May 28 and July 7) were compared for three years using Randomized Complete Block Design with four replications in both locations. A Clearfield short stature oil type sunflower hybrid variety (Triumph 870) was used in this trial. Plots of 20 ft. by 26.25 ft. size (8 rows 26.25 ft. long) were used for this study in both sites.

In 2014, out of four sunflower heads were randomly selected and covered with Delnet bags in the field when flowering is complete (R5.1) in each plot, two were inspected weekly or biweekly (between 9/3 and 10/14) for presence of sunflower moth, banded moth and seed weevil larvae respectively. During the weekly inspection, larvae of these insects leaving the sunflower heads after completion of development captured in the bag were identified and counted.

In 2015 and 2016, however, when each planting reached fully blooming stage, two sunflower heads were randomly cut and put in plastic zip lock from each plot and brought to Colorado State University insect laboratory for determining sunflower moth and banded moth larval infestations.

At maturity, two sunflower heads were harvested from each plot and put in pollen bags and shelled. After shelling the sunflower seeds were bulked and put in a pollen bag and a sample of 500 seeds were taken to determine the number seeds with a typical damage signs from sunflower/banded moth and seed weevil larvae and percentage damage due to moth and weevil larvae were calculated from these data.

All field data were analyzed using SAS JMP PRO 12 statistical

package to determine effects of planting dates on populations and damages of sunflower head moth, banded moth and seed weevils and LSD was used for means separation.

Results

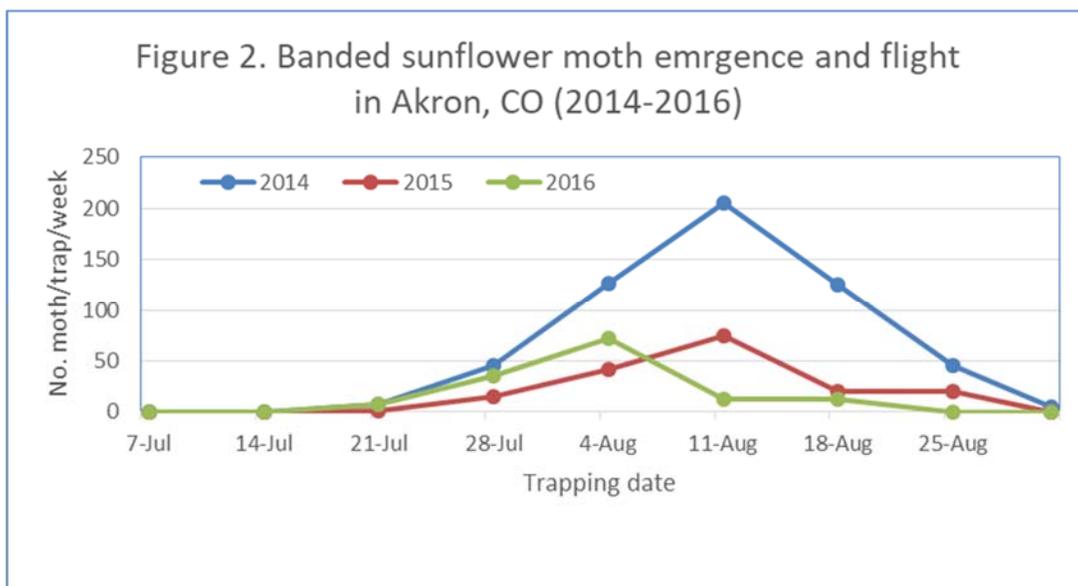
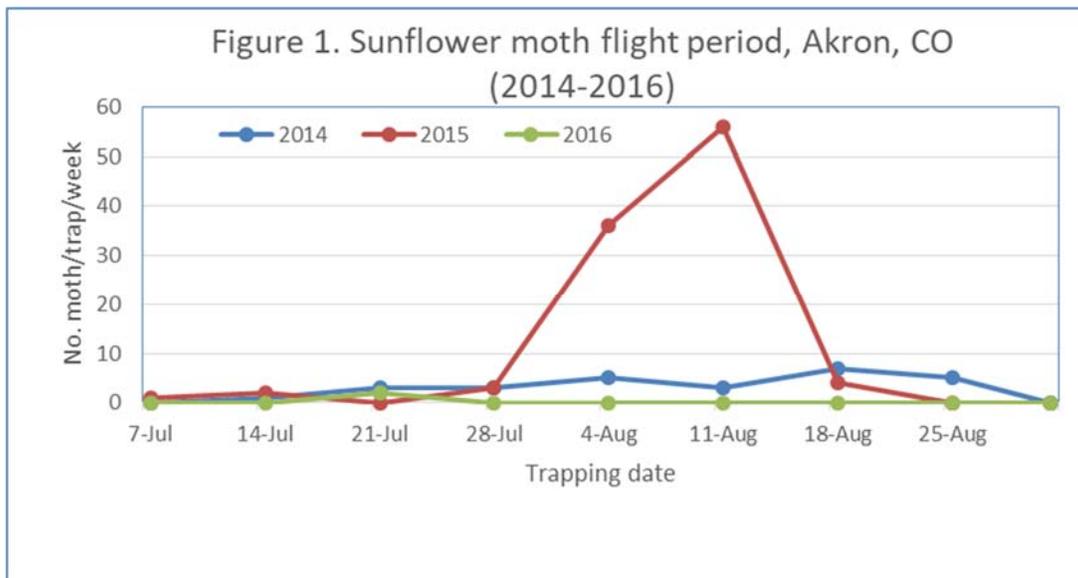
Sunflower moth and banded moth monitoring: as can be seen from pheromone trap data in Figures 1-4, the two sunflower moth species were seen flying from early July to middle of September in the Eastern Plains of Colorado. The peak moth populations of these sunflower pests occurred between the end of July and second week of August in the area.

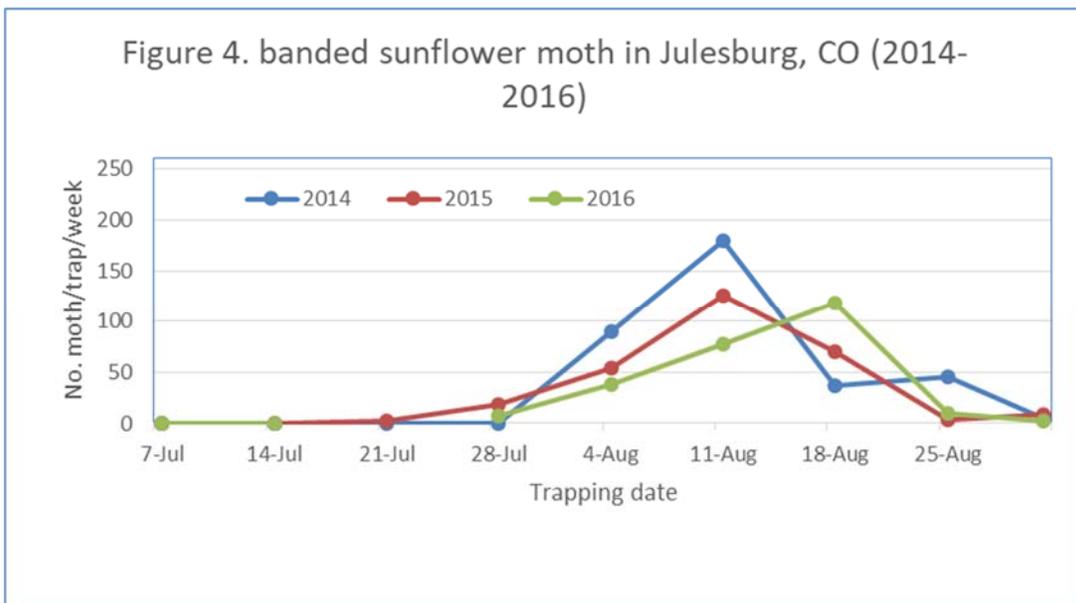
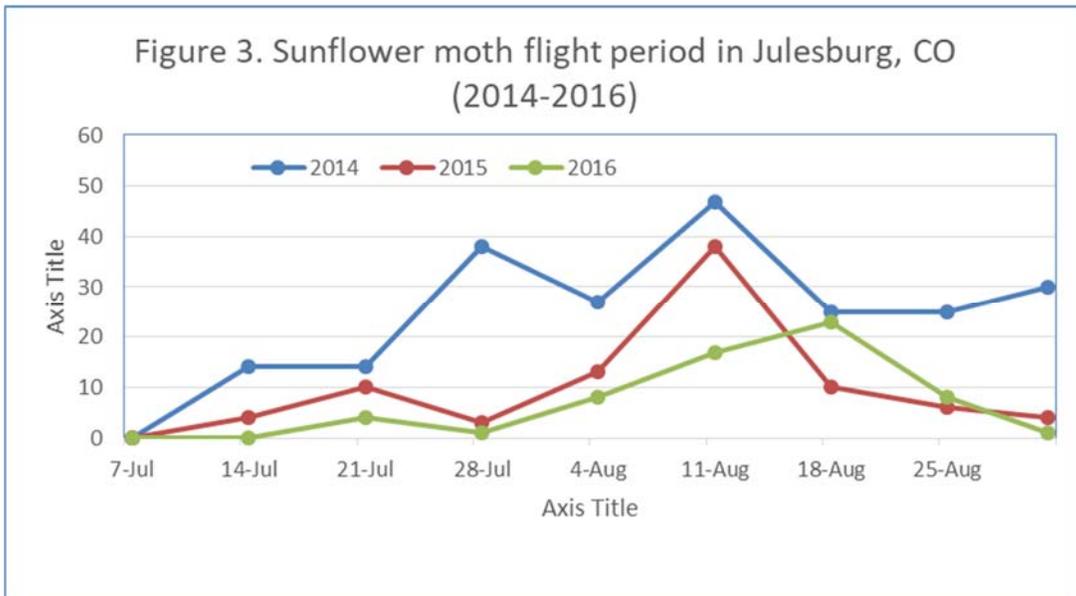
Banded moth populations were significantly larger than the

sunflower head moth populations in both locations throughout the study period. This data confirmed our previous observations of these insects in Colorado.

Julesburg had more sunflower moth populations and prolonged flight periods than in Akron (Figure 1 and 3) with the exception of that of 2015.

Year 2014 had the largest populations of both sunflower moth and banded moth and followed by 2015 and 2016 in Julesburg (figures 3 & 4) whereas in Akron, the largest number of sunflower moth was recorded in 2015. In general, 2016 had lower moth populations in both locations (figures 1-4).





Planting dates and sunflower head infesting insects: The three year field study in two locations of eastern Colorado (Akron and Julesburg) compared the impact of four planting dates on banded moth, sunflower moth and red sunflower weevil populations, degree of infestation and seed damage as a part of integrated pest management (Tables 1-12).

Akron (CO): Early plantings (between June 5 and 17) had significantly larger populations of sunflower moth larval infestations with the exception of planting of May 28, 2014 which had the lowest number of larvae (Table 1-6.).

Banded sunflower moth larval infestation relatively very low during the entire field study period despite the moth abundance in pheromone traps (tables 1, 2 & 5).

Delayed plantings in Akron (around early July) encountered the highest number of sunflower seed weevil larval infestations in 2014 but the differences were not significant among planting in 2015 and 2016 (tables 3 & 5).

Sunflower seed weevil larval populations from mid-June plantings (2014) were significantly larger than the other plantings in 2015 and were comparable to June 28, 2014 plantings (tables 1, 3 & 5).

Sunflower seed damage due to sunflower moth and seed weevil larvae in Akron were presented in tables 2, 4 and 6 respectively. About 0.1 to 2.1 % seed damaged was accounted for sunflower moth larvae in Akron, however, the study did not show any significant difference among plantings in

terms of seed damage although early plantings had significantly larger sunflower moth larval populations than later plantings (tables 2, 4 and 6).

Sunflower seed weevil appeared to be the most important insect pest causing significant reduction of quality as well as quantity of sunflower seeds in Akron. Increased risks of seed weevil larval damage was determined as planting dates delayed with the exception of 2015 where June 5 to 15 plantings had the worst damage (tables 2, 4, and 6).

Julesburg (CO): like in Akron, June plantings (June 5-17) had significantly more sunflower moth larvae than both earlier and later plantings in Julesburg (tables 7, 9 and 11) similar to Akron. The largest number of sunflower moth larvae were recorded from June 5 and 6 plantings throughout the study period.

Late planted sunflowers (around the end of June or early part of July) encountered significantly lower populations of sunflower moth larvae.

The degree of direct seed damage by sunflower moth larvae

was compared in different planting dates using typical damage signs (tables 8, 10 & 12). Proportions of seeds damaged by sunflower moth ranged from 0.3% to 4.9% in Julesburg area. Even though we found more larval populations in the earlier plantings, there was less sunflower moth larval seed damage in those early planting dates than the late planted (tables 8, 10 & 12).

To the contrary to sunflower moth, seed weevil larval populations significantly increased in those later plantings with the exception of the year 2015 (tables 7 & 11). There was strong relationship between seed weevil larval population and damaged seeds in all planting dates. Seed damage due to seed weevils accounted for 0.4% -28.3% in Julesburg (tables 8, 10 & 12).

Studies from other states indicate that early planted sunflower fields stand the greatest chance of developing significant infestation of sunflower moth (Sunflower Production Handbook). For instance, in Kansas, early plantings usually have higher infestations than later plantings (11).

Table 1. Planting Dates and Sunflower head infesting insect populations Akron, Colorado, 2014.

Planting Date	Mean no. sunflower moth larvae	Mean no. banded sunflower larvae/head	Mean no. seed weevil larvae
5/28/2014	0.50 B	1.0 A	34.25 B
6/5/2014	8.75 AB	0.2 A	94.25 AB
6/17/2014	11.75 A	1.5 A	39.75 B
6/28/2014	1.00 B	0.3 A	238.33 A

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 2. The relationship between Planting Dates and Sunflower seed damage by head infesting insects in Akron, Colorado, 2014.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. damaged seeds/500 (%)
5/28/2014	6.2 A (1.2%)	15.5 B (3.1%)	21.7 B (4.3%)
6/5/2014	9.5 A (1.9%)	46.2 A (9.2%)	55.7 A (11.1%)
6/17/2014	9.7 A (1.9%)	29.0 AB (5.8%)	38.7 AB (7.7%)
6/30/2014	6.7 A (1.3%)	51.7 A (10.3%)	58.7 A (11.7%)

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 3. Planting Dates and Sunflower head infesting insect populations Akron, Colorado, 2015.

Planting Date	Mean no. sunflower moth larvae/head	Mean no. banded moth larvae/head	Mean no. seed weevil larvae/head
6/5/2015	102.2 A	0	89.3 B
6/15/2015	20.9 B	0	329.3 A
6/30/2015	2.0 C	0	59.3 B
7/2/2015	0.0 C	0	30.1 B

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 4. Planting Dates and Sunflower head infesting insect populations Akron, Colorado, 2015.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. seeds damaged/500 (%)
6/5/2015	10.5 A (2.1%)	80.5 B (16.1%)	91.0 B (18.2%)
6/15/2015	10.2 A (2.1%)	151.7 A (30.3%)	162.0 A (32.4%)
6/30/2015	6.0 A (1.2%)	62.2 B (12.0%)	70.7 B (13.4%)
7/2/2015	5.0 A (0.1%)	52.0 B (10.4%)	57.0 B (10.5%)

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$).

Table 5. Planting Dates and Sunflower head infesting insect populations Akron, Colorado, 2016

Planting Date	Mean no. sunflower moth larvae/head	Mean no. banded moth larvae/head	Mean no. seed weevil larvae/head
6/6/2016	2.6 A	0.4 A	7.7 A
6/12/2016	1.2 AB	0.4 A	9.7 A
6/22/2016	0.0 B	0.7 A	2.7 A
7/7/2016	-	-	-

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$).

Table 6. Planting Dates and Sunflower head infesting insect populations Akron, Colorado, 2016.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. seeds damaged/500 (%)
6/6/2016	0.5 A (0.1%)	3.0 B (0.6%)	3.5 B (0.7%)
6/12/2016	1.2 A (0.2%)	4.7 B (0.9%)	6.0 B (1.2%)
6/22/2016	4.7 A (0.9%)	17.7 A (3.5%)	22.0 A (4.4%)
7/7/2016	-	-	-

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$).

Table 7. Planting Dates and Sunflower head infesting insect populations in Julesburg, Colorado, 2014.

Planting Date	Mean no. sunflower moth larvae/head	Mean no. banded moth larvae/head	Mean no. seed weevil larvae/head
5/28/2014	0.25 C	0.2 A	0.50 B
6/5/2014	21.25 A	2.2 A	3.25 B
6/17/2014	17.50 AB	2.7 A	177.00 AB
6/30/2014	2.75 BC	2.5 A	379.50 A

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 8. The relationship between Planting Dates and Sunflower seed damage by head infesting insects in Julesburg, Colorado, 2014.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. damaged seeds/500 (%)
5/28/2014	1.7 B (0.3%)	2.2 C (0.4%)	4.0 C (0.7%)
6/5/2014	3.3 B (0.7%)	16.7 BC (3.3%)	20.0 C (4.0%)
6/17/2014	14.7 A (2.9%)	53.2 B (10.6%)	70.3 B (13.5%)
6/30/2014	12.5 A (2.5%)	122.7 A (24.5%)	144.5 A (27.0%)

Means followed by the same letter in a column are not significantly different, LSD ($p < 0.05$)

Table 9. Planting Dates and Sunflower head infesting insect populations Julesburg, Colorado, 2015.

Planting Date	Mean no. sunflower moth larvae/head	Mean no. banded moth larvae/head	Mean no. seed weevil larvae/head
6/5/2015	67.5 A	0.2 A	64.0 A
6/15/2015	15.9 A	0.1 A	58.7 A
6/30/2015	5.5 B	0.1 A	58.5 A
7/2/2015	0.8 B	0.0 A	29.1 A

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 10. Planting Dates and Sunflower head infesting insect populations Julesburg, Colorado, 2015.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. seeds damaged/500 (%)
6/5/2015	11.3 A (2.3%)	41.3 BC (8.3%)	52.7 BC (10.6%)
6/15/2015	8.7 A (1.7%)	17.0 C (3.4%)	25.7 C (5.1%)
6/30/2015	23.0 A (4.6%)	77.5 A (15.4%)	100.5 A (20.0%)
7/2/2015	10.0 A (2.0%)	71.0 AB (14.2%)	81.0 AB (16.2%)

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$).

Table 11. Planting Dates and Sunflower head infesting insect populations Julesburg, Colorado, 2016.

Planting Date	Mean no. sunflower moth larvae/head	Mean no. banded moth larvae/head	Mean no. seed weevil larvae/head
6/6/2016	26.1 A	0	1.0 C
6/12/2016	7.1 B	0	6.2 BC
6/22/2016	0.6 B	0	37.3 B
7/7/2016	0.2 B	0	184.2 A

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Table 12. Planting Dates and Sunflower head infesting insect damage to sunflower seeds in Julesburg, Colorado, 2016.

Planting Date	No. sunflower moth damaged seeds/500 (%)	No. seed weevil damaged seeds/500 (%)	Total no. seeds damaged /500 (%)
6/6/2016	5.0 B (1.0%)	13.7 B (2.7%)	18.5 B (3.7%)
6/12/2016	7.5 B (1.5%)	14.7 B (2.9%)	22.2 B (4.4%)
6/22/2016	19.2 AB (3.8%)	39.7 B (7.9%)	59.0 B (11.7%)
7/7/2016	24.7 A (4.9%)	141.5 A (28.3%)	166.2 A (33.2%)

Means followed by the same letter in a column are not significantly, LSD ($p < 0.05$)

Discussions: Pheromone based monitoring of sunflower moth and banded moth in Colorado show that these insects appear in the sunflower fields at the beginning of July. Moth populations peaked around the end of same month and the second week of August during the three years of monitoring. According to this study, scouting for these insects for making pest management decisions can be initiated around the 3rd week July through middle of August in Colorado.

Planting date can be included as an integrated pest management tool to manage some of the head-infesting insects in Colorado. Early planted sunflower fields face high 1st generation sunflower head moth larval infestations. All sunflower head moth larval counts in the early plantings represented the first generation sunflower moth and while the later plantings around the last week of June and early part of July escaped infestations of this generation. However, the increase in the proportion of sunflower moth damaged seeds in these late planted sunflower were due to the 2nd generation larvae coming from moths developed in early planted sunflower. Similar reports available in from other sunflower producing states (Gebre-Amlak, et al. 2005).

Late planted sunflowers are more vulnerable to infestations of sunflower seed weevil (more of red seed weevil). This means that sunflower producers will be managing different insect pests and generations in early and late planted sunflowers respectively.

Red sunflower seed weevils appeared to be the most damaging pest and followed by the sunflower head moth in Colorado. There was a marked difference between two study sites in terms of sunflower seed damage by sunflower moth and seed weevil larvae. Julesburg area (Sedgwick County) had more consistent and higher average percent damage (4.1% due to sunflower moth and 22.3% seed weevil damage) whereas in Akron average seed damage were 1.7% (sunflower moth) and 14% (seed weevil) respectively.

Between years, 2015 was the worst year in Akron with 30% seed weevil damage (June 15 planting) whereas 2016 had 4.4% seed weevil damage. In Julesburg, however, such big variations were not observed between years/seasons.

Interestingly, banded sunflower moth larval population was insignificantly small compared to sunflower moth and red

seed weevil numbers in the sample despite its abundance in pheromone traps in both study sites. Although earlier studies in North Dakota demonstrated that delayed planting of sunflower until late May or early June will help reduce infestation levels of banded sunflower moth (Oseto et al. 1989), no significant differences in larval infestations were detected among four planting dates (between May 28 and July 7) in Colorado.

Conclusions and recommendation:

The major findings of this study are presented as follows:

1. In Colorado, sunflower moth and banded moths appear in sunflower fields between July and September and the best field scouting period for these insects would be between the 3rd week of July and 2nd week of August.
2. Banded sunflower moth are more abundant than sunflower moth in pheromone traps but less important as a pest compared to sunflower moth and seed weevils.
3. Further research on economic importance and field biology of banded sunflower in relation to cultivated and native sunflowers is recommended in Colorado.
4. Red sunflower seed weevil was found to be the key pest among the major sunflower head-infesting insect pests followed by sunflower moth in Colorado considering larval infestations and percent sunflower seed damage.
5. This study revealed the development of second generation sunflower moth during the same growing season as can be seen from presence of a significant number of moth in caged sunflower heads around the end of September and presence of small instars of sunflower moth larvae and during the early part of October. Depending upon early moth population, the second generation can cause seed damage in late planted fields.

6. Planting dates can be used to manage sunflower head-infesting insects, early planted sunflower will face less infestation and damage of sunflower seed weevils in and late planting can be recommended for managing sunflower head moth in Colorado provided that no significant development 2nd generation larvae.
7. Planting date recommendations for current sunflower insects need to consider other sunflower insect pests and soils and moisture situations in each location. For example, delayed planting is an important management tool for stem-infesting insects in Colorado and Kansas (Charlet et al. 2007) whereas the current study shows the increased risk of infestations and damage by sunflower seed weevils.

Literature cited:

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Effects of Additional Inputs on Sunflower Production

RF Meyer, Area Extension Agronomist

Golden Plains Area, Colorado State University Extension

Sunflower production inputs were studied on irrigated fields during both the 2015 and 2016 growing seasons. Six treatments were imposed on a sunflower testing site in the Prospect Valley of Colorado. 1) check plot fertilized according to recommendations from a soil test, 2) an insecticide applied during early vegetative stages, 3) a fungicide applied pre-bloom, 4) a micro-nutrient mix, 5) additional N-P-K (in addition to what was called for by the soil test) , and 6) a treatment that included all the above. Treatments were not replicated within a year however the same experiment was conducted in the two years.

Flood irrigation was used on the trial. Both growing seasons during 2015 and 2016 were exceptional for sunflower pro-

duction at the site. The check treatment received only farmer applied fertility based on soil sample analysis. The insecticide (treatment 2) used in 2015 was Counter, applied 6/23/15, while in 2016 Force was applied on 7/11. In addition, the producer also applied insecticide applications to the entire field during bloom stage. For treatment 3, Headline Amp was the fungicide applied, pre-bloom, on 7/23 both seasons. The micronutrient mix (treatment 4) consisted of the following actual nutrients applied per acre: 13 lbs/a nitrogen, 27 lbs/a phosphorous, 7 lbs/a potassium, 7 lbs/a sulfur, 1 lb/a manganese, 1.5 lb/a iron, 0.06 lb/a boron, and 1.75 pounds per acre zinc. For treatment 5, actual additional nitrogen, phosphorous, and potassium treatments applied were 50 lbs/a nitrogen, 30 lbs/a phosphorous, and 15 lbs/a potassium. Finally, treatment 6 consisted of all the above treatments.

2016 Growing Season

<u>Treatment</u>	<u>%harvest moisture</u>	<u>Test Weight</u>	<u>Yield @10% Moisture</u>
Check	6.8	16.3	3481.255
Fungicide	6.2	20.5	2576.449
Micronutrients	5.9	21.2	3250.424
Insecticide	9.7	17.2	2930.474
NPK	7.2	18.8	3778.951
All Inputs	6.5	19.5	4259.215

2015 Growing Season

Treatment	% Harvest Moisture	Test Weight	Yield @10% Moisture
NPK	10	21.2	4008.8821
Fungicide	10	19.9	4036.0822
Check	10.1	22.1	3877.3223
Insecticide	16.2	16.3	3593.4666
Micronutrient Mix	17.7	20.6	2963.3267
All Inputs	13.5	19	3878.4841

Yield results indicate that additional N-P-K increased yields over the check even when soil tests indicated additional fertility may not be needed. When additional N-P-K was added yield increases of 132 and 308 pounds per acre from 2015 and 2016, respectively. Although these were positive increases to yield, the increases were small. Micronutrients failed to increase yields in either year. Observed decreases of 914 and 231 pounds per acre were found from 2015 and 2016, respectively when micronutrients were applied. This follows past observations by the author when micronutrients have been studied in sunflower.

Insecticide applications early in the growing seasons were an attempt to control stalk boring insects primarily *Dectes* and sunflower stem weevil. However, in both years, early insecticide treatments did not increase yield and yields from both

years were much lower than the check where no early insecticide applications were applied.

Likewise, fungicide applications failed to increase yields in this study. The seasonal nature of disease activities is evident and may help explain the increase in 2015 as low levels of some leaf diseases were noted later in the season. Rust was not a yield limiting factor in either year.

When all treatments were combined there was a favorable response in 2016 but less so in 2015. It is felt that the micronutrient mix could have reduced yield when added to this combination in 2015.

Additional trials are planned for the 2017 season. It is hoped that we can separate the beneficial effects on sunflower yield of nitrogen, phosphorus, and potassium.

Cover Crop Trial Results

RF Meyer, Area Extension Agronomist

Golden Plains Area, Colorado State University Extension

Covering fields with living plants is a cropping strategy that can affect soil erosion and potentially enhance yields. In an effort to answer questions regarding which cover mix works best in Northeast Colorado, a series of research trials have been established. Currently, a number dryland cover crop production research sites have been established at various locations within Northeast Colorado, four of which are managed by the author. Locations have been established on -farm in Kit Carson, Yuma, and Lincoln Counties. These sites have provided new information regarding which cover mixes that may have potential for integration into current northeastern Colorado cropping systems.

The Lincoln County trial is replicated 4 times and consists of 4 treatment mixes. The study was analyzed using Analysis of Variance. Treatments are as follows:

Treatment 1) Chickpea 28%, Oats 28%, super sugar sorghum sudan 28%, rapeseed 2%, sunflower 2%, collards 2%

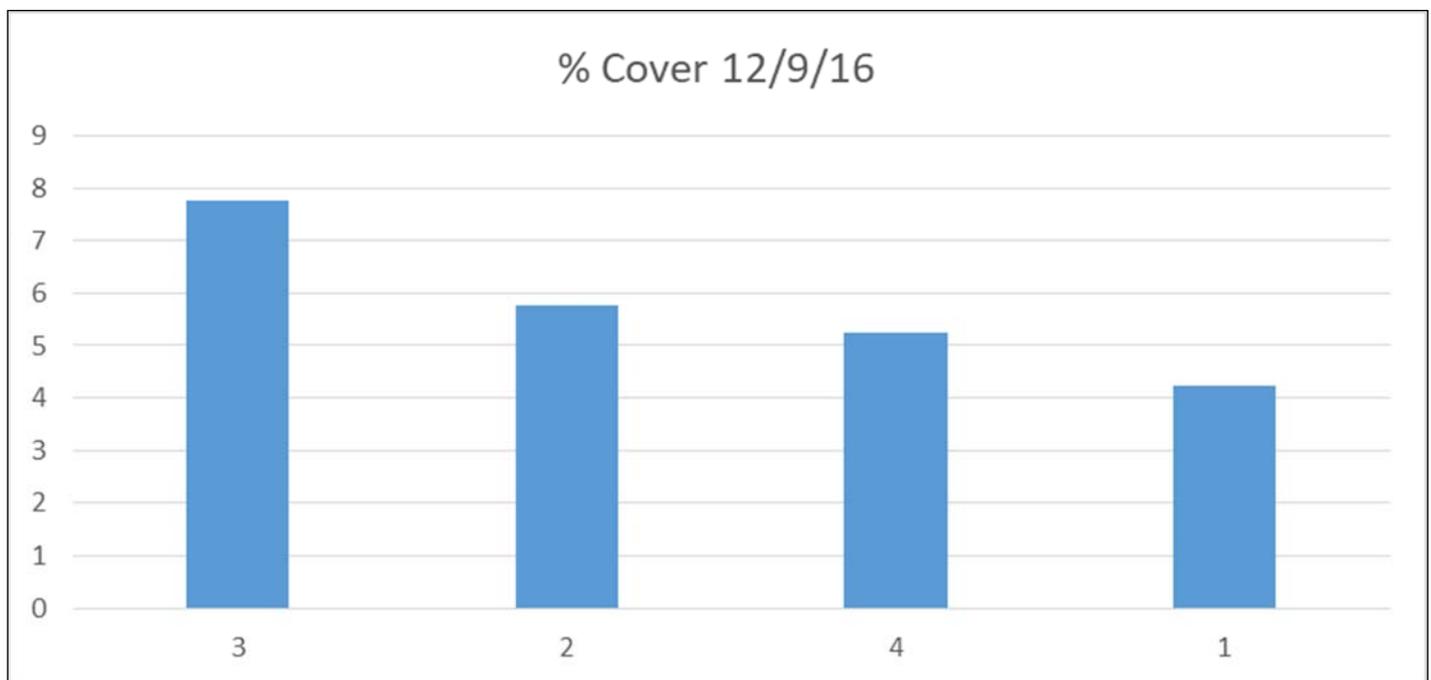
Treatment 2) Cow peas 50%, pearl millet 10%, super sugar sorghum sudan 25%, german millet 8%, cabbage 3%, collards 3%, turnip 3%

Treatment 3) Chickpea 53%, pearl millet 11%, japanese millet 8%, german millet 8%, sorghum 21%

Treatment 4) chickpeas 45%, oats 30%, white wonder millet 6%, rapeseed 2%, sunflower 6%, sorghum 11%

Cover notes were taken in December of 2016 and statistical differences were found. Treatment 3 produced the most cover with 1675 pounds of dry matter per acre harvested. Treatment 2 produced 1317 pounds of dry matter per acre while treatments 4 and 1 produced 1175 and 774 pounds dry matter per acre. Treatment 3 was statistically higher than treatment 1, but not treatments 2 and 4.

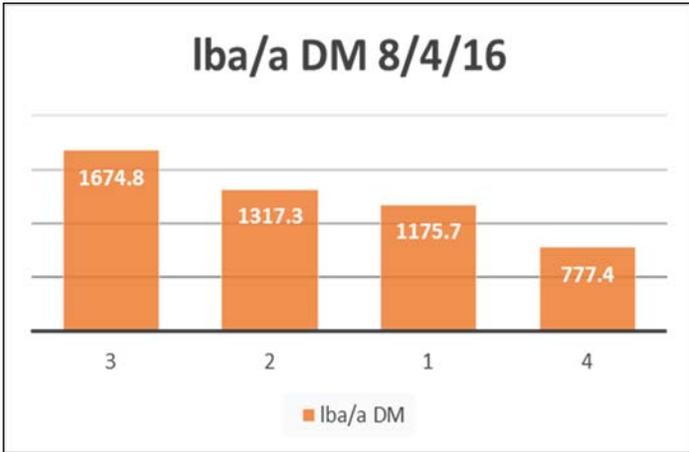
Lincoln County Cover Crop Trial



Forage samples were harvested and both quality and quantity were analyzed. At writing, quality analysis had not been finished and lab results are pending. However, forage yields were harvested and compared at two dates, August 4 and December 9. The site was grazed following the August 4th sampling. Grazing did not appear to affect forage produc-

tion as forage harvested both before and after grazing appears similar. Forage quality data both before and after grazing will be analyzed and reported when it is complete. Soil test results are also pending.

Lincoln County Cover Crop Trial Yield Results



A second location has been established in Yuma County. Treatments have varied over the seasons with a number of different cover mixes planted and observed. Following are

planting rates and treatments for one year in the Yuma County Cover trial.

Yuma County Cover Crop Trial

Varieties and Planting Rates

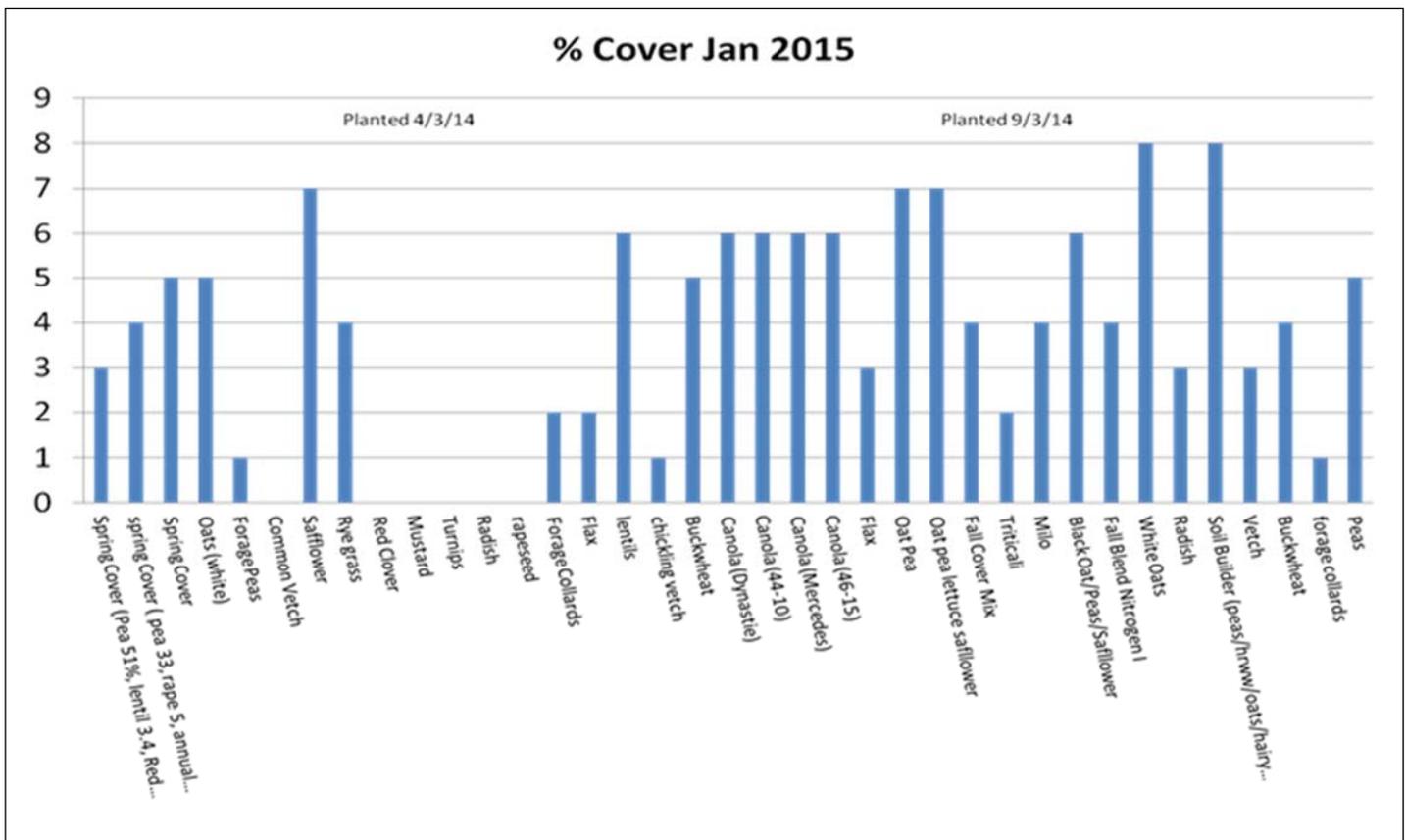
- Medium Red Clover – 11 lbs/a
- Common Vetch – 67 lbs/a
- 126 Oats -55 lbs/a
- W 2 Peas – 55 lbs/a
- Barkamp Turnips 4 lbs/a
- Safflower – 27 lbs/a
- Jumbo Annual Ryegrass – 26 lbs/a
- Soil Builder Radish – 6 lbs
- Florida Broadleaf Mustard – 10 lbs
- Buckbuster Rape – 10 lbs
- Spring Mix 1 – 55 lbs 51.8% Pea, 3.4% lentil, 3.4% red clover, 6.8% rape, 25.8% oats, 8.6% vetch,
- Spring Mix 2 – 55 lbs 39.8% pea, 39.4% oats, 5% rape, 10% safflower, 5% florida mustard,
- Spring Mix 3 – 55 lbs 32.8% pea, 48.6% Oats, 8% annual ryegrass, 1.6% florida mustard, 5% rapeseed, 3.4% red clover
- Forage Collards – 8 lbs/a
- Flax – 48 lbs/a
- Lentils – 59 lbs/a
- Chickling Vetch – 77 lbs/a
- Buckwheat – 48 lbs/a

Results from this site compared a spring versus fall planted strategy with various mixes and species. Spring planted broadleaves did not produce adequate cover when evaluated in January. Common vetch, red clover, mustard, turnips, radish and rapeseed produced zero cover when planted in the spring. However, limited cover was produced with some of these forages when planted in the fall. Treatments that contained a grass such as oats (white or black) or winter wheat produced superior cover when planted alone or in a mix. This was true from both spring and fall plantings. White oats and the soil builder mix (which contained winter wheat) produced the highest cover ratings when planted in

the fall versus any of the other treatments. Keep in mind that winter annuals such as winter wheat will survive the winter and continue growth in the spring. Oats will not survive Colorado's winters.

Another site consisted of a cover trial located at Eastern Colorado Seed near Burlington, Co. This trial was established and compared various blends with solid seeded species alone. The results indicate that Blends covered better than straight species, with the exception of vetch, oats, and barley by themselves.

Burlington Cover Crop Trial



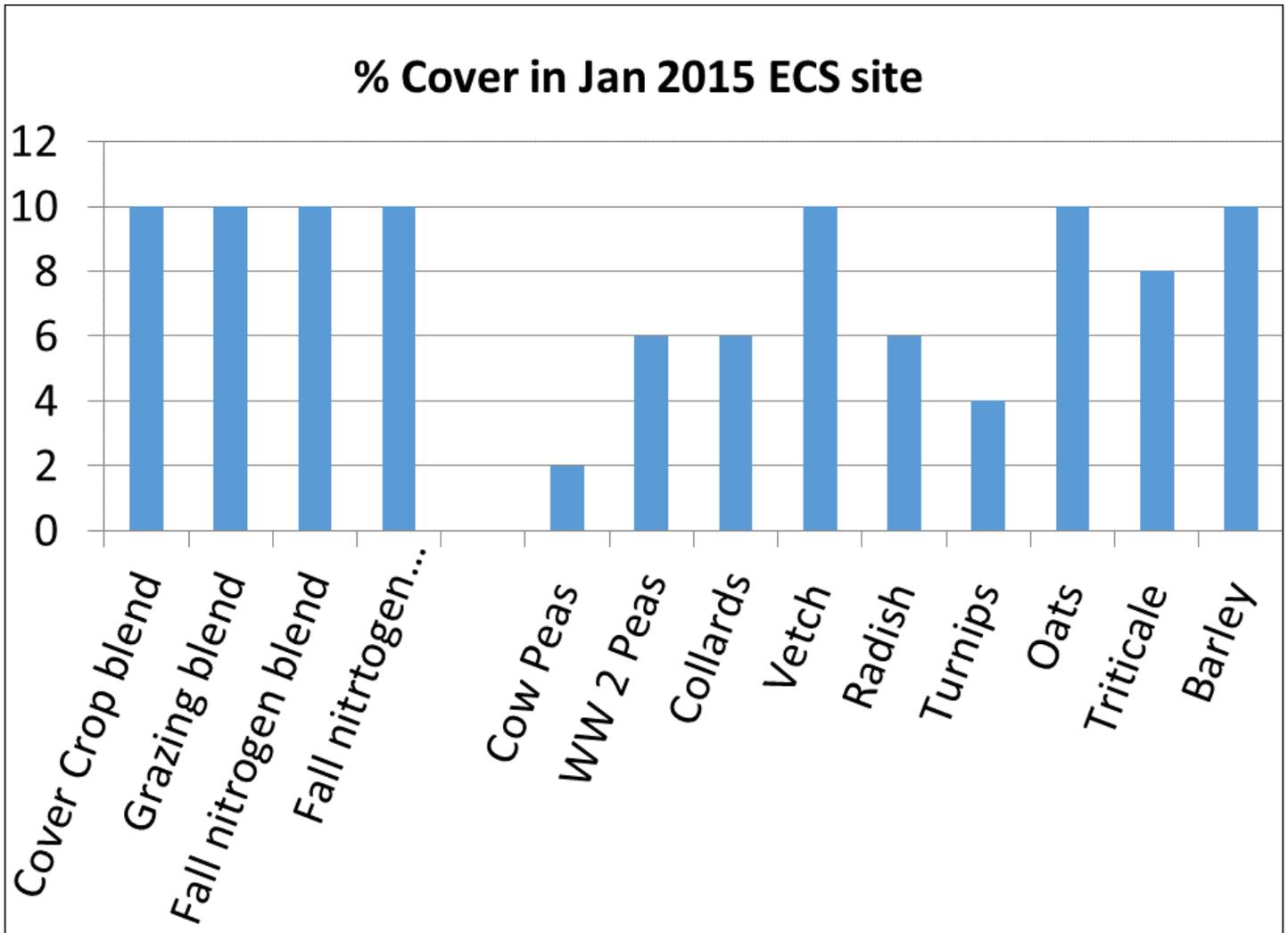
A fourth cover trial is located at the Burlington Airport. This is a cropping systems trial with both fall and spring planted cover treatments. Wheat is planted within each of

these treatments and compared to a no-cover treatment. Data is still being evaluated and will be reported at a later date.

A fourth cover trial is located at the Burlington Airport. This is a cropping systems trial with both fall and spring planted cover treatments. Wheat is planted within each of

these treatments and compared to a no-cover treatment. Data is still being evaluated and will be reported at a later date.

Burlington Airport Cover Crop Trial



Options for Hailed Corn

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Problem: Hail is a common occurrence in Colorado. The hail season of northeastern Colorado occurs from March to October. The timing of the hail season coincides with much of the growing season. Most hail events occur between May and August with June having the most hail days. Damage to crop production in northeastern Colorado from severe and unpredictable weather is frequent. Farming sustainability in areas with severe weather patterns depends on the response options to damaged crops.

There are many options available to producers when this occurs. Options include leaving corn in the field and harvesting in the fall, abandonment of those acres or destruction of the crop and planting to an alternative crop. If the hail occurs late enough in the growing season and is severe enough to warrant abandonment or destruction, what is a viable option? Where producers have a livestock enterprise, one of those options is to plant a forage and harvest by either haying or grazing. A major concern of complete abandonment late in the season is that a majority of the nitrogen has been applied and is highly leachable. Planting to either a cover crop or forage, what is the production capability as well as potential uptake of nitrogen by that crop. Also, what is the response in yield and nitrogen uptake to irrigation and the economics of that management.

Approach: Hail occurred at Akron, CO on August 1, 2015. This hail was severe enough at R1 growth stage that evaluation of 2 trials showed the yield potential to be between 0 and 20% of potential. One trial was destroyed and planted to a forage for evaluation of yield potential, quality and nitrogen uptake under 2 irrigation strategies of dryland and limited irrigation (2 inches of water per cutting).

Spring triticale was planted on August 15 at a rate of 50 lbs of seed per acre. Yield was evaluated at boot stage and samples sent for nutrient analysis. The crop was then mowed to allow for a second growth which would mimic a mob grazing practice with livestock. Spring triticale was utilized for planting because of 2 reasons. The first was that we had seed available and second, a freeze would kill that crop and regrowth in the spring would not have to be dealt with.

Results: Irrigation of plots occurred at planting to ensure establishment and at that point plots were split to either

dryland or limited irrigation. Irrigation was limited to a maximum of 2 inches per cutting to allow for utilization of soil moisture available. Precipitation recorded at the Akron Colorado Agricultural Meteorological Network between August 15 to October 5 and October 6 to November 16 was 1.82 and 1.56 inches respectively.

After establishment, growth of the triticale appeared to have been enough to allow for potential grazing after September 1 for the first cutting. Growth after the first cutting was limited due to the above average temperatures in early October and growth was seen approximately 15 days after the first harvest. Harvest occurred twice during the fall of 2015 of the spring triticale. The harvest dates were Oct 5 and November 16. Samples were taken for yield and nutrient quality at this time.

Total yield for the irrigated plot was approximately 3000 lbs acre⁻¹ with nearly 2/3rds of that occurring on the first cutting. Yields for dryland were 1700 lbs acre⁻¹ with approximately 70% of that occurring on the first cutting. Yields were significantly greater for irrigated compared to dryland with 4 inches of water applied. Crude protein was not significantly different between irrigated and dryland.

One consideration of growing a forage after a hailed corn crop is nutrient uptake. At the time of hail, most if not all the nitrogen needed by the corn crop had been applied. Nitrogen is a mobile nutrient and would have the possibility of leaching with moisture. Growing a forage would either remove the nitrogen or place it in an organic form that is not leachable. Irrigated triticale had a total uptake of nearly 95 lbs N acre⁻¹ compared to 52 lbs N acre⁻¹. At current prices, irrigation stabilized an additional 40 lbs N equivalent to about \$20 acre⁻¹.

Potential income from either grazing or haying a forage is a potential income source. At current prices for good quality grass, hayed income potential would be approximately \$180 acre⁻¹ irrigated and \$102 for dryland. Grazing potential would allow for approximately 1300 lbs and 600 lbs of beef capacity or 1.3 and 0.6 AUM's acre⁻¹ for first and second cutting respectively for irrigated and 800 lbs and 270 lbs of beef capacity or 0.8 and 0.3 AUM's acre⁻¹.

Table 1. Yield, Crude Protein (CP), Nitrogen uptake and estimated carrying capacity of forage production.

	Dryland	Irrigated		Dryland	Irrigated		Dryland	Irrigated
	Cutting 1			Cutting 2			Total	
Yield (lbs/acre)	1210.6	1835.7		516.1	1177.0		1726.7	3012.8
CP %	19.3%	20.8%		18.1%	18.0%			
Nitrogen (lbs/acre)	37.1	60.7		14.8	33.7		51.9	94.3
Lbs carrying capacity (lbs/acre)	862	1308		276	629			
Carrying capacity calculated @ 50% efficiency and 2.6% consumption of weight.								

Colorado State University



CSU Crops Testing is an Extension program within the Department of Soil and Crop Sciences. The Crops Testing group is housed in the Plant Sciences Building on the CSU Main campus in Fort Collins, CO. Our principal field location is at the USDA/ARS Central Great Plains Research Center at Akron, CO.

Crop Variety Performance Trials are conducted by Colorado State University's Crops Testing to provide unbiased and reli-

able information to Colorado crop producers to help them make better variety decisions. Each crop in our program has a report generated and is posted to our web site. That web address is www.extsoilcrop.colostate.edu. Technical reports are also available for each crop.

The following tables include crop testing data and results for crops of interest in the Golden Plains Area.

2016 Irrigated Corn Hybrid Performance Trial at Yuma

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Insect and Herbicide Technology Traits ^a	Yield ^b bu/ac	Relative		Test	Plant	Population plants/ac	Bacterial Leaf
				Maturity ^c	Moisture	Weight	Height		Streak
					percent	lb/bu	in		score (1-5) ^d
LG Seeds	LG5643STX	STX, RR2, LL	217.9	114	17.0	57.8	110	31,726	2
B-H Genetics	BH 8399VT2P	VT2Pro, RR2	213.5	113	15.1	58.9	111	32,597	2
NuTech/G2 Genetics	5F-709	AM, RR2, LL	210.6	109	15.9	59.4	108	30,430	3
NuTech/G2 Genetics	5F-906	AM, RR2, LL	210.5	106	13.8	59.5	111	31,218	3
Phoenix	6518GTA	GT	210.4	116	18.0	57.1	110	30,563	3
LG Seeds	LG5548STXRIB	STXRIB, RR2, LL	207.7	109	14.6	58.6	111	31,871	3
B-H Genetics	BH 8550SS	STX, RR2, LL	205.9	113	14.6	61.2	111	32,402	5
NuTech/G2 Genetics	5F-308	AM, RR2, LL	204.1	108	14.4	59.4	109	31,436	2
Phoenix	6948A3	3000GT, GT, LL	204.1	114	17.0	58.3	115	31,753	2
LG Seeds	LG2602VT3PRIB	VT3PRIB, RR2	201.7	112	14.1	57.2	111	33,255	2
NuTech/G2 Genetics	5F-510	AM, RR2, LL	201.2	110	15.1	60.2	114	31,700	2
Phoenix	6342A4	3111, GT, LL	201.0	113	16.3	55.7	111	31,354	3
Phoenix	5552A4	3111, GT, LL	184.7	110	15.3	57.8	102	31,218	3
LG Seeds	LG5565STXRIB	STXRIB, RR2, LL	174.9	108	14.6	59.9	107	31,363	3
B-H Genetics	BH 7646VT2P	VT2Pro, RR2	172.7	107	13.3	59.1	107	30,975	4
Average			201.4	111	15.3	58.7	110	31,591	3

^eLSD (P<0.30)

10.3

^aTechnology trait designations: 3000GT=Agrisure 3000GT; 3111=Agrisure Viptera 3111; AM=Optimum AcreMax; GT=Glyphosate Tolerant; LL=LibertyLink; RR2=Roundup Ready 2; STX=Genuity SmartStax; STXRIB=Genuity SmartStax Refuge in the Bag Complete; VT2Pro=Genuity VecTran Double Protection; VT3PRIB=Genuity VecTran Triple Protection Refuge in the Bag Complete.

^bYields corrected to 15.5% moisture.

^cRelative maturity is provided by the respective companies and is the approximate time from planting to harvest maturity. The method of calculation of the relative maturity ratings may vary among companies.

^dBacterial Leaf Streak (*Xanthomonas vasicola* pv. *vasculorum*) Score: 1 equals no leaf streak disease present and 5 equals severe disease presence.

^eIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is significant.

Plot size: 5' x 30'

Site Information

Collaborator: Joe Newton
 Planting Date: May 12, 2016
 Harvest Date: October 25, 2016
 Fertilizer: Manure applied at 10 ton/ac
 Early-season: N at 60 lb/ac through pivot and 160 lb/ac side-dressed, P at 40 lb/ac
 Mid to Late-season: N at 20 lb/ac thru pivot at tasseling, N at 20 lb/ac thru pivot at brown silk stage
 Herbicide: Early post-emergence: Clarity at 8 oz/ac, atrazine at 1 pt/ac, Roundup at 1 qt/ac
 Mid-season: Clarity at 4 oz/ac, Laudis at 3 oz/ac, Dual Magnum at 1.3 pt/ac, Roundup at 1 qt/ac
 Fungicide: Quadris at 9 oz/ac at tasseling
 Soil Type: Julesburg loamy sand
 Irrigation Type: Center-pivot

This table may be reproduced only in its entirety.

2016 Irrigated Corn Hybrid Performance Trial at Holyoke

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Insect and Herbicide Technology Traits ^a	Yield ^b bu/ac	Relative		Test		Plant Height Population Greensnap	
				Maturity ^c	Moisture	Weight	Height		
NuTech/G2 Genetics	5F-906	AM, RR2, LL	218.1	106	14.7	59.9	108	32,249	2.2
NuTech/G2 Genetics	5F-713	AM, RR2, LL	202.0	113	16.3	59.4	114	34,036	8.5
NuTech/G2 Genetics	5F-510	AM, RR2, LL	196.9	110	15.3	60.3	107	33,243	7.9
NuTech/G2 Genetics	5F-709	AM, RR2, LL	190.9	109	15.5	60.1	98	34,848	6.0
LG Seeds	LG5618STXRIB	STXRIB, RR2, LL	190.4	112	17.2	60.0	98	33,457	7.8
LG Seeds	LG5548STXRIB	STXRIB, RR2, LL	182.4	109	13.9	60.2	102	32,910	2.2
Phoenix	6948A3	3000GT, GT, LL	182.0	114	16.4	59.3	110	32,432	0.9
Phoenix	5552A4	3111, GT, LL	179.3	110	14.4	58.3	98	33,364	0.8
LG Seeds	LG2602VT3PRIB	VT3PRIB, RR2	178.0	112	14.1	57.8	104	33,759	4.9
Phoenix	6342A4	3111, GT, LL	177.9	113	14.2	56.8	86	33,167	2.2
Phoenix	6518GTA	GT	174.5	116	16.1	59.0	106	33,759	0.4
LG Seeds	LG5565STXRIB	STXRIB, RR2, LL	173.6	108	13.6	61.6	95	33,033	1.5
Average			187.1	111	15.1	59.4	102	33,355	3.8

^dLSD (P<0.30)

8.1

^aTechnology trait designations: 3000GT=Agrisure 3000GT; 3111=Agrisure Viptera 3111; AM=Optimum AcreMax; GT=Glyphosate Tolerant; LL=LibertyLink; RR2=Roundup Ready 2; STXRIB=Genuity SmartStax Refuge in the Bag Complete; VT3PRIB=Genuity VecTran Triple Protection Refuge in the Bag Complete.

^bYields corrected to 15.5% moisture.

^cRelative maturity is provided by the respective companies and is the approximate time from planting to harvest maturity. The method of calculation of the relative maturity ratings may vary among companies.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is significant.

Plot size: 5' x 31'

Site Information

Collaborator: Brent Adler
 Planting Date: May 6, 2016
 Harvest Date: October 27, 2016
 Fertilizer: N at 208, P at 70, S at 35, and Z at 1.5 lb/ac
 Herbicide: Post-emergence (early): Atrazine at 0.75 lb/ac, Status at 3.5 oz/ac, and Roundup at 32 oz/ac
 Post-emergence (30 days after planting): Status at 2 oz/ac, Roundup at 32 oz/ac, Dual at 22 oz/ac
 Soil Type: Valent sand
 Irrigation Type: Center-pivot
 Comments: Trial was hailed on June 27, which caused some greensnap in the trial.

This table may be reproduced only in its entirety.

2016 Irrigated Corn Hybrid Performance Trial at Burlington

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Insect and Herbicide		Relative		Test	Plant	Population	
		Technology	Traits ^a	Yield ^b	Maturity ^c	Moisture	Weight		Height
				bu/ac		percent	lb/bu	in	plants/ac
NuTech/G2 Genetics	5F-510	AM, RR2, LL		183.9	110	13.1	60.5	101	34,340
NuTech/G2 Genetics	5F-308	AM, RR2, LL		173.5	108	12.6	59.5	99	33,954
NuTech/G2 Genetics	5F-713	AM, RR2, LL		172.4	113	13.6	59.0	102	33,320
Phoenix	6948A3	3000GT, GT, LL		170.4	114	14.6	59.0	101	32,221
NuTech/G2 Genetics	5F-906	AM, RR2, LL		166.2	106	12.5	59.0	98	33,456
Phoenix	6518GTA	GT		163.4	116	14.0	58.4	104	32,865
NuTech/G2 Genetics	5F-709	AM, RR2, LL		157.9	109	13.2	59.8	95	33,013
LG Seeds	LG2602VT3PRIB	VT3PRIB, RR2		155.8	112	12.3	57.0	97	33,396
LG Seeds	LG5548STXRIB	STXRIB, RR2, LL		153.0	109	12.1	58.5	95	33,251
Phoenix	6342A4	3111, GT, LL		150.1	113	13.1	56.5	98	32,452
LG Seeds	LG5565STXRIB	STXRIB, RR2, LL		147.6	108	12.6	60.1	95	34,340
Phoenix	5552A4	3111, GT, LL		141.3	110	12.2	56.9	92	32,810
Average				161.3	111	13.0	58.7	98	33,285

^dLSD (P<0.30)

9.9

^aTechnology trait designations: 3000GT=Agrisure 3000GT; 3111=Agrisure Viptera 3111; AM=Optimum AcreMax; GT=Glyphosate Tolerant; LL=LibertyLink; RR2=Roundup Ready 2; STXRIB=Genuity SmartStax Refuge in the Bag Complete; VT3PRIB=Genuity VecTran Triple Protection Refuge in the Bag Complete.

^bYields corrected to 15.5% moisture.

^cRelative maturity is provided by the respective companies and is the approximate time from planting to harvest maturity. The method of calculation of the relative maturity ratings may vary among companies.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance the difference is significant.

Plot size: 5' x 31'

Site Information

Collaborator: Tim Stahlecker

Planting Date: May 6, 2016

Harvest Date: October 24, 2016

Fertilizer: N at 218, P at 60, S at 10, and Zn at 1.5 lb/ac

Herbicide: Post-emergence (early): Atrazine at 1 pt/ac, Laudis at 2.5 oz/ac, and Roundup at 32 oz/ac
Post-emergence (mid-season): Halx GT at 3.6 pt/ac (includes Touchdown at 24 oz/ac, Dual at 15.6 oz/ac, and Callisto at 3 oz/ac)

Soil Type: Kuma-Keith silt loam

Irrigation Type: Center-pivot

This table may be reproduced only in its entirety.

2016 Dailey Dryland Corn Drought and Non-Drought Tolerant Hybrid Performance at Three Plant Densities

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Company	Hybrid ^a	Yield				Test Weight			
		Plant Density (plants/acre)				Plant Density (plants/acre)			
		11,000	14,000	17,000	Average	11,000	14,000	17,000	Average
		bu/ac				b/ac			
	<u>Drought Tolerant</u>	110.5	119.8	106.9	112.4	56.9	56.9	56.8	56.9
Dekalb	DKC51-20	114.6	123.9	117.8	118.8	57.1	57.1	56.8	57.0
NuTech	5X698	115.0	119.2	105.6	113.2	56.2	56.8	56.8	56.6
Channel	198-00	110.8	123.3	105.1	113.1	57.5	57.3	57.0	57.2
NuTech	5F200	108.0	122.9	101.4	110.8	56.6	56.5	56.1	56.4
Golden Harvest	G01P52	104.3	109.6	104.8	106.2	57.1	56.8	57.4	57.1
	<u>Traditional</u>	115.2	119.6	112.0	115.6	56.9	56.9	57.0	56.9
Golden Harvest	G98L17	134.6	123.6	115.8	124.7	55.9	55.9	56.1	56.0
Dekalb	DKC50-84	114.4	126.6	110.6	117.2	57.2	57.0	57.2	57.1
NuTech	5F399	116.2	124.2	108.8	116.4	54.5	55.1	54.8	54.8
Channel	197-68	108.4	120.6	116.0	115.0	58.0	57.7	57.8	57.8
Channel	200-48	115.0	121.0	108.7	114.9	57.8	57.1	57.8	57.5
Dekalb	DKC50-64	106.9	114.5	116.2	112.5	58.1	58.3	58.2	58.2
Golden Harvest	G01Q76	111.1	106.9	107.9	108.6	56.7	56.9	57.2	56.9
	Average	113.3	119.7	109.9	114.3	56.9	56.9	56.9	56.9

^aHybrids ranked from highest to lowest average yield across the three plant densities within each drought tolerance group.

Site Information:

Collaborator: Mark and Neil Lambert
 Planting Date: May 20, 2016
 Harvest Date: October 4, 2016
 Fertilizer: Pre-plant: Composted manure at 1.5 ton/ac
 Planting: N at 20, P at 10, and Zn at 1.5 lb/ac
 Herbicide: Glyphosate at 22 oz/ac, DiFlexx, and Atrazine
 Soil Type: Haxtun sandy loam

This table may be reproduced only in its entirety.

2016 Akron Dryland Corn Drought and Non-Drought Tolerant Hybrid Performance at Three Plant Densities

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Company	Hybrid ^a	Yield				Test Weight			
		Plant Density (plants/acre)				Plant Density (plants/acre)			
		11,000	14,000	17,000	Average	11,000	14,000	17,000	Average
		bu/ac				b/ac			
	<u>Drought Tolerant</u>	62.8	66.7	66.6	65.4	56.3	55.7	55.6	55.9
NuTech	5X698	71.8	73.0	70.6	71.8	56.0	55.6	55.9	55.8
Dekalb	DKC51-20	68.2	74.3	70.8	71.1	56.2	55.5	54.8	55.5
Channel	198-00	62.0	62.7	69.4	64.7	56.7	56.8	55.8	56.4
Golden Harvest	G01P52	59.2	63.7	56.9	60.0	56.5	55.9	56.0	56.1
NuTech	5F200	52.7	60.1	65.4	59.4	56.0	55.0	55.5	55.5
	<u>Traditional</u>	66.5	71.4	69.7	69.2	56.2	56.3	55.8	56.1
Golden Harvest	G98L17	73.9	70.7	82.3	75.6	54.1	54.5	53.9	54.2
Channel	200-48	71.1	71.8	71.1	71.3	56.3	56.5	56.0	56.3
Dekalb	DKC50-84	62.5	81.6	69.2	71.1	57.0	56.5	55.8	56.4
Dekalb	DKC50-64	64.3	69.7	73.9	69.3	57.3	57.9	56.9	57.4
Channel	197-68	62.2	68.3	68.0	66.2	57.0	56.9	56.1	56.7
Golden Harvest	G01Q76	68.2	69.8	60.2	66.0	56.3	56.3	57.1	56.6
NuTech	5F399	63.2	68.1	63.1	64.8	55.3	55.3	54.7	55.1
	Average	65.0	69.5	68.4	67.6	56.2	56.0	55.7	56.0

^aHybrids ranked from highest to lowest average yield across the three plant densities within each drought tolerance group.

Site Information:

Collaborator: Central Great Plains Research Center
 Planting Date: June 1, 2016
 Harvest Date: October 10, 2016
 Fertilizer: N at 52 lb/ac and P at 6 lb/ac
 Herbicide: Cornerstone Plus at 48 oz/ac, Lumax at 1.75 pt/ac, Atrazine at 1 pt/ac applied on June 9
 Soil Type: Ascalon sandy loam

This table may be reproduced only in its entirety.

2016 Dryland Grain Sorghum Hybrid Performance Trial at Burlington

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Grain		Test Weight	Harvest Plant Population	Plant Height	Maturity Group ^b	Grain Color
		Yield ^a bu/ac	Yield % of test avg.					
Sorghum Partners	SP 34A19	63.2	149	55.7	19,502	41	ME	Bronze
Sorghum Partners	KS310	61.6	145	59.8	18,783	41	E	Bronze
Dyna-Gro Seed	GX16667	56.8	134	56.5	19,447	42	M	Bronze
Dyna-Gro Seed	GX16957	51.2	121	58.0	19,169	39	E	Bronze
Dekalb	DKS29-28	47.9	113	58.4	17,116	38	E	Bronze
Chromatin, Inc	CHR0L0163	47.1	111	59.2	15,520	41	E	Bronze
Alta Seeds	AG1101	43.6	103	59.1	18,010	37	E	Red
Sorghum Partners	SP 31A15	43.5	102	58.4	19,048	41	E	Bronze
Dyna-Gro Seed	GX16988	42.9	101	59.7	20,050	44	E	Bronze
Dekalb	DKS28-05	40.6	96	60.6	21,136	44	E	Bronze
Alta Seeds	AG1201	32.8	77	58.1	16,490	36	E	Bronze
Alta Seeds	AG2115	29.6	70	57.8	13,989	45	M	Red
Dyna-Gro Seed	M58GR24	29.0	68	59.2	14,562	47	E	Red
Alta Seeds	AG1203	23.4	55	58.0	12,320	43	ME	Bronze
Dyna-Gro Seed	M60GB31	23.0	54	58.2	10,478	38	ME	Bronze
Average		42.4		58.4	17,041	41		

^cLSD (P<0.30)

6.0

^aYields adjusted to 14% moisture and hybrids ranked by yield within maturity group.

^bMaturity Group: E=early; ME=medium-early; M=medium.

^cIf the difference between two varieties yields equals or exceeds the LSD value, there is a 70% chance the difference is significant.

Site Information

Collaborator: Tim Stahlecker

Planting Date: June 8, 2016

Harvest Date: November 14, 2016

Fertilizer: N at 40 lb/ac

Herbicide: Pre-Emergence: Sequence at 3 pt/ac

Post-Emergence: Huskie at 13 oz/ac, atrazine at 0.75 pt/ac, and 2,4-D Amine

Soil Type: Satanta-Sampson loam

This table may be reproduced only in its entirety.

2016 Dryland Oil Sunflower Hybrid Performance Trial at Genoa

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Oil Technology		Yield ^c	Moisture	Test Weight	Plant Height	Population	Oil Content ^c
		Type ^a	Traits ^b						
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	2059	5.3	32.0	50	10,091	44.6
Syngenta	3732 NS	NS	N/A	1924	5.2	29.9	44	11,035	41.5
Mycogen Seeds	8H456CL	HO	Clearfield, DM	1824	5.1	28.2	52	11,398	44.5
Syngenta	SY7919	HO	Clearfield, DM	1704	5.8	29.3	52	6,582	41.0
Syngenta	SY7717	HO	Clearfield, DM	1153	5.2	29.3	52	10,019	41.0
Average				1733	5.3	29.7	50	9,825	42.5
^d LSD (P<0.30)				231					

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bTechnology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology traits.

^cYield and oil content were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) the difference is significant.

Plot size: 10' x 31'

Site Information

Collaborator: Rob Boyd
 Planting Date: June 8, 2016
 Harvest Date: November 1, 2016
 Fertilizer: N at 50 lb/ac
 Herbicide: Roundup at 36 oz/ac and Spartan Charge at 4 oz/ac
 Soil Type: Fort Collins-Platner loams

This table may be reproduced only in its entirety.

2016 Limited-Irrigation Oil Sunflower Hybrid Performance Trial at Burlington

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Oil Technology		2016	2-Year Avg.	Test		Plant		Oil	
		Type ^a	Traits ^b	Yield ^c	Yield ^c	Moisture	Weight	Height	Population	Lodging	Content ^c
				lb/ac	lb/ac	percent	lb/bu	in	plants/ac	percent	percent
Mycogen Seeds	8H456CL	HO	Clearfield, DM	3721	2837	7.0	24.8	70	19,146	1.0	43.8
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	3542	2814	6.6	28.7	67	19,228	1.1	44.5
Croplan	455 E HO	HO	ExpressSun, DM	3340	-	6.9	26.8	68	17,217	16.0	41.2
Croplan	545 CL	NS	Clearfield, DM	3328	2835	7.5	26.4	74	17,294	0.0	40.2
Croplan	553 CL HO	HO	Clearfield, DM	3270	2570	7.1	28.2	72	16,687	1.9	40.7
Syngenta	SY7919	HO	Clearfield, DM	3256	-	7.1	27.9	62	17,943	1.5	43.6
Nuseed	Sierra	HO	N/A	3184	-	8.4	26.5	67	20,023	0.0	39.8
Nuseed	Hornet	HO	Clearfield, DM	3034	2415	6.6	28.5	65	17,940	10.1	41.4
Croplan	549 CL HO	HO	Clearfield, DM	2942	2385	6.5	28.6	74	18,542	1.6	40.1
Croplan	432 E	NS	ExpressSun, DM	2760	2222	6.8	25.9	62	17,139	0.0	38.5
Syngenta	3732 NS	NS	N/A	2508	1981	6.3	27.7	61	20,257	1.7	42.7
Croplan	458 E HO	HO	ExpressSun, DM	2356	1569	7.2	26.3	67	18,637	0.8	40.6
Nuseed	N4HM354	HO	Clearfield, DM	2240	-	6.4	28.4	64	17,022	0.0	41.8
Syngenta	SY7717	HO	Clearfield, DM	2051	1473	6.4	27.6	59	19,542	0.0	41.6
Nuseed	Daytona	HO	Clearfield	1879	-	7.0	28.2	61	17,892	1.5	40.7
Nuseed	Cobalt II	HO	Clearfield, DM	1791	-	6.4	27.4	59	21,123	0.0	41.5
Average				2825	2310	6.9	27.4	66	18,477	2.3	41.4
^d LSD (P<0.30)				299							
^d LSD (P<0.05)				574							
Coefficient of Variation (%)				14.3							

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bTechnology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

^cYield and oil content were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

Plot size: 5' x 30'

Site Information

Collaborator: Gerhard Heintges

Planting Date: June 4, 2016

Harvest Date: October 14, 2016

Fertilizer: N at 120 lb/ac and P at 40 lb/ac

Herbicide: Spartan 4F at 3 oz/ac and Dual II Magnum at 1.2 pt/ac applied on June 8.

Insecticide: Lorsban at 1 pt/ac and Lambda at 3.8 oz/ac

Irrigation: Center-pivot; pre-watered 3 inches before planting and applied 2 inches during growing season

Soil Type: Kuma-Keith silt loam

This table may be reproduced only in its entirety.

2016 Limited-Irrigation Confection Sunflower Hybrid Performance Trial at Burlington

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Technology Traits ^a	2016 Yield ^b	3-Year Avg. Yield ^b	Moisture	Test Weight	Plant Height	Population	Seed Retained Over Screen			
									Over 24/64	Over 22/64	Over 20/64	Over 16/64
Red River Commodities, Inc.	RRC 2215 CL	Clearfield	3031	3088	8.3	20.5	80	16,005	18.8	52.4	82.2	98.4
Nuseed	N6LM448	Clearfield	2958	-	9.2	18.5	68	12,935	43.2	64.2	84.4	98.2
Nuseed	6946 DMR	DM	2898	-	7.2	22.7	66	14,969	12.6	37.0	71.4	95.8
Red River Commodities, Inc.	RRC 8015	N/A	2846	2829	8.1	17.9	70	15,849	16.6	49.2	85.8	98.8
Red River Commodities, Inc.	RRC 2215	N/A	2810	2838	7.7	21.6	77	15,527	9.8	38.0	74.2	96.8
Red River Commodities, Inc.	RRC 8042	N/A	2798	-	9.4	19.4	67	13,971	20.0	45.6	75.8	96.6
Red River Commodities, Inc.	RRC 2217 CP	Clearfield Plus	2681	2664	8.4	18.7	72	12,478	37.0	67.2	90.6	98.6
Nuseed	Panther DMR	DM	2015	-	7.8	18.2	62	12,822	23.2	46.8	75.4	95.0
Red River Commodities, Inc.	RRC 2205	N/A	2011	-	8.1	19.3	66	14,934	25.4	56.8	78.0	96.8
Average			2672	2855	8.2	19.6	70	14,388	23.0	50.8	79.8	97.2
^c LSD (P<0.30)			297									
^c LSD (P<0.05)			577									
Coefficient of Variation (%)			14.8									

^aTechnology trait designations: Clearfield=tolerant to Beyond herbicide; Clearfield Plus=tolerant to Beyond herbicide; DM=downy mildew resistance; N/A=no technology traits.

^bYields were corrected to 10% moisture.

^cIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

Plot size: 5' x 30'

Site Information

Collaborator: Gerhard Heintges
 Planting Date: June 4, 2016
 Harvest Date: October 14, 2016
 Fertilizer: N at 120 lb/ac and P at 40 lb/ac
 Herbicide: Spartan 4F at 3 oz/ac and Dual II Magnum at 1.2 pt/ac applied on June 8.
 Insecticide: Lorsban at 1 pt/ac and Lambda at 3.8 oz/ac
 Irrigation: Center-pivot; pre-watered 3 inches before planting and applied 2 inches during growing season
 Soil Type: Kuma-Keith silt loam

This table may be reproduced only in its entirety.

2016 Dryland Oil Sunflower Hybrid Performance Trial at Julesburg

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Oil Type ^a	Technology Traits ^b	2016		Test		Plant		Oil
				Yield ^c lb/ac	Moisture percent	Weight lb/bu	Height in	Population plants/ac	Lodging percent	Content ^c percent
Mycogen Seeds	8H456CL	HO	Clearfield, DM	2021	7.5	28.4	59	12,107	20.8	40.4
Nuseed	Hornet	HO	Clearfield, DM	1935	6.6	29.2	54	12,452	33.5	-
Croplan	553 CL HO	HO	Clearfield, DM	1778	7.2	30.4	55	13,351	45.7	39.1
Pioneer	P64ME01	NS	ExpressSun	1774	8.8	29.2	57	12,379	20.6	36.9
Syngenta	3732 NS	NS	N/A	1765	6.7	30.7	51	12,150	29.7	38.2
Syngenta	SY7919	HO	Clearfield, DM	1754	7.9	28.6	50	8,695	24.8	37.1
Mycogen Seeds	8H449CLDM	HO	Clearfield, DM	1709	7.4	29.4	55	11,991	24.3	39.7
Nuseed	Sierra	HO	N/A	1659	9.0	27.6	57	12,449	28.1	36.3
Croplan	545 CL	NS	Clearfield, DM	1522	6.8	29.6	56	11,129	35.0	38.2
Croplan	455 E HO	HO	ExpressSun, DM	1490	7.7	29.7	53	11,206	40.2	38.9
Pioneer	P63HE90	HO	ExpressSun	1461	8.4	29.2	55	7,850	49.5	36.6
Croplan	549 CL HO	HO	Clearfield, DM	1424	7.1	29.6	54	14,236	37.6	36.7
Pioneer	P63HE60	HO	ExpressSun	1386	7.0	30.0	52	13,052	37.9	38.3
Croplan	458 E HO	HO	ExpressSun, DM	1358	7.3	28.7	50	12,162	21.6	37.9
Nuseed	Daytona	HO	Clearfield	1343	6.8	28.5	52	12,534	36.8	38.0
Nuseed	N4HM354	HO	Clearfield, DM	1322	6.5	30.4	54	13,881	34.3	38.2
Croplan	432 E	NS	ExpressSun, DM	1235	6.7	29.4	48	11,166	30.7	35.5
Syngenta	SY7717	HO	Clearfield, DM	1168	8.0	28.4	50	8,178	29.3	34.9
Nuseed	Cobalt II	HO	Clearfield, DM	1093	6.5	29.4	47	14,081	30.1	36.6
Average				1537	7.4	29.3	53	11,845	32.1	37.6
^d LSD (P<0.30)				187						
^d LSD (P<0.05)				358						
Coefficient of Variation (%)				16.5						

^aOil type designations: HO=High oleic; NS=NuSun/Mid-oleic.

^bTechnology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance; ExpressSun=tolerant to Express herbicide; N/A=no technology traits.

^cYield and oil content were corrected to 10% moisture.

^dIf the difference between two hybrid yields equals or exceeds the LSD value, there is a 70% chance (P<0.30) or 95% chance (P<0.05) the difference is significant.

Plot size: 10' x 31'

Site Information

Collaborator: Josh Leachman

Planting Date: June 8, 2016

Harvest Date: October 20, 2016

Fertilizer: N at 39 lb/ac and P at 9 lb/ac at planting

Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl at 1.8 pt/ac

Soil Type: Richfield loam

Trial Comments: Trial was hailed in late-June. Sunflower plants recovered despite serious damage.

This table may be reproduced only in its entirety.

2016 Dryland Confection Sunflower Hybrid Performance Trial at Julesburg

Jerry Johnson, Sally Jones, Ed Asfeld - Colorado State University Crops Testing

Brand	Hybrid	Technology Traits ^a	2016		Test Weight	Plant Height	Population	Lodging	Seed Retained Over Screen			
			Yield ^b	Moisture					Over 24/64	Over 22/64	Over 20/64	Over 16/64
			lb/ac	percent	lb/bu	in	plants/ac	percent	percent			
Nuseed	N6LM448	Clearfield	2124	17.3	18.1	53	5,154	21.7	15.4	35.2	71.8	94.2
Nuseed	Panther DMR	DM	1768	9.5	22.9	46	5,842	28.0	59.4	77.0	86.6	94.2
Nuseed	6946 DMR	DM	1737	10.0	22.7	49	5,078	32.2	21.0	40.8	71.6	95.2
Average			1876	12.2	21.2	49	5,358	27.3	31.9	51.0	76.7	94.5

^cLSD (P<0.30)

NS

^aTechnology trait designations: Clearfield=tolerant to Beyond herbicide; DM=downy mildew resistance.

^bYield corrected to 10% moisture.

^cNS=Yields were not significantly different from each other.

Plot size: 10' x 31'

Site Information

Collaborator: Josh Leachman

Planting Date: June 8, 2016

Harvest Date: October 20, 2016

Fertilizer: N at 39 lb/ac and P at 9 lb/ac at planting

Herbicide: Pre-plant: Spartan at 4 oz/ac and Prowl at 1.8 pt/ac

Soil Type: Richfield loam

Trial Comments: Trial was hailed in late-June. Sunflower plants recovered despite serious damage.

This table may be reproduced only in its entirety.

Summary of 2016 Dryland Winter Wheat Variety Performance Results
Jerry Johnson, Scott Haley, Sally Jones, Ed Asfeld - Colorado State University

Variety ^b	2016 Individual Trial Yield ^a								2016 Multi-Location Average				
	Arapahoe	Julesburg	Lamar	Sheridan				Yuma	Yield	Yield	Stripe Rust	Test	
				Orchard	Roggen	Lake	Walsh					bu/ac	% of avg
Antero	98.3	95.0	68.7	51.4	105.5	115.5	62.0	93.3	86.2	110%	2	57.2	34
CO11D1539	91.3	96.2	64.8	49.0	111.1	111.1	66.4	94.7	85.6	109%	3	56.3	36
Langin	110.2	84.2	72.7	45.3	101.2	115.1	64.6	90.0	85.4	109%	2	59.0	32
CO12D2011	95.2	89.0	62.6	47.3	106.3	108.6	62.1	94.1	83.2	106%	3	60.1	34
CO12D2010	93.8	91.1	66.2	46.2	103.0	108.9	57.5	94.3	82.6	105%	3	56.2	33
Hatcher	97.9	91.4	71.3	50.7	103.0	100.9	57.3	88.2	82.6	105%	5	57.7	33
Avery	93.0	95.7	66.7	47.7	109.6	113.9	58.7	73.8	82.4	105%	7	58.6	35
CO11D1312	92.2	98.6	64.9	51.0	107.0	108.0	62.6	74.1	82.3	105%	8	58.3	34
LCH13NEDH-14-6	89.9	91.8	56.5	44.2	111.8	114.0	57.6	90.5	82.0	104%	2	59.0	32
Joe	95.4	92.1	54.6	45.0	110.7	106.7	62.2	87.3	81.7	104%	1	58.7	34
Sunshine	85.3	95.5	57.2	49.9	110.1	102.2	60.7	91.8	81.6	104%	7	56.4	34
WB-Grainfield	92.9	93.1	61.0	50.5	96.4	105.1	60.5	92.1	81.5	104%	3	59.4	34
CO11D1767	96.0	91.4	63.3	49.8	94.6	110.7	58.0	85.8	81.2	103%	1	57.0	33
CO11D1397	94.4	89.3	67.1	48.5	104.4	111.8	60.0	71.5	80.9	103%	7	57.8	31
CO11D1236	102.3	90.4	58.8	47.9	101.1	105.5	64.0	76.2	80.8	103%	6	58.3	35
TAM 114	96.4	100.6	56.3	51.1	96.0	100.2	54.3	90.5	80.7	103%	2	60.6	34
CO12D922	70.0	96.3	61.2	49.5	102.2	108.5	66.1	91.2	80.6	103%	7	58.6	35
LCS Mint	96.4	91.8	54.6	47.3	105.3	110.2	54.0	84.7	80.5	103%	4	59.4	34
Byrd	94.2	86.8	67.9	46.0	100.6	110.3	60.4	73.6	80.0	102%	6	59.3	34
CO11D421	89.9	84.6	70.4	46.9	102.5	108.3	59.6	77.2	79.9	102%	4	57.6	33
Cowboy	94.1	83.0	62.0	52.6	111.3	110.7	50.0	75.1	79.8	102%	8	56.8	32
CO11D1306W	91.9	91.2	65.9	43.6	101.8	109.3	60.9	73.7	79.8	102%	7	59.6	34
Denali	87.9	98.5	59.6	50.7	101.9	102.4	56.6	76.5	79.3	101%	8	59.5	36
Oakley CL	81.9	92.6	57.2	45.6	99.9	104.8	53.2	94.9	78.8	100%	1	58.4	32
CO12D1028	84.0	92.8	66.5	48.2	108.9	95.5	59.4	72.4	78.5	100%	7	55.4	34
CO12D906	84.2	87.5	60.0	46.9	104.8	104.1	57.2	82.7	78.4	100%	5	58.7	33
Winterhawk	80.9	89.5	57.0	45.6	107.2	97.8	61.7	87.6	78.4	100%	4	59.6	35
WB4721	87.4	86.3	60.7	45.3	88.4	100.8	54.0	102.4	78.2	100%	2	60.4	33
SY Monument	95.5	89.1	57.9	51.9	93.1	99.9	51.9	85.5	78.1	99%	2	58.2	33
SY Sunrise	89.7	93.6	57.1	48.1	92.9	93.4	55.0	88.8	77.3	98%	2	59.6	31
Settler CL	84.8	87.2	61.2	49.4	98.4	99.5	53.1	81.3	76.8	98%	8	57.7	33
Ruth	90.0	93.4	48.6	49.8	90.1	102.9	50.8	88.8	76.8	98%	3	60.3	35
KanMark	86.7	92.2	54.3	42.3	97.5	106.9	54.0	78.2	76.5	97%	4	58.4	31
Brawl CL Plus	91.1	86.2	58.7	48.2	91.0	97.0	56.5	83.2	76.5	97%	4	58.0	34
Ripper	91.5	94.4	67.7	45.1	95.6	99.8	51.6	62.7	76.0	97%	8	57.1	34
LCS Chrome	83.2	83.3	59.3	39.2	97.2	99.0	55.4	87.8	75.6	96%	2	59.1	33
Snowmass	89.0	87.7	55.4	44.3	102.0	101.0	57.2	66.8	75.4	96%	8	58.8	34
SY Wolf	78.7	92.8	51.8	48.8	93.4	96.1	51.3	86.0	74.9	95%	3	56.1	33
LCH13-032	83.1	83.8	54.9	42.9	87.6	95.9	54.8	94.3	74.7	95%	3	60.5	32
TAM 204	93.2	79.4	65.1	39.5	91.7	91.5	57.3	78.1	74.5	95%	2	54.9	30
CO14A065	84.5	84.0	67.0	45.9	96.4	94.6	48.1	64.2	73.1	93%	5	55.4	31
Doublestop CL Plus	76.5	91.3	55.1	44.7	84.2	84.7	53.0	84.2	71.7	91%	4	58.8	34
Akron	86.2	87.2	59.6	40.9	88.2	93.3	54.8	63.1	71.7	91%	8	56.5	35
MTS1024	90.3	80.5	52.2	44.0	97.2	91.8	33.2	74.9	70.5	90%	2	55.3	31
CO14A058	72.4	82.2	67.9	43.5	90.4	89.3	53.2	61.4	70.1	89%	6	55.2	34
Prairie Red	77.6	86.4	55.4	39.9	78.8	88.9	53.0	71.7	69.0	88%	8	57.0	32
Average	89.4	90.0	61.0	46.8	99.4	102.7	56.6	82.2	78.5		4	58.1	33
^d LSD (P<0.30)	6.2	4.7	3.8	3.2	6.3	4.2	2.4	5.7					

^aVarieties in the top LSD yield group in each location are in bold.

^bVarieties ranked according to multi-location average yield in 2016.

^cStripe rust score: 1 equals no stripe rust and 9 equals severe stripe rust infection.

^dIf the difference between two variety yields equals or exceeds the LSD value then they are significantly different with less than 30% probability that the difference is due to random error.

This table may be reproduced only in its entirety.

Summary of 2-Year (2015-2016) Dryland Wheat Variety Performance Results

Jerry Johnson, Scott Haley, Sally Jones, Ed Asfeld - Colorado State University

Variety ^b	Brand/Source	Market Class ^c	2-Year Average ^a			
			Yield bu/ac	Yield % trial average	Test Weight lb/bu	Plant Height in
Joe	Kansas Wheat Alliance	HWW	81.5	115%	59.5	34
Antero	PlainsGold	HWW	81.2	115%	57.8	33
CO11D1767	Colorado State Univ. exp.	HRW	80.3	114%	57.0	33
CO11D1539	Colorado State Univ. exp.	HRW	78.8	111%	57.2	35
CO11D1236	Colorado State Univ. exp.	HRW	76.1	108%	58.6	35
SY Monument	AgriPro Syngenta	HRW	75.9	107%	58.4	33
Oakley CL	Kansas Wheat Alliance	HRW	75.3	106%	58.0	31
Langin	Colorado State Univ. exp.	HRW	74.7	106%	59.0	31
CO11D1306W	Colorado State Univ. exp.	HWW	74.1	105%	59.4	34
TAM 114	AGSECO	HRW	74.0	105%	59.9	33
WB-Grainfield	WestBred Monsanto	HRW	73.6	104%	59.2	34
Denali	PlainsGold	HRW	73.0	103%	59.1	35
Ruth	Husker Genetics	HRW	72.8	103%	60.1	34
LCS Mint	Limagrain	HRW	72.1	102%	58.6	34
Avery	PlainsGold	HRW	71.5	101%	58.0	35
Winterhawk	WestBred Monsanto	HRW	71.1	101%	59.1	34
Sunshine	PlainsGold	HWW	70.8	100%	56.7	33
Hatcher	PlainsGold	HRW	69.4	98%	57.0	33
CO11D1397	Colorado State Univ. exp.	HRW	69.4	98%	57.4	31
Cowboy	Crop Res. Foundation of WY	HRW	69.3	98%	56.5	32
Byrd	PlainsGold	HRW	69.3	98%	58.7	34
SY Wolf	AgriPro Syngenta	HRW	68.7	97%	56.4	32
KanMark	Kansas Wheat Alliance	HRW	68.5	97%	58.5	30
TAM 204	Watley Seed	HRW	67.6	96%	55.1	30
Settler CL	Husker Genetics	HRW	66.8	94%	56.8	32
Snowmass	PlainsGold	HWW	66.8	94%	58.0	34
Brawl CL Plus	PlainsGold	HRW	63.4	90%	58.1	33
MTS 1024	Montana State Univ. exp.	HRW	60.6	86%	54.5	32
Ripper	PlainsGold	HRW	59.5	84%	55.7	32
Akron	Colorado State Univ.	HRW	59.3	84%	56.0	34
Prairie Red	PlainsGold	HRW	56.7	80%	56.7	31
Average			70.7		57.8	33

^aThe 2-year average yield and plant heights are based on eight 2016 and nine 2015 trials. Test weights are based on nine 2016 trials and six 2015 trials.

^bVarieties ranked according to average 2-year yield.

^cMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

This table may be reproduced only in its entirety.

Summary of 3-Year (2014-2016) Dryland Wheat Variety Performance Results

Jerry Johnson, Scott Haley, Sally Jones, Ed Asfeld - Colorado State University

Variety ^b	Brand/Source	Market Class ^c	3-Year Average ^a			
			Yield	Yield	Test Weight	Plant Height
			bu/ac	% trial average	lb/bu	in
Antero	PlainsGold	HWW	74.6	114%	58.6	31
Oakley CL	Kansas Wheat Alliance	HRW	69.3	106%	58.8	29
SY Monument	AgriPro Syngenta	HRW	69.3	106%	59.3	30
Langin	Colorado State Univ. exp.	HRW	69.2	106%	59.8	29
Avery	PlainsGold	HRW	69.0	106%	59.3	32
Denali	PlainsGold	HRW	68.2	105%	60.3	32
WB-Grainfield	WestBred Monsanto	HRW	67.0	103%	60.0	31
LCS Mint	Limagraim	HRW	66.3	102%	59.7	31
Byrd	PlainsGold	HRW	66.2	101%	59.8	31
Cowboy	Crop Res. Foundation of WY	HRW	66.1	101%	58.3	30
Sunshine	PlainsGold	HWW	65.8	101%	57.5	30
Winterhawk	WestBred Monsanto	HRW	65.7	101%	60.4	31
Hatcher	PlainsGold	HRW	65.2	100%	58.2	30
SY Wolf	AgriPro Syngenta	HRW	64.9	100%	57.5	30
Settler CL	Husker Genetics	HRW	64.0	98%	57.7	29
KanMark	Kansas Wheat Alliance	HRW	63.2	97%	59.6	27
Snowmass	PlainsGold	HWW	63.2	97%	59.1	32
Brawl CL Plus	PlainsGold	HRW	60.6	93%	59.2	31
Ripper	PlainsGold	HRW	58.5	90%	57.3	29
Akron	Colorado State Univ.	HRW	57.7	89%	57.8	31
Prairie Red	PlainsGold	HRW	55.9	86%	57.7	29
Average			65.2		58.8	30

^aThe 3-year average yield is based on eight 2016, nine 2015, and nine 2014 trials. Test weights are based on nine 2016, six 2015, and eight 2014 trials. Plant heights are based on eight 2016, nine 2015, and nine 2014 trials.

^bVarieties ranked according to average 3-year yield.

^cMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

This table may be reproduced only in its entirety.

Summary of 2-Year (2015-2016) Irrigated Wheat Variety Performance Results at Haxtun

Jerry Johnson, Scott Haley, Sally Jones, Ed Asfeld - Colorado State University

Variety ^a	Brand/Source	Market Class ^b	2-Year Average				
			Yield	Yield	Test Weight	Plant Height	Lodging ^c
			bu/ac	% trial average	lb/bu	in	scale (1-9) ^d
WB-Cedar	WestBred Monsanto	HRW	91.9	124%	58.7	32	3
Sunshine	PlainsGold	HWW	86.8	117%	54.6	35	5
Langin	Colorado State Univ.	HRW	84.8	115%	59.0	36	9
SY Sunrise	AgriPro Syngenta	HRW	84.6	114%	57.5	34	3
SY Wolf	AgriPro Syngenta	HRW	82.2	111%	54.8	35	4
CO11D1767	Colorado State Univ. exp.	HRW	79.4	107%	56.3	38	6
Denali	PlainsGold	HRW	78.6	106%	58.4	39	5
CO11D1306W	Colorado State Univ. exp.	HWW	73.4	99%	55.6	38	6
Byrd	PlainsGold	HRW	73.4	99%	56.9	36	7
KanMark	Kansas Wheat Alliance	HRW	72.5	98%	56.5	33	2
Antero	PlainsGold	HWW	72.4	98%	55.5	37	8
Brawl CL Plus	PlainsGold	HRW	71.1	96%	56.9	36	3
Oakley CL	Kansas Wheat Alliance	HRW	70.6	95%	53.7	37	8
CO11D1236	Colorado State Univ. exp.	HRW	70.0	95%	56.2	38	7
Yuma	CO State Univ.	HRW	69.8	94%	55.1	36	6
CO11D1539	Colorado State Univ. exp.	HRW	68.8	93%	53.8	38	8
Avery	PlainsGold	HRW	67.0	91%	56.8	37	7
CO11D1397	Colorado State Univ. exp.	HRW	66.9	90%	53.6	34	5
Thunder CL	PlainsGold	HWW	66.2	89%	55.1	37	1
Hatcher	PlainsGold	HRW	62.9	85%	56.0	35	7
Cowboy	Crop Res. Found. of WY	HRW	60.7	82%	55.7	37	8
Average			74.0		56.0	36	6

^aVarieties ranked according to average 2-year yield at Haxtun.

^bMarket class: HRW=hard red winter wheat; **HWW**=hard white winter wheat.

^cLodging scores based on 2016 data.

^dLodging scale: 1=no lodging, 9=severe lodging.

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2016 Collaborative On-Farm Test (COFT) Wheat Variety Performance Results

**Jerry Johnson, Ron Meyer, Wilma Trujillo, Dennis Kaan, Brian Talamantes,
Kelly Roesch, & Sally Jones - Colorado State University**

2016 Varieties^a

County/Nearest Town	<u>Sunshine</u>		<u>Denali</u>		<u>Avery</u>		<u>WB-Grainfield</u>		<u>Byrd</u>		<u>COFT Average</u>	
	Yield ^b	Test Weight	Yield ^b	Test Weight	Yield ^b	Test Weight	Yield ^b	Test Weight	Yield ^b	Test Weight	Yield ^b	Test Weight
	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu	bu/ac	lb/bu
Adams/Prospect Valley	52.0	62.4	42.6	62.1	37.5	61.6	47.4	63.7	35.3	60.2	43.0	62.0
Baca/Pritchett	67.0	58.3	64.7	59.0	64.3	57.4	63.5	58.3	63.9	57.4	64.7	58.1
Baca/Two Buttes	53.3	54.4	47.7	54.7	51.1	55.7	52.2	56.0	50.5	54.9	51.0	55.1
Baca/Vilas	78.8	56.4	80.0	56.0	83.7	55.3	68.5	56.4	79.7	56.2	78.2	56.1
Cheyenne/Cheyenne Wells	62.0	59.3	71.4	59.7	58.1	57.6	60.5	58.1	60.0	58.2	62.4	58.6
Kiowa/Haswell	26.1	-	23.6	-	32.7	-	20.6	-	24.8	-	25.6	-
Kit Carson/Bethune	63.5	53.0	70.7	53.8	66.2	53.3	56.5	57.7	61.6	53.5	63.7	54.3
Kit Carson/Burlington N	108.1	57.1	100.9	58.4	104.3	56.8	94.7	58.5	96.3	58.1	100.8	57.8
Lincoln/Arriba	84.8	56.2	78.9	54.9	74.4	55.1	78.1	55.9	72.5	55.0	77.7	55.4
Logan/Leroy	83.3	60.4	74.4	60.8	70.7	60.6	79.9	62.3	60.6	60.5	73.8	60.9
Phillips/Haxtun	80.5	55.5	69.8	55.2	71.3	53.2	77.0	55.5	73.4	54.9	74.4	54.9
Prowers/Lamar	54.9	56.3	51.2	57.1	51.3	55.9	52.7	57.3	59.4	56.0	53.9	56.5
Prowers/Lamar S	80.7	57.2	75.4	57.0	84.4	57.3	74.8	57.8	81.4	57.3	79.3	57.3
Washington/Akron	67.1	62.1	72.8	61.5	63.3	60.3	62.4	61.6	67.3	61.1	66.6	61.3
Washington/Akron S	72.0	61.5	72.3	61.0	72.5	61.3	72.5	61.1	78.8	60.2	73.6	61.0
Washington/Central	79.6	59.6	78.1	60.1	80.1	59.2	74.5	59.3	71.5	59.3	76.8	59.5
Weld/Keenesburg	91.9	65.0	66.0	62.0	62.7	60.7	82.1	64.6	61.2	60.2	72.8	62.5
Weld/New Raymer SE	36.8	59.9	38.3	60.9	36.5	59.4	36.7	59.4	34.3	61.7	36.5	60.3
Weld/New Raymer SW	72.4	59.2	73.3	59.6	-	-	78.3	59.1	71.7	58.6	73.9	59.1
Weld/Roggen	64.4	63.1	73.3	62.4	68.2	62.1	61.8	63.0	66.9	61.8	66.9	62.5
Average	69.0	58.8	66.3	58.7	64.9	57.9	64.7	59.2	63.6	58.2	65.8	58.6

Yield Significance^c

A

B

B

B,C

C

Test Weight Significance^c

B

B

C

A

C

LSD ($P < 0.30$) for yield = 1.7 bu/ac

LSD ($P < 0.30$) for test weight = 0.3 lb/bu

^aVarieties are ranked left to right by highest average yield.

^bAll yields are corrected to 12% moisture.

^cYield and test weight significance: varieties with different letters have yields or test weights that are significantly different from one another.

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GPA BASIS DATA 2003 - 2016

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The relationship between the cash and futures markets is often referred to as basis. By understanding this relationship, the futures markets can be utilized as a tool to help achieve marketing goals. The formula for calculating basis is simply (Cash Price – Futures Price). A negative basis implies that the futures price is higher than the cash price while a positive basis implies that the futures price is less than the cash price.

Some factors affecting basis include supply and demand, transportation costs, geographical location, grain quality, and seasonality. Despite these many influences, basis is generally easier to predict than futures or cash prices over time and can be used to forecast expected future prices. For example, if December Corn futures are currently trading at \$5.59 and the average expected basis is -\$0.55, we would expect the cash price in December to be \$5.04. Variation in basis over time will result in the actual cash price being higher or lower depending on whether basis is stronger (+) or weaker (-) than expected. Assessing this variability is crucial in using basis in the marketing process. Comparing the current year’s basis to a multiple year average is one method for this assessment.

Figures 1 and 2 show area wide basis trends for corn and wheat respectively. While not a good representation of any one location, solid seasonal trends are evident in each case. As harvest approaches for each crop, basis weakens considerably as one would expect when supplies are in excess. Corn basis begins to strengthen around May when supplies begin

getting tight while wheat basis generally begins to recover after the passing of the harvest rush into the fall.

Times of especially strong or positive basis can indicate a period of high demand and/or low supply as can be seen in the corn tables during mid 2007. This premium is generally a sign of a “sellers market”, a good time to take advantage of the situation and lock in favorable prices. The opposite of this situation is weak or negative basis, an indicator that the market is faced with low demand and/or excessive supply. This situation can be seen taking form in mid 2007 due to a locally large wheat harvest, high futures prices, and rising freight costs. In these times, exploring storage options may be the best option.

While there is much debate about the methods used to estimate future basis, three, four, and five year rolling averages are generally accepted. The following tables include ten years of data with a five-year weekly average calculated in the right hand column for Akron M&M, Flagler, Holyoke, Julesburg, Wray M&M, and Yuma M&M.

Basis data was acquired from the following Kansas State University Department of Agricultural Economics website for this project. <http://www.agmanager.info/marketing/basis/> Missing basis data was averaged with neighboring weeks to complete the table.

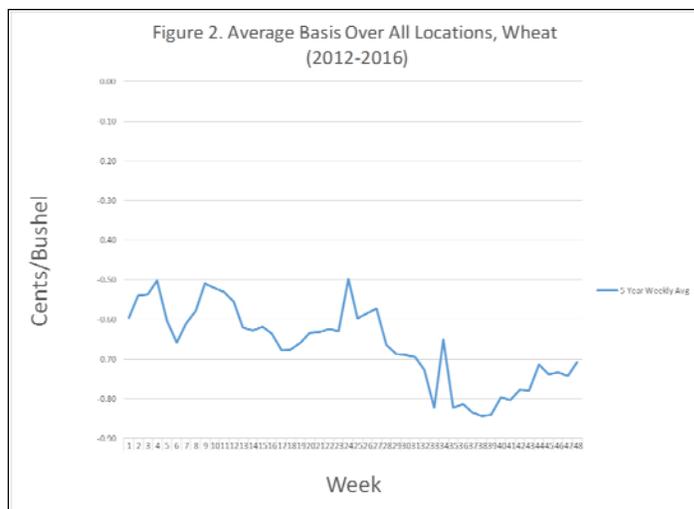
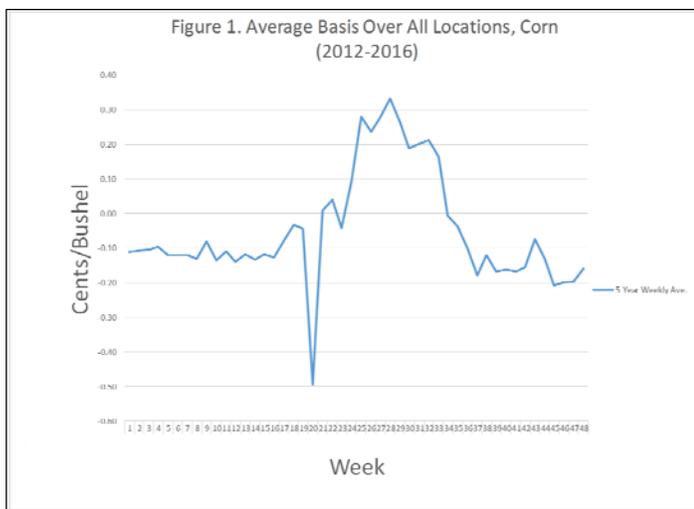


Table 1. Corn Basis - Akron M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.11	-0.21	-0.20		-0.54	-0.19					-0.19
	2	-0.08	-0.24	-0.20		-0.46	-0.16				-0.23	-0.19
	3	-0.08	-0.35	-0.19		-0.59	-0.12				-0.23	-0.18
	4	-0.02	-0.27	-0.20	-0.37	-0.59	-0.07					-0.23
FEB	5	-0.04	-0.20	-0.19	-0.38	-0.62	-0.21	0.10	-0.01	-0.25	-0.23	-0.12
	6	-0.04	-0.19	-0.15	-0.36	-0.60	-0.12	0.12	-0.05	-0.23	-0.23	-0.10
	7	-0.04	-0.20	-0.14	-0.36	-0.54	-0.06	0.12	-0.10	-0.23	-0.24	-0.10
	8	0.20	-0.14	-0.10	-0.36	-0.58	-0.09	0.12	-0.10	-0.23	-0.25	-0.11
MAR	9	0.01	-0.27	-0.20	-0.38	-0.65	-0.04				-0.30	-0.17
	10	0.01	-0.27	-0.20	-0.40	-0.64	-0.06				-0.30	-0.18
	11	0.01	-0.37	-0.19	-0.39	-0.66	-0.09				-0.30	-0.19
	12	0.01	-0.27	-0.19	-0.35	-0.65	-0.11				-0.30	-0.21
APR	13	0.01	-0.27	-0.19	-0.34	-0.64	-0.13	0.22	-0.20		-0.30	-0.10
	14	0.01	-0.27	-0.19	-0.30	-0.68	-0.10	0.20	-0.27		-0.33	-0.12
	15	0.01	-0.28	-0.20	-0.31	-0.64	0.01	0.21	-0.16		-0.32	-0.06
	16	0.01	-0.24	-0.19	-0.30	-0.87	-0.12	0.20	-0.15		-0.37	-0.11
MAY	17	0.09	-0.33	-0.24	-0.34	-0.58		0.55		-0.18	-0.38	0.00
	18	0.09	-0.33	-0.24	-0.32	-0.32				-0.13	-0.37	-0.25
	19	0.09	-0.33	-0.23	-0.32	-0.32				-0.13	-0.37	-0.25
	20	0.14	-0.34	-0.23	-0.33	-0.32				-12.50	-0.37	-6.43
JUN	21	0.24	-0.34		-0.32	-0.15	0.10	0.65	-0.07	-0.14	-0.37	0.03
	22	0.24	-0.33		-0.32	-0.12	0.16	0.63	-0.07	-0.13	-0.42	0.03
	23	0.24	-0.33		-0.32	-0.10	0.25		0.50	-0.13	-0.42	0.05
	24	0.27	-0.33		-0.32	0.01	0.26	0.65	0.50	-0.01	-0.46	0.19
JUL	25	0.29	-0.51	-0.41	-0.36	0.32				-0.09	-0.45	-0.27
	26	0.44	-0.41	-0.29	-0.40	0.31					-0.46	-0.46
	27	0.44	-0.42		-0.36	0.31					-0.45	-0.45
	28	0.34	-0.38		-0.24	0.31					-0.45	-0.45
AUG	29	0.34	-0.34		-0.31	0.20		1.40	0.27		-0.45	0.41
	30	0.34	-0.28	-0.23	-0.31	0.33	-0.09	1.20	0.18		-0.45	0.21
	31	0.29	-0.28	-0.23	-0.27	0.48	-0.21	1.19	0.16		-0.35	0.20
	32	0.14	-0.17	-0.23	-0.26	0.23	-0.23	1.60	0.15		-0.49	0.26
SEP	33	0.05	-0.26	-0.25	-0.43	-0.48			0.05		-0.55	-0.25
	34	-0.04	-0.26	-0.25	-0.44	-0.50			0.05		-0.55	-0.25
	35	-0.03	-0.26	-0.25	-0.48	-0.65			0.05		-0.55	-0.25
	36	-0.09	-0.11	-0.25	-0.52	-0.38			0.05			0.05
OCT	37	-0.10	-0.11	-0.27	-0.52			-0.05	0.00	-0.21		-0.09
	38	-0.14	-0.12	-0.29	-0.63			-0.06		-0.21		-0.14
	39	-0.19	-0.18	-0.29	-0.64					-0.21		-0.21
	40	-0.20	-0.23	-0.29	-0.69					-0.21		-0.21
NOV	41	-0.19	-0.12	-0.29	-0.63	-0.27	0.04	0.00	-0.26			-0.07
	42	-0.19	-0.13	-0.29	-0.58	-0.28	0.03	-0.06	-0.20			-0.08
	43	-0.19	-0.12	-0.29	-0.48	-0.31	0.05	-0.05	-0.19			-0.06
	44	-0.19	-0.13	-0.29	-0.59	-0.25	0.05		-0.19		-0.58	-0.24
DEC	45	-0.26	-0.24	-0.42	-0.63	-0.21				-0.25	-0.56	-0.40
	46	-0.26	-0.24	-0.47	-0.55	-0.17				-0.22	-0.55	-0.39
	47	-0.26	-0.20	-0.52	-0.54	-0.13				-0.23	-0.55	-0.39
	48	-0.18	-0.19	-0.41	-0.54	-0.17				-0.23		-0.23
Average		0.03	-0.26	-0.25	-0.41	-0.30	-0.05	0.43	0.00	-0.77	-0.39	

Table 2. Corn Basis - Flagler (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.12	-0.42	-0.42	-0.55	-0.70	-0.15	0.05	-0.03	-0.25	-0.30	-0.14
	2	-0.11	-0.42	-0.42	-0.60	-0.62	-0.15	0.05	-0.03	-0.25	-0.30	-0.14
	3	-0.12	-0.38	-0.35	-0.55	-0.70	-0.15	0.05	-0.03	-0.25	-0.30	-0.14
	4	-0.09	-0.38	-0.35	-0.54	-0.70	-0.15	0.05	-0.01	-0.15	-0.30	-0.11
FEB	5	-0.11	-0.37	-0.35	-0.55	-0.70	-0.15	0.06	0.04	-0.25	-0.30	-0.12
	6	-0.11	-0.37	-0.35	-0.50	-0.70	-0.15	0.06	0.03	-0.25	-0.30	-0.12
	7	-0.11	-0.37	-0.35	-0.50	-0.70	-0.15	0.06	0.03	-0.25	-0.30	-0.12
	8	0.06	-0.32	-0.35	-0.50	-0.70	-0.16	0.06	0.01	-0.25	-0.30	-0.13
MAR	9	-0.24	-0.45	-0.35	-0.55	-0.79	-0.19	0.16	-0.05	-0.22	-0.32	-0.12
	10	-0.24	-0.45	-0.35	-0.55	-0.80	-0.19		-0.05	-0.30	-0.32	-0.21
	11	-0.16	-0.45	-0.35	-0.50	-0.80	-0.25	0.16	-0.05	-0.30	-0.32	-0.15
	12	-0.16	-0.45	-0.30	-0.50	-0.80	-0.25	-0.01	-0.05	-0.30	-0.32	-0.19
APR	13	-0.25	-0.46	-0.30	-0.50	-0.80	-0.25	0.16	-0.05	-0.30	-0.32	-0.15
	14	-0.16	-0.44	-0.30	-0.50	-0.75	-0.30	0.15	-0.15	-0.30	-0.32	-0.18
	15	-0.16	-0.45	-0.30	-0.46	-0.75	-0.30	0.15	-0.15	-0.30	-0.41	-0.20
	16	-0.15	-0.46	-0.28	-0.45	-1.00	-0.30	0.16	-0.12	-0.30	-0.40	-0.19
MAY	17	-0.26	-0.54	-0.35	-0.52	-0.70	-0.20	0.30	-0.15	-0.30	-0.40	-0.15
	18	-0.26	-0.50	-0.40	-0.52	-0.70	-0.10	0.30	-0.05	-0.30	-0.40	-0.11
	19	-0.16	-0.51	-0.35	-0.52	-0.60	-0.10	0.31	-0.05	-0.30	-0.40	-0.11
	20	-0.11	-0.56	-0.35	-0.52	-0.55	0.01	0.30	-0.05	-0.30	-0.45	-0.10
JUN	21	-0.06	-0.63	-0.45	-0.52	-0.40	0.10	0.30	0.05	-0.30	-0.45	-0.06
	22	-0.02	-0.55	-0.40	-0.52	-0.40	0.11	0.51	0.05	-0.30	-0.45	-0.02
	23	-0.02	-0.58	-0.40	-0.52	-0.30	0.10		-0.05	-0.30	-0.45	-0.18
	24	-0.01	-0.58	-0.40	-0.51	-0.21	0.11	0.51	0.05	-0.24	-0.45	0.00
JUL	25	0.00	-0.72	-0.40	-0.59	-0.10	0.30	1.50	0.14	-0.29	-0.51	0.23
	26	0.00	-0.67	-0.40	-0.59	-0.10	0.33	1.50	0.10	-0.25	-0.41	0.25
	27	-0.10	-0.60	-0.40	-0.59	-0.10	0.20	1.51	0.20	-0.29	-0.50	0.22
	28	-0.10	-0.50	-0.34	-0.52	-0.10	0.20	1.50	0.25	-0.30	-0.50	0.23
AUG	29	0.10	-0.40	-0.40	-0.50	0.10	-0.05	1.50	0.20	-0.30	-0.50	0.17
	30	0.10	-0.40	-0.40	-0.50	0.10	-0.05	1.50	0.20	-0.30	-0.50	0.17
	31	0.10	-0.40	-0.40	-0.50	0.11	-0.05	1.50	0.21	-0.30	-0.50	0.17
	32	0.10	-0.30	-0.40	-0.50	0.10	-0.01	1.50	0.20	-0.41	-0.45	0.17
SEP	33	-0.13	-0.60	-0.40	-0.60	-0.20	-0.05	1.61	0.05	-0.24	-0.59	0.15
	34	-0.13	-0.60	-0.40	-0.60	-0.20	-0.05	0.81	0.05	-0.25	-0.60	-0.01
	35	-0.14	-0.46	-0.40	-0.60	-0.20	-0.05	0.80	0.05	-0.28	-0.60	-0.02
	36	-0.30	-0.46	-0.40	-0.58	-0.20	-0.05	0.30	0.06	-0.25	-0.60	-0.11
OCT	37	-0.30	-0.40	-0.33	-0.56	-0.20	-0.05	0.30	0.05	-0.30	-0.65	-0.13
	38	-0.30	-0.40	-0.40	-0.65	-0.27	-0.05	0.01	0.05	-0.30	-0.64	-0.19
	39	-0.30	-0.40	-0.45	-0.65	-0.33	-0.05	0.00	0.01	-0.30	-0.65	-0.20
	40	-0.30	-0.44	-0.45	-0.65	-0.21	0.10	0.00	-0.20	-0.25	-0.65	-0.20
NOV	41	-0.32	-0.39	-0.40	-0.65	-0.15	0.10	0.00	-0.20	-0.27	-0.65	-0.20
	42	-0.33	-0.34	-0.50	-0.62	-0.15	0.10	0.00	-0.24	-0.25	-0.65	-0.21
	43	-0.33	-0.30	-0.50	-0.65	-0.46	0.10	0.00		-0.25	-0.65	-0.20
	44	-0.31	-0.30	-0.50	-0.65	-0.15	0.09	0.00	-0.11	-0.18	-0.65	-0.17
DEC	45	-0.48	-0.45	-0.60	-0.79	-0.20	0.05	-0.05	-0.25	-0.25	-0.70	-0.24
	46	-0.50	-0.40	-0.63	-0.79	-0.20	0.06	-0.03	-0.25	-0.24	-0.70	-0.23
	47	-0.45	-0.40	-0.65	-0.75	-0.15	0.05	-0.03	-0.25	-0.24	-0.70	-0.23
	48	-0.35	-0.46	-0.55	-0.73	-0.15	0.06	-0.03	-0.25	-0.30	-0.70	-0.24
Average		-0.16	-0.46	-0.40	-0.57	-0.40	-0.04	0.43	-0.02	-0.27	-0.47	

Table 3. Corn Basis - Holyoke (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.17	-0.40		-0.49	-0.65		-0.10	-0.13	-0.07	0.00	-0.08
	2	-0.17	-0.37		-0.55	-0.57		-0.10	-0.13	-0.07	0.00	-0.07
	3	-0.19	-0.42		-0.49	-0.65		-0.10	-0.13	-0.07	0.00	-0.07
	4	-0.13	-0.42	-0.33	-0.46	-0.65		-0.10	-0.14	-0.05	-0.09	-0.10
FEB	5	-0.13	-0.42	-0.27	-0.47	-0.65		-0.10	-0.12	-0.05	-0.05	-0.08
	6	-0.13	-0.42	-0.27	-0.47	-0.68		-0.12	-0.18	-0.05	-0.05	-0.10
	7	-0.13	-0.42	-0.23	-0.43	-0.68		-0.12	-0.22	-0.05	-0.05	-0.11
	8	-0.13	-0.42	-0.23	-0.43	-0.68		-0.19	-0.24	-0.05	-0.05	-0.13
MAR	9	-0.18	-0.47	-0.31	-0.45	-0.77	0.00	0.04	-0.32	-0.05	-0.06	-0.08
	10	-0.18	-0.47	-0.31	-0.43	-0.78		0.03	-0.34	-0.13		-0.15
	11	-0.18	-0.47	-0.32	-0.43	-0.78		0.01	-0.34	-0.06	-0.08	-0.12
	12	-0.18	-0.47	-0.31	-0.42	-0.78		-0.05	-0.34	-0.06	-0.14	-0.15
APR	13	-0.18	-0.48	-0.31	-0.41	-0.78		-0.05	-0.36	-0.06	-0.14	-0.15
	14	-0.17	-0.46	-0.33	-0.41	-0.78		-0.05	-0.36	-0.06	-0.14	-0.15
	15	-0.17	-0.47	-0.33	-0.42	-0.71		-0.06	-0.36	0.00		-0.14
	16	-0.17	-0.47	-0.30	-0.41	-0.98		-0.06	-0.29	0.00		-0.12
MAY	17	-0.14	-0.56	-0.38	-0.50	-0.63	0.01	0.17	-0.28	0.08	-0.25	-0.05
	18	-0.11	-0.57	-0.38	-0.50	-0.47		0.17	-0.31	0.15		0.00
	19	-0.04	-0.58	-0.38	-0.50	-0.33		0.31	-0.31	0.15	-0.23	-0.02
	20	0.16	-0.62	-0.38	-0.49	-0.26		0.33	-0.26	0.16		0.08
JUN	21	0.16	-0.65	-0.37	-0.43	-0.21		0.40	-0.20	0.15		0.12
	22	0.21	-0.57	-0.39	-0.43	-0.18	0.61	0.41	-0.13	0.15		0.26
	23	0.20	-0.57	-0.39	-0.43	-0.18	0.60		-0.08	0.15		0.22
	24	0.20	-0.57	-0.39	-0.41	-0.14		0.44	-0.08	0.16		0.17
JUL	25	0.13	-0.70	-0.57	-0.49	0.17		1.22	-0.03	0.01	-0.32	0.22
	26	0.12	-0.70	-0.46	-0.49	0.17		1.22	-0.07	0.06	-0.25	0.24
	27	0.12	-0.70	-0.43	-0.49	0.17		1.43	0.00	0.00	-0.25	0.30
	28	0.13	-0.70	-0.38	-0.42	0.33	0.16	1.56	0.09	0.00	-0.10	0.34
AUG	29	0.19	-0.70	-0.43	-0.49	0.47	0.16	1.52	0.08	0.00	-0.10	0.33
	30	0.10	-0.70	-0.37	-0.49	0.47	0.15	1.23	0.08	0.01		0.37
	31	0.07	-0.70	-0.37	-0.49	0.43	0.15	1.27	-0.05	0.08		0.36
	32	-0.04		-0.35	-0.42	0.22	0.15	1.27	-0.10	-0.03		0.32
SEP	33	-0.20		-0.42	-0.57	-0.18	0.14	1.21	-0.17	-0.04		0.28
	34	-0.20		-0.35	-0.57	-0.22		0.36	-0.05	-0.04		0.09
	35	-0.20		-0.36	-0.57	-0.28		0.22	0.03	0.12		0.12
	36	-0.20		-0.33	-0.59	-0.30		0.05	0.11	0.15		0.10
OCT	37	-0.30		-0.20	-0.56	-0.33		-0.10	0.24	-0.05		0.03
	38	-0.35		-0.28	-0.70	-0.33	0.05	-0.10	0.10	-0.05		0.00
	39	-0.35		-0.28	-0.70	-0.33	0.06	-0.09	-0.35	-0.05		-0.11
	40	-0.33		-0.21	-0.70	-0.30	-0.01	-0.07	-0.35	-0.05		-0.12
NOV	41	-0.32		-0.35	-0.70	-0.30	0.20	-0.05	-0.35	-0.06		-0.07
	42	-0.30		-0.35	-0.67	-0.28	0.20	-0.05	-0.35	-0.05		-0.06
	43	-0.30		-0.35	-0.71	-0.28	0.20	-0.07		0.05	-0.10	0.02
	44	-0.27		-0.35	-0.65	-0.28		-0.05		0.04		0.00
DEC	45	-0.44		-0.50	-0.71	-0.25		-0.15		0.04	-0.27	-0.13
	46	-0.40		-0.49	-0.68	-0.26		-0.15		0.06	-0.24	-0.11
	47	-0.40		-0.60	-0.68	-0.26		-0.05		0.01	-0.24	-0.09
	48	-0.32		-0.49	-0.67	-0.28		-0.01	-0.04	-0.05	-0.24	-0.09
Average		-0.13	-0.54	-0.36	-0.52	-0.33	0.18	0.27	-0.16	0.01	-0.14	

Table 4. Corn Basis - Julesburg (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.17	-0.15	-0.17	-0.25	-0.39	-0.07	-0.10	-0.13	-0.39		-0.17
	2	-0.01	-0.15	-0.17	-0.30	-0.40	-0.08	-0.10	-0.13	-0.39		-0.17
	3	-0.05	-0.15	-0.16	-0.29	-0.40	-0.08	-0.10	-0.13	-0.38		-0.17
	4	-0.05	-0.15	-0.17	-0.27		-0.09	-0.10	-0.14	-0.39		-0.18
FEB	5	-0.05	-0.16	-0.17	-0.25		-0.04	-0.10	-0.12			-0.09
	6	-0.05	-0.15	-0.05	-0.25		0.01	-0.12	-0.18			-0.10
	7	-0.05	-0.10	0.00	-0.25		0.00	-0.12	-0.22			-0.11
	8	0.10	-0.16	0.01	-0.14		0.00	-0.19	-0.24			-0.14
MAR	9	-0.04	-0.21	-0.08	-0.45		0.00	0.04	-0.32			-0.09
	10	0.03	-0.20	-0.09	-0.24		-0.09	0.03	-0.34			-0.13
	11	0.04	-0.28	-0.07	-0.25		-0.09	0.01	-0.34			-0.14
	12	0.05	-0.12		-0.20		-0.09	-0.05	-0.34			-0.16
APR	13	0.00	-0.12		-0.15			-0.05	-0.36	-0.30		-0.24
	14	0.03	-0.13		-0.15			-0.05	-0.36	-0.30		-0.24
	15	0.05	-0.13		-0.06			-0.06	-0.36	-0.23		-0.22
	16	-0.04	-0.11		-0.05			-0.06	-0.29	-0.22		-0.19
MAY	17	0.05	-0.19		-0.13		0.01	0.17	-0.28	-0.20		-0.07
	18	0.06	-0.15		-0.11		0.35	0.17	0.31	-0.17		0.16
	19	0.25	-0.35		-0.10	0.05	0.38	0.31	-0.31	-0.20		0.05
	20	0.23	-0.18		-0.11	0.10	0.38	0.33	-0.26			0.15
JUN	21	0.27	-0.18	-0.15	-0.10	-0.01	0.50	0.40	-0.20	-0.21		0.12
	22	0.41	-0.18	-0.15	-0.10	0.11	0.61	0.41	-0.13	-0.20		0.17
	23	0.40	-0.19	-0.15	-0.06	0.11	0.60		-0.08	-0.20		0.11
	24	0.40	-0.18	-0.23	-0.10	0.10	0.41	0.44	-0.08	-0.20		0.14
JUL	25	0.32	-0.30	-0.30	-0.17	0.20	0.85	1.22	-0.03	-0.28	-0.35	0.28
	26	0.35	-0.26	-0.18	-0.15	0.60		1.22	-0.07		-0.35	0.27
	27	0.46	-0.23	-0.01	-0.15	0.60		1.43	0.00		-0.35	0.36
	28	0.46	-0.22	-0.17	-0.08	0.86	0.16	1.56	0.09			0.60
AUG	29	0.30	-0.19	-0.06	-0.10		0.16	1.52	0.08	-0.37	-0.49	0.18
	30	0.30	-0.20	-0.05	-0.10		0.15	1.23	0.08	-0.34		0.28
	31	0.28		-0.05	-0.10		0.15	1.27	-0.05			0.46
	32	0.20		-0.17	-0.10	0.40	0.15	1.27	-0.10			0.44
SEP	33	-0.16		-0.28		0.09	0.14	1.21	-0.17	-0.29		0.22
	34	-0.16	-0.38	-0.26		0.09		0.36	-0.05	-0.30		0.00
	35	-0.15	-0.34	-0.29		-0.46		0.22	0.03	-0.33		-0.03
	36	-0.15	-0.40	-0.29		-0.46		0.05	0.11	-0.30		-0.05
OCT	37	-0.17	-0.40	-0.16		-0.31		-0.10	0.24			0.07
	38	-0.19	-0.40	-0.25		-0.40	0.05	-0.10	0.10			0.02
	39	-0.20	-0.25	-0.25		-0.23	0.06	-0.09	-0.35			-0.13
	40	-0.15	-0.29	-0.25		-0.05	0.24	-0.07	-0.35			-0.06
NOV	41	-0.20	-0.25	-0.25		-0.05	0.20	-0.05	-0.35			-0.07
	42	-0.05	-0.25	-0.25		0.10	0.20	-0.05	-0.35			-0.07
	43	-0.09	0.03	-0.25		0.10	0.20	-0.07				0.07
	44	-0.13	-0.25	-0.25		0.03		-0.05				-0.05
DEC	45	-0.17	-0.41	-0.40		-0.01		-0.15		-0.25		-0.20
	46	-0.16	-0.17	-0.38	-0.46	0.10		-0.15		-0.24		-0.19
	47	-0.13	-0.20	-0.35	-0.42	0.11		-0.15		-0.25		-0.20
	48		-0.16	-0.25	-0.44	-0.05		-0.10	-0.42	-0.27		-0.26
Average		0.05	-0.21	-0.18	-0.19	0.02	0.16	0.27	-0.15	-0.28	-0.39	

Table 5. Corn Basis - Wray M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.21	-0.31	-0.30		-0.62	-0.22			0.43		0.10
	2	-0.18	-0.34	-0.30		-0.54	-0.19			0.58	-0.30	0.03
	3	-0.18	-0.45	-0.29		-0.67	-0.15			0.51	-0.30	0.02
	4	-0.12	-0.37	-0.30	-0.45	-0.67	-0.10			0.66	-0.30	0.09
FEB	5	-0.14	-0.30	-0.29	-0.46	-0.70	-0.24	0.02	-0.09	-0.29	-0.30	-0.18
	6	-0.14	-0.29	-0.25	-0.44	-0.68	-0.23	0.04	-0.13	-0.27	-0.30	-0.18
	7	-0.14	-0.30	-0.24	-0.44	-0.62	-0.17	0.04	-0.18	-0.27	-0.31	-0.18
	8	0.10	-0.24	-0.20	-0.44	-0.66	-0.19	0.04	-0.18	-0.27	-0.31	-0.18
MAR	9	-0.10	-0.37	-0.29	-0.46	-0.73	-0.14			0.57	-0.37	0.02
	10	-0.09	-0.37	-0.29	-0.48	-0.72	-0.17			0.48	-0.37	-0.02
	11	-0.09	-0.47	-0.28	-0.47	-0.74	-0.20			0.64	-0.37	0.02
	12	-0.10	-0.37	-0.28	-0.43	-0.73	-0.22			0.44	-0.35	-0.04
APR	13	-0.09	-0.37	-0.28	-0.42	-0.72	-0.24	0.14	-0.28	0.57	-0.36	-0.03
	14	-0.10	-0.37	-0.28	-0.38	-0.77	-0.21	0.12	-0.32	0.60	-0.38	-0.04
	15	-0.10	-0.38	-0.29	-0.39	-0.72	-0.10	0.13	-0.25	0.63	-0.37	0.01
	16	-0.09	-0.34	-0.28	-0.38	-0.95	-0.23	0.12	-0.24	0.71	-0.43	-0.01
MAY	17	-0.01	-0.43	-0.33	-0.42	-0.66		0.47		-0.20	-0.44	-0.05
	18	-0.01	-0.43	-0.33	-0.39	-0.40				-0.16	-0.44	-0.30
	19	-0.01	-0.43	-0.32	-0.39	-0.40				-0.16	-0.43	-0.29
	20	0.04	-0.44	-0.32	-0.40	-0.40				-0.17	0.25	0.04
JUN	21	0.14	-0.44		-0.40	-0.23	0.02	0.57	-0.14	-0.17	-0.43	-0.03
	22	0.14	-0.43		-0.39	-0.20	0.08	0.55	-0.14	-0.16	-0.48	-0.03
	23	0.14	-0.43		-0.39	-0.18	0.17		-0.04	-0.16	-0.48	-0.13
	24	0.17	-0.43		-0.40	-0.07	0.18	0.57	-0.04	0.73	-0.51	0.19
JUL	25	0.19	-0.51	-0.50	-0.43	0.24			0.50	0.16	-0.51	0.05
	26	0.34	-0.51	-0.38	-0.40	0.23			0.06	0.14	-0.51	-0.10
	27	0.34	-0.52		-0.43	0.23			0.61	0.06	-0.51	0.05
	28	0.24	-0.48		-0.31	0.23			0.77	0.54	-0.51	0.27
AUG	29	0.24	-0.44		-0.38	0.12		1.40	0.22	0.66	-0.51	0.44
	30	0.24	-0.38	-0.32	-0.38	0.26	-0.17	1.20	0.09	0.82	-0.51	0.28
	31	0.19	-0.38	-0.32	-0.34	0.40	-0.29	1.19	0.07	0.72	-0.40	0.26
	32	0.04	-0.27	-0.32	-0.33	0.15	-0.31	1.60	0.06	0.66	-0.52	0.30
SEP	33	-0.05	-0.36	-0.34	-0.49	-0.51			-0.04	0.71	-0.55	0.04
	34	-0.14	-0.36	-0.34	-0.50	-0.53			-0.04	0.70	-0.55	0.04
	35	-0.13	-0.36	-0.34	-0.54	-0.68			-0.04	0.53	-0.55	-0.02
	36	-0.19	-0.21	-0.34	-0.57	-0.41			-0.05	0.53		0.24
OCT	37	-0.20	-0.21	-0.36	-0.60			-0.05	-0.04	-0.24		-0.11
	38	-0.24	-0.22	-0.37	-0.71			-0.06	0.96	-0.24		0.22
	39	-0.29	-0.28	-0.37	-0.72				0.92	-0.24		0.34
	40	-0.30	-0.33	-0.37	-0.76				0.75	-0.24		0.25
NOV	41	-0.29	-0.22	-0.37	-0.70	-0.30	-0.04	0.00	-0.26	0.58		0.07
	42	-0.29	-0.23	-0.37	-0.65	-0.31	-0.05	-0.06	-0.25	0.77		0.10
	43	-0.29	-0.22	-0.37	-0.55	-0.34	-0.03	-0.05		0.77		0.23
	44	-0.29	-0.23	-0.37	-0.66	-0.28	-0.03		-0.26	0.73	-0.62	-0.05
DEC	45	-0.36	-0.34	-0.50	-0.71	-0.24				-0.31	-0.61	-0.46
	46	-0.36	-0.34	-0.55	-0.63	-0.20				-0.29	-0.60	-0.44
	47	-0.36	-0.30	-0.60	-0.62	-0.16				-0.30	-0.60	-0.45
	48	-0.28	-0.29	-0.49	-0.62	-0.20			0.25	-0.30		-0.03
Average		-0.07	-0.36	-0.34	-0.49	-0.37	-0.13	0.38	0.07	0.25	-0.42	

Table 6. Corn Basis - Yuma M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.52	-0.42	-0.12	-0.23	-0.16	-0.09			-0.10	-0.25	-0.15
	2	-0.46	-0.44	-0.14	-0.20	-0.14	-0.12			-0.06	-0.25	-0.14
	3	-0.56	-0.33	-0.13	-0.18	-0.12	-0.06			-0.05	-0.25	-0.12
	4	-0.58	-0.32	-0.13	-0.20	-0.10	-0.10			-0.03	-0.25	-0.13
FEB	5	-0.59	-0.28	-0.08	-0.17	-0.10	-0.07	0.04	-0.06	-0.04	-0.25	-0.08
	6	-0.58	-0.27	-0.11	-0.20	-0.10	-0.05	0.06	-0.10	-0.06	-0.25	-0.08
	7	-0.57	-0.25	-0.09	-0.21	-0.10	-0.02	0.07	-0.15	-0.01	-0.25	-0.07
	8	-0.57	-0.25	-0.04	-0.20	0.19	-0.04	0.06	-0.16	-0.01	-0.26	-0.08
MAR	9	-0.63	-0.37	-0.11	-0.24	-0.08	-0.02			-0.02	-0.27	-0.10
	10	-0.59	-0.33	-0.10	-0.25	-0.02	-0.08			-0.11	-0.32	-0.17
	11	-0.52	-0.29	-0.03	-0.27	0.00	-0.04			-0.10	-0.32	-0.15
	12	-0.58	-0.24	-0.06	-0.22	0.05	0.02			-0.08	-0.32	-0.13
APR	13	0.17	-0.22	-0.06	-0.31	0.06	-0.04	0.17	-0.03	-0.02	-0.32	-0.05
	14	-0.60	-0.23	-0.05	-0.23	0.07	-0.01	0.15	-0.32	0.01	-0.32	-0.10
	15	-0.57	-0.23	-0.10	-0.22	0.11	-0.02	0.16	-0.21	0.08	-0.35	-0.07
	16	-0.82	-0.23	-0.06	-0.19	0.09	0.01	0.15	-0.20	0.00	-0.34	-0.07
MAY	17	-0.43	-0.30	-0.16	-0.26	-0.06	0.11	0.50		0.03	-0.40	0.06
	18	-0.27	-0.31	-0.17	-0.26	0.11	0.13			0.08	-0.40	-0.06
	19	-0.30	-0.24	-0.16	-0.27	0.09	0.18			0.05	-0.40	-0.05
	20	-0.14	-0.27	-0.21	-0.23	0.20	0.18			0.05	-0.40	-0.05
JUN	21	-0.04	-0.24	-0.21	-0.25	0.37	0.19	0.60	-0.10	0.06	-0.40	0.07
	22	0.08	-0.21	-0.22	-0.45	0.37	0.23	0.58	-0.10	0.08	-0.40	0.08
	23	0.09	-0.24	-0.18	-0.34	0.36	0.33		0.01	0.06	-0.45	-0.01
	24	0.13	-0.25	-0.24	-0.35	0.56	0.31	0.60	0.00	0.04	-0.45	0.10
JUL	25	0.41	-0.31	-0.43	-0.49	0.37	0.26			-0.07	-0.48	-0.10
	26	0.43	-0.69	-0.30	-0.40	0.47	0.25			-0.01	-0.48	-0.08
	27	0.47	-0.32	-0.35	-0.29	0.48	0.27			-0.08	-0.48	-0.09
	28	0.59	-0.24	-0.25	-0.29	0.49	0.17			-0.02	-0.48	-0.11
AUG	29	0.54	-0.30	-0.27	-0.18	0.43	0.15	1.40	0.22	0.00	-0.48	0.26
	30	0.52	-0.28	-0.21	-0.14	0.39	-0.01	1.20	0.13	0.05	-0.48	0.18
	31	0.49	-0.29	-0.15	-0.15	0.27	0.00	1.19	0.11	0.06	-0.48	0.18
	32	0.30	-0.20	-0.11	-0.03	0.15	-0.07	1.60	0.10	-0.05	-0.35	0.25
SEP	33	-0.18	-0.37	-0.12	-0.20	-0.05	0.00		0.00	-0.04	-0.49	-0.13
	34	-0.24	-0.38	-0.07	-0.07	-0.07	0.06		0.00	0.01	-0.55	-0.12
	35	-0.31	-0.45	-0.14	0.01	-0.11	-0.16		0.00	0.20	-0.55	-0.13
	36	-0.31	-0.48	-0.16	0.27	-0.10	-0.15		-0.01	-0.13	-0.55	-0.21
OCT	37	-0.36	-0.55	-0.18	0.16	-0.15	-0.22	-0.05	0.00	-0.16		-0.11
	38	-0.46	-0.64	-0.33	0.03	-0.17	-0.12	-0.06		-0.14		-0.11
	39	-0.39	-0.66	-0.32	0.12	-0.18	-0.06			-0.19		-0.12
	40	-0.27	-0.65	-0.31	-0.09	-0.14	0.06	0.00		-0.16		-0.03
NOV	41	-0.20	-0.66	-0.32	-0.10	-0.16	0.07	-0.06	-0.26	-0.15		-0.10
	42	-0.11	-0.54	-0.39	-0.10	-0.11	0.10	-0.05	-0.23	-0.09		-0.07
	43	-0.06	-0.49	-0.38	-0.09	-0.09	0.10			-0.04		0.03
	44	-0.08	-0.54	-0.44	-0.09	-0.14	0.10		-0.24	-0.01		-0.05
DEC	45	-0.13	-0.60	-0.50	-0.26	-0.26	0.07		-0.24	-0.08	-0.62	-0.22
	46	-0.09	-0.55	-0.40	-0.14	-0.28	0.08			-0.05	-0.61	-0.19
	47	-0.07	-0.54	-0.52	-0.18	-0.26	0.08			-0.07	-0.60	-0.20
	48	-0.06	-0.54	-0.43	-0.13	-0.17	0.11			-0.05	-0.60	-0.18
Average		-0.19	-0.38	-0.21	-0.18	0.05	0.04	0.40	-0.07	-0.03	-0.40	

All Sites Average Basis

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.22	-0.32	-0.24	-0.38	-0.51	-0.14	-0.05	-0.10	-0.08	-0.19	-0.11
	2	-0.17	-0.33	-0.25	-0.41	-0.45	-0.14	-0.05	-0.10	-0.04	-0.22	-0.11
	3	-0.20	-0.35	-0.22	-0.38	-0.52	-0.11	-0.05	-0.10	-0.05	-0.22	-0.10
	4	-0.17	-0.32	-0.25	-0.38	-0.54	-0.10	-0.05	-0.10	0.01	-0.24	-0.10
FEB	5	-0.18	-0.29	-0.23	-0.38	-0.55	-0.14	0.00	-0.06	-0.17	-0.23	-0.12
	6	-0.18	-0.28	-0.20	-0.37	-0.55	-0.11	0.01	-0.10	-0.17	-0.23	-0.12
	7	-0.17	-0.27	-0.18	-0.37	-0.53	-0.08	0.01	-0.14	-0.16	-0.23	-0.12
	8	-0.04	-0.25	-0.15	-0.35	-0.49	-0.10	-0.02	-0.15	-0.16	-0.23	-0.13
MAR	9	-0.20	-0.36	-0.22	-0.42	-0.60	-0.07	0.08	-0.23	0.07	-0.26	-0.08
	10	-0.18	-0.35	-0.22	-0.39	-0.59	-0.12	0.03	-0.24	-0.02	-0.33	-0.13
	11	-0.15	-0.39	-0.21	-0.39	-0.60	-0.13	0.06	-0.24	0.05	-0.28	-0.11
	12	-0.16	-0.32	-0.23	-0.35	-0.58	-0.13	-0.04	-0.24	0.00	-0.29	-0.14
APR	13	-0.06	-0.32	-0.23	-0.36	-0.58	-0.17	0.10	-0.21	-0.02	-0.29	-0.12
	14	-0.17	-0.32	-0.23	-0.33	-0.58	-0.16	0.09	-0.30	-0.01	-0.29	-0.13
	15	-0.16	-0.32	-0.24	-0.31	-0.54	-0.10	0.09	-0.25	0.04	-0.36	-0.12
	16	-0.21	-0.31	-0.22	-0.30	-0.74	-0.16	0.09	-0.22	0.04	-0.38	-0.13
MAY	17	-0.12	-0.39	-0.29	-0.36	-0.53	-0.02	0.36	-0.24	-0.13	-0.37	-0.08
	18	-0.08	-0.38	-0.30	-0.35	-0.36	0.13	0.21	-0.02	-0.09	-0.40	-0.03
	19	-0.03	-0.41	-0.29	-0.35	-0.25	0.15	0.31	-0.22	-0.10	-0.36	-0.04
	20	0.05	-0.40	-0.30	-0.35	-0.21	0.19	0.32	-0.19	-2.55	-0.24	-0.49
JUN	21	0.12	-0.41	-0.30	-0.34	-0.11	0.18	0.49	-0.11	-0.10	-0.41	0.01
	22	0.18	-0.38	-0.29	-0.37	-0.07	0.30	0.52	-0.09	-0.10	-0.44	0.04
	23	0.18	-0.39	-0.28	-0.34	-0.05	0.34		0.04	-0.10	-0.45	-0.04
	24	0.19	-0.39	-0.31	-0.35	0.04	0.25	0.54	0.06	0.08	-0.46	0.09
JUL	25	0.22	-0.51	-0.44	-0.42	0.20	0.47	1.31	0.15	-0.09	-0.43	0.28
	26	0.28	-0.54	-0.34	-0.41	0.28	0.29	1.31	0.01	-0.02	-0.41	0.24
	27	0.29	-0.47	-0.30	-0.39	0.28	0.24	1.46	0.20	-0.08	-0.42	0.28
	28	0.28	-0.42	-0.29	-0.31	0.35	0.17	1.54	0.30	0.06	-0.41	0.33
AUG	29	0.29	-0.40	-0.29	-0.33	0.26	0.11	1.46	0.18	0.00	-0.42	0.26
	30	0.27	-0.37	-0.26	-0.32	0.31	0.00	1.26	0.13	0.05	-0.48	0.19
	31	0.24	-0.41	-0.25	-0.31	0.34	-0.04	1.27	0.08	0.14	-0.43	0.20
	32	0.12	-0.24	-0.26	-0.27	0.21	-0.05	1.47	0.05	0.04	-0.45	0.21
SEP	33	-0.11	-0.40	-0.30	-0.46	-0.22	0.06	1.34	-0.05	0.02	-0.55	0.17
	34	-0.15	-0.40	-0.28	-0.44	-0.24	0.01	0.51	-0.01	0.02	-0.56	-0.01
	35	-0.16	-0.37	-0.30	-0.44	-0.40	-0.11	0.41	0.02	0.05	-0.56	-0.04
	36	-0.21	-0.33	-0.30	-0.40	-0.31	-0.10	0.13	0.05	0.00	-0.58	-0.10
OCT	37	-0.24	-0.33	-0.25	-0.42	-0.25	-0.14	-0.01	0.08	-0.19	-0.65	-0.18
	38	-0.28	-0.36	-0.32	-0.53	-0.29	-0.02	-0.06	0.30	-0.19	-0.64	-0.12
	39	-0.29	-0.35	-0.33	-0.52	-0.27	0.00	-0.06	0.06	-0.20	-0.65	-0.17
	40	-0.26	-0.39	-0.31	-0.58	-0.18	0.10	-0.04	-0.04	-0.18	-0.65	-0.16
NOV	41	-0.25	-0.33	-0.33	-0.56	-0.21	0.10	-0.03	-0.28	0.02	-0.65	-0.17
	42	-0.21	-0.30	-0.36	-0.52	-0.17	0.10	-0.05	-0.27	0.09	-0.65	-0.15
	43	-0.21	-0.22	-0.36	-0.50	-0.23	0.10	-0.05	-0.19	0.13	-0.37	-0.07
	44	-0.21	-0.29	-0.37	-0.53	-0.18	0.05	-0.03	-0.20	0.15	-0.62	-0.13
DEC	45	-0.31	-0.41	-0.49	-0.62	-0.20	0.06	-0.12	-0.25	-0.19	-0.55	-0.21
	46	-0.30	-0.34	-0.49	-0.54	-0.17	0.07	-0.11	-0.25	-0.16	-0.54	-0.20
	47	-0.28	-0.33	-0.54	-0.53	-0.14	0.07	-0.08	-0.25	-0.18	-0.54	-0.20
	48	-0.24	-0.33	-0.44	-0.52	-0.17	0.09	-0.05	-0.12	-0.20	-0.52	-0.16
Average		-0.08	-0.36	-0.29	-0.41	-0.25	0.02	0.34	-0.08	-0.10	-0.42	

Table 7. Wheat Basis - Akron M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.47	-0.73	-0.70	-1.20	-1.59	-0.89					-0.89
	2	-0.43	-0.70	-0.70	-1.27	-1.55	-0.83				-0.80	-0.82
	3	-0.43	-0.70	-0.71	-1.13	-1.60	-0.81				-0.80	-0.80
	4	-0.51	-0.70	-0.70	-1.09	-1.59	-0.75				-0.81	-0.78
FEB	5	-0.44	-0.60	-0.65	-1.12	-1.59	-0.91	-0.75	-0.31	-0.58	-0.80	-0.67
	6	-0.37	-0.60	-0.60	-1.09	-1.59	-0.86	-0.74	-0.37	-0.95	-0.80	-0.74
	7	-0.37	-0.60	-0.56	-1.09	-1.59	-0.83	-0.76	-0.47	-0.55	-0.80	-0.68
	8	-0.24	-0.89	-0.50	-1.09	-1.59	-0.70	-0.74	-0.47	-0.55	-0.92	-0.68
MAR	9	-0.31	-0.60	-0.52	-1.11	-1.66	-0.77				-0.85	-0.81
	10	-0.30	-0.60	-0.52	-1.12	-1.67	-0.80				-0.85	-0.82
	11	-0.30	-0.83	-0.50	-1.12	-1.66	-0.81				-0.85	-0.83
	12	-0.31	-0.83	-0.50	-1.12	-1.66	-0.81				-0.85	-0.83
APR	13	-0.25	-0.83	-0.50	-1.12	-1.77	-0.82	-0.60	-0.60		-0.86	-0.72
	14	-0.26	-0.83	-0.50	-1.13	-1.69	-0.80	-0.64	-0.61	-0.47	-0.86	-0.68
	15	-0.26	-0.83	-0.50	-1.14	-1.69	-0.73	-0.64	-0.60	-0.45	-0.85	-0.65
	16	-0.25	-1.04	-0.50	-1.23	-1.79	-0.83	-0.64	-0.60	-0.46	-0.95	-0.70
MAY	17	-0.20	-1.03	-0.67	-1.29	-1.42	-0.93	-0.74	-0.61	-0.50	-0.95	-0.75
	18	-0.26	-1.03	-0.67	-1.29	-1.42	-0.79	-0.74	-0.60	-0.50	-0.95	-0.72
	19	-0.30	-1.03	-0.67	-1.30	-1.42	-0.79	-0.75	-0.60	-0.50	-0.95	-0.72
	20	-0.40	-0.99	-0.67	-1.39	-1.42	-0.79	-0.79	-0.60	-0.50	-0.80	-0.70
JUN	21	-0.46	-0.94		-1.39		-0.89	-0.60	-0.71	-0.50	-0.95	-0.73
	22	-0.45	-0.95		-1.49		-0.89	-0.41	-0.70	-0.50	-0.95	-0.69
	23	-0.48	-0.94		-1.50		-0.69		-0.60	-0.50	-0.93	-0.68
	24	-0.54	-0.94	-0.88	-1.49			-0.40	-0.60		-1.15	-0.72
JUL	25	-0.59	-1.04	-0.96	-1.70	-1.15					-1.26	-1.26
	26	-0.59	-1.05	-1.03	-1.66	-1.09					-1.30	-1.30
	27	-0.69	-1.05	-1.04	-1.80	-1.09					-1.30	-1.30
	28	-0.75	-1.02	-1.05	-1.66	-1.09			-0.59		-1.30	-0.95
AUG	29	-0.74	-0.99	-1.09	-1.76	-1.09		-0.20	-0.64	-0.61	-1.31	-0.69
	30	-0.81	-0.89	-1.12	-1.79	-1.09	-0.76	-0.20	-0.64	-0.60	-1.30	-0.70
	31	-0.81	-0.89	-1.12	-1.64		-0.77	-0.21	-0.64	-0.60	-1.30	-0.70
	32	-0.81	-0.89	-1.12	-1.49		-0.75	-0.20	-0.64	-0.82	-1.58	-0.80
SEP	33	-0.88	-1.04	-1.24	-1.59						-1.58	-1.58
	34	-0.96	-1.05	-1.25	-1.60						-1.58	-1.58
	35	-0.96	-1.05	-1.24	-1.59						-1.58	-1.58
	36	-0.95	-1.04	-1.19	-1.63						-1.58	-1.58
OCT	37	-0.95	-1.04	-1.09	-1.49					-0.82	-1.54	-1.18
	38	-0.95	-1.04	-1.19	-1.76					-0.82	-1.80	-1.31
	39	-0.95	-1.02	-1.14	-1.76					-0.82	-1.53	-1.17
	40	-0.87	-0.99	-1.14	-1.76					-0.82		-0.82
NOV	41	-0.79	-0.86	-1.14	-1.72		-0.94	-0.42	-0.71		-1.53	-0.90
	42	-0.74	-0.73	-1.10	-1.66		-0.87	-0.40	-0.65		-1.54	-0.86
	43	-0.74	-0.73	-1.06	-1.71	-0.95	-0.89	-0.42	-0.65		-1.53	-0.87
	44	-0.75	-0.72	-1.03	-1.66	-0.94	-0.89		-0.65			-0.77
DEC	45	-0.75	-0.84	-1.13	-1.69	-0.90				-0.95	-1.55	-1.25
	46	-0.74	-0.84	-1.20	-1.60	-0.86				-0.77	-1.55	-1.16
	47	-0.74	-0.77	-1.27	-1.59	-0.83				-0.80	-1.56	-1.18
	48	-0.76	-0.70	-1.13	-1.59	-0.88				-0.80		-0.80
Average		-0.58	-0.88	-0.88	-1.44	-1.37	-0.82	-0.55	-0.59			-0.92

Table 8. Wheat Basis - Flagler (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.59	-0.78	-0.66	-1.05	-1.60	-0.80	-0.80	-0.15	-0.50	-0.75	-0.60
	2	-0.58	-0.78	-0.60	-1.14	-1.56	-0.70	-0.65	-0.15	-0.50	-0.75	-0.55
	3	-0.59	-0.78	-0.60	-1.05	-1.60	-0.70	-0.65	-0.14	-0.53	-0.75	-0.56
	4	-0.63	-0.74	-0.60	-0.96	-1.60	-0.70	-0.65	-0.15	-0.50	-0.75	-0.55
FEB	5	-0.52	-0.70	-0.60	-1.00	-1.60	-0.70	-0.65	-0.15	-0.50	-0.75	-0.55
	6	-0.51	-0.70	-0.60	-0.95	-1.60	-0.70	-0.55	-0.15	-0.90	-0.74	-0.61
	7	-0.46	-0.70	-0.60	-0.90	-1.60	-0.70	-0.55	-0.15	-0.50	-0.75	-0.53
	8	-0.36	-0.99	-0.60	-0.90	-1.60	-0.57	-0.55	-0.09	-0.45	-0.75	-0.48
MAR	9	-0.47	-0.70	-0.50	-0.99	-1.65	-0.80	-0.49	-0.10	-0.41	-0.80	-0.52
	10	-0.43	-0.70	-0.50	-0.99	-1.65	-0.80		-0.20	-0.45	-0.80	-0.56
	11	-0.41	-0.70	-0.50	-0.90	-1.65	-0.80	-0.40	-0.20	-0.45	-0.80	-0.53
	12	-0.40	-0.70	-0.50	-0.90	-1.65	-0.80		-0.20	-0.45	-0.80	-0.56
APR	13	-0.35	-0.70	-0.49	-0.90	-1.65	-0.80	-0.40	-0.20	-0.45	-0.80	-0.53
	14	-0.35	-0.70	-0.47	-0.95	-1.65	-0.80	-0.40	-0.30	-0.45	-0.80	-0.55
	15	-0.35	-0.70	-0.47	-1.07	-1.65	-0.80	-0.40	-0.30	-0.45	-0.81	-0.55
	16	-0.35	-0.70	-0.46	-1.10	-1.79	-0.80	-0.40	-0.28	-0.45	-0.80	-0.55
MAY	17	-0.30	-0.70	-0.54	-1.20	-1.40	-0.80	-0.40	-0.30	-0.50	-0.88	-0.57
	18	-0.30	-0.70	-0.59	-1.20	-1.40	-0.80		-0.40	-0.50	-0.88	-0.64
	19	-0.30	-0.70	-0.57	-1.20	-1.30	-0.80	-0.40	-0.30	-0.50	-0.88	-0.58
	20	-0.30	-0.70	-0.57	-1.35	-1.25	-0.80	-0.40	-0.30	-0.50	-0.90	-0.58
JUN	21	-0.30	-0.72	-0.57	-1.35	-1.25	-0.80	-0.40	-0.30	-0.50	-0.90	-0.58
	22	-0.44	-1.51	-0.65	-1.50	-1.25	-0.80	-0.41	-0.30	-0.50	-0.90	-0.58
	23	-0.50	-0.70	-0.65	-1.65	-1.15	-0.70		-0.30	-0.50	-0.87	-0.59
	24	-0.55	-0.70	-0.65	-1.60	-1.14	-0.50	-0.40	-0.25	-0.44	-0.90	-0.50
JUL	25	-0.60	-0.85	-0.78	-1.60	-0.90	-0.72	-0.50	-0.18	-0.54	-1.20	-0.63
	26	-0.65	-0.80	-0.90	-1.60	-0.90	-0.72	-0.16	-0.25	-0.53	-1.30	-0.59
	27	-0.70	-0.80	-0.90	-1.75	-0.90	-0.72	-0.15	-0.30	-0.54	-1.30	-0.60
	28	-0.69	-0.80	-0.93	-1.61	-1.00	-0.72	-0.12	-0.35	-0.55	-1.35	-0.62
AUG	29	-0.70	-0.80	-1.00	-1.90	-0.90	-0.72	-0.15	-0.40	-0.55	-1.35	-0.63
	30	-0.77	-0.80	-1.00	-1.80	-0.90	-0.72	-0.15	-0.50	-0.55	-1.36	-0.66
	31	-0.76	-0.80	-1.00	-1.65	-0.90	-0.72	-0.15	-0.50	-0.55	-1.35	-0.65
	32	-0.76	-0.80	-1.00	-1.50	-0.90	-0.72	-0.15	-0.50	-0.77	-1.29	-0.69
SEP	33	-0.91	-1.00	-1.16	-1.64	-1.00	-0.90	-0.26	-0.55	-0.75	-1.50	-0.79
	34	-0.91	-1.00	-1.16	-1.64	-1.00	-0.90	-0.19	-0.55	-0.75	-1.50	-0.78
	35	-0.91	-1.00	-1.16	-1.60	-1.00	-0.90	-0.25	-0.55	-0.75	-1.50	-0.79
	36	-0.91	-1.00	-1.15	-1.60	-1.00	-0.90	-0.25	-0.55	-0.75	-1.50	-0.79
OCT	37	-0.91	-0.88	-1.06	-1.60	-1.00	-0.90	-0.30	-0.55	-0.75	-1.50	-0.80
	38	-0.91	-0.76	-1.16	-1.60	-0.94	-0.90	-0.30	-0.55	-0.75	-1.50	-0.80
	39	-0.91	-0.76	-1.12	-1.60	-0.87	-0.80	-0.30	-0.55	-0.74	-1.77	-0.83
	40	-0.88	-0.76	-1.12	-1.60	-0.94	-0.80	-0.30	-0.55	-0.70	-1.50	-0.77
NOV	41	-0.87	-0.70	-1.04	-1.60	-0.90	-0.80	-0.25	-0.45	-0.74	-1.50	-0.75
	42	-0.85	-0.64	-1.04	-1.55	-0.90	-0.80	-0.25		-0.70	-1.50	-0.81
	43	-0.75	-0.58	-0.90	-1.59	-0.59	-0.80	-0.25		-0.70	-1.40	-0.79
	44	-0.71	-0.58	-0.89	-1.60	-0.90	-0.62	-0.26	-0.38	-0.60	-1.28	-0.63
DEC	45	-0.85	-0.73	-1.05	-1.76	-0.80	-0.80	-0.20	-0.40	-0.75	-1.45	-0.72
	46	-0.85	-0.68	-1.12	-1.65	-0.80	-0.80	-0.20	-0.45	-0.77	-1.45	-0.73
	47	-0.78	-0.68	-1.19	-1.60	-0.80	-0.80	-0.20	-0.45	-0.75	-1.45	-0.73
	48	-0.79	-0.72	-1.05	-1.60	-0.80	-0.80	-0.20	0.50	-0.75	-1.45	-0.54
Average		-0.62	-0.77	-0.80	-1.38	-1.20	-0.77	-0.35	-0.31			-0.64

Table 9. Wheat Basis - Holyoke (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg	
JAN	1		-0.75		-1.16	-1.60	-0.70	-0.78	-0.38			-0.92	
	2		-0.75		-1.24	-1.56	-0.75	-0.70	-0.30			-0.91	
	3		-0.75		-1.15	-1.61	-0.75	-0.70	-0.29			-0.90	
	4		-0.75	-0.80	-1.11	-1.60	-0.75	-0.65	-0.30			-0.88	
FEB	5		-0.75	-0.80	-1.15	-1.60	-0.75	-0.65	-0.30			-0.89	
	6		-0.66	-0.78	-1.15	-1.60	-0.75	-0.60	-0.35			-0.89	
	7		-0.69	-0.78	-1.15	-1.60	-0.75	-0.60	-0.38			-0.90	
	8		-1.04	-0.75	-1.10	-1.60	-0.61	-0.50	-0.38			-0.84	
MAR	9		-0.75	-0.75	-1.20	-1.60	-0.80	-0.59	-0.40			-0.92	
	10		-0.75	-0.75	-1.15	-1.60	-0.80	-0.49	-0.40			-0.89	
	11		-0.75	-0.75	-1.15	-1.59	-0.80	-0.49	-0.45			-0.90	
	12		-0.75	-0.74	-1.13	-1.58	-0.80	-0.49	-0.55			-0.91	
APR	13		-0.75	-0.75	-1.10	-1.55	-0.85	-0.48	-0.55			-0.91	
	14		-0.75	-0.75	-1.10	-1.55	-0.85	-0.49	-0.55			-0.91	
	15		-0.75	-0.75	-1.12	-1.35	-0.85	-0.49	-0.55			-0.87	
	16		-0.81	-0.75	-1.20	-1.74	-0.85	-0.49	-0.56			-0.97	
MAY	17		-0.60	-0.80	-1.34	-1.40	-0.90	-0.49	-0.61			-0.95	
	18		-0.60	-0.80	-1.40	-1.35	-0.85	-0.49	-0.61			-0.94	
	19		-0.60	-0.80	-1.40	-1.25	-0.80	-0.49	-0.61			-0.91	
	20		-0.22	-0.61	-0.80	-1.40	-1.20	-0.80	-0.47	-0.50			-0.87
JUN	21		-0.30	-0.62	-0.80	-1.40	-1.20	-0.75	-0.40	-0.50			-0.85
	22		-0.34	-0.60	-0.80	-1.40	-1.15	-0.75	-0.38	-0.50			-0.84
	23		-0.47	-0.75	-0.80	-1.50	-1.15	-0.60		-0.50			-0.94
	24		-0.47	-0.80	-0.80	-1.60	-1.13	-0.60	-0.35	-0.50			-0.84
JUL	25		-0.55	-1.00	-1.09	-1.65	-1.05	-0.76	-0.37	-0.43			-0.85
	26		-0.75	-1.00	-1.00	-1.65	-1.05	-0.80	-0.15	-0.45			-0.82
	27		-0.80	-1.00	-1.00	-1.84	-1.05	-0.80	-0.15	-0.55			-0.88
	28		-0.79	-1.00	-1.02	-1.61	-1.05	-0.85	-0.15	-0.65			-0.86
AUG	29		-0.80		-1.08	-1.76	-1.05	-0.85	-0.15	-0.70			-0.90
	30		-0.80		-1.08	-1.75	-0.96	-0.85	-0.18	-0.70			-0.89
	31		-0.80		-1.08	-1.65	-0.96	-0.85	-0.18	-0.70			-0.87
	32		-0.79		-1.08	-1.50	-0.97	-0.79	-0.21	-0.70			-0.83
SEP	33		-0.91		-1.24	-1.64	-1.21	-0.98	-0.32	-0.84			-1.00
	34		-0.94		-1.24	-1.64	-1.15	-0.94	-0.25	-0.84			-0.96
	35		-0.94		-1.24	-1.64	-1.15	-0.94	-0.37	-0.84			-0.99
	36		-0.94		-1.23	-1.66	-1.10	-0.90	-0.37	-0.84			-0.97
OCT	37		-0.94		-1.14	-1.67	-1.10	-0.85	-0.40	-0.84			-0.97
	38		-0.94		-1.20	-1.67	-1.05	-0.85	-0.40	-0.75			-0.94
	39		-0.94		-1.20	-1.67	-0.95	-0.85	-0.40	-0.76			-0.93
	40		-0.89		-1.20	-1.67	-0.95	-0.81	-0.42	-0.76			-0.92
NOV	41		-0.89		-1.12	-1.67	-0.90	-0.75	-0.42	-0.67			-0.88
	42		-0.89		-1.12	-1.62	-0.85	-0.75	-0.42				-0.91
	43		-0.89		-1.12	-1.66	-0.80	-0.75	-0.40				-0.90
	44		-0.84		-1.12	-1.67	-0.77	-0.75	-0.41				-0.90
DEC	45		-0.75		-1.25	-1.82	-0.70	-0.85	-0.35				-0.93
	46		-0.75		-1.21	-1.64	-0.70	-0.78	-0.35				-0.87
	47		-0.75		-1.29	-1.64	-0.70	-0.78	-0.35				-0.87
	48		-0.76		-1.15	-1.62	-0.70	-0.78	-0.38				-0.87
Average			-0.75	-0.76	-0.97	-1.45	-1.21	-0.80	-0.42	-0.56			-0.90

Table 10. Wheat Basis - Julesburg (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1		-0.75		-1.16	-1.60	-0.70	-0.78	-0.38			-0.92
	2		-0.75		-1.24	-1.56	-0.75	-0.70	-0.30			-0.91
	3		-0.75		-1.15	-1.61	-0.75	-0.70	-0.29			-0.90
	4		-0.75	-0.80	-1.11	-1.60	-0.75	-0.65	-0.30			-0.88
FEB	5		-0.75	-0.80	-1.15	-1.60	-0.75	-0.65	-0.30			-0.89
	6		-0.66	-0.78	-1.15	-1.60	-0.75	-0.60	-0.35			-0.89
	7		-0.69	-0.78	-1.15	-1.60	-0.75	-0.60	-0.38			-0.90
	8		-1.04	-0.75	-1.10	-1.60	-0.61	-0.50	-0.38			-0.84
MAR	9		-0.75	-0.75	-1.20	-1.60	-0.80	-0.59	-0.40			-0.92
	10		-0.75	-0.75	-1.15	-1.60	-0.80	-0.49	-0.40			-0.89
	11		-0.75	-0.75	-1.15	-1.59	-0.80	-0.49	-0.45			-0.90
	12		-0.75	-0.74	-1.13	-1.58	-0.80	-0.49	-0.55			-0.91
APR	13		-0.75	-0.75	-1.10	-1.55	-0.85	-0.48	-0.55			-0.91
	14		-0.75	-0.75	-1.10	-1.55	-0.85	-0.49	-0.55			-0.91
	15		-0.75	-0.75	-1.12	-1.35	-0.85	-0.49	-0.55			-0.87
	16		-0.81	-0.75	-1.20	-1.74	-0.85	-0.49	-0.56			-0.97
MAY	17		-0.60	-0.80	-1.34	-1.40	-0.90	-0.49	-0.61			-0.95
	18		-0.60	-0.80	-1.40	-1.35	-0.85	-0.49	-0.61			-0.94
	19		-0.60	-0.80	-1.40	-1.25	-0.80	-0.49	-0.61			-0.91
	20	-0.17	-0.61	-0.80	-1.40	-1.20	-0.80	-0.47	-0.50			-0.87
JUN	21	-0.30	-0.62	-0.80	-1.40	-1.20	-0.75	-0.40	-0.50			-0.85
	22	-0.34	-0.60	-0.80	-1.40	-1.15	-0.75	-0.38	-0.50			-0.84
	23	-0.47	-0.75	-0.80	-1.50	-1.15	-0.60		-0.50			-0.94
	24	-0.47	-0.80	-0.80	-1.60	-1.13	-0.60	-0.35	-0.50			-0.84
JUL	25	-0.55	-1.00	-1.09	-1.65	-1.05	-0.76	-0.37	-0.43			-0.85
	26	-0.75	-1.00	-1.00	-1.65	-1.05	-0.80	-0.15	-0.45			-0.82
	27	-0.80	-1.00	-1.00	-1.84	-1.05	-0.80	-0.15	-0.55			-0.88
	28	-0.79	-1.00	-1.02	-1.61	-1.05	-0.85	-0.15	-0.65			-0.86
AUG	29	-0.80		-1.08	-1.76	-1.05	-0.85	-0.15	-0.70			-0.90
	30	-0.80		-1.08	-1.75	-0.96	-0.85	-0.18	-0.70			-0.89
	31	-0.80		-1.08	-1.65	-0.96	-0.85	-0.18	-0.70			-0.87
	32	-0.79		-1.08	-1.50	-0.97	-0.79	-0.21	-0.70			-0.83
SEP	33	-0.91		-1.24	-1.64	-1.21	-0.98	-0.32	-0.84			-1.00
	34	-0.94		-1.24	-1.64	-1.15	-0.94	-0.25	-0.84			-0.96
	35	-0.94		-1.24	-1.64	-1.15	-0.94	-0.37	-0.84			-0.99
	36	-0.94		-1.23	-1.66	-1.10	-0.90	-0.37	-0.84			-0.97
OCT	37	-0.94		-1.14	-1.67	-1.10	-0.85	-0.40	-0.84			-0.97
	38	-0.94		-1.20	-1.67	-1.05	-0.85	-0.40	-0.75			-0.94
	39	-0.94		-1.20	-1.67	-0.95	-0.85	-0.40	-0.76			-0.93
	40	-0.89		-1.20	-1.67	-0.95	-0.81	-0.42	-0.76			-0.92
NOV	41	-0.89		-1.12	-1.67	-0.90	-0.75	-0.42	-0.67			-0.88
	42	-0.89		-1.12	-1.62	-0.85	-0.75	-0.42	-0.67			-0.86
	43	-0.89		-1.12	-1.66	-0.80	-0.75	-0.40				-0.90
	44	-0.84		-1.12	-1.67	-0.77	-0.75	-0.41				-0.90
DEC	45	-0.75		-1.25	-1.82	-0.70	-0.85	-0.35				-0.93
	46	-0.75		-1.21	-1.64	-0.70	-0.78	-0.35				-0.87
	47	-0.75		-1.29	-1.64	-0.70	-0.78	-0.35				-0.87
	48	-0.76		-1.15	-1.62	-0.70	-0.78	-0.38				-0.87
Average		-0.75	-0.76	-0.97	-1.45	-1.21	-0.80	-0.42	-0.56			-0.90

Table 11. Wheat Basis - Wray M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1		-0.72	-0.70	-1.20	-1.59	-0.85			-0.25		-0.55
	2		-0.69	-0.70	-1.27	-1.55	-0.79			0.20	-0.80	-0.46
	3		-0.69	-0.71	-1.13	-1.60	-0.77			0.20	-0.80	-0.46
	4		-0.69	-0.70	-1.09	-1.59	-0.71			0.59	-0.81	-0.31
FEB	5		-0.59	-0.65	-1.12	-1.59	-0.87	-0.74	-0.31	-0.58	-0.80	-0.66
	6		-0.59	-0.60	-1.09	-1.59	-0.82	-0.73	-0.37	-0.95	-0.80	-0.73
	7		-0.59	-0.56	-1.09	-1.59	-0.79	-0.75	-0.47	-0.55	-0.80	-0.67
	8	-0.24	-0.88	-0.50	-1.09	-1.59	-0.66	-0.73	-0.47	-0.55	-0.92	-0.67
MAR	9	-0.31	-0.59	-0.52	-1.11	-1.66	-0.73			0.71	-0.85	-0.29
	10	-0.30	-0.59	-0.52	-1.12	-1.67	-0.76			0.54	-0.85	-0.36
	11	-0.30	-0.82	-0.50	-1.12	-1.66	-0.77			0.42	-0.85	-0.40
	12	-0.31	-0.82	-0.50	-1.12	-1.66	-0.77			0.32	-0.85	-0.43
APR	13	-0.25	-0.82	-0.50	-1.12	-1.77	-0.78	-0.59	-0.60	-0.47	-0.86	-0.66
	14	-0.25	-0.82	-0.50	-1.13	-1.69	-0.76	-0.63	-0.61	-0.47	-0.86	-0.67
	15	-0.26	-0.82	-0.50	-1.14	-1.69	-0.69	-0.63	-0.60	-0.45	-0.85	-0.64
	16	-0.25	-1.02	-0.50	-1.23	-1.79	-0.79	-0.63	-0.60	-0.46	-0.95	-0.69
MAY	17	-0.20	-1.00	-0.67	-1.29	-1.42	-0.89	-0.74	-0.61	-0.50	-0.95	-0.74
	18	-0.26	-1.00	-0.67	-1.29	-1.42	-0.79	-0.74	-0.60	-0.50	-0.95	-0.72
	19	-0.30	-1.00	-0.67	-1.30	-1.42	-0.79	-0.75	-0.60	-0.50	-0.95	-0.72
	20	-0.40	-0.95	-0.67	-1.39	-1.42	-0.79	-0.79	-0.60	-0.50	-0.80	-0.70
JUN	21	-0.46	-0.90		-1.39		-0.89	-0.60	-0.71	-0.50	-0.95	-0.73
	22	-0.45	-0.91		-1.49		-0.89	-0.41	-0.70	-0.50	-0.95	-0.69
	23	-0.48	-0.90		-1.50		-0.69		-0.60	-0.50	-0.93	-0.68
	24	-0.53	-0.90	-0.88	-1.49			-0.40	-0.60	0.70	-1.15	-0.36
JUL	25	-0.57	-1.00	-0.96	-1.70	-1.15				0.02	-1.21	-0.59
	26	-0.57	-1.01	-1.03	-1.66	-1.05				0.12	-1.25	-0.56
	27	-0.67	-1.01	-1.04	-1.80	-1.05				0.38	-1.25	-0.43
	28	-0.73	-0.98	-1.05	-1.66	-1.05			-0.59	-0.61	-1.25	-0.82
AUG	29	-0.72	-0.95	-1.05	-1.76	-1.05		-0.20	-0.64	-0.60	-1.26	-0.67
	30	-0.79	-0.85	-1.05	-1.79	-1.05	-0.76	-0.20	-0.64	-0.60	-1.25	-0.69
	31	-0.79	-0.85	-1.12	-1.64		-0.77	-0.21	-0.64	-0.82	-1.25	-0.74
	32	-0.79	-0.85	-1.12	-1.49		-0.75	-0.20	-0.64		-1.53	-0.78
SEP	33	-0.87	-1.00	-1.24	-1.59						-1.53	-1.53
	34	-0.94	-1.01	-1.25	-1.60						1.53	1.53
	35	-0.94	-1.01	-1.24	-1.59						-1.53	-1.53
	36	-0.93	-1.00	-1.19	-1.63						-1.53	-1.53
OCT	37	-0.93	-1.00	-1.09	-1.67					-0.82	-1.51	-1.16
	38	-0.93	-1.00	-1.19	-1.76					-0.82	-1.77	-1.29
	39	-0.93	-0.98	-1.14	-1.76					-0.82	-1.50	-1.16
	40	-0.86	-0.95	-1.14	-1.76					-0.82		-0.82
NOV	41	-0.78	-0.82	-1.14	-1.72		-0.93	-0.42		-0.95	-1.50	-0.95
	42	-0.73	-0.83	-1.10	-1.66		-0.86	-0.40		-0.77	-1.50	-0.88
	43	-0.73	-0.83	-1.06	-1.71	-0.91	-0.88	-0.42		-0.80	-1.50	-0.90
	44	-0.74	-0.82	-1.03	-1.66	-0.90	-0.88			-0.80		-0.84
DEC	45	-0.74	-0.94	-1.13	-1.69	-0.87					-1.52	-1.52
	46	-0.73	-0.94	-1.20	-1.60	-0.83					-1.52	-1.52
	47	-0.73	-0.87	-1.27	-1.59	-0.79					-1.53	-1.53
	48	-0.75	-0.70	-1.13	-1.59	-0.84			-0.70			-0.70
Average		-0.60	-0.86	-0.88	-1.45	-1.36	-0.80	-0.54	-0.59			-0.74

Table 12. Wheat Basis - Yuma M&M Elevator (\$/Bushel)

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.50	-0.56	-0.72	-1.11	-1.55	-0.73	-0.75	-0.30	-0.70	-0.80	-0.66
	2	-0.47	-0.54	-0.68	-1.19	-1.48	-0.74	-0.70	-0.30	-0.65	-0.80	-0.64
	3	-0.41	-0.56	-0.66	-1.10	-1.56	-0.75	-0.66	-0.25	-0.68	-0.80	-0.63
	4	-0.50	-0.61	-0.66	-1.04	-1.53	-0.75	-0.64	-0.25	-0.60	-0.80	-0.61
FEB	5	-0.42	-0.50	-0.60	-1.06	-1.58	-0.76	-0.60	-0.25	-0.60	-0.81	-0.60
	6	-0.40	-0.46	-0.58	-1.06	-1.58	-0.75	-0.60	-0.25	-0.95	-0.80	-0.67
	7	-0.37	-0.44	-0.54	-1.04	-1.52	-0.73		-0.35	-0.55	-0.80	-0.61
	8	-0.23	-0.72	-0.49	-1.05	-1.51	-0.60	-0.55	-0.24	-0.52	-0.80	-0.54
MAR	9	-0.30	-0.30	-0.49	-1.16	-1.60	-0.80	-0.54	-0.30	-0.52	-0.92	-0.62
	10	-0.27	-0.48	-0.48	-1.11	-1.54	-0.77	-0.55	-0.41	-0.53	-0.85	-0.62
	11	-0.25	-0.93	-0.47	-1.05	-1.46	-0.77	-0.45	-0.55	-0.53	-0.85	-0.63
	12	-0.19	-0.69	-0.47	-1.03	-1.53	-0.77	-0.45	-0.64	-0.53	-0.85	-0.65
APR	13	-0.20	-0.61	-0.46	-1.04	-2.37	-0.77	-0.45	-0.66	-0.53	-0.85	-0.65
	14	-0.18	-0.68	-0.50	-1.05	-1.57	-0.74	-0.45	-0.65	-0.49	-0.86	-0.64
	15	-0.20	-0.71	-0.47	-1.17	-1.50	-0.76	-0.45	-0.65	-0.47	-0.86	-0.64
	16	-0.19	-0.78	-0.46	-1.13	-1.62	-0.76	-0.45	-0.61	-0.43	-0.85	-0.62
MAY	17	-0.18	-0.68	-0.54	-1.34	-1.18	-0.87	-0.50	-0.61	-0.46	-0.95	-0.68
	18	-0.16	-0.76	-0.55	-1.29	-1.22	-0.86	-0.50	-0.60	-0.44	-0.95	-0.67
	19	-0.25	-0.78	-0.60	-1.29	-1.25	-0.76	-0.51	-0.55	-0.50	-0.95	-0.65
	20	-0.29	-0.74	-0.67	-1.28	-1.22	-0.78	-0.44	-0.45	-0.50	-0.95	-0.62
JUN	21	-0.42	-0.65	-0.72	-1.33	-1.12	-0.73	-0.43	-0.45	-0.50	-0.80	-0.58
	22	-0.47	-0.91	-0.68	-1.38	-1.05	-0.71	-0.41	-0.44	-0.50	-0.95	-0.60
	23	-0.52	-0.80	-0.69	-1.48	-1.00	-0.61		-0.51	-0.48	-0.95	-0.64
	24	-0.49	-0.80	-0.69	-1.47	-0.99	-0.64	-0.28	-0.48	-0.50	-0.93	-0.56
JUL	25	-0.57	-0.98	-0.88	-1.59	-1.02	-0.83	-0.38	-0.38	-0.58	-1.15	-0.66
	26	-0.59	-0.93	-0.77	-1.71	-0.92	-0.85	-0.34	-0.48	-0.56	-1.21	-0.69
	27	-0.73	-0.86	-0.88	-1.75	-0.94	-0.80	-0.20	-0.50	-0.59	-1.25	-0.67
	28	-0.79	-0.92	-1.03	-1.67	-0.95	-0.80	-0.20	-0.60	-0.59	-1.25	-0.69
AUG	29	-0.81	-0.89	-1.04	-2.02	-0.98	-0.85		-0.70	-0.57	-1.25	-0.84
	30	-0.80	-0.86	-1.05	-1.95	-0.97	-0.85	-0.19	-0.64	-0.55	-1.26	-0.70
	31	-0.81	-0.81	-1.07	-1.75	-0.95	-0.75	-0.20	-0.65	-0.55	-1.25	-0.68
	32	-0.82	-0.88	-1.05	-1.50	-0.99	-0.75	-0.19	-0.65	-0.77	-1.25	-0.72
SEP	33	-0.99	-0.94	-1.20	-1.66	-1.12	-0.95	-0.29	-0.75	-0.78	-1.53	-0.86
	34	-0.98	-0.89	-1.18	-1.60	-1.02	-0.90	-0.22	-0.79	-0.77	-1.53	-0.84
	35	-0.96	-0.89	-1.18	-1.60	-1.01	-0.90	-0.28	-0.78	-1.03	-1.53	-0.90
	36	-0.98	-0.87	-1.17	-1.60	-1.05	-0.90	-0.30	-0.80	-0.77	-1.53	-0.86
OCT	37	-1.00	-0.94	-1.06	-1.62	-1.05	-0.85	-0.31	-0.81	-0.77	-1.53	-0.85
	38	-0.91	-0.88	-1.15	-1.61	-0.96	-0.81	-0.30	-0.80	-0.77	-1.49	-0.83
	39	-0.88	-0.85	-1.14	-1.68	-0.91	-0.74	-0.30	-0.75	-0.76	-1.75	-0.86
	40	-0.81	-0.72	-1.12	-1.70	-0.86	-0.75	-0.28	-0.75	-0.76	-1.48	-0.80
NOV	41	-0.56	-0.72	-1.13	-1.70	-0.80	-0.73	-0.26	-0.75	-0.81		-0.64
	42	-0.47	-0.76	-1.06	-1.62	-0.72	-0.73	-0.25	-0.69	-0.77	-1.48	-0.79
	43	-0.55	-0.72	-1.10	-1.60	-0.72	-0.69	-0.29		-0.77	-1.48	-0.81
	44	-0.64	-0.67	-1.13	-1.64	-0.79	-0.70	-0.32	-0.61	-0.77	-1.48	-0.78
DEC	45	-0.68	-0.86	-1.16	-1.66	-0.69	-0.80	-0.25		-0.90		-0.65
	46	-0.76	-0.76	-1.11	-1.58	-0.68	-0.79	-0.30		-0.92	-1.50	-0.88
	47	-0.62	-0.78	-1.23	-1.45	-0.67	-0.75	-0.30		-0.75	-1.50	-0.83
	48	-0.54	-0.81	-1.13	-1.75	-0.68	-0.75	-0.31	-0.70	-0.75	-1.51	-0.80
Average		-0.54	-0.75	-0.83	-1.42	-1.17	-0.77	-0.39	-0.55			-0.70

All Sites Average Basis

Month	Week	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	5 Year Weekly Avg
JAN	1	-0.52	-0.72	-0.70	-1.15	-1.59	-0.78	-0.78	-0.30	-0.35	-0.78	-0.60
	2	-0.49	-0.70	-0.67	-1.23	-1.54	-0.76	-0.69	-0.26	-0.21	-0.79	-0.54
	3	-0.48	-0.71	-0.67	-1.12	-1.60	-0.76	-0.68	-0.24	-0.22	-0.79	-0.54
	4	-0.55	-0.71	-0.71	-1.07	-1.59	-0.74	-0.65	-0.25	-0.09	-0.79	-0.50
FEB	5	-0.46	-0.65	-0.68	-1.10	-1.59	-0.79	-0.67	-0.27	-0.50	-0.79	-0.60
	6	-0.43	-0.61	-0.66	-1.08	-1.59	-0.77	-0.64	-0.31	-0.79	-0.79	-0.66
	7	-0.40	-0.62	-0.64	-1.07	-1.58	-0.76	-0.65	-0.37	-0.49	-0.79	-0.61
	8	-0.27	-0.93	-0.60	-1.06	-1.58	-0.63	-0.60	-0.34	-0.49	-0.85	-0.58
MAR	9	-0.35	-0.62	-0.59	-1.13	-1.63	-0.78	-0.55	-0.30	-0.06	-0.85	-0.51
	10	-0.33	-0.65	-0.59	-1.11	-1.62	-0.79	-0.51	-0.35	-0.12	-0.84	-0.52
	11	-0.32	-0.80	-0.58	-1.08	-1.60	-0.79	-0.46	-0.41	-0.16	-0.84	-0.53
	12	-0.30	-0.76	-0.57	-1.07	-1.61	-0.79	-0.48	-0.49	-0.18	-0.84	-0.56
APR	13	-0.26	-0.74	-0.57	-1.06	-1.78	-0.81	-0.50	-0.53	-0.42	-0.84	-0.62
	14	-0.26	-0.76	-0.58	-1.08	-1.62	-0.80	-0.52	-0.55	-0.43	-0.84	-0.63
	15	-0.27	-0.76	-0.57	-1.13	-1.54	-0.78	-0.52	-0.54	-0.41	-0.84	-0.62
	16	-0.26	-0.86	-0.57	-1.18	-1.75	-0.81	-0.52	-0.54	-0.42	-0.89	-0.64
MAY	17	-0.22	-0.77	-0.67	-1.30	-1.37	-0.88	-0.56	-0.56	-0.46	-0.93	-0.68
	18	-0.25	-0.78	-0.68	-1.31	-1.36	-0.82	-0.59	-0.57	-0.47	-0.93	-0.68
	19	-0.29	-0.79	-0.69	-1.32	-1.32	-0.79	-0.57	-0.55	-0.47	-0.93	-0.66
	20	-0.30	-0.77	-0.70	-1.37	-1.29	-0.79	-0.56	-0.49	-0.47	-0.86	-0.63
JUN	21	-0.37	-0.74	-0.72	-1.38	-1.19	-0.80	-0.47	-0.53	-0.46	-0.90	-0.63
	22	-0.42	-0.91	-0.73	-1.44	-1.15	-0.80	-0.40	-0.52	-0.47	-0.94	-0.62
	23	-0.49	-0.81	-0.74	-1.52	-1.11	-0.65		-0.50	-0.46	-0.92	-0.63
	24	-0.51	-0.82	-0.78	-1.54	-1.10	-0.59	-0.36	-0.49	-0.02	-1.03	-0.50
JUL	25	-0.57	-0.98	-0.96	-1.65	-1.05	-0.77	-0.41	-0.36	-0.26	-1.20	-0.60
	26	-0.65	-0.97	-0.96	-1.66	-1.01	-0.79	-0.20	-0.41	-0.26	-1.26	-0.58
	27	-0.73	-0.95	-0.98	-1.80	-1.01	-0.78	-0.16	-0.48	-0.17	-1.27	-0.57
	28	-0.76	-0.95	-1.02	-1.64	-1.03	-0.81	-0.16	-0.57	-0.50	-1.29	-0.66
AUG	29	-0.76	-0.91	-1.06	-1.83	-1.02	-0.82	-0.17	-0.63	-0.53	-1.29	-0.69
	30	-0.80	-0.85	-1.06	-1.81	-0.99	-0.80	-0.18	-0.64	-0.53	-1.29	-0.69
		-0.80	-0.84	-1.08	-1.66	-0.94	-0.79	-0.19	-0.64	-0.58	-1.29	-0.70
	32	-0.79	-0.85	-1.08	-1.50	-0.96	-0.76	-0.19	-0.64	-0.63	-1.41	-0.73
SEP	33	-0.91	-1.00	-1.22	-1.63	-1.14	-0.95	-0.30	-0.75	-0.59	-1.54	-0.82
	34	-0.95	-0.99	-1.22	-1.62	-1.08	-0.92	-0.23	-0.76	-0.58	-0.77	-0.65
	35	-0.94	-0.99	-1.22	-1.61	-1.08	-0.92	-0.32	-0.75	-0.59	-1.54	-0.82
	36	-0.94	-0.98	-1.19	-1.63	-1.06	-0.90	-0.32	-0.76	-0.55	-1.54	-0.81
OCT	37	-0.95	-0.97	-1.10	-1.62	-1.06	-0.86	-0.35	-0.76	-0.68	-1.52	-0.84
	38	-0.93	-0.92	-1.18	-1.68	-1.00	-0.85	-0.35	-0.71	-0.67	-1.64	-0.84
	39	-0.93	-0.90	-1.16	-1.69	-0.92	-0.81	-0.35	-0.71	-0.70	-1.64	-0.84
	40	-0.87	-0.86	-1.15	-1.69	-0.93	-0.79	-0.36	-0.71	-0.64	-1.49	-0.80
NOV	41	-0.80	-0.78	-1.12	-1.68	-0.88	-0.82	-0.37	-0.65	-0.68	-1.51	-0.80
	42	-0.76	-0.74	-1.09	-1.62	-0.83	-0.79	-0.36	-0.67	-0.56	-1.50	-0.78
	43	-0.76	-0.71	-1.06	-1.66	-0.80	-0.79	-0.36	-0.65	-0.62	-1.47	-0.78
	44	-0.75	-0.70	-1.05	-1.65	-0.85	-0.77	-0.35	-0.55	-0.53	-1.38	-0.71
DEC	45	-0.75	-0.84	-1.16	-1.74	-0.78	-0.83	-0.29	-0.40	-0.68	-1.51	-0.74
	46	-0.76	-0.81	-1.18	-1.62	-0.76	-0.79	-0.30	-0.45	-0.62	-1.51	-0.73
	47	-0.73	-0.78	-1.26	-1.59	-0.75	-0.78	-0.30	-0.45	-0.68	-1.51	-0.74
	48	-0.73	-0.73	-1.12	-1.63	-0.77	-0.78	-0.32	-0.30	-0.67	-1.48	-0.71
Average		-0.58	-0.81	-0.88	-1.43	-1.22	-0.79	-0.42	-0.51			-0.67

CROP ENTERPRISE COST ESTIMATES FOR 2016 IN NORTHEASTERN COLORADO

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Introduction

Estimated production costs and returns for the major crops grown in Northeastern Colorado are included in this section for 2016. It would only be fair to call the following cost of production estimates, or budgets, “typical” and hopefully representative of the area. These budgets are not averages, but rather represent typical costs as reported by producers in Northeastern Colorado and from data provided by the USDA-NASS Colorado field office. These budgets represent no one single individual, as all producers are different with unique management techniques, machinery complements, chemical applications, market timing and uncontrollable fortune with frost, hail, rain and insects. No attempt was made to conform these results to ideal production recommendations. Our goal is simply to report typical production costs from actual production.

These cost of production estimates conformed to the traditional economic method of accounting for all variable and fixed costs of production. Starting in 2006, the Mississippi State Budget generator became the software of choice to develop the enterprise budgets. Expected returns on land are capitalized using a capitalization rate based on the “real” rate of interest, which is the rate of interest paid minus the inflation rate. Net receipts need to be large enough to give the operator a four percent return on the land investment. If receipts are large enough to cover these items, the operator then has a positive return to management and risk. From a business management standpoint, farmers must earn positive receipts in order to provide for family living expenses, pay debt, earn positive returns on their investments and make new investments when feasible.

Variability in Input Use and Conditions

Caution is urged when using these ‘typical’ production cost and return estimates. This is especially true for agricultural lenders, appraisers, insurance adjusters, landlords and government agencies. Even among this survey group, which was pre-screened to be typical of the area, there were great differences. These differences were seldom due to good or bad management, but rather due to a variety of weather and pest conditions, soils, and irrigation management.

Table 1 lists typical fertilizer rates for the crops specified in this publication. Again, these rates are not meant to be recommendations for fertilizer requirements, but rather are typical rates reported by producers participating in the survey

process. Also, the survey instrument does not inquire as to the usage of soil testing by producers for plant nutrients. As a result, no correlation can be made between the typical fertilizer rate reported and actual plant nutrient requirements.

In addition to crop yield and input rates, the survey instrument sent to producers asked for cultural practices, machinery complements and machinery values. Machine cost variability from one producer to the next was often impacted by management choices. An operator that chooses to purchase newer machinery may feel they realize enough from increased dependability and lower repair costs that the extra investment is warranted. The typical machine complement in use is 7 to 15 years of age. When replacement machines are purchased they are not always new. As stated previously, positive returns to “management and risk” would have to be used to initiate replacement machinery purchases if that is a management priority.

Price Received

As always, a key management perspective for producers will be to pay close attention to production costs, marketing plans and price information. This is especially important in the current environment of rising commodity prices as production costs, and land rents have begun to rise again as well, putting pressure on profits in future years if commodity prices fall below their current levels. All local commodity prices were above FSA established loan rates for the 2016 marketing year. Table 2 presents a summary of the county loan rates for the Golden Plains Area.

Estimated Production Costs and Returns for Irrigated Crops Tables 3 through 9 describe enterprise production costs and returns for irrigated crops in Northeastern Colorado. These enterprises include alfalfa, dry edible beans, corn, sugar beets, oil sunflowers, soybeans and winter wheat. All irrigated budgets are produced under center pivot irrigation. The alfalfa enterprise is assumed to be in production 5 years. Alfalfa establishment costs are amortized over a 5-year time period as a result. Crop rotations for dry bean production typically assumed production once every three or four years. Crop rotations that include sugar beets typically assumed production of these crops once every four years. Corn was the crop typically used to fill out the rotations. Tables 10, 11, and 12 describe irrigated corn, sugar beet, and winter wheat enterprises for the South Platte River valley. These enterprises also assume center pivot irrigation and sugar beet production once every four years.

Estimated Production Costs and Returns for Dryland Crops
 Many dryland producers are adopting a two crop in three-year system such as wheat-corn-fallow, wheat-sunflower-fallow, or wheat-millet-fallow. As a result there are two dryland winter wheat budgets defined in this report. Table 13, the conventional wheat-fallow budget, charges all fallow costs against the wheat crop, employing traditional tillage operations for weed control in the fallow period. Tables 14 through 17 describe reduced-till intensive cropping system enterprises for winter wheat, corn, millet, and oil-type sunflowers. In these reduced-till intensive cropping system budgets, fallow expenses from wheat harvest to summer crop planting (9 months) are charged to the summer crop enterprise. Fallow expenses from summer crop harvest to wheat planting (11 months) are charged to the wheat enterprise. Fallow operations include a combination of herbicide use and tillage operations for weed control in the reduced-till budgets.

The breakeven analysis feature at the bottom of each budget allows us to see the per acre bottom line effect of positive or negative changes in price and/or yield while holding all inputs constant. By matching various different scenarios in this way, we can get a feeling for the relative production and marketing risks of each crop enterprise. In Table 5 - Irrigated Corn, price received was \$3.70/bushel while quantity harvested was 260 bushel/acre. For the 2015 crop year, this combination results in \$303.96 net receipts per acre before factor payments (Row 3, Column 3). The result of a 25% reduction in yield holding price constant at \$3.70/bushel is \$63.46 per acre returns over direct costs, a net loss of \$240.50 per acre, (Row 1, Column 3). It should be noted that the 25% (+/-) ranges shown in these tables are meant for illustration purposes only and do not represent the worst or best case scenarios for any crop enterprise.

Table 1. Typical Fertilizer Application Rates for Irrigated and Dryland Crops.

	Nitrogen (N)¹	Phosphate (P)¹	Potassium (K)¹
	Lbs/Acre	Lbs/Acre	Lbs/Acre
Irrigated Crops			
Corn	218	45	15
Sugar Beets	160	35	0
Pinto Beans	52	65	16
Winter Wheat	60	12	0
Potatoes	280	148	150
Alfalfa	65	60	73
Corn, South Platte Valley	175	30	50
Sugar Beets, South Platte Valley	120	35	60
Dryland Crops			
Winter Wheat	40	12	0
Corn	60	32	24
Oil Sunflowers	50	10	0
Millet	25	0	0

¹These values are typical rates reported by producers participating in the survey process and are not meant to be recommendations for fertilizer requirements.

Table 2. National Loan Rates for Wheat, Corn, Sunflowers and Soybeans (2016 Crop Year)

Crop	Unit	Average	Kit Carson	Phillips	Sedgwick	Washington	Yuma
Wheat	\$/Bu	3.03	3.03	3.02	3.02	3.08	3.02
Corn	\$/Bu	2.00	2.04	1.97	1.97	2.10	2.02
Sunflower	\$/Cwt	11.01	11.12	10.98	10.91	10.98	11.06
Soybeans	\$/Bu	4.69	4.74	4.65	4.65	4.65	4.74

Table 3. 2016 Estimated Production Costs and Returns - Irrigated Alfalfa in Northeastern Colorado.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
ALFALFA (Round Bales)	TONS	117.00	6.00	702.00		
TOTAL RECEIPTS				702.00	117.00	
DIRECT COSTS						
Operating Preharvest						
ESTABLISHMENT ALLOCATION (5 Years)	DOLS	32.18	1.00	32.18	5.36	
FERTILIZER	DOLS	58.37	1.00	58.37	9.73	
HERBICIDE	DOLS	25.53	1.00	25.53	4.26	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	1.17	
INSECTICIDE	DOLS	18.22	1.00	18.22	3.04	
IRRIGATION ENERGY	DOLS	75.65	1.00	75.65	12.61	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	1.88	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	11.67	
CUSTOM AERIAL SPRAY	DOLS	0.00	1.00	0.00	0.00	
INTEREST EXPENSE ³	DOLS			11.48	1.91	
Total Preharvest	DOLS			309.69	51.62	
Operating Harvest						
FUEL	DOLS			2.66	0.44	
REPAIR & MAINTENANCE	DOLS			8.64	1.44	
LABOR	DOLS			4.33	1.00	
BALING ¹	DOLS			120.00	20.00	
HAULING/STACKING ²	DOLS			24.00	4.00	
Total Harvest				159.63	26.61	
Total Operating Costs				469.32	78.22	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			16.43	2.74	
GENERAL FARM OVERHEAD	DOLS			10.00	1.67	
REAL ESTATE TAXES	DOLS			15.42	2.57	
Total Property and Ownership Costs	DOLS			41.85	6.98	
TOTAL DIRECT COSTS				511.17	85.20	
NET RECEIPTS BEFORE FACTOR PAYMENTS				190.83	31.81	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	33.33	
RETURN TO MANAGEMENT AND RISK	DOLS			-9.17	-1.53	

1 Baling = \$15/Bale (Round Baler)

2 Hauling/Stacking = \$3/Bale

3 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES				
		\$/TON				
		-25%	-10%	\$ 117.00	+10%	+25%
		\$ 87.75	\$ 105.30	\$ 117.00	\$ 128.70	\$ 146.25
ALTERNATIVE YIELDS	-25%	\$ (116.30)	\$ (37.32)	\$ 15.33	\$ 67.98	\$ 146.96
	-10%	\$ (37.32)	\$ 57.45	\$ 120.63	\$ 183.81	\$ 278.58
	TONS	\$ 15.33	\$ 120.63	\$ 190.83	\$ 261.03	\$ 366.33
	+10%	\$ 67.98	\$ 183.81	\$ 261.03	\$ 338.25	\$ 454.08
	+25%	\$ 146.96	\$ 278.58	\$ 366.33	\$ 454.08	\$ 585.71

Table 4. 2016 Estimated Production Costs and Returns - Irrigated Pinto Beans in Northeastern Colorado

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
PINTO BEANS	CWT	33.15	35.00	1160.25		
TOTAL RECEIPTS				1160.25	33.15	
Direct Costs						
Operating Preharvest						
SEED	DOLS	51.41	1.00	51.41	1.47	
FERTILIZER	DOLS	90.24	1.00	90.24	2.58	
HERBICIDE	DOLS	34.53	1.00	34.53	0.99	
CUSTOM APPLICATION	DOLS	8.00	1.00	8.00	0.23	
INSECTICIDE	DOLS	7.65	1.00	7.65	0.22	
FUNGICIDE	DOLS	25.27	1.00	25.27	0.72	
IRRIGATION ENERGY	DOLS	52.44	1.00	52.44	1.50	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.32	
CROP INSURANCE	DOLS	29.17	1.00	29.17	0.83	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	2.00	
CUSTOM AERIAL SPRAY	DOLS	8.00	1.00	8.00	0.23	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.34	
FUEL	DOLS			7.73	0.22	
REPAIR & MAINTENANCE	DOLS			5.37	0.15	
LABOR	DOLS			3.65	0.10	
INTEREST EXPENSE ²	DOLS			14.44	0.41	
Total Preharvest	DOLS			431.16	12.32	
Operating Harvest						
FUEL	DOLS			15.51	0.44	
REPAIR & MAINTENANCE	DOLS			8.51	0.24	
LABOR	DOLS			6.06	0.17	
HAULING ¹	DOLS			8.05	0.23	
Total Harvest				38.13	1.09	
Total Operating Costs				469.29	13.41	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			60.03	1.72	
GENERAL FARM OVERHEAD	DOLS			10.00	0.29	
REAL ESTATE TAXES	DOLS			15.42	0.44	
Total Property and Ownership Costs	DOLS			85.45	2.44	
TOTAL DIRECT COSTS:				554.74	15.85	
NET RECEIPTS BEFORE FACTOR PAYMENTS				605.51	17.30	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	5.71	
RETURN TO MANAGEMENT AND RISK	DOLS			405.51	11.59	

1 Hauling Machinery & Labor Charges = \$0.23/CWT

2 Interest on Operating Capital is Included in Pre-Harvest Operating Costs, Calculated at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES								
		\$/CWT								
		-25%	-10%		+10%	+25%				
		\$ 24.86	\$ 29.84	\$ 33.15	\$ 36.47	\$ 41.44				
ALTERNATIVE YIELDS	-25%	26.3	\$ 97.90	\$ 228.43	\$ 315.45	\$ 402.47	\$ 532.99			
	-10%	31.5	\$ 228.43	\$ 385.06	\$ 489.49	\$ 593.91	\$ 750.54			
		35.0	\$ 315.45	\$ 489.49	\$ 605.51	\$ 721.54	\$ 895.57			
	+10%	38.5	\$ 402.47	\$ 593.91	\$ 721.54	\$ 849.16	\$ 1,040.60			
	+25%	43.8	\$ 532.99	\$ 750.54	\$ 895.57	\$ 1,040.60	\$ 1,258.15			

Table 5. 2016 Estimated Production Costs and Returns - Irrigated Corn in Northeastern Colorado.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
CORN	BU	3.46	240.00	830.40		
TOTAL RECEIPTS				830.40	3.46	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	124.86	1.00	124.86	0.52	
FERTILIZER	DOLS	92.24	1.00	92.24	0.38	
HERBICIDE (APPLIED)	DOLS	26.35	1.00	26.35	0.11	
INSECTICIDE	DOLS	21.07	1.00	21.07	0.09	
IRRIGATION ENERGY	DOLS	65.00	1.00	65.00	0.27	
IRRIGATION REPAIR	DOLS	65.07	1.00	65.07	0.27	
CROP INSURANCE	DOLS	44.50	1.00	44.50	0.19	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	0.29	
CUSTOM AERIAL SPRAY	DOLS	8.00	1.00	8.00	0.03	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.05	
FUEL	DOLS			12.65	0.05	
REPAIR & MAINTENANCE	DOLS			7.61	0.03	
LABOR	DOLS			8.40	0.04	
INTEREST EXPENSE ²	DOLS			17.48	0.07	
Total Preharvest	DOLS			575.23	2.40	
Operating Harvest						
FUEL	DOLS			4.12	0.02	
REPAIR & MAINTENANCE	DOLS			5.09	0.02	
LABOR	DOLS			1.66	0.01	
HAULING ¹	DOLS			50.00	0.21	
Total Harvest				60.87	0.25	
Total Operating Costs				636.10	2.65	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			52.79	0.22	
GENERAL FARM OVERHEAD	DOLS			10.00	0.04	
REAL ESTATE TAXES	DOLS			15.42	0.06	
Total Property and Ownership Costs	DOLS			78.21	0.33	
TOTAL DIRECT COSTS				714.31	2.98	
NET RECEIPTS BEFORE FACTOR PAYMENTS				116.09	0.48	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	0.83	
RETURN TO MANAGEMENT AND RISK	DOLS			-83.91	-0.35	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/BU					
		-25%	-10%	3.46	+10%	+25%	
		\$ 2.60	\$ 3.11	\$ 3.46	\$ 3.81	\$ 4.33	
ALTERNATIVE YIELDS	-25%	180.0	\$ (247.21)	\$ (153.79)	\$ (91.51)	\$ (29.23)	\$ 64.19
	-10%	216.0	\$ (153.79)	\$ (41.69)	\$ 33.05	\$ 107.79	\$ 219.89
	BUSHELS	240.0	\$ (91.51)	\$ 33.05	\$ 116.09	\$ 199.13	\$ 323.69
	+10%	264.0	\$ (29.23)	\$ 107.79	\$ 199.13	\$ 290.47	\$ 427.49
	+25%	300.0	\$ 64.19	\$ 219.89	\$ 323.69	\$ 427.49	\$ 583.19

Table 6. 2016 Estimated Production Costs and Returns - Irrigated Sugarbeets in Northeastern Colorado

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
SUGARBEETS	CWT	36.00	33.00	1188.00		
TOTAL RECEIPTS				1188.00	36.00	
DIRECT COSTS:						
Operating Preharvest						
SEED	DOLS	84.94	1.00	84.94	2.57	
FERTILIZER	DOLS	83.03	1.00	83.03	2.52	
HERBICIDE	DOLS	113.28	1.00	113.28	3.43	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	0.21	
INSECTICIDE	DOLS	12.54	1.00	12.54	0.38	
FUNGICIDE	DOLS	24.18	1.00	24.18	0.73	
IRRIGATION ENERGY	DOLS	106.78	1.00	106.78	3.24	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.34	
CROP INSURANCE	DOLS	57.00	1.00	57.00	1.73	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	2.12	
CUSTOM AERIAL SPRAY	DOLS	8.00	1.00	8.00	0.24	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.36	
FUEL	DOLS			16.10	0.49	
REPAIR & MAINTENANCE	DOLS			12.48	0.38	
LABOR	DOLS			9.79	0.30	
INTEREST EXPENSE ²	DOLS			22.11	0.67	
Total Preharvest	DOLS			650.49	19.71	
Operating Harvest						
FUEL	DOLS			21.30	0.65	
REPAIR & MAINTENANCE	DOLS			90.34	2.74	
LABOR	DOLS			9.00	0.27	
HAULING ¹	DOLS			158.32	4.80	
Total Harvest				278.96	8.45	
Total Operating Costs				929.45	28.17	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			132.23	4.01	
GENERAL FARM OVERHEAD	DOLS			30.00	0.91	
REAL ESTATE TAXES	DOLS			15.42	0.47	
PAYMENT ON COOP SHARE ³	DOLS			43.92	1.33	
Total Property and Ownership Costs	DOLS			221.57	5.38	
TOTAL DIRECT COSTS:				1151.02	33.55	
NET RECEIPTS BEFORE FACTOR PAYMENTS				36.98	2.45	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	6.06	
RETURN TO MANAGEMENT AND RISK	DOLS			-163.02	-3.61	

1 Hauling Machinery & Labor Charges = \$2.5/CWT and \$0.17 per ton per loaded mile (15 Miles)

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 \$185 Annualized over 5 years at 6% interest

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/CWT					
		-25%	-10%		+10%	+25%	
		\$ 27.00	\$ 32.40	\$ 36.00	\$ 39.60	\$ 45.00	
ALTERNATIVE YIELDS	-25%	24.8	\$ (482.77)	\$ (349.12)	\$ (260.02)	\$ (170.92)	\$ (37.27)
	-10%	29.7	\$ (349.12)	\$ (188.74)	\$ (81.82)	\$ 25.10	\$ 185.48
CWT		33.0	\$ (260.02)	\$ (81.82)	\$ 36.98	\$ 155.78	\$ 333.98
	+10%	36.3	\$ (170.92)	\$ 25.10	\$ 155.78	\$ 286.46	\$ 482.48
	+25%	41.3	\$ (37.27)	\$ 185.48	\$ 333.98	\$ 482.48	\$ 705.23

Table 7. 2016 Estimated Production Costs and Returns - Irrigated Oil Sunflowers in Northeastern Colorado.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production Your Farm
GROSS RECEIPTS FROM PRODUCTION:					
SUNFLOWERS	CWT	16.80	28.25	474.60	
TOTAL RECEIPTS				474.60	16.80
DIRECT COSTS:					
Operating Preharvest					
SEED	DOLS	39.50	1.00	39.50	1.40
FERTILIZER	DOLS	24.33	1.00	24.33	0.86
HERBICIDE	DOLS	45.91	1.00	45.91	1.63
CUSTOM APPLICATION	DOLS	7.00	2.00	14.00	0.50
INSECTICIDE	DOLS	16.98	1.00	16.98	0.60
IRRIGATION ENERGY	DOLS	43.02	1.00	43.02	1.52
IRRIGATION REPAIR	DOLS	11.00	1.00	11.00	0.39
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	2.48
CROP INSURANCE	DOLS	37.00	1.00	37.00	1.31
CUSTOM AERIAL APPLICATION	DOLS	8.05	1.00	8.05	0.28
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.42
FUEL	DOLS			2.74	0.10
REPAIR & MAINTENANCE	DOLS			1.84	0.07
LABOR	DOLS			4.84	0.17
INTEREST EXPENSE ²	DOLS			11.54	0.41
Total Preharvest	DOLS			342.75	12.13
Operating Harvest					
FUEL	DOLS			4.46	0.16
REPAIR & MAINTENANCE	DOLS			4.51	0.16
LABOR	DOLS			1.08	0.04
HAULING ¹	DOLS			7.06	0.25
Total Harvest				17.11	0.61
Total Operating Costs				359.86	12.74
Property and Ownership Costs					
MACHINERY OWNERSHIP COSTS	DOLS			18.34	0.65
GENERAL FARM OVERHEAD	DOLS			10.00	0.35
REAL ESTATE TAXES	DOLS			11.34	0.40
Total Property and Ownership Costs	DOLS			39.68	1.40
TOTAL DIRECT COSTS:				399.54	14.14
NET RECEIPTS BEFORE FACTOR PAYMENTS				75.06	2.66
FACTOR PAYMENTS					
LAND @ 4.00%	DOLS			200.00	7.08
RETURN TO MANAGEMENT AND RISK	DOLS			-124.94	-4.42

1 Hauling Machinery & Labor Charges = \$0.25/Cwt

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES								
		\$/CWT								
		-25%	-10%		+10%	+25%				
		\$ 12.60	\$ 15.12	\$ 16.80	\$ 18.48	\$ 21.00				
ALTERNATIVE YIELDS	-25%	21.2	\$ (132.58)	\$ (79.19)	\$ (43.59)	\$ (8.00)	\$ 45.40			
	-10%	25.4	\$ (79.19)	\$ (15.12)	\$ 27.60	\$ 70.31	\$ 134.38			
	CWT	28.3	\$ (43.59)	\$ 27.60	\$ 75.06	\$ 122.52	\$ 193.71			
	+10%	31.1	\$ (8.00)	\$ 70.31	\$ 122.52	\$ 174.72	\$ 253.03			
	+25%	35.3	\$ 45.40	\$ 134.38	\$ 193.71	\$ 253.03	\$ 342.02			

Table 8. 2016 Estimated Production Costs and Returns - Irrigated Winter Wheat in Northeastern Colorado.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
HARD RED WINTER WHEAT	BU	3.90	97.00	378.30		
TOTAL RECEIPTS				378.30	3.90	
DIRECT COSTS:						
Operating Preharvest						
SEED	DOLS	28.01	1.00	28.01	0.29	
FERTILIZER	DOLS	42.46	1.00	42.46	0.44	
IRRIGATION ENERGY	DOLS	43.28	1.00	43.28	0.45	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.12	
CROP INSURANCE	DOLS	55.00	1.00	55.00	0.57	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	0.72	
FUEL	DOLS			6.15	0.06	
REPAIR & MAINTENANCE	DOLS			4.92	0.05	
LABOR	DOLS			2.06	0.02	
INTEREST EXPENSE ²	DOLS			9.58	0.10	
Total Preharvest	DOLS			272.72	2.81	
Operating Harvest						
FUEL	DOLS			5.02	0.05	
REPAIR & MAINTENANCE	DOLS			3.25	0.03	
LABOR	DOLS			1.71	0.02	
HAULING ¹	DOLS			19.40	0.20	
Total Harvest				29.38	0.30	
Total Operating Costs				302.10	3.11	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			32.29	0.33	
GENERAL FARM OVERHEAD	DOLS			10.00	0.10	
REAL ESTATE TAXES	DOLS			15.42	0.16	
Total Property and Ownership Costs	DOLS			57.71	0.59	
TOTAL DIRECT COSTS:				359.81	3.71	
NET RECEIPTS BEFORE FACTOR PAYMENTS				18.49	0.19	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	2.06	
RETURN TO MANAGEMENT AND RISK	DOLS			-181.51	-1.87	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 Capital and Labor Payments are included in Machinery Operating and Ownership Costs.

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES							
		\$/BU							
		-25%	-10%			+10%	+25%		
		\$ 2.93	\$ 3.51	\$ 3.90	\$ 4.29	\$ 4.88			
ALTERNATIVE YIELDS	-25%	72.8	\$ (147.02)	\$ (104.46)	\$ (76.09)	\$ (47.71)	\$ (5.15)		
	-10%	87.3	\$ (104.46)	\$ (53.39)	\$ (19.34)	\$ 14.71	\$ 65.78		
BUSHEL		97.0	\$ (76.09)	\$ (19.34)	\$ 18.49	\$ 56.32	\$ 113.07		
	+10%	106.7	\$ (47.71)	\$ 14.71	\$ 56.32	\$ 97.93	\$ 160.35		
	+25%	121.3	\$ (5.15)	\$ 65.78	\$ 113.07	\$ 160.35	\$ 231.28		

Table 9. 2016 Estimated Production Costs and Returns - Irrigated Soybeans Northeastern Colorado (Kit Carson County)

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
SOYBEANS	BU	8.95	65.00	581.75		
TOTAL RECEIPTS				581.75	8.95	
DIRECT COSTS:						
Operating Preharvest						
SEED	DOLS	55.47	1.00	55.47	0.85	
FERTILIZER	DOLS	8.50	1.00	8.50	0.13	
HERBICIDE	DOLS	32.93	1.00	32.93	0.51	
IRRIGATION ENERGY	DOLS	56.39	1.00	56.39	0.87	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.17	
CROP INSURANCE	DOLS	49.00	1.00	49.00	0.75	
CUSTOM APPLICATION	DOLS	14.00	2.00	28.00	0.43	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.18	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	1.08	
FUEL	DOLS			6.72	0.10	
REPAIR & MAINTENANCE	DOLS			4.51	0.07	
LABOR	DOLS			3.06	0.05	
INTEREST EXPENSE ²	DOLS			11.48	0.18	
Total Preharvest	DOLS			349.32	5.37	
Operating Harvest						
FUEL	DOLS			3.76	0.06	
REPAIR & MAINTENANCE	DOLS			2.99	0.05	
LABOR	DOLS			1.71	0.03	
HAULING ¹	DOLS			13.60	0.21	
Total Harvest				22.06	0.34	
Total Operating Costs				371.38	5.71	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			31.52	0.48	
GENERAL FARM OVERHEAD	DOLS			10.00	0.15	
REAL ESTATE TAXES	DOLS			5.79	0.09	
Total Property and Ownership Costs	DOLS			47.31	0.73	
TOTAL DIRECT COSTS:				418.69	6.44	
NET RECEIPTS BEFORE FACTOR PAYMENTS				163.06	2.51	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	3.08	
RETURN TO MANAGEMENT AND RISK	DOLS			-36.94	-0.57	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES								
		\$/BU								
		-25%	-10%	8.95	+10%	+25%				
		\$ 6.71	\$ 8.06	\$ 8.95	\$ 9.85	\$ 11.19				
ALTERNATIVE YIELDS	-25%	48.8	\$ (91.46)	\$ (26.01)	\$ 17.62	\$ 61.25	\$ 126.70			
	-10%	58.5	\$ (26.01)	\$ 52.53	\$ 104.89	\$ 157.24	\$ 235.78			
BUSHEL		65.0	\$ 17.62	\$ 104.89	\$ 163.06	\$ 221.24	\$ 308.50			
	+10%	71.5	\$ 61.25	\$ 157.24	\$ 221.24	\$ 285.23	\$ 381.22			
	+25%	81.3	\$ 126.70	\$ 235.78	\$ 308.50	\$ 381.22	\$ 490.29			

Table 10. 2016 Estimated Production Costs and Returns - Irrigated Corn in South Platte Valley.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
CORN	BU	3.64	255.00	928.20		
TOTAL RECEIPTS				928.20	3.64	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	124.86	1.00	124.86	0.49	
FERTILIZER	DOLS	93.24	1.00	93.24	0.37	
HERBICIDE	DOLS	27.91	1.00	27.91	0.11	
INSECTICIDE	DOLS	23.21	1.00	23.21	0.09	
IRRIGATION ENERGY	DOLS	58.70	1.00	58.70	0.23	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.04	
CROP INSURANCE	DOLS	48.50	1.00	48.50	0.19	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	0.27	
CUSTOM AERIAL SPRAY	DOLS	8.00	1.00	8.00	0.03	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.05	
FUEL	DOLS			12.18	0.05	
REPAIR & MAINTENANCE	DOLS			9.85	0.04	
LABOR	DOLS			6.01	0.02	
INTEREST EXPENSE ²	DOLS			17.09	0.07	
Total Preharvest	DOLS			522.81	2.05	
Operating Harvest						
FUEL	DOLS			4.56	0.02	
REPAIR & MAINTENANCE	DOLS			5.44	0.02	
LABOR	DOLS			1.66	0.01	
HAULING ¹	DOLS			33.63	0.13	
Total Harvest				45.29	0.18	
Total Operating Costs				568.10	2.23	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			54.94	0.22	
GENERAL FARM OVERHEAD	DOLS			10.00	0.04	
REAL ESTATE TAXES	DOLS			13.25	0.05	
Total Property and Ownership Costs	DOLS			78.19	0.31	
TOTAL DIRECT COSTS				646.29	2.53	
NET RECEIPTS BEFORE FACTOR PAYMENTS				281.91	1.11	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	0.78	
RETURN TO MANAGEMENT AND RISK				81.91	0.32	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES							
		\$/BU							
		-25%	-10%		+10%	+25%			
		\$ 2.73	\$ 3.28	\$ 3.64	\$ 4.00	\$ 4.55			
ALTERNATIVE YIELDS	-25%	191.3	\$ (124.18)	\$ (19.75)	\$ 49.86	\$ 119.48	\$ 223.90	\$ 397.94	\$ 804.02
	-10%	229.5	\$ (19.76)	\$ 105.55	\$ 189.09	\$ 272.63	\$ 374.73	\$ 629.99	
	BUSHELS	255.0	\$ 49.86	\$ 189.09	\$ 281.91	\$ 374.73	\$ 476.83	\$ 629.99	
	+10%	280.5	\$ 119.48	\$ 272.63	\$ 374.73	\$ 476.83	\$ 629.99	\$ 804.02	
	+25%	318.8	\$ 223.90	\$ 397.94	\$ 513.96	\$ 629.99	\$ 804.02		

Table 11. 2016 Estimated Production Costs and Returns - Irrigated Sugar Beets in South Platte Valley.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
SUGARBEETS	TON	36.00	33.00	1188.00		
TOTAL RECEIPTS				1188.00	36.00	
DIRECT COSTS:						
Operating Preharvest						
SEED	DOLS	84.94	1.00	84.94	2.57	
FERTILIZER	DOLS	95.16	1.00	95.16	2.88	
HERBICIDE (APPLIED)	DOLS	94.09	1.00	94.09	2.85	
INSECTICIDE	DOLS	7.52	1.00	7.52	0.23	
FUNGICIDE	DOLS	60.04	1.00	60.04	1.82	
IRRIGATION ENERGY	DOLS	55.40	1.00	55.40	1.68	
IRRIGATION REPAIR	DOLS	10.24	1.00	10.24	0.31	
CROP INSURANCE	DOLS	65.00	1.00	65.00	1.97	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	2.12	
CUSTOM AERIAL SPRAY	DOLS	8.00	2.00	16.00	0.48	
CROP CONSULTANT	DOLS	12.00	1.00	12.00	0.36	
HAND LABOR	DOLS		1.00	0.00	0.00	
FUEL	DOLS			20.16	0.61	
REPAIR & MAINTENANCE	DOLS			14.46	0.44	
LABOR	DOLS			10.96	0.33	
INTEREST EXPENSE ²	DOLS			24.68	0.75	
RETAINED REVENUE & DUES	DOLS	50.48	1.00	50.48	1.53	
Total Preharvest	DOLS			691.13	20.94	
Operating Harvest						
FUEL	DOLS			18.24	0.55	
REPAIR & MAINTENANCE	DOLS			91.76	2.78	
LABOR	DOLS			9.00	0.27	
HAULING ¹	DOLS			165.71	5.02	
Total Harvest				284.71	8.63	
Total Operating Costs				975.84	29.57	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			135.10	4.09	
GENERAL FARM OVERHEAD	DOLS			30.00	0.91	
REAL ESTATE TAXES	DOLS			13.25	0.40	
PAYMENT ON COOP SHARE	DOLS			43.92	1.33	
Total Property and Ownership Costs	DOLS			222.27	5.40	
TOTAL DIRECT COSTS:				1198.11	34.98	
NET RECEIPTS BEFORE FACTOR PAYMENTS				-10.11	1.02	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	6.06	
RETURN TO MANAGEMENT AND RISK				-210.11	-5.04	

1 Hauling Machinery & Labor Charges = \$2.5/CWT and \$0.17 per ton per loaded mile (15 Miles)

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES				
		\$/TON				
		-25%	-10%	\$ 36.00	+10%	+25%
ALTERNATIVE YIELDS	-25%	\$ 27.00	\$ 32.40	\$ 36.00	\$ 39.60	\$ 45.00
	-10%	\$ (529.86)	\$ (396.21)	\$ (307.11)	\$ (218.01)	\$ (84.36)
		\$ (396.21)	\$ (235.83)	\$ (128.91)	\$ (21.99)	\$ 138.39
TONS	33.0	\$ (307.11)	\$ (128.91)	\$ (10.11)	\$ 108.69	\$ 286.89
	+10%	\$ (218.01)	\$ (21.99)	\$ 108.69	\$ 239.37	\$ 435.39
	+25%	\$ (84.36)	\$ 138.39	\$ 286.89	\$ 435.39	\$ 658.14

Table 12. 2016 Estimated Production Costs and Returns - Irrigated Winter Wheat in South Platte Valley.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION:						
HARD RED WINTER WHEAT	BU	3.90	95.00	370.50		
TOTAL RECEIPTS				370.50	3.90	
DIRECT COSTS:						
Operating Preharvest						
SEED	DOLS	22.11	1.00	22.11	0.23	
FERTILIZER	DOLS	42.46	1.00	42.46	0.45	
HERBICIDE (APPLIED)	DOLS	25.10	1.00	25.10	0.26	
IRRIGATION ENERGY	DOLS	30.24	1.00	30.24	0.32	
IRRIGATION REPAIR	DOLS	11.26	1.00	11.26	0.12	
CROP INSURANCE	DOLS	53.00	1.00	53.00	0.56	
SPRINKLER LEASE	DOLS	70.00	1.00	70.00	0.74	
FUEL	DOLS			6.01	0.06	
REPAIR & MAINTENANCE	DOLS			5.11	0.05	
LABOR	DOLS			2.47	0.03	
INTEREST EXPENSE ²	DOLS			11.11	0.12	
Total Preharvest	DOLS			278.87	2.94	
OPERATING HARVEST:						
FUEL	DOLS			3.39	0.04	
REPAIR & MAINTENANCE	DOLS			3.19	0.03	
LABOR	DOLS			1.67	0.02	
HAULING ¹	DOLS			21.00	0.22	
Total Harvest				29.25	0.31	
Total Operating Costs				308.12	3.24	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			33.52	0.35	
GENERAL FARM OVERHEAD	DOLS			10.00	0.11	
REAL ESTATE TAXES	DOLS			11.77	0.12	
Total Property and Ownership Costs	DOLS			55.29	0.58	
TOTAL DIRECT COSTS:				363.41	3.83	
NET RECEIPTS BEFORE FACTOR PAYMENTS				7.09	0.07	
FACTOR PAYMENTS						
LAND @ 4.00%	DOLS			200.00	2.11	
RETURN TO MANAGEMENT AND RISK				-192.91	-2.03	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/BU					
		-25%	-10%	3.90	+10%	+25%	
		\$ 2.93	\$ 3.51	\$ 3.90	\$ 4.29	\$ 4.88	
ALTERNATIVE YIELDS	-25%	71.3	\$ (155.00)	\$ (113.32)	\$ (85.54)	\$ (57.75)	\$ (16.07)
	-10%	85.5	\$ (113.32)	\$ (63.31)	\$ (29.96)	\$ 3.38	\$ 53.40
	BUSHEL	95.0	\$ (85.54)	\$ (29.96)	\$ 7.09	\$ 44.14	\$ 99.71
	+10%	104.5	\$ (57.75)	\$ 3.38	\$ 44.14	\$ 84.89	\$ 146.03
	+25%	118.8	\$ (16.07)	\$ 53.40	\$ 99.71	\$ 146.03	\$ 215.50

Table 13. 2016 Estimated Production Costs and Returns - Dryland Winter Wheat in Northeastern Colorado. Conventional-Till Wheat - Fallow Rotation

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
HARD RED WINTER WHEAT	BU	3.90	84.00	327.60		
TOTAL RECEIPTS				327.60	3.90	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	8.81	1.00	8.81	0.10	
FERTILIZER	DOLS	23.92	1.00	23.92	0.28	
FUNGICIDE	DOLS	16.99	1.00	16.99	0.20	
HERBICIDE	DOLS	10.01	1.00	10.01	0.12	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	0.08	
CROP INSURANCE	DOLS	32.00	1.00	32.00	0.38	
FUEL	DOLS			7.58	0.09	
REPAIR & MAINTENANCE	DOLS			9.22	0.11	
LABOR	DOLS			2.52	0.03	
INTEREST EXPENSE ²	DOLS			4.20	0.05	
Total Preharvest	DOLS			122.25	1.46	
Operating Harvest						
FUEL	DOLS			4.70	0.06	
REPAIR & MAINTENANCE	DOLS			3.25	0.04	
LABOR	DOLS			1.70	0.02	
HAULING ¹	DOLS			17.10	0.20	
Total Harvest				26.75	0.32	
Total Operating Costs				149.00	1.77	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			46.51	0.55	
GENERAL FARM OVERHEAD	DOLS			10.00	0.12	
REAL ESTATE TAXES	DOLS			2.39	0.03	
Total Property and Ownership Costs	DOLS			58.90	0.70	
TOTAL DIRECT COSTS:				207.90	2.48	
NET RECEIPTS BEFORE FACTOR PAYMENTS				119.70	1.43	
FACTOR PAYMENTS						
LAND @ 4.00% ³	DOLS			40.00	0.48	
RETURN TO MANAGEMENT AND RISK	DOLS			79.70	0.95	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 Includes allocation of fallow acres in the rotation

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/BU					
		-25%	-10%	3.90	+10%	+25%	
		\$ 2.93	\$ 3.51	\$ 3.90	\$ 4.29	\$ 4.88	
ALTERNATIVE YIELDS	-25%	63.0	\$ (23.63)	\$ 13.23	\$ 37.80	\$ 62.37	\$ 99.23
	-10%	75.6	\$ 13.23	\$ 57.46	\$ 86.94	\$ 116.42	\$ 160.65
BUSHEL		84.0	\$ 37.80	\$ 86.94	\$ 119.70	\$ 152.46	\$ 201.60
	+10%	92.4	\$ 62.37	\$ 116.42	\$ 152.46	\$ 188.50	\$ 242.55
	+25%	105.0	\$ 99.23	\$ 160.65	\$ 201.60	\$ 242.55	\$ 303.98

Table 14. 2016 Estimated Production Costs and Returns - Dryland Winter Wheat in Northeastern Colorado. Reduced-Till in a Two-Crop in Three-Year Rotation.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
HARD RED WINTER WHEAT	BU	3.90	87.00	339.30		
TOTAL RECEIPTS				339.30	3.90	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	8.81	1.00	8.81	0.10	
FERTILIZER	DOLS	23.92	1.00	23.92	0.27	
HERBICIDE	DOLS	33.80	1.00	33.80	0.39	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	0.08	
CROP INSURANCE	DOLS	32.00	1.00	32.00	0.37	
FUEL	DOLS			6.97	0.08	
REPAIR & MAINTENANCE	DOLS			6.93	0.08	
LABOR	DOLS			2.37	0.03	
INTEREST EXPENSE ²	DOLS			4.35	0.05	
Total Preharvest	DOLS			126.15	1.45	
Operating Harvest						
FUEL	DOLS			4.30	0.05	
REPAIR & MAINTENANCE	DOLS			3.25	0.04	
LABOR	DOLS			1.70	0.02	
HAULING ¹	DOLS			17.20	0.20	
Total Harvest				26.45	0.30	
Total Operating Costs				152.60	1.75	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			35.91	0.41	
GENERAL FARM OVERHEAD	DOLS			10.00	0.11	
REAL ESTATE TAXES	DOLS			2.39	0.03	
Total Property and Ownership Costs	DOLS			48.30	0.56	
TOTAL DIRECT COSTS:				200.90	2.31	
NET RECEIPTS BEFORE FACTOR PAYMENTS				138.40	1.59	
FACTOR PAYMENTS						
LAND @ 4.00% ³	DOLS			40.00	0.46	
RETURN TO MANAGEMENT AND RISK	DOLS			98.40	1.13	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 Includes allocation of fallow acres in the rotation

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES							
		\$/BU							
		-25%		-10%		+10%		+25%	
		\$	\$	\$	\$	\$	\$	\$	\$
ALTERNATIVE YIELDS	-25%	65.3	(10.04)	28.13	53.58	79.02	117.19		
	-10%	78.3	28.13	73.93	104.47	135.01	180.81		
BUSHEL		87.0	53.58	104.47	138.40	172.33	223.23		
	+10%	95.7	79.02	135.01	172.33	209.65	265.64		
	+25%	108.8	117.19	180.81	223.23	265.64	329.26		

Table 15. 2016 Estimated Production Costs and Returns - Dryland Corn in Northeastern Colorado. Reduced-Till in a Two-Crop in Three-Year Rotation.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
CORN	BU	3.66	86.00	314.76		
CROP INSURANCE INDEMNITY PAYMEN DOLS				0.00		
TOTAL RECEIPTS				314.76	3.66	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	57.17	1.00	57.17	0.66	
FERTILIZER	DOLS	35.38	1.00	35.38	0.41	
HERBICIDE	DOLS	38.48	1.00	38.48	0.45	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	0.08	
CROP INSURANCE	DOLS	25.00	1.00	25.00	0.29	
FUEL	DOLS			3.23	0.04	
REPAIR & MAINTENANCE	DOLS			2.80	0.03	
LABOR	DOLS			2.02	0.02	
INTEREST EXPENSE ²	DOLS			6.17	0.07	
Total Preharvest	DOLS			177.25	2.06	
Operating Harvest						
FUEL	DOLS			4.17	0.05	
REPAIR & MAINTENANCE	DOLS			5.21	0.06	
LABOR	DOLS			1.49	0.02	
HAULING ¹	DOLS			17.20	0.20	
Total Harvest				28.07	0.33	
Total Operating Costs				205.32	2.39	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			32.12	0.37	
GENERAL FARM OVERHEAD	DOLS			10.00	0.12	
REAL ESTATE TAXES	DOLS			2.46	0.03	
Total Property and Ownership Costs	DOLS			44.58	0.52	
TOTAL DIRECT COSTS				249.90	2.91	
NET RECEIPTS BEFORE FACTOR PAYMENTS				64.86	0.75	
FACTOR PAYMENTS						
LAND @ 4.00% ³	DOLS			40.00	0.47	
RETURN TO MANAGEMENT AND RISK	DOLS			24.86	0.29	

1 Hauling Machinery & Labor Charges = \$0.20/Bushel

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 Includes allocation of fallow acres in the rotation

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/BU					
		-25%	-10%	+10%	+25%		
		\$ 2.75	\$ 3.29	\$ 3.66	\$ 4.03	\$ 4.58	
ALTERNATIVE YIELDS	-25%	64.5	\$ (72.85)	\$ (37.44)	\$ (13.83)	\$ 9.78	\$ 45.19
	-10%	77.4	\$ (37.44)	\$ 5.06	\$ 33.38	\$ 61.71	\$ 104.21
		86.0	\$ (13.83)	\$ 33.38	\$ 64.86	\$ 96.34	\$ 143.55
	+10%	94.6	\$ 9.78	\$ 61.71	\$ 96.34	\$ 130.96	\$ 182.90
	+25%	107.5	\$ 45.19	\$ 104.21	\$ 143.55	\$ 182.90	\$ 241.91

**Table 16. 2016 Estimated Production Costs and Returns - Dryland Proso Millet.
Reduced-Till in a Two-Crop in Three-Year Rotation.**

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
PROSO MILLET	CWT	5.78	57.00	329.46		
CROP INSURANCE INDEMNITY				0.00		
TOTAL RECEIPTS				329.46	5.78	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	4.01	1.00	4.01	0.07	
FERTILIZER	DOLS	14.02	1.00	14.02	0.25	
HERBICIDE	DOLS	12.67	1.00	12.67	0.22	
CUSTOM APPLICATION	DOLS	7.00	1.00	7.00	0.12	
CROP INSURANCE	DOLS	11.00	1.00	11.00	0.19	
FUEL	DOLS			5.11	0.09	
REPAIR & MAINTENANCE	DOLS			4.90	0.09	
LABOR	DOLS			2.55	0.04	
INTEREST EXPENSE ²	DOLS			2.21	0.04	
Total Preharvest	DOLS			63.47	1.11	
Operating Harvest						
FUEL	DOLS			8.56	0.15	
REPAIR & MAINTENANCE	DOLS			7.86	0.14	
LABOR	DOLS			4.23	0.07	
HAULING ¹	DOLS			22.80	0.40	
Total Harvest				43.45	0.76	
Total Operating Costs				106.92	1.88	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			43.44	0.76	
GENERAL FARM OVERHEAD	DOLS			10.00	0.18	
REAL ESTATE TAXES	DOLS			2.39	0.04	
Total Property and Ownership Costs	DOLS			55.83	0.98	
TOTAL DIRECT COSTS				162.75	2.86	
NET RECEIPTS BEFORE FACTOR PAYMENTS				166.71	2.92	
FACTOR PAYMENTS						
LAND @ 4.00% ³	DOLS			40.00	0.70	
RETURN TO MANAGEMENT AND RISK	DOLS			126.71	2.22	

1 Hauling Machinery & Labor Charges = \$0.40/CWT

2 Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

3 Includes allocation of fallow acres in the rotation

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES					
		\$/CWT					
		-25%	-10%		+10%	+25%	
		\$	\$	\$	\$	\$	\$
ALTERNATIVE YIELDS	-25%	42.8	\$ 22.57	\$ 59.64	\$ 84.35	\$ 109.05	\$ 146.12
	-10%	51.3	\$ 59.64	\$ 104.11	\$ 133.76	\$ 163.42	\$ 207.89
	CWT	57.0	\$ 84.35	\$ 133.76	\$ 166.71	\$ 199.66	\$ 249.08
	+10%	62.7	\$ 109.05	\$ 163.42	\$ 199.66	\$ 235.90	\$ 290.26
	+25%	71.3	\$ 146.12	\$ 207.89	\$ 249.08	\$ 290.26	\$ 352.03

Table 17. 2016 Estimated Production Costs and Returns - Dryland Oil Sunflowers in Northeastern Colorado. Reduced-Till in a Two-Crop in Three-Year Rotation.

	Unit	Price or Cost/Unit	Quantity	Value or Cost Per Acre	Value or Cost/Unit Production	Your Farm
GROSS RECEIPTS FROM PRODUCTION						
SUNFLOWERS	CWT	16.80	14.75	247.80		
CROP INSURANCE INDEMNITY				0.00		
TOTAL RECEIPTS				247.80	16.80	
DIRECT COSTS						
Operating Preharvest						
SEED	DOLS	25.58	1.00	25.58	1.73	
FERTILIZER	DOLS	24.10	1.00	24.10	1.63	
HERBICIDE	DOLS	44.00	1.00	44.00	2.98	
CUSTOM APPLICATION	DOLS	7.00	2.00	14.00	0.95	
INSECTICIDE	DOLS	10.90	1.00	10.90	0.74	
CROP INSURANCE	DOLS	42.00	1.00	42.00	2.85	
CUSTOM AERIAL APPLICATION	DOLS	8.00	1.00	8.00	0.54	
FUEL	DOLS			2.01	0.14	
REPAIR & MAINTENANCE	DOLS			2.07	0.14	
LABOR	DOLS			1.33	0.09	
INTEREST EXPENSE ²	DOLS			6.16	0.42	
Total Preharvest				180.15	12.21	
Operating Harvest						
FUEL	DOLS			4.91	0.33	
REPAIR & MAINTENANCE	DOLS			5.06	0.34	
LABOR	DOLS			1.62	0.11	
HAULING ¹	DOLS			3.00	0.20	
Total Harvest				14.59	0.99	
Total Operating Costs				194.74	13.20	
Property and Ownership Costs						
MACHINERY OWNERSHIP COSTS	DOLS			22.49	1.52	
GENERAL FARM OVERHEAD	DOLS			10.00	0.68	
REAL ESTATE TAXES	DOLS			2.73	0.19	
Total Property and Ownership Costs	DOLS			35.22	2.39	
TOTAL DIRECT COSTS				229.96	15.59	
NET RECEIPTS BEFORE FACTOR PAYMENTS				17.84	1.21	
FACTOR PAYMENTS						
LAND @ 4.00% ³	DOLS			40.00	2.71	
RETURN TO MANAGEMENT AND RISK	DOLS			-22.16	-1.50	

¹ Hauling Machinery & Labor Charges = \$0.25/Cwt

² Interest on Operating Capital is calculated on 1/2 of pre-harvest operating costs at 7%

³ Includes allocation of fallow acres in the rotation

BREAKEVEN ANALYSIS - PER ACRE RETURNS OVER TOTAL DIRECT COSTS (\$/ACRE)

		ALTERNATIVE PRICES				
		\$/CWT				
		-25%	-10%		+10%	+25%
		\$ 12.60	\$ 15.12	\$ 16.80	\$ 18.48	\$ 21.00
ALTERNATIVE YIELDS	-25%	\$ (90.57)	\$ (62.70)	\$ (44.11)	\$ (25.53)	\$ 2.35
	-10%	\$ (62.70)	\$ (29.24)	\$ (6.94)	\$ 15.36	\$ 48.82
	CWT	\$ (44.11)	\$ (6.94)	\$ 17.84	\$ 42.62	\$ 79.79
	+10%	\$ (25.53)	\$ 15.36	\$ 42.62	\$ 69.88	\$ 110.77
	+25%	\$ 2.35	\$ 48.82	\$ 79.79	\$ 110.77	\$ 157.23

COST OF PRODUCTION TRENDS FOR IRRIGATED AND DRYLAND CROPS IN THE GOLDEN PLAINS AREA, 2016 - 2012

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Each year, irrigated and dryland crop enterprise budgets are published in the Golden Plains Area Agricultural Handbook. These budgets are compiled using production and price data obtained from producers surveyed for each production season. No attempt is made each year to average data over time or to include the effects of farm program payments on net income. This paper will evaluate cost of production trends over a five year time period and the contribution of farm program payments or crop insurance indemnity payments for the crop enterprise budgets published in this handbook. Irrigated crops include alfalfa, pinto beans, corn, potatoes, sugar beets and wheat. Dryland crops include reduced-till wheat, corn, millet and oil-type sunflowers.

ARC-CO and PLC Payments

The Agricultural Act of 2014 provided farmers and ranchers with a unique opportunity to custom design the Title 1 Commodity Programs to meet the needs of their individual operations. Growers were able to reallocate base acres, update program crop yields, and choose between three different commodity programs, Price Loss Coverage (PLC), Agriculture Risk Coverage-County (ARC-CO), and Agriculture Risk Coverage-Individual (ARC-IC).

Base acre reallocation was determined by the acres planted to program crops in 2009 through 2012. In most cases producers chose the allocation (current or reallocation) that would result in the largest share of program crops associated with greater program payments. Nationally, US crop producers increased corn base acres by 12.8 million acres, soybean base acres increased by 4.7 million acres, and wheat base acres decreased by 9.9 million acres.

In addition to reallocating base acres, the Agricultural Act of 2014 allowed producers an opportunity to update counter-cyclical yields on program crops. In many cases producers

had not updated yields since the early 1980's. Nationwide yields of corn, soybeans and wheat increased by 30% over the counter-cyclical yields.

Agricultural producers were required to select PLC, ARC-CO or ARC-IC. Nationally, 96% of soybean producers, 91% of corn producers, and 66% of wheat producers chose ARC-CO. Colorado producers selected the ARC-CO at lower rates than national trends. In Colorado soybean, corn, and wheat producers selected ARC-CO by 68%, 65% and 32% respectively.

Program payments for PLC and ARC-CO are partially determined by the Marketing Year Average (MYA) of the underlying commodity and as such if a payment is triggered it's paid in the following year. Golden Plains Area producers received their 2014 program payments in November 2015. PLC payments for corn in 2014 were \$.05/bu. and wheat did not trigger a PLC payment.

Since 2005, the Mississippi State University Budget generator has been used to formulate the enterprise budgets in Colorado. This software matches enterprise specific equipment and inputs to estimate operating, input, depreciation and interest costs. The budgets generated with this software account for labor and capital payments in the machinery operating and ownership categories. Categories such as labor, fuel, repairs and operating interest are included as machinery operating costs in the pre and post-harvest categories. All other changes in format will be explained in footnotes.

Each crop enterprise budget presented in Tables 1 through 9 contains four major sections; revenue, direct costs, property and ownership costs and breakeven prices. The columns show the five-year average and data for each year for 2016 through 2012.

The first section of the budget is gross receipts from production. Price received data is derived from producer surveys collected in the data gathering process. If typical price received was below the Marketing Year Average price for a particular commodity, an estimate for an ARC-CO or PLC payment is included in the trend analysis. Crop insurance indemnity payments are also included in the revenue section if applicable. Crop insurance is based on a Crop Revenue Coverage (CRC) policy for wheat and corn and Multi-Peril Crop Insurance (MPCI) for sunflowers.

The next section of the budget describes the cost of production for each crop enterprise. Direct costs are broken down into preharvest, harvest, and property and ownership costs. Preharvest costs include variable costs of production such as fertilizer, seed, herbicide, fuel and lube and others. These items can vary with the level of production in the enterprise. Harvest costs include paid labor, and fuel and lube costs for harvest machinery. Property and ownership costs include fixed costs of production such as depreciation, insurance, taxes and overhead expenses. These cost items must be accounted for whether production occurs or not. Net income before adjustments for unpaid labor, capital investment and land investment is calculated following the cost sections of the budget. The next part of the budget presents calculation of these factors of production. Finally, a return to management and risk is calculated.

The last section of each crop enterprise budget calculates breakeven prices to cover operating costs, direct costs and factor payments. Annual breakeven prices are calculated by

dividing each level of cost investment by crop yield. This breakeven price does not factor in government payments or crop insurance indemnity payments.

Figures 1 through 27 present a graphical representation of revenue, cost and breakeven sections of each enterprise budget. For each enterprise, the first graph depicts the contribution of production revenue, farm program payments and crop insurance indemnity payments (when applicable) to total revenue. In general, congressional intent of the 1996 Farm Bill for declining contribution of farm program payments to farm income can be seen in these graphs.

The second graph depicts the breakdown of costs in each enterprise budget. Costs are broken down into operating costs (preharvest and harvest), property and ownership costs and factor payments. The contribution of these costs to total enterprise costs can clearly be seen in these graphs.

The third graph in the series plots breakeven costs to cover operating costs (harvest and preharvest), direct costs (operating plus property and ownership) and direct costs plus factor payments along with marketing year average price received for each crop. These graphs show the relationship between breakeven costs and market prices and show the importance of market planning to cover various cost levels in each enterprise budget.

Table 1. Irrigated Alfalfa Cost of Production Trends, 2016-2012

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
ALFALFA	ton/acre	5.38	6.00	6.00	5.00	5.00	4.90
PRICE RECEIVED	\$/ton	189.20	117.00	178.00	195.00	246.00	210.00
RECEIPTS FROM PRODUCTION	\$/acre	1,000.80	702.00	1,068.00	975.00	1,230.00	1,029.00
DIRECT COSTS:							
OPERATING--PREHARVEST							
ESTABLISHMENT ALLOCATION (5 YRS.)	\$/acre	45.10	32.18	36.57	52.25	52.25	52.25
FERTILIZER	\$/acre	76.36	58.37	66.33	77.13	77.13	102.84
HERBICIDE	\$/acre	26.16	25.53	26.32	26.32	26.32	26.32
INSECTICIDE	\$/acre	18.68	18.22	18.79	18.79	18.79	18.79
IRRIGATION ENERGY	\$/acre	81.27	75.65	83.15	75.59	75.90	96.08
IRRIGATION REPAIR	\$/acre	10.65	11.26	11.26	10.24	10.24	10.24
SPRINKLER LEASE	\$/acre	70.00	70.00	70.00	70.00	70.00	70.00
CUSTOM SPRAY INSECTICIDE	\$/acre	7.40	7.00	8.00	7.00	7.00	8.00
CUSTOM APPLICATION	\$/acre						
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre						
MACH REPAIRS	\$/acre						
INTEREST ON OP. CAP.	\$/acre	12.17	11.48	11.46	12.09	12.10	13.70
TOTAL PREHARVEST:	\$/acre	347.79	309.69	331.88	349.41	349.73	398.22
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	168.73	159.63	198.00	162.00	162.00	162.00
TOTAL HARVEST:	\$/acre	168.73	159.63	198.00	162.00	162.00	162.00
TOTAL OPERATING COSTS:	\$/acre	516.51	469.32	529.88	511.41	511.73	560.22
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	16.43	16.43	16.43	16.43	16.43	16.43
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	15.42	15.42	15.42	15.42	15.42	15.42
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	41.85	41.85	41.85	41.85	41.85	41.85
TOTAL DIRECT COSTS:	\$/acre	558.36	511.17	571.73	553.26	553.58	602.07
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	442.44	190.83	496.27	421.74	676.42	426.93
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	4.00%	185.00	200.00	200.00	200.00	162.50	162.50
TOTAL FACTOR PAYMENTS	\$/acre	185.00	200.00	200.00	200.00	162.50	162.50
FACTOR PYMTS PLUS DIRECT COSTS	\$/acre	743.36	711.17	771.73	753.26	716.08	764.57
RETURN TO MANAGEMENT AND RISK	\$/acre	257.44	-9.17	296.27	221.74	513.92	264.43
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/ton	97.10	78.22	88.31	102.28	102.35	114.33
REQUIRED TO COVER DIRECT COSTS	\$/ton	104.94	85.20	95.29	110.65	110.72	122.87
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/ton	139.41	118.53	128.62	150.65	143.22	156.03

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Includes Baling \$15/Bale (Round Bales), Hauling/Stacking = \$3/Bale

Table 2. Irrigated Pinto Beans Cost of Production Trends, 2016-2012

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
PINTO BEANS	cwt/ac	26.12	35.00	35.00	25.00	18.19	17.42
PRICE RECEIVED	\$/cwt	35.15	33.15	26.50	29.45	36.66	50.00
RECEIPTS FROM PRODUCTION	\$/acre	872.37	1,160.25	927.50	736.25	666.85	871.00
FARM PROGRAM PAYMENTS	\$/acre	21.56				20.25	22.86
TOTAL REVENUE	\$/acre	880.99	1,160.25	927.50	736.25	687.10	893.86
DIRECT COSTS:							
OPERATING--PREHARVEST							
FERTILIZER	\$/acre	108.77	90.24	93.03	108.18	108.18	144.24
SEED	\$/acre	50.22	51.41	49.92	49.92	49.92	49.92
HERBICIDE	\$/acre	35.39	34.53	35.60	35.60	35.60	35.60
FUNGICIDES/BACTERICIDES	\$/acre	26.09	25.27	26.29	26.29	26.29	26.29
INSECTICIDES	\$/acre	7.65	7.65	7.65	7.65	7.65	7.65
IRRIGATION ENERGY	\$/acre	51.39	52.44	51.42	46.75	46.94	59.42
IRRIGATION REPAIR	\$/acre	10.65	11.26	11.26	10.24	10.24	10.24
SPRINKLER LEASE	\$/acre	70.00	70.00	70.00	70.00	70.00	70.00
CROP INSURANCE	\$/acre	28.71	29.17	28.60	28.60	28.60	28.60
CUSTOM APPLICATION	\$/acre	15.20	16.00	15.00	15.00	15.00	15.00
CROP CONSULTANT	\$/acre	8.00	12.00	7.00	7.00	7.00	7.00
MACHINERY OPERATING COSTS ¹							
MACH FUEL & LUBE	\$/acre	10.05	7.73	7.62	11.05	11.10	12.74
MACH REPAIRS	\$/acre	5.37	5.37	5.37	5.37	5.37	5.37
MACHINERY LABOR	\$/acre	3.65	3.65	3.65	3.65	3.65	3.65
INTEREST ON OP. CAP.	\$/acre	15.08	14.44	14.55	14.89	14.89	16.65
TOTAL PREHARVEST:	\$/acre	446.22	431.16	426.96	440.19	440.43	492.37
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	6.01	8.05	8.05	5.75	4.18	4.01
MACH FUEL & LUBE	\$/acre	20.28	15.51	15.59	22.27	22.36	25.65
MACH REPAIRS	\$/acre	8.51	8.51	8.51	8.51	8.51	8.51
MACHINERY LABOR	\$/acre	6.06	6.06	6.06	6.06	6.06	6.06
TOTAL HARVEST:	\$/acre	40.85	38.13	38.21	42.59	41.11	44.23
TOTAL OPERATING COSTS:	\$/acre	487.08	469.29	465.17	482.78	481.54	536.60
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	60.03	60.03	60.03	60.03	60.03	60.03
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	15.42	15.42	15.42	15.42	15.42	15.42
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	85.45	85.45	85.45	85.45	85.45	85.45
TOTAL DIRECT COSTS:	\$/acre	572.53	554.74	550.62	568.23	566.99	622.05
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	308.47	605.51	376.88	168.02	120.11	271.81
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	185.00	200.00	200.00	200.00	162.50	162.50
TOTAL FACTOR PAYMENTS	\$/acre	185.00	200.00	200.00	200.00	162.50	162.50
FACTOR PYMTS PLUS DIRECT COSTS	\$/acre	757.53	754.74	750.62	768.23	729.49	784.55
RETURN TO MANAGEMENT AND RISK	\$/acre	123.47	405.51	176.88	-31.98	-42.39	109.31
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/cwt	20.66	13.41	13.29	19.31	26.47	30.80
REQUIRED TO COVER DIRECT COSTS	\$/cwt	24.24	15.85	15.73	22.73	31.17	35.71
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/cwt	31.78	21.56	21.45	30.73	40.10	45.04

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.23/Cwt

Figure 1. Irrigated Alfalfa Revenue per Acre, 2016-2012

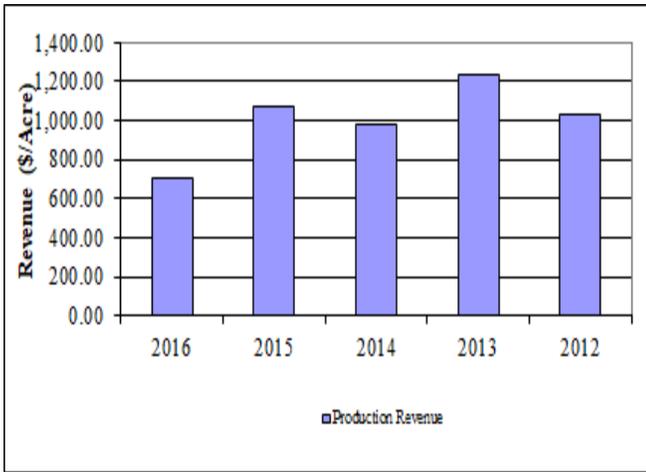


Figure 4. Irrigated Pinto Beans Revenue per Acre, 2016-2012

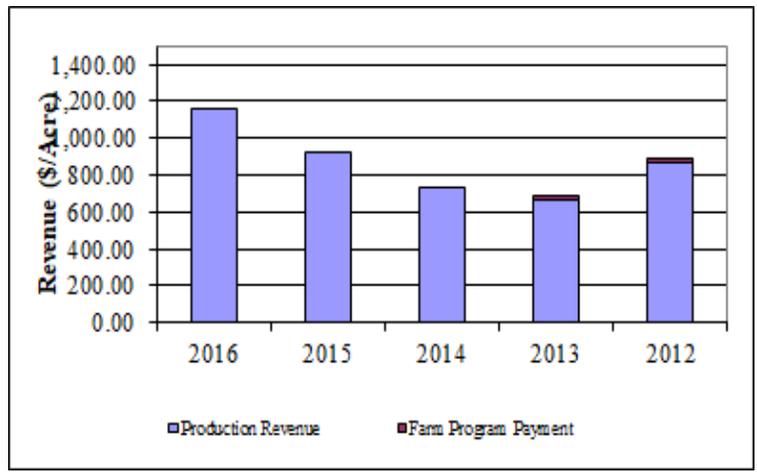


Figure 2. Irrigated Alfalfa Cost of Production per Acre, 2016-2012

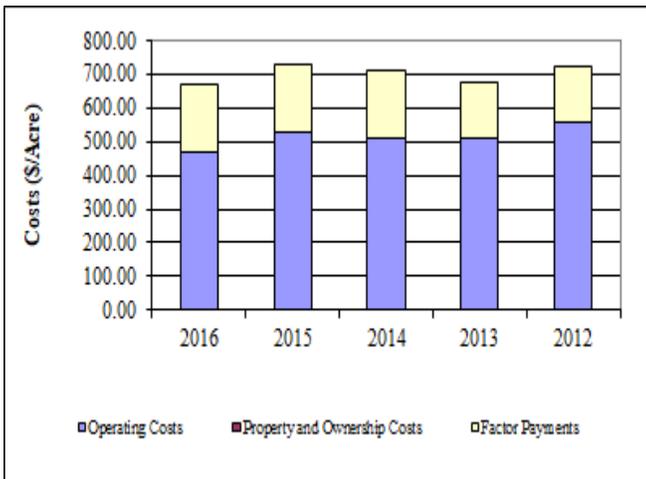


Figure 5. Irrigated Pinto Beans Cost of Production per Acre, 2016-2012

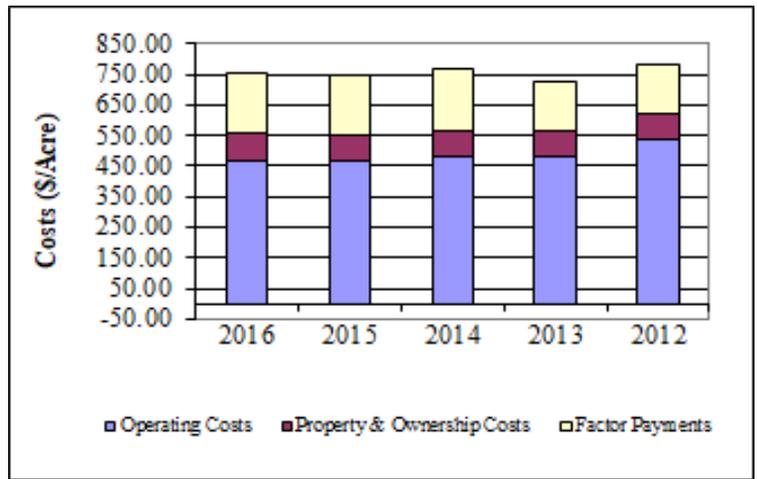


Figure 3. Irrigated Alfalfa Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

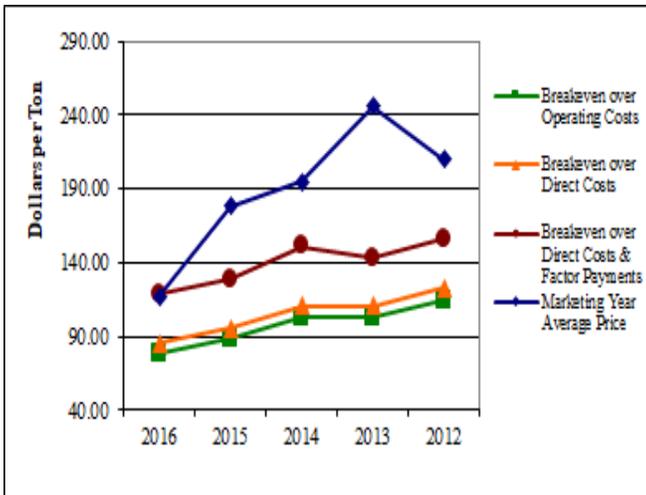


Figure 6. Irrigated Pinto Beans Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

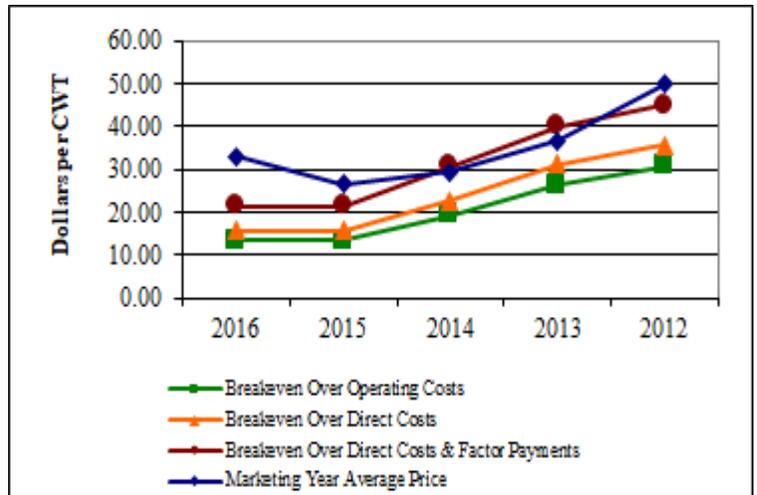


Table 3. Irrigated Corn Cost of Production Trends, 2016-2012

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
CORN	bu/acre	220.80	240.00	260.00	230.00	182.00	192.00
PRICE RECEIVED	\$/bu	4.52	3.46	3.70	4.10	4.54	6.80
RECEIPTS FROM PRODUCTION	\$/acre	973.46	830.40	962.00	943.00	826.28	1,305.60
FARM PROGRAM PAYMENTS	\$/Acre	21.56				20.25	22.86
TOTAL REVENUE	\$/Acre	982.08	830.40	962.00	943.00	846.53	1,328.46
DIRECT COSTS:							
OPERATING--PREHARVEST							
SEED (31,000)	\$/acre	91.92	124.86	83.69	83.69	83.69	83.69
FERTILIZER	\$/acre	119.94	92.24	104.06	121.00	121.00	161.38
HERBICIDES	\$/acre	28.13	26.35	28.58	28.58	28.58	28.58
INSECTICIDES	\$/acre	15.75	21.07	14.42	14.42	14.42	14.42
IRRIGATION ENERGY	\$/acre	80.71	65.00	85.12	77.38	77.70	98.36
IRRIGATION REPAIR	\$/acre	21.41	65.07	11.26	10.24	10.24	10.24
CROP INSURANCE	\$/acre	54.50	44.50	57.00	57.00	57.00	57.00
SPRINKLER LEASE	\$/acre	70.00	70.00	70.00	70.00	70.00	70.00
CUSTOM SPRAY	\$/acre	8.00	8.00	8.00	8.00	8.00	8.00
CROP CONSULTANT	\$/acre	8.80	12.00	8.00	8.00	8.00	8.00
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre	17.23	12.65	13.34	19.05	19.14	21.96
MACH REPAIRS	\$/acre	7.61	7.61	7.61	7.61	7.61	7.61
MACHINERY LABOR	\$/acre	8.40	8.40	8.40	8.40	8.40	8.40
INTEREST ON OP. CAP.	\$/acre	18.23	17.48	17.48	17.98	17.98	20.22
TOTAL PREHARVEST:	\$/acre	550.63	575.23	516.96	531.35	531.76	597.86
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	43.00	50.00	44.20	46.00	36.40	38.40
MACH FUEL & LUBE	\$/acre	5.37	4.12	4.12	5.89	5.92	6.80
MACH REPAIRS	\$/acre	5.09	5.09	5.09	5.09	5.09	5.09
MACHINERY LABOR	\$/acre	1.66	1.66	1.66	1.66	1.66	1.66
TOTAL HARVEST:	\$/acre	55.12	60.87	55.07	58.64	49.07	51.95
TOTAL OPERATING COSTS:	\$/acre	605.75	636.10	572.03	589.99	580.83	649.81
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	52.79	52.79	52.79	52.79	52.79	52.79
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	15.42	15.42	15.42	15.42	15.42	15.42
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	78.21	78.21	78.21	78.21	78.21	78.21
TOTAL DIRECT COSTS:	\$/acre	683.96	714.31	650.24	668.20	659.04	728.02
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	298.12	116.09	311.76	274.80	187.49	600.44
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	185.00	200.00	200.00	200.00	162.50	162.50
TOTAL FACTOR PAYMENTS	\$/acre	185.00	200.00	200.00	200.00	162.50	162.50
FACTOR PYMT'S PLUS DIRECT COSTS	\$/acre	868.96	914.31	850.24	868.20	821.54	890.52
RETURN TO MANAGEMENT AND RISK	\$/acre	113.12	-83.91	111.76	74.80	24.99	437.94
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/bu	2.80	2.65	2.20	2.57	3.19	3.38
REQUIRED TO COVER DIRECT COSTS	\$/bu	3.16	2.98	2.50	2.91	3.62	3.79
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/bu	4.00	3.81	3.27	3.77	4.51	4.64

1 Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

2 Hauling Machinery & Labor Charges = \$0.17/Bushel

Table 4. Irrigated Sugar Beets Cost of Production Trends, 2016-2012

	UNIT	5-Year	2016	2015	2014	2013	2012
		Average					
			VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
SUGAR BEETS	ton	33.12	33.00	33.00	33.00	35.00	31.60
PRICE RECEIVED	\$/ton	45.06	36.00	46.70	45.00	38.00	59.60
RECEIPTS FROM PRODUCTION	\$/acre	1,485.49	1,188.00	1,541.10	1,485.00	1,330.00	1,883.36
FARM PROGRAM PAYMENTS	\$/acre	21.56				20.25	22.86
TOTAL REVENUE	\$/acre	1,494.11	1,188.00	1,541.10	1,485.00	1,350.25	1,906.22
DIRECT COSTS:							
OPERATING--PREHARVEST							
FERTILIZER (APPLIED)	\$/acre	101.84	83.03	87.40	101.63	101.63	135.50
SEED	\$/acre	82.96	84.94	82.47	82.47	82.47	82.47
HERBICIDE	\$/acre	116.08	113.28	116.78	116.78	116.78	116.78
INSECTICIDES	\$/acre	12.54	12.54	12.54	12.54	12.54	12.54
FUNGICIDE	\$/acre	25.09	24.18	25.32	25.32	25.32	25.32
IRRIGATION REPAIR	\$/acre	10.65	11.26	11.26	10.24	10.24	10.24
IRRIGATION ENERGY	\$/acre	106.29	106.78	106.78	97.07	97.46	123.37
SPRINKLER LEASE	\$/acre	70.00	70.00	70.00	70.00	70.00	70.00
CROP INSURANCE	\$/acre	57.00	57.00	57.00	57.00	57.00	57.00
CUSTOM APPLICATION	\$/acre	15.00	15.00	15.00	15.00	15.00	15.00
CROP CONSULTANT	\$/acre	8.80	12.00	8.00	8.00	8.00	8.00
MACHINERY OPERATING COSTS ¹							
MACH FUEL & LUBE	\$/acre	21.87	16.10	16.93	24.18	24.28	27.85
MACH REPAIRS	\$/acre	12.48	12.48	12.48	12.48	12.48	12.48
MACHINERY LABOR	\$/acre	9.79	9.79	9.79	9.79	9.79	9.79
INTEREST ON OP. CAP.	\$/acre	22.79	22.11	22.11	22.50	22.50	24.72
TOTAL PREHARVEST:	\$/acre	673.18	650.49	653.86	665.00	665.49	731.06
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²							
MACH FUEL & LUBE	\$/acre	28.98	21.30	22.43	32.05	32.18	36.92
MACH REPAIRS	\$/acre	91.82	90.34	92.19	92.19	92.19	92.19
MACHINERY LABOR	\$/acre	9.00	9.00	9.00	9.00	9.00	9.00
TOTAL HARVEST:	\$/acre	295.39	278.96	290.27	299.89	310.12	297.69
TOTAL OPERATING COSTS:	\$/acre	968.57	929.45	944.13	964.89	975.61	1,028.75
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	132.23	132.23	132.23	132.23	132.23	132.23
GENERAL FARM OVERHEAD	\$/acre	30.00	30.00	30.00	30.00	30.00	30.00
PAYMENT ON COOP SHARE ³	\$/acre	43.92	43.92	43.92	43.92	43.92	43.92
REAL ESTATE TAXES	\$/acre	15.42	15.42	15.42	15.42	15.42	15.42
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	221.57	221.57	221.57	221.57	221.57	221.57
TOTAL DIRECT COSTS:	\$/acre	1,190.14	1,151.02	1,165.70	1,186.46	1,197.18	1,250.32
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	303.98	36.98	375.40	298.54	153.07	655.90
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	185.00	200.00	200.00	200.00	162.50	162.50
TOTAL FACTOR PAYMENTS	\$/acre	185.00	200.00	200.00	200.00	162.50	162.50
FACTOR PYMTS PLUS DIRECT COSTS	\$/acre	1,375.14	1,351.02	1,365.70	1,386.46	1,359.68	1,412.82
RETURN TO MANAGEMENT AND RISK	\$/acre	118.98	-163.02	175.40	98.54	-9.43	493.40
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/ton	29.29	28.17	28.61	29.24	27.87	32.56
REQUIRED TO COVER DIRECT COSTS	\$/ton	35.99	34.88	35.32	35.95	34.21	39.57
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/ton	41.58	40.94	41.38	42.01	38.85	44.71

1 Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

2 Hauling Machinery & Labor Charges = \$2.5/Ton, \$0.17/Ton X 15 Loaded Miles

3 \$185 Annualized over 5 years at 6% interest

Figure 7. Irrigated Corn Revenue per Acre, 2016-2012

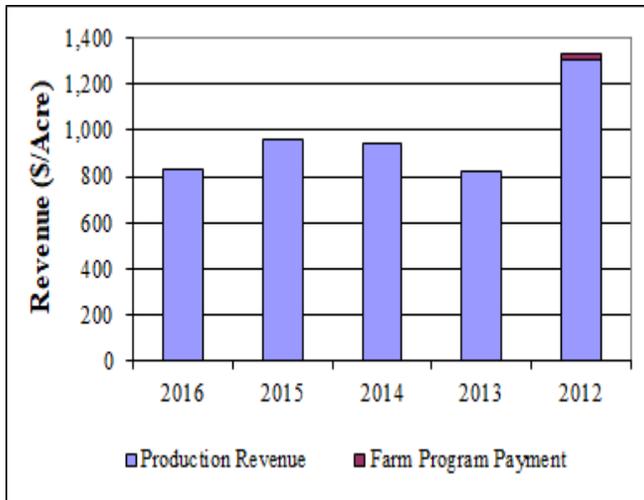


Figure 8. Irrigated Corn Cost of Production per Acre, 2016-2012

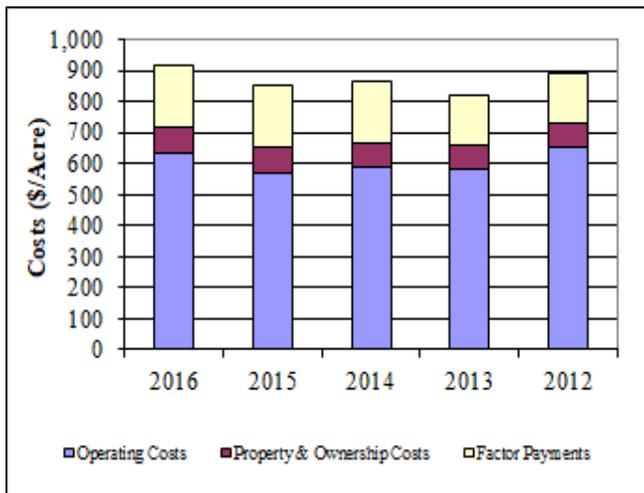


Figure 9. Irrigated Corn Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

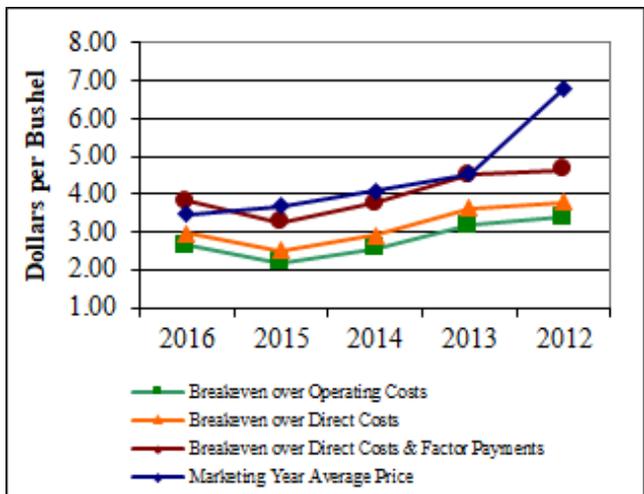


Figure 10. Irrigated Sugar Beets Revenue per Acre, 2016-2012

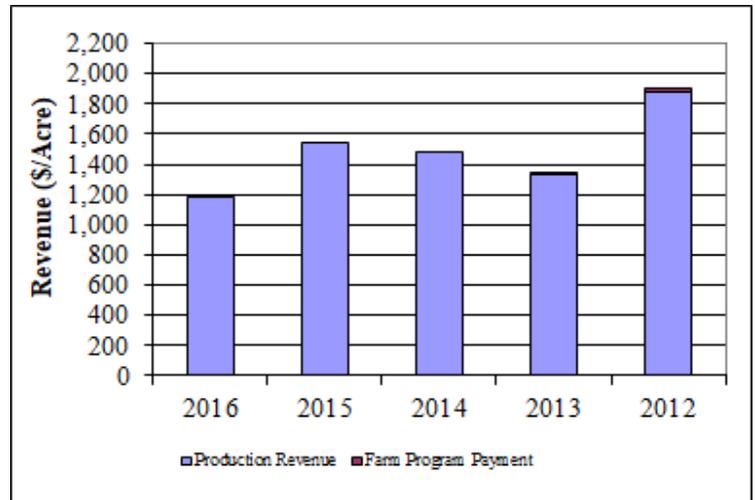


Figure 11. Irrigated Sugar Beets Cost of Production per Acre, 2016-2012

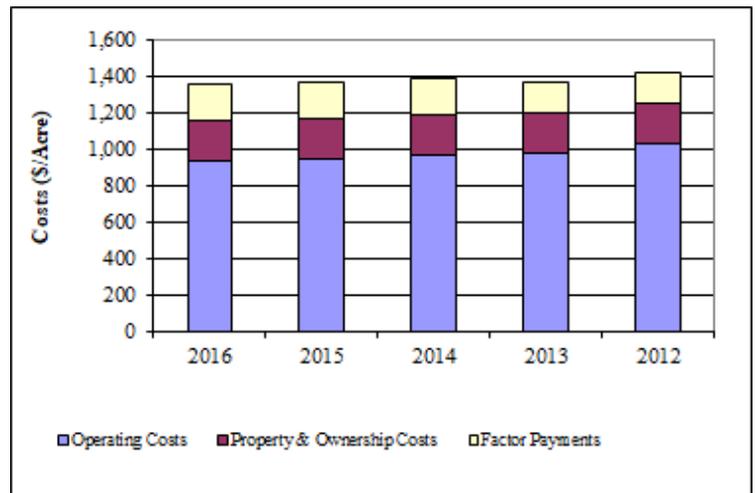


Figure 12. Irrigated Sugar Beets Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

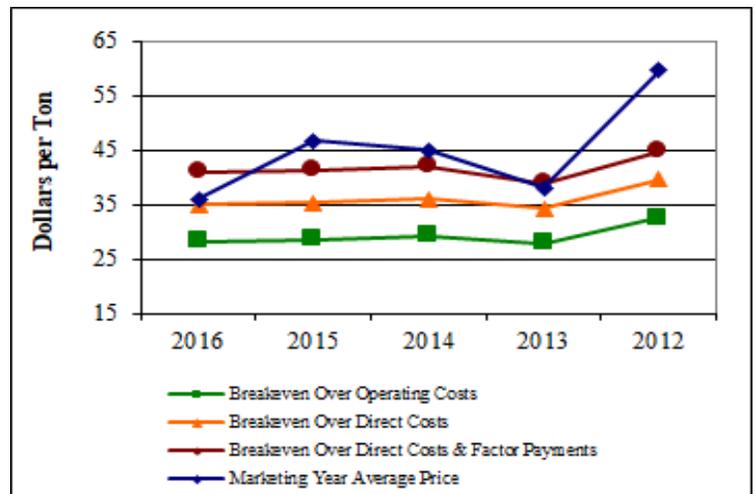


Table 5. Irrigated Wheat Cost of Production Trends, 2016-2012

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
WHEAT	bu/acre	102.08	97.00	105.00	122.00	95.00	91.40
PRICE RECEIVED	\$/bu	5.77	3.90	4.89	6.15	6.82	7.10
RECEIPTS FROM PRODUCTION	\$/acre	587.78	378.30	513.45	750.30	647.90	648.94
FARM PROGRAM PAYMENTS	\$/Acre	21.56				20.25	22.86
TOTAL REVENUE	\$/Acre	596.40	378.30	513.45	750.30	668.15	671.80
DIRECT COSTS:							
OPERATING--PREHARVEST							
FERTILIZER	\$/acre	60.15	42.46	48.25	56.10	56.10	97.86
CROP INSURANCE	\$/acre	55.00	55.00	55.00	55.00	55.00	55.00
SEED	\$/acre	28.71	28.01	28.88	28.88	28.88	28.88
IRRIGATION ENERGY	\$/acre	46.51	43.28	47.56	43.24	43.46	55.02
IRRIGATION REPAIR	\$/acre	10.65	11.26	11.26	10.24	10.24	10.24
SPRINKLER LEASE	\$/acre	70.00	70.00	70.00	70.00	70.00	70.00
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre	8.68	6.15	6.76	9.66	9.71	11.14
MACH REPAIRS	\$/acre	4.92	4.92	4.92	4.92	4.92	4.92
MACHINERY LABOR	\$/acre	2.01	2.06	2.00	2.00	2.00	2.00
INTEREST ON OP. CAP.	\$/acre	10.11	9.58	9.61	9.80	9.81	11.73
TOTAL PREHARVEST:	\$/acre	296.74	272.72	284.24	289.84	290.12	346.79
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	19.79	19.40	17.85	24.40	19.00	18.28
MACH FUEL & LUBE	\$/acre	7.09	5.02	5.52	7.89	7.93	9.10
MACH REPAIRS	\$/acre	3.25	3.25	3.25	3.25	3.25	3.25
MACHINERY LABOR	\$/acre	1.74	1.71	2.00	1.66	1.66	1.66
TOTAL HARVEST:	\$/acre	31.87	29.38	28.62	37.20	31.84	32.29
TOTAL OPERATING COSTS:	\$/acre	328.61	302.10	312.86	327.04	321.96	379.08
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	32.29	32.29	32.29	32.29	32.29	32.29
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	15.42	15.42	15.42	15.42	15.42	15.42
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	57.71	57.71	57.71	57.71	57.71	57.71
TOTAL DIRECT COSTS:	\$/acre	386.32	359.81	370.57	384.75	379.67	436.79
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	210.08	18.49	142.88	365.55	288.48	235.01
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	185.00	200.00	200.00	200.00	162.50	162.50
TOTAL FACTOR PAYMENTS	\$/acre	185.00	200.00	200.00	200.00	162.50	162.50
FACTOR PAYMENTS PLUS DIRECT COSTS	\$/acre	571.32	559.81	570.57	584.75	542.17	599.29
RETURN TO MANAGEMENT AND RISK	\$/acre	25.08	-181.51	-57.12	165.55	125.98	72.51
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/bu	3.26	3.11	2.98	2.68	3.39	4.15
REQUIRED TO COVER DIRECT COSTS	\$/bu	3.83	3.71	3.53	3.15	4.00	4.78
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENT	\$/bu	5.65	5.77	5.43	4.79	5.71	6.56

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.17/Bushel

Table 6. Reduced Tillage Dryland Wheat Cost of Production Trends, 2016-2012

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
WHEAT	bu/acre	58.51	87.00	70.00	60.00	35.00	40.56
PRICE RECEIVED	\$/bu	5.77	3.90	4.89	6.15	6.82	7.10
RECEIPTS FROM PRODUCTION	\$/acre	315.46	339.30	342.30	369.00	238.70	287.98
FARM PROGRAM PAYMENTS	\$/Acre	21.56				20.25	22.86
CROP INSURANCE INDEMNITY	\$/Acre						
TOTAL REVENUE	\$/Acre	324.08	339.30	342.30	369.00	258.95	310.84
DIRECT COSTS:							
OPERATING--PREHARVEST							
SEED	\$/acre	9.03	8.81	9.08	9.08	9.08	9.08
FERTILIZER	\$/acre	33.88	23.92	27.18	31.60	31.60	55.12
HERBICIDE	\$/acre	33.02	33.80	32.82	32.82	32.82	32.82
CUSTOM HERB. APPLICATION	\$/acre	7.00	7.00	7.00	7.00	7.00	7.00
CROP INSURANCE	\$/acre	32.00	32.00	32.00	32.00	32.00	32.00
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre	7.76	6.97	7.66	7.66	7.70	8.83
MACH REPAIRS	\$/acre	6.93	6.93	6.93	6.93	6.93	6.93
MACH LABOR	\$/acre	2.31	2.37	2.30	2.30	2.30	2.30
INTEREST ON OP. CAP.	\$/acre	4.63	4.35	4.37	4.53	4.53	5.39
TOTAL PREHARVEST:	\$/acre	136.57	126.15	129.34	133.92	133.96	159.47
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	8.74		11.90	10.20	5.95	6.90
MACH FUEL & LUBE	\$/acre	6.07	4.30	4.72	6.75	6.79	7.79
MACH REPAIRS	\$/acre	3.25	3.25	3.25	3.25	3.25	3.25
MACH LABOR	\$/acre	1.79	1.70	2.30	1.65	1.65	1.65
HAULING	\$/acre	11.24	17.20	11.90	12.00	7.00	8.11
TOTAL HARVEST:	\$/acre	29.34	26.45	34.07	33.85	24.64	27.70
TOTAL OPERATING COSTS:	\$/acre	165.91	152.60	163.41	167.77	158.60	187.17
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	35.91	35.91	35.91	35.91	35.91	35.91
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	2.39	2.39	2.39	2.39	2.39	2.39
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	48.30	48.30	48.30	48.30	48.30	48.30
TOTAL DIRECT COSTS:	\$/acre	214.21	200.90	211.71	216.07	206.90	235.47
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	109.87	138.40	130.59	152.93	52.05	75.37
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	37.00	40.00	40.00	40.00	32.50	32.50
TOTAL FACTOR PAYMENTS	\$/acre	37.00	40.00	40.00	40.00	32.50	32.50
FACTOR PAYMENTS PLUS DIRECT COSTS	\$/acre	251.21	240.90	251.71	256.07	239.40	267.97
RETURN TO MANAGEMENT AND RISK	\$/acre	72.87	98.40	90.59	112.93	19.55	42.87
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/bu	3.85	1.75	4.67	4.19	3.97	4.68
REQUIRED TO COVER DIRECT COSTS	\$/bu	4.96	2.31	6.05	5.40	5.17	5.89
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/bu	5.81	2.77	7.19	6.40	5.99	6.70

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.17/Bushel

Figure 13. Irrigated Wheat Revenue per Acre, 2016-2012

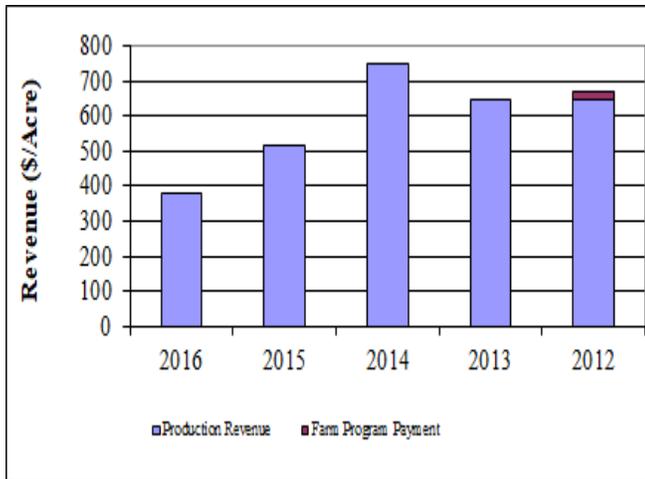


Figure 16. Reduced-Till Dryland Wheat Revenue per Acre, 2016-2012

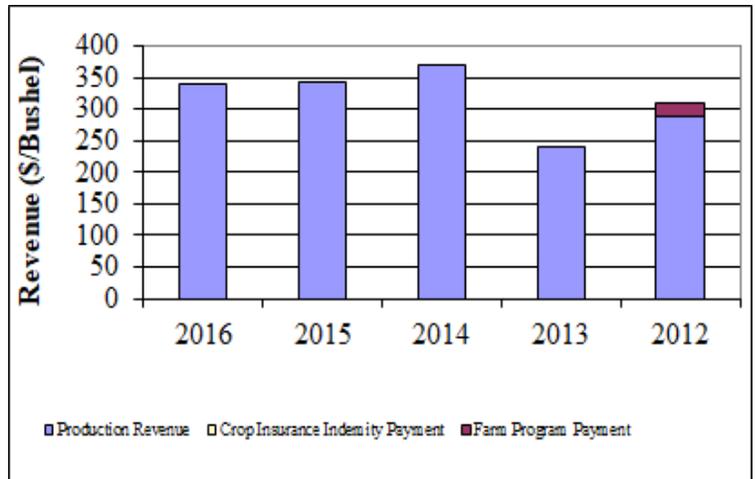


Figure 14. Irrigated Wheat Cost of Production per Acre, 2016-2012

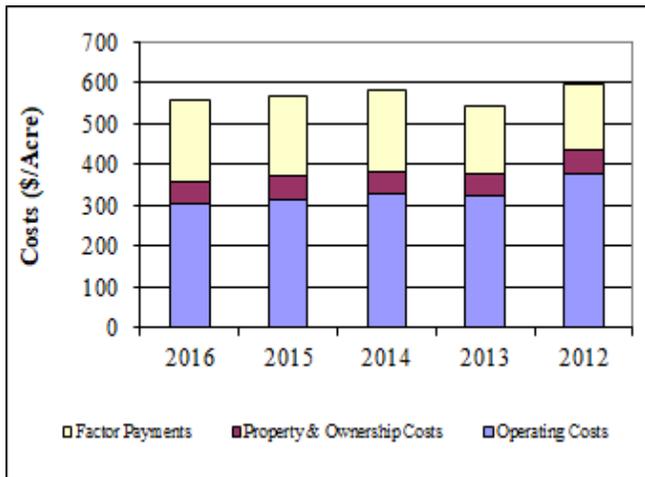


Figure 17. Reduced-Till Dryland Wheat Cost of Production per Acre, 2016-2012

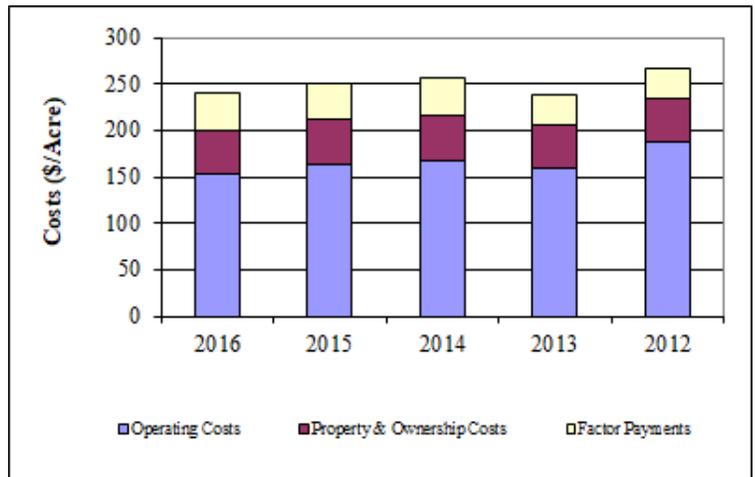


Figure 15. Irrigated Wheat Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

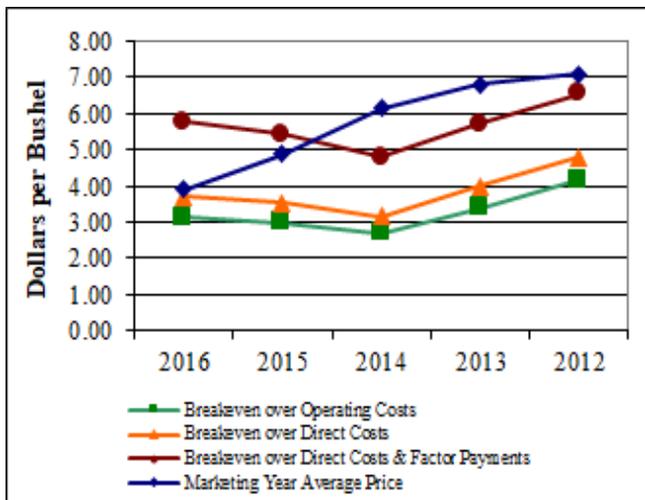


Figure 18. Reduced-Till Dryland Wheat Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

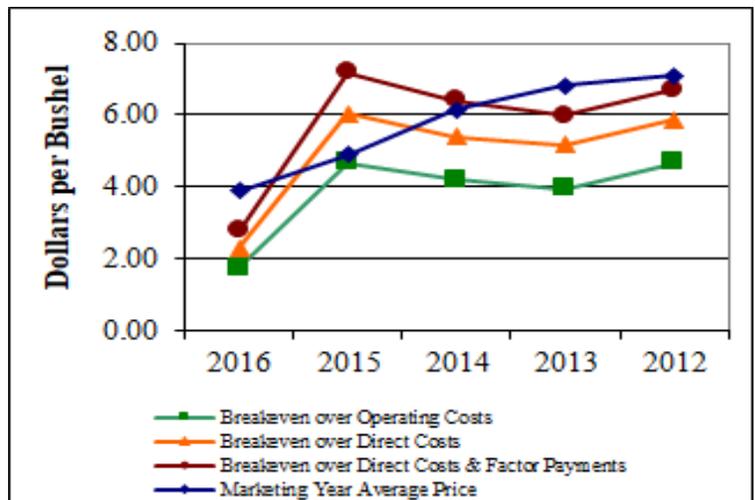


Table 7. Reduced Tillage Dryland Corn Cost of Production Trends, 2015-2011

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
CORN	bu/acre	58.50	86.00	82.00	72.00	33.00	19.50
PRICE RECEIVED	\$/bu	4.56	3.66	3.70	4.10	4.54	6.80
RECEIPTS FROM PRODUCTION	\$/acre	239.16	314.76	303.40	295.20	149.82	132.60
CROP INSURANCE INDEMNITY	\$/Acre	65.85					65.85
FARM PROGRAM PAYMENTS	\$/Acre	21.56				20.25	22.86
TOTAL REVENUE	\$/Acre	260.95	314.76	303.40	295.20	170.07	221.31
DIRECT COSTS:							
OPERATING--PREHARVEST							
SEED (15,000/ACRE)	\$/acre	58.59	57.17	58.94	58.94	58.94	58.94
FERTILIZER	\$/acre	46.29	35.38	40.21	46.76	46.76	62.35
HERBICIDE	\$/acre	37.58	38.48	37.36	37.36	37.36	37.36
CUSTOM APPLICATION	\$/acre	7.00	7.00	7.00	7.00	7.00	7.00
CROP INSURANCE	\$/acre	25.00	25.00	25.00	25.00	25.00	25.00
MACHINERY OPERATING COSTS ¹	\$/acre	#DIV/0!					
MACH FUEL & LUBE	\$/acre	4.58	3.23	3.55	5.07	5.10	5.94
MACH REPAIRS	\$/acre	2.80	2.80	2.80	2.80	2.80	2.80
MACHINERY LABOR	\$/acre	1.97	2.02	1.96	1.96	1.96	1.96
INTEREST ON OP. CAP.	\$/acre	6.47	6.17	6.19	6.47	6.47	7.05
TOTAL PREHARVEST:	\$/acre	190.28	177.25	183.01	191.36	191.39	208.40
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	11.21	17.20	13.94	14.40	6.60	3.90
MACH FUEL & LUBE	\$/acre	5.88	4.17	4.58	6.54	6.58	7.55
MACH REPAIRS	\$/acre	5.21	5.21	5.21	5.21	5.21	5.21
MACHINERY LABOR	\$/acre	1.46	1.49	1.45	1.45	1.45	1.45
TOTAL HARVEST:	\$/acre	23.76	28.07	25.18	27.60	19.84	18.11
TOTAL OPERATING COSTS:		214.04	205.32	208.19	218.96	211.23	226.51
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	32.12	32.12	32.12	32.12	32.12	32.12
GENERAL FARM OVERHEAD	\$/acre	10.20	10.00	10.99	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	2.46	2.46	2.46	2.46	2.46	2.46
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	44.78	44.58	45.57	44.58	44.58	44.58
TOTAL DIRECT COSTS:	\$/acre	258.82	249.90	253.76	263.54	255.81	271.09
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	2.13	64.86	49.64	31.66	-85.74	-49.78
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	37.00	40.00	40.00	40.00	32.50	32.50
TOTAL FACTOR PAYMENTS	\$/acre	37.00	40.00	40.00	40.00	32.50	32.50
FACTOR PAYMENTS PLUS DIRECT COSTS	\$/acre	295.82	289.90	293.76	303.54	288.31	303.59
RETURN TO MANAGEMENT AND RISK	\$/acre	-34.87	24.86	9.64	-8.34	-118.24	-82.28
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/bu	3.33	2.39	4.63	3.22	3.11	3.33
REQUIRED TO COVER DIRECT COSTS	\$/bu	4.03	2.91	5.64	3.88	3.76	3.99
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/bu	4.61	3.37	6.53	4.46	4.24	4.46

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.17/Bushel

Table 8. Reduced Tillage Dryland Millet Cost of Production Trends, 2015-2011

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
PROSO MILLET	cwt/acre	38.66	57.00	55.00	52.00	22.00	7.30
PRICE RECEIVED	\$/cwt	10.34	5.78	3.30	7.54	9.76	25.30
RECEIPTS FROM PRODUCTION	\$/acre	260.49	329.46	181.50	392.08	214.72	184.69
CROP INSURANCE INDEMNITY		47.23					47.23
FARM PROGRAM PAYMENTS	\$/acre	21.56				20.25	22.86
TOTAL REVENUE	\$/acre	278.56	329.46	181.50	392.08	234.97	254.78
DIRECT COSTS:							
OPERATING--PREHARVEST							
FERTILIZER	\$/acre	21.16	14.02	15.93	22.76	22.76	30.34
SEED	\$/acre	4.11	4.01	4.13	4.13	4.13	4.13
HERBICIDE	\$/acre	12.37	12.67	12.30	12.30	12.30	12.30
CROP INSURANCE	\$/acre	11.00	11.00	11.00	11.00	11.00	11.00
CUSTOM APPLICATION	\$/acre	7.00	7.00	7.00	7.00	7.00	7.00
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre	7.24	5.11	5.62	8.03	8.13	9.33
MACH REPAIRS	\$/acre	4.90	4.90	4.90	4.90	4.90	4.90
MACHINERY LABOR	\$/acre	2.49	2.55	2.48	2.48	2.48	2.48
INTEREST ON OP. CAP.	\$/acre	2.47	2.21	2.22	2.54	2.54	2.85
TOTAL PREHARVEST:	\$/acre	72.75	63.47	65.58	75.14	75.24	84.33
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	14.80	22.80	18.70	20.80	8.80	2.92
MACH FUEL & LUBE	\$/acre	12.08	8.56	9.41	13.44	13.51	15.50
MACH REPAIRS	\$/acre	7.86	7.86	7.86	7.86	7.86	7.86
MACHINERY LABOR	\$/acre	4.13	4.23	4.11	4.11	4.11	4.11
TOTAL HARVEST :	\$/acre	38.88	43.45	40.08	46.21	34.28	30.39
TOTAL OPERATING COSTS:		111.63	106.92	105.66	121.35	109.52	114.72
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	43.44	43.44	43.44	43.44	43.44	43.44
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	2.39	2.39	2.39	2.39	2.39	2.39
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	55.83	55.83	55.83	55.83	55.83	55.83
TOTAL DIRECT COSTS:	\$/acre	167.46	162.75	161.49	177.18	165.35	170.55
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	111.09	166.71	20.01	214.90	69.62	84.23
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	37.00	40.00	40.00	40.00	32.50	32.50
TOTAL FACTOR PAYMENTS	\$/acre	37.00	40.00	40.00	40.00	32.50	32.50
FACTOR PAYMENTS PLUS DIRECT COSTS	\$/acre	204.46	202.75	201.49	217.18	197.85	203.05
MANAGEMENT AND RISK	\$/acre	74.09	126.71	-19.99	174.90	37.12	51.73
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/cwt	5.36	1.88	1.92	2.33	4.98	15.72
REQUIRED TO COVER DIRECT COSTS	\$/cwt	8.02	2.86	2.94	3.41	7.52	23.36
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/cwt	9.64	3.56	3.66	4.18	8.99	27.82

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.34/Cwt

Figure 19. Dryland Corn Revenue per Acre, 2016-2012

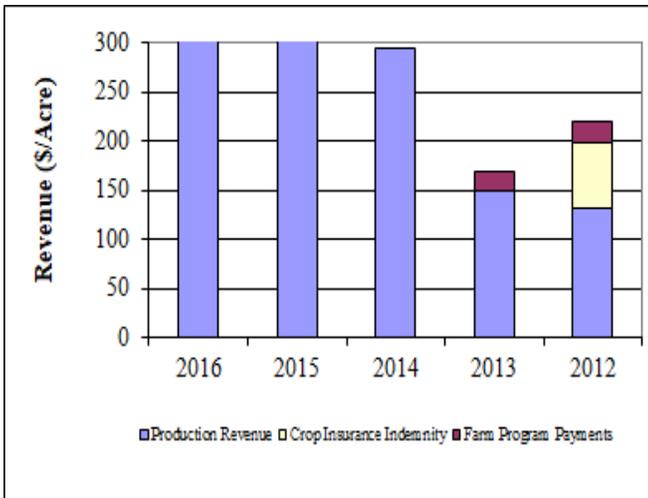


Figure 22. Dryland Millet Revenue per Acre, 2016-2012

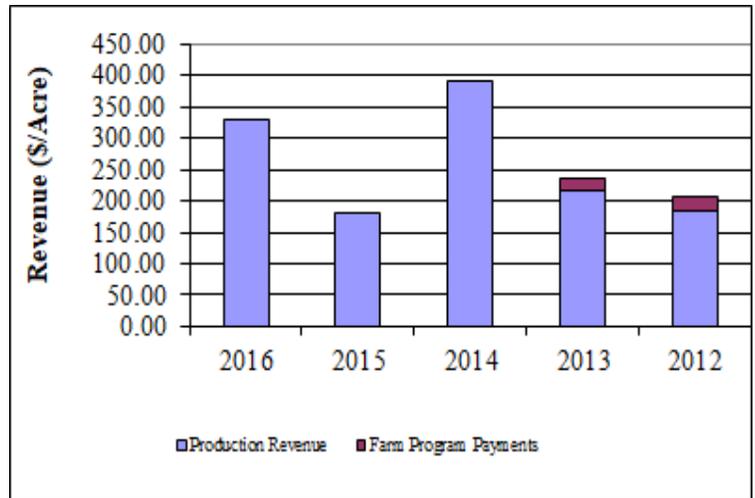


Figure 20. Dryland Corn Cost of Production per Acre, 2016-2012

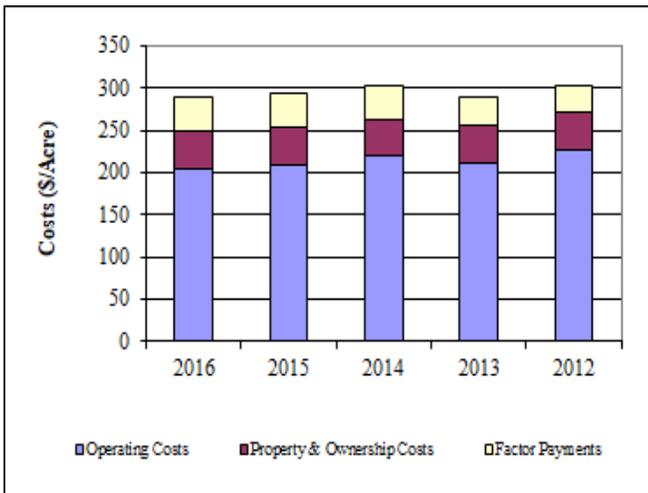


Figure 23. Dryland Millet Cost of Production per Acre, 2016-2012

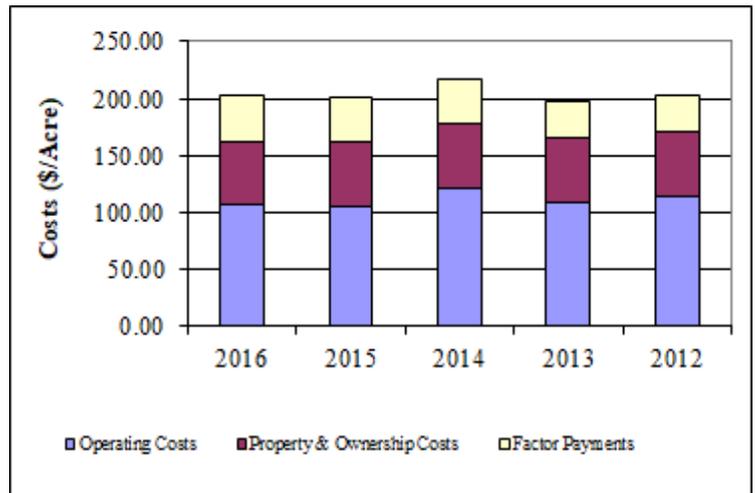


Figure 21. Dryland Corn Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

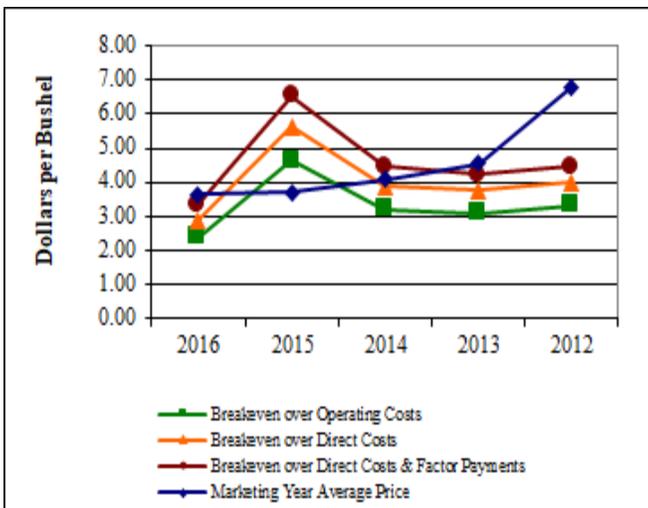


Figure 24. Dryland Millet Marketing Year Average Price and Enterprise Breakeven Prices, 2016-2012

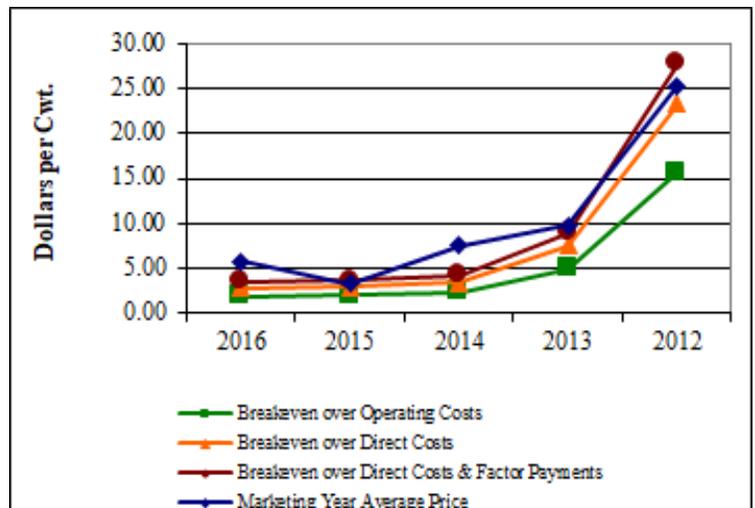


Table 9. Reduced Tillage Oil-Type Sunflower Cost of Production Trends, 2015-2011

		5-Year Average	2016	2015	2014	2013	2012
	UNIT		VALUE OR COST PER ACRE				
GROSS RECEIPTS FROM PRODUCTION:							
SUNFLOWERS	cwt/ac	13.21	14.75	12.00	22.00	9.50	7.80
PRICE RECEIVED	\$/cwt	19.13	16.80	20.00	17.80	19.57	21.50
RECEIPTS FROM PRODUCTION	\$/acre	246.60	247.80	240.00	391.60	185.92	167.70
CROP INSURANCE INDEMNITY	\$/acre	64.40					64.40
FARM PROGRAM PAYMENTS	\$/acre	21.56				20.25	22.86
TOTAL REVENUE	\$/acre	268.11	247.80	240.00	391.60	206.17	254.96
DIRECT COSTS:							
OPERATING--PREHARVEST							
FERTILIZER	\$/acre	31.53	24.10	27.39	31.85	31.85	42.46
SEED	\$/acre	26.21	25.58	26.37	26.37	26.37	26.37
HERBICIDE	\$/acre	42.98	44.00	42.72	42.72	42.72	42.72
CROP INSURANCE	\$/acre	42.00	42.00	42.00	42.00	42.00	42.00
INSECTICIDE	\$/acre	10.65	10.90	10.59	10.59	10.59	10.59
CUSTOM APPLICATION	\$/acre	22.00	22.00	22.00	22.00	22.00	22.00
MACHINERY OPERATING COSTS ¹	\$/acre						
MACH FUEL & LUBE	\$/acre	2.84	2.01	2.21	3.16	3.18	3.65
MACH REPAIRS	\$/acre	2.07	2.07	2.07	2.07	2.07	2.07
MACHINERY LABOR	\$/acre	1.23	1.33	1.20	1.20	1.20	1.20
INTEREST ON OP. CAP.	\$/acre	6.37	6.16	6.18	6.37	6.37	6.76
TOTAL PREHARVEST:	\$/acre	187.88	180.15	182.73	188.33	188.35	199.82
OPERATING--HARVEST:							
MACHINERY OPERATING COSTS ²	\$/acre	3.17	3.00	3.00	5.50	2.38	1.95
MACH FUEL & LUBE	\$/acre	6.93	4.91	5.40	7.71	7.75	8.89
MACH REPAIRS	\$/acre	5.06	5.06	5.06	5.06	5.06	5.06
MACHINERY LABOR	\$/acre	1.58	1.62	1.57	1.57	1.57	1.57
TOTAL HARVEST:	\$/acre	16.74	14.59	15.03	19.84	16.76	17.47
TOTAL OPERATING COSTS:	\$/acre	204.61	194.74	197.76	208.17	205.11	217.29
PROPERTY AND OWNERSHIP COSTS:							
MACHINERY OWNERSHIP COSTS	\$/acre	22.49	22.49	22.49	22.49	22.49	22.49
GENERAL FARM OVERHEAD	\$/acre	10.00	10.00	10.00	10.00	10.00	10.00
REAL ESTATE TAXES	\$/acre	2.73	2.73	2.73	2.73	2.73	2.73
TOTAL PROPERTY AND OWNERSHIP COSTS:	\$/acre	35.22	35.22	35.22	35.22	35.22	35.22
TOTAL DIRECT COSTS:	\$/acre	239.83	229.96	232.98	243.39	240.33	252.51
NET REVENUE BEFORE FACTOR PAYMENTS:	\$/acre	28.27	17.84	7.02	148.21	-34.17	2.45
DISTRIBUTION OF FACTOR PAYMENTS:							
LAND	3.25%	37.00	40.00	40.00	40.00	32.50	32.50
TOTAL FACTOR PAYMENTS	\$/acre	37.00	40.00	40.00	40.00	32.50	32.50
FACTOR PAYMENTS PLUS DIRECT COSTS	\$/acre	276.83	269.96	272.98	283.39	272.83	285.01
RETURN TO MANAGEMENT AND RISK	\$/acre	-8.73	-22.16	-32.98	108.21	-66.67	-30.05
BREAKEVEN PRICES:							
REQUIRED TO COVER OPERATING COSTS	\$/cwt	19.21	13.20	19.78	20.82	20.51	21.73
REQUIRED TO COVER DIRECT COSTS	\$/cwt	22.50	15.59	23.30	24.34	24.03	25.25
REQUIRED TO COVER DIRECT COSTS PLUS FACTOR PAYMENTS	\$/cwt	25.94	18.30	27.30	28.34	27.28	28.50

¹ Interest on Operating Capital, Machinery Fuel & Lube, And Machinery Repairs Included

² Hauling Machinery & Labor Charges = \$0.25/Cwt

Figure 25. Dryland Oil-Type Sunflowers Revenue per Acre, 2016-2012

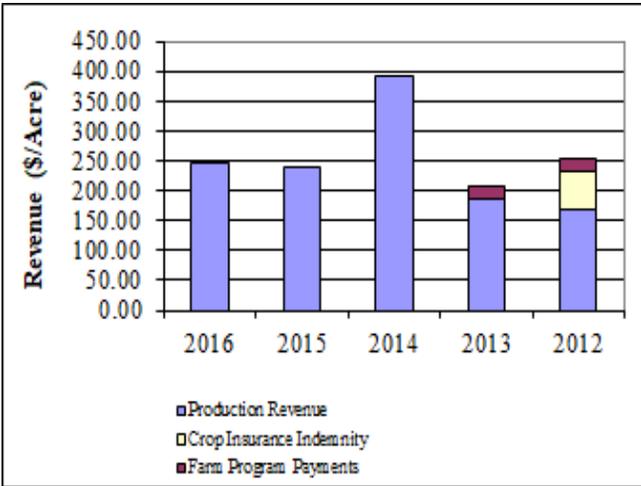


Figure 26. Dryland Oil-Type Sunflower Cost of Production per Acre, 2016-2012

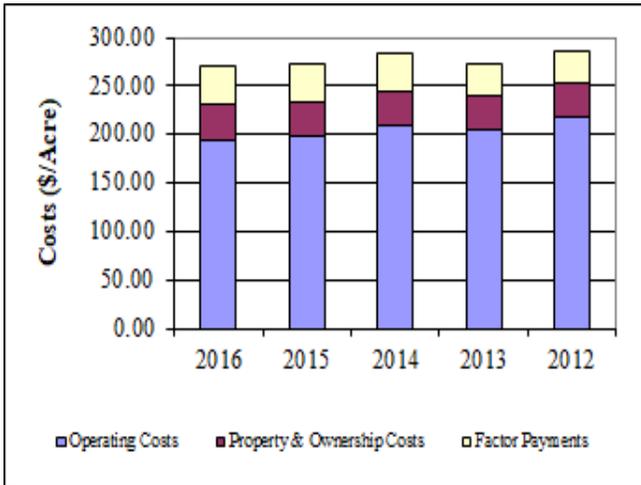
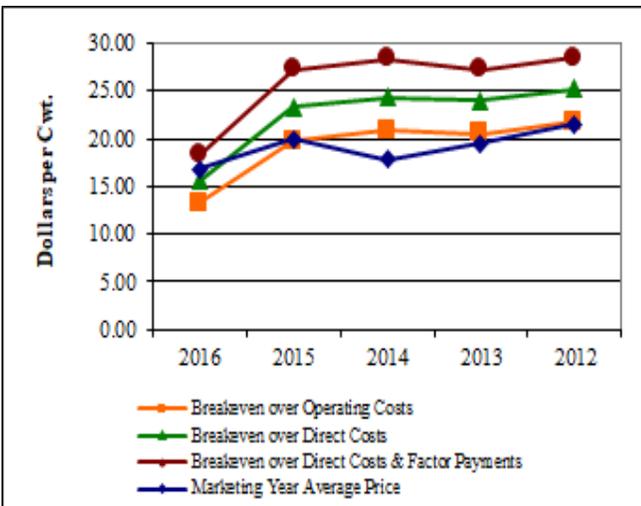


Figure 27. Dryland Oil-Type Sunflower Marketing Year Average Price and Enterprise Breakeven Prices, 2012-2016



LIVESTOCK ENTERPRISE BUDGET PRINCIPLES

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Introduction | An enterprise is defined as a single crop or livestock commodity being produced. Most farms or ranches consist of a combination of several enterprises. An enterprise budget is a listing of all estimated income and expenses associated with a specific enterprise to help evaluate its profitability. An enterprise budget can be developed for each current or future enterprise in a farm plan. Each is developed on the basis of a common unit such as one acre or one head of livestock. This permits comparison of the profit for alternative and competing enterprises.

Developing an Enterprise Budget | Enterprise budgets can be organized and presented in several different formats, however, they typically contain three sections: 1) Variable or operating costs; 2) Fixed costs; and 3) Income. The following are four basic steps in developing an enterprise budget.

- ◆ The first step is to estimate variable costs. In the case of livestock such expenses would include feed, veterinary, repairs, fuel, labor, etc.
- ◆ The second step is the development an assessment of fixed costs. Fixed costs include, but are not limited to, machinery, breeding stock replacement and land debt payments, lease payments and overhead charges like insurance, taxes and interest.
- ◆ The third step in the process is to estimate the total production and realistic expected commodity price.
- ◆ The last step is to determine net returns (profits) for the given enterprise. Net returns represent that income which is left for the farm or ranch manager and his family to live on, pay debts, invest or save.

The primary weakness of the budget is that it presents income and cost data for only one situation. The use of computerized budgets will allow you to ask many “what if” questions, thus allowing greater flexibility of the enterprise budget as a management decision tool. Finally, the enterprise budget ignores the impact of one enterprise on other

enterprises. For example, a dairy enterprise may compete for a limited labor supply, particularly when it causes delays in planting or harvesting of grain crops.

Livestock Enterprise Budgets | Livestock budgets follow the same general format as crop budgets but are often more difficult to complete because there is a problem of accounting for multiple outputs such as calves, culls cows and cull bulls for a beef cow enterprise or lambs, wool, cull ewes and cull rams for a sheep enterprise. A second problem is a proper accounting for the cost of raising or purchasing replacement animals to maintain a breeding herd. Thirdly is the problem of determining a proper charge for farm raised feed, pasture or crop residues used in the livestock enterprise.

Break-Even Factors for the Cow/Calf Operator | While the producer has little or no control over market prices, he does have at least some control over the price needed to break even. Three important factors of break-even prices for the cow/calf producer are: 1) Annual cow costs; 2) Percent calf crop; and 3) Weaning weights. Break-even selling prices for weaned calves are presented in Table 1. Factors affecting annual cow costs are expenses for feed, pasture or range leases, vet and medicine, marketing, utilities, labor, fuel, machinery and facility repairs, interest, depreciation, property taxes, etc.

Percent of calf crop is the number of calves weaned per 100 cows exposed the previous breeding season. The two major factors affecting this are: 1) Failure to conceive at breeding, and 2) Death loss at or near birth. Calving difficulties play an important role in both areas through actual losses at birth and by delaying the subsequent rebreeding. Weaning weight is significantly influenced by the age of the calf at weaning. Calves born in the first three weeks of calving season average 70 pounds heavier than those born in the last three weeks. Once a cow starts calving late, she tends to always calve late unless she is left open for a year. Obviously, there are numerous factors affecting percent calf crop and weaning weights. However, three pieces of infor-

mation, kept on an annual basis for each cow, can provide a basis for evaluating the current status of the herd and suggest areas for improvement. These three pieces of information are: 1) calving date; 2) calving ease, and 3) actual weaning weights.

Summary: Enterprise budgets are a tool Colorado producers can use to assist them in making management decisions involving production, financial requirements and marketing strategies. Although enterprise budgets have been used primarily for production planning, like identifying the most profitable enterprise to produce, they also provide valuable information about dollar needs and the timing of those needs. Marketing decisions must be continually evaluated, and should impact the quantity of various products that a farmer/rancher decides to produce. With increased costs

of inputs, including money, producers must concern themselves with financial and marketing management decisions. Enterprise budgets are a tool to help evaluate some of these important management decisions.

Tables 1 through 11 contain enterprise budgets (Cost-Return Budgets) for various classes of livestock. The Cost-Return Budgets have been taken from the Kansas State University AgManager.info web site (www.agmanager.info). Glynn Tonsor and Robin Reid are the authors of the cost-return budgets. Glynn and Robin are located in the Department of Agricultural Economics, K-State Research and Extension, Kansas State University, Manhattan, KS.

Table 1. Beef Cow-Calf Enterprise Budget

KSU Beef Cow-Calf Budget		2017 Production Year (as of March 1st, 2017)				
Production Efficiency Information						
Weaning Percentage		91.0%				
Cow Replacement Percentage		16.0%				
Revenue	Price	Unit	Qty	Unit		Total per Year per Cow
Weaned Calf Sale	\$ 127.59	per cwt	x 550	lbs	x 0.91	= \$ 638.59
Cull Cows	\$ 67.25	per cwt	x 1250	lbs	x 0.16	= \$ 134.50
Other Income						
Gross Income						\$ 773.09
Variable Costs						
Pasture	\$ 20.00	per acre	x 9.5	total acres	=	\$ 190.00
Crop Residue	\$ 15.00	per acre	x 2.0	total acres	=	\$ 30.00
Harvested Forage	\$ 65.00	per ton	x 2.25	total tons	=	\$ 146.25
Grain/Protein Supplements	\$ 119.08	per ton	x 833.0	total lbs	=	\$ 49.60
Mineral	\$ 800.00	per ton	x 100.0	total lbs	=	\$ 40.00
Other Feed	\$ -	per unit	x 0.0	units	=	\$ -
Labor	\$ 20.00	per hour	x 8.0	total hours	=	\$ 160.00
Vet Medicine/Drugs					=	\$ 31.00
Replacement Females	\$ 674.52	per head	x 0.16	hd	=	\$ 107.92
Annual Bull Charge or A.I.					=	\$ 43.00
Other Livestock Breeding/Marketing					=	\$ 24.00
Utilities, Gas, Fuel, Oil					=	\$ 45.00
Machinery, Facility/Equip. Repairs					=	\$ 59.00
Cash Interest Paid					=	\$ 27.00
Other variable costs					=	\$ 18.00
Total Variable Costs					=	\$ 970.77
Fixed Costs						
Depreciation					=	\$ 59.00
Taxes					=	\$ 7.00
Farm/Livestock Insurance					=	\$ 13.00
Opportunity Cost of Investment					=	\$ 157.00
Other fixed costs					=	\$ -
Total Fixed Costs					=	\$ 236.00
Total Costs					=	\$ 1,206.77
Income Over Variable Costs					=	\$ (197.68)
Income Over Total Costs					=	\$ (433.68)

Table 2. Beef Backgrounding Enterprise Budget

KSU Beef Backgrounding Budget		2017 Production Year		(as of March 1st, 2017)	
Production Efficiency Information					
Death Loss	2.0%				CWT Produced
Days in Backgrounding Lot	150.0	Average Daily Gain	1.25		1.875
Gross Return	Price	Unit	Qty	Unit	Total per Year
Feeder Animal Sale	\$ 123.07	per cwt	x 738	lbs	= \$ 907.66
Purchase price	\$ 132.54	per cwt	x 550	lbs	= \$ (728.97)
Death Loss					\$ (14.58)
Other					
Total Gross Return					\$ 164.11
Variable Costs					
Pasture	\$ 20.00	per acre	x 0.0	total acres	= \$ -
Crop Residue	\$ 15.00	per acre	x 0.0	total acres	= \$ -
Harvested Forage	\$ 82.50	per ton	x 0.53	total tons	= \$ 43.31
Grain/Protein Supplements	\$ 121.04	per ton	x 2100	total lbs	= \$ 127.09
Mineral	\$ 550.00	per ton	x 45.0	total lbs	= \$ 12.38
Other Feed	\$ -	per unit	x 0.0	units	= \$ -
Labor	\$ 20.00	per hour	x 1.5	hours	= \$ 30.00
Vet Medicine/Drugs					\$ 18.00
Marketing costs					\$ 10.00
Utilities,Gas, Fuel, Oil					\$ 6.00
Machinery, Facility/Equip. Repairs					\$ 8.00
Cash Interest Paid					\$ 9.00
Other variable costs					\$ 3.00
Total Variable Costs					\$ 266.78
Fixed Costs					
Depreciation					\$ 6.00
Taxes					\$ 1.00
Farm/Livestock Insurance					\$ 1.00
Opportunity Cost of Investment					\$ 28.00
Other fixed costs					\$ -
Total Fixed Costs					\$ 36.00
Total Costs					\$ 302.78
Income Over Variable Costs					\$ (102.67)
Income Over Total Costs					\$ (138.67)

Table 3. Beef Stocker Enterprise Budget

KSU Beef Stocker Budget		2017 Production Year (as of March 1st, 2017)			
Production Efficiency Information					
Death Loss	1.0%				CWT Produced
Days on Grass	120.0	Average Daily Gain	1.25		1.500
Gross Return	Price	Unit	Qty	Unit	Total per Year
Feeder Sale	\$ 119.88	per cwt	x 888	lbs	= \$ 1,063.95
Purchase price	\$ 135.79	per cwt	x 738	lbs	= \$ (1,001.47)
Death Loss					\$ (10.01)
Other					
Total Gross Return					\$ 52.47
Variable Costs					
Pasture	\$ 20.00	per acre	x 2.0	total acres	= \$ 40.00
Crop Residue	\$ 15.00	per acre	x 0.0	total acres	= \$ -
Harvested Forage	\$ -	per ton	x 0	total tons	= \$ -
Grain/Protein Supplements	\$ -	per ton	x 0	total lbs	= \$ -
Mineral	\$ 550.00	per ton	x 12.0	total lbs	= \$ 3.30
Other Feed	\$ -	per unit	x 0.0	units	= \$ -
Labor	\$ 20.00	per hour	x 0.8	hours	= \$ 16.00
Vet Medicine/Drugs					\$ 6.00
Marketing costs					\$ 10.00
Utilities,Gas, Fuel, Oil					\$ 5.00
Machinery, Facility/Equip. Repairs					\$ 8.00
Cash Interest Paid					\$ 6.00
Other variable costs					\$ 2.00
Total Variable Costs					\$ 96.30
Fixed Costs					
Depreciation					\$ 6.00
Taxes					\$ 1.00
Farm/Livestock Insurance					\$ 1.00
Opportunity Cost of Investment					\$ 18.00
Other fixed costs					\$ -
Total Fixed Costs					\$ 26.00
Total Costs					\$ 122.30
Income Over Variable Costs					\$ (43.83)
Income Over Total Costs					\$ (69.83)

Table 4. Beef Finishing Enterprise Budget

KSU Beef Finishing Budget **2017 Production Year (as of March 1st, 2017)**

Production Efficiency Information

Death Loss	1.5%				CWT Produced	
Days on Feed	150.0	Average Daily Gain	3.7		5.550	

Gross Return	Price	Unit	Qty	Unit	Total per Year
Fed Animal Sale	\$ 88.46	per cwt	x 1443	lbs	= \$ 1,276.09
Purchase price	\$ 119.88	per cwt	x 888	lbs	= \$ (1,063.95)
Death Loss					\$ (15.96)
Other					
Total Gross Return					\$ 196.18

Variable Costs

Harvested Forage	\$ 82.50	per ton	x 0.23	total tons	= \$ 18.56
Grain/Protein Supplements	\$ 122.42	per ton	x 3300.0	total lbs	= \$ 201.99
Mineral	\$ 550.00	per ton	x 75.0	total lbs	= \$ 20.63
Other Feed	\$ -	per unit	x 0.0	units	= \$ -
Labor	\$ 20.00	per hour	x 1.5	hours	= \$ 30.00
Vet Medicine/Drugs					\$ 26.00
Marketing costs					\$ 10.00
Utilities, Gas, Fuel, Oil					\$ 14.00
Machinery, Facility/Equip. Repairs					\$ 15.00
Cash Interest Paid					\$ 15.00
Other variable costs					\$ 8.00
Total Variable Costs					\$ 359.18

Fixed Costs

Depreciation					\$ 24.00
Taxes					\$ 1.25
Farm/Livestock Insurance					\$ 7.00
Opportunity Cost of Investment					\$ 50.00
Other fixed costs					\$ -
Total Fixed Costs					\$ 82.25

Total Costs

Total Costs					\$ 441.43
Income Over Variable Costs					\$ (163.00)
Income Over Total Costs					\$ (245.25)

Table 5. Dairy Cow Enterprise Budget - Raised Replacements

KSU Dairy Cow Budget- Raised Replacements **Current Prices (as of March 1st, 2017)**

Production Efficiency Information

Milk Produced Per Cow (lbs)	23,500	Cull Cows Sales	27.0%	Calves Sold at Birth	46%
Cull Replacements Sold	5.0%	Cull Yearlings Sold	2.0%	Repl. Heifer Death Loss	9.00%
Replacement Heifer Turnover	34.0%				

Returns	Price	Unit	Qty	Unit		Total per Cow/Year	Total per CWT Milk/Year
Milk Sales	\$ 18.50	per cwt	x 23500	lbs	=	\$ 4,347.50	\$ 18.50
Milk Premiums	\$ -	per cwt	x 23500	lbs	=	\$ -	\$ -
Calves Sold	\$ 160.00	per head	x 0.46	hd	=	\$ 73.60	\$ 0.31
Cull Cows Sold	\$ 66.00	per cwt	x 1350	lbs	x 0.27 =	\$ 240.57	\$ 1.02
Cull Replacements Sold	\$ 93.36	per cwt	x 1250	lbs	x 0.05 =	\$ 58.35	\$ 0.25
Cull Yearlings Sold	\$ 114.71	per cwt	x 725	lbs	x 0.02 =	\$ 16.63	\$ 0.07
Manure Credit						\$ 148.60	\$ 0.63
Other Income						\$ 79.00	\$ 0.34
Total Gross Return						\$ 4,964.25	\$ 21.12

Variable Costs

Heifer Feed Cost	\$ 822.00	total cost			x 0.42	\$ 345.24	\$ 1.47
Cow Feed Cost	\$ 5.44	per head/day	x 365	days		\$ 1,986.48	\$ 8.45
Breeding Fees						\$ 71.00	\$ 0.30
Daily Labor	\$ 13.50	per hour	x 38.5	hours	=	\$ 519.75	\$ 2.21
Management Labor	\$ 25.00	per hour	x 10.5	hours	=	\$ 262.50	\$ 1.12
Milk Marketing & Hauling						\$ 116.00	\$ 0.49
Veterinary						\$ 134.00	\$ 0.57
Fuel & Oil						\$ 101.00	\$ 0.43
Utilities						\$ 72.00	\$ 0.31
Machinery, Facility/Equip. Repairs						\$ 190.00	\$ 0.81
Bedding						\$ 114.00	\$ 0.49
Custom Hire						\$ 75.00	\$ 0.32
Cash Interest Paid						\$ 123.00	\$ 0.52
Other variable costs						\$ 278.00	\$ 1.18
Total Variable Costs						\$ 4,387.97	\$ 18.67

Fixed Costs

Depreciation						\$ 192.00	\$ 0.82
Farm/Livestock Insurance						\$ 53.00	\$ 0.23
Opportunity Cost of Investment						\$ 260.00	\$ 1.11
Other fixed costs						\$ 133.00	\$ 0.57
Total Fixed Costs						\$ 638.00	\$ 2.71

Total Costs

						\$ 5,025.97	\$ 21.39
Income Over Variable Costs						\$ 576.28	\$ 2.45
Income Over Total Costs						\$ (61.72)	\$ (0.26)

Table 6. Dairy Replacement Heifer Enterprise Budget

KSU Dairy Replacement Heifer Budget				Current Prices (as of March 1st, 2017)			
Production Efficiency Information							
Cull Replacements Sold	5.0%	Death Loss	9.0%				
Cull Yearlings Sold	2.0%						
Returns	Price	Unit	Qty	Unit	%	Total per Heifer	
Springer Heifer Sales	\$ 1,412.50	per head	x		x 0.84	=	\$ 1,186.50
Cull Replacements Sold	\$ 93.36	per cwt	x	1250	lbs	x 0.05	= \$ 58.35
Cull Yearlings Sold	\$ 114.71	per cwt	x	725	lbs	x 0.02	= \$ 16.63
Manure Credit							\$ 40.00
Other Income							
Purchase of Heifer Calf	\$ 200.00	per head					\$ (200.00)
Total Gross Return							\$ 1,101.48
Variable Costs							
Feed Costs							\$ 822.00
Daily Labor	\$ 13.50	per hour	x	11.5	hours		\$ 155.25
Management Labor	\$ 25.00	per hour	x	3.5	hours		\$ 87.50
Breeding Fees							\$ 38.00
Veterinary							\$ 44.00
Fuel & Oil							\$ 35.00
Utilities							\$ 25.00
Machinery, Facility/Equip. Repairs							\$ 64.00
Bedding							\$ 49.00
Custom Hire							\$ 20.00
Cash Interest Paid							\$ 42.00
Other Variable Costs							\$ 43.00
Total Variable Costs							\$ 1,424.75
Fixed Costs							
Depreciation							\$ 66.00
Insurance							\$ 19.00
Opportunity Cost of Investment							\$ 84.00
Other fixed costs							\$ 45.00
Total Fixed Costs							\$ 214.00
Total Costs							\$ 1,638.75
Income Over Variable Costs							\$ (323.27)
Income Over Total Costs							\$ (537.27)

Table 7. Farrow to Weaned Enterprise Budget

KSU Farrow-to-Wean Swine Budget		Current Prices		(as of March 1st, 2017)		
Production Efficiency Information						
Weaned Pigs/Mated Sow/Year	22.20					
Litters/Mated Sow/Year	2.26					
Weaning Weight (lbs)	13.60					
Sow Replacement Rate	50%					
Sow Mortality (%)	8%					
Revenue	Price	Unit	Qty	Unit	Total per Year per Sow	Total per Year per Pig Sold
Weaned Pig	\$ 46.52	per hd	x 1	hd	= \$ 1,032.74	\$ 46.52
Cull Sows	\$ 32.16	per cwt	x 410	lbs	x 0.42 = \$ 55.38	\$ 2.49
Manure Credit					\$ 11.10	\$ 0.50
Other revenue					\$ -	\$ -
Gross Income					\$ 1,099.22	\$ 49.51
Variable Costs						
Sow Feed	\$ 0.09	per lb	x 125.0	lbs	= \$ 247.41	\$ 11.14
Feed Processing	\$ 17.00	per ton	x 0.1	ton	= \$ 23.59	\$ 1.06
Labor	\$ 15.00	per hour	x 6.8	hours	= \$ 101.70	\$ 4.58
Vet Medicine/Drugs					\$ 30.59	\$ 1.38
Replacement Females	\$ 222.15	per head	x 0.50	hd	= \$ 111.08	\$ 5.00
Semen Cost & Genetic Fee					\$ 29.38	\$ 1.32
Marketing, Bedding, and Misc					\$ 2.45	\$ 0.11
Utilities, Gas, Fuel, Oil					\$ 21.10	\$ 0.95
Machinery, Facility/Equip. Repairs					\$ 9.87	\$ 0.44
Other variable costs					\$ -	\$ -
Total Variable Costs					\$ 577.17	\$ 26.00
Fixed Costs						
Machinery, Facilities, General Overhead					\$ 125.27	\$ 5.64
Taxes and Insurance					\$ 6.88	\$ 0.31
Legal, Accounting, etc.					\$ 11.10	\$ 0.50
Other fixed costs					\$ -	\$ -
Total Fixed Costs					\$ 143.25	\$ 6.45
Total Costs					\$ 720.42	\$ 32.45
Income Over Variable Costs					\$ 522.05	\$ 23.52
Income Over Total Costs					\$ 378.80	\$ 17.06

Table 7. Wean to Finish Enterprise Budget

KSU Wean-to-Finish Swine Budget		Current Prices		(as of March 1st, 2017)	
Production Efficiency Information					
Wean-Finish Mortality (%)	6.88				
Wean-Finish Feed to Gain	2.70				
Placement Weight (lbs)	13.60				
Revenue	Price	Unit	Qty	Unit	Total per Year per Pig Sold
Market Hogs	\$ 53.51	per cwt	x 280	lbs	x 0.93 = \$ 139.37
Less cost of Weaned Pigs	\$ 46.52	per hd	x 1	hd	= \$ (46.52)
Manure Credit					\$ 4.50
Other revenue					\$ -
Gross Income					\$ 97.35
Variable Costs					
Nursery Feed	\$ 0.15	per lb	x 57.7	lbs	= \$ 8.58
Grow-Finish Feed	\$ 0.09	per lb	x 660.8	lbs	= \$ 56.77
Feed Processing	\$ 17.00	per ton	x 0.4	ton	= \$ 6.11
Labor	\$ 15.00	per hour	x 0.7	hours	= \$ 10.50
Vet Medicine/Drugs					\$ 4.20
Marketing, Bedding, and Misc					\$ 1.27
Utilities, Gas, Fuel, Oil					\$ 2.93
Machinery, Facility/Equip. Repairs					\$ 1.93
Other variable costs					\$ -
Total Variable Costs					\$ 92.29
Fixed Costs					
Machinery, Facilities, General Overhead					\$ 19.48
Taxes and Insurance					\$ 1.37
Legal, Accounting, etc.					\$ 1.00
Other fixed costs					\$ -
Total Fixed Costs					\$ 21.85
Total Costs					\$ 114.14
Income Over Variable Costs					\$ 5.07
Income Over Total Costs					\$ (16.78)

Table 7. Swine Nursery Enterprise Budget

KSU Nursery Swine Budget		Current Prices		(as of March 1st, 2017)	
Production Efficiency Information					
Nursery Mortality (%)	5.47				
Feed to Gain Conversion	1.51				
Entry Weight (lbs)	13.60				
Exit Weight (lbs)	51.80				
Revenue	Price	Unit	Qty	Unit	Total per Year per Pig Sold
Feeder Pigs	\$ 74.78	per hd	x 51.80	lbs	x 0.95 = \$ 70.69
Less cost of Weaned Pigs	\$ 46.52	per hd	x 1	hd	= \$ (46.52)
Manure Credit					\$ 0.50
Other revenue					\$ -
Gross Income					\$ 24.67
Variable Costs					
Nursery Feed	\$ 0.15	per lb	x 57.7	lbs	= \$ 8.58
Feed Processing	\$ 17.00	per ton	x 0.03	ton	= \$ 0.49
Labor	\$ 15.00	per hour	x 0.2	hours	= \$ 3.00
Vet Medicine/Drugs					\$ 1.07
Marketing, Bedding, and Misc					\$ 0.14
Utilities, Gas, Fuel, Oil					\$ 0.84
Machinery, Facility/Equip. Repairs					\$ 0.47
Other variable costs					\$ -
Total Variable Costs					\$ 14.59
Fixed Costs					
Machinery, Facilities, General Overhead					\$ 4.62
Taxes and Insurance					\$ 0.43
Legal, Accounting, etc.					\$ 0.50
Other fixed costs					\$ -
Total Fixed Costs					\$ 5.55
Total Costs					\$ 20.14
Income Over Variable Costs					\$ 10.08
Income Over Total Costs					\$ 4.53

Table 7. Swine Finishing Enterprise Budget

KSU Finishing Swine Budget		Current Prices		(as of March 1st, 2017)	
Production Efficiency Information					
Finisher Mortality (%)	5.78				
Feed to Gain Conversion	2.70				
Entry Weight (lbs)	51.80				
Exit Weight (lbs)	279.70				
Revenue	Price	Unit	Qty	Unit	Total per Year per Pig Sold
Market Hogs	\$ 53.51	per cwt	x 280	lbs	x 0.94 = \$ 141.02
Less cost of Feeder Pigs	\$ 74.78	per hd			= \$ (74.78)
Manure Credit					\$ 4.00
Other revenue					\$ -
Gross Income					\$ 70.24
Variable Costs					
Grow-Finish Feed	\$ 0.09	per lb	x 615.3	lbs	= \$ 52.87
Feed Processing	\$ 17.00	per ton	x 0.31	ton	= \$ 5.23
Labor	\$ 15.00	per hour	x 0.2	hours	= \$ 3.00
Vet Medicine/Drugs					\$ 2.85
Marketing, Bedding, and Misc					\$ 1.05
Utilities, Gas, Fuel, Oil					\$ 1.89
Machinery, Facility/Equip. Repairs					\$ 1.32
Other variable costs					\$ -
Total Variable Costs					\$ 68.21
Fixed Costs					
Machinery, Facilities, General Overhead					\$ 15.41
Taxes and Insurance					\$ 0.98
Legal, Accounting, etc.					\$ 1.00
Other fixed costs					\$ -
Total Fixed Costs					\$ 17.39
Total Costs					\$ 85.59
Income Over Variable Costs					\$ 2.03
Income Over Total Costs					\$ (15.36)

Livestock Terms, Tables, and Figures

Chris Shelley, Area Livestock Agent

Livestock management decisions determine the success of an operation. The following section contains important information and tools to aid livestock producers in their decision-making and management practices.

Livestock Nutrition Terms

Proper livestock nutrition requires an understanding of the composition of animal feeds. This section contains key terms and definitions for understanding feed nutrient analysis results.

DM % - Dry Matter

Moisture levels vary greatly between livestock feeds. The material remaining in a feed after the water is removed is called the DM. The DM content of a feed affects feed intake. The following feed analysis values are on a DM basis.

CP % - Crude Protein

CP is an estimation of the protein content in a feed by measuring the amount of nitrogen. On average, proteins contain 16% nitrogen; therefore, by multiplying the nitrogen content by (6.25 or 100/16) gives an estimation of the protein content.

DIP % - Degradable Intake Protein

DIP is the fraction of the feed crude protein that is degraded in the rumen. It provides a nitrogen source for rumen microbes from both protein and non-protein nitrogen.

UIP % - Undegraded Intake Protein

UIP, also known as “by-pass” protein, is the fraction of the feed crude protein that passes out of the rumen undigested. It contributes to the metabolizable protein value.

MP % - Metabolizable Protein

MP is protein that is available to the animal including microbial crude protein and UIP.

NDF % - Neutral Detergent Fiber

NDF is the percentage of fiber in a feed (cellulose and lignin) including hemicellulose. There is a high correlation between NDF and feed intake.

ADF % - Acid Detergent Fiber

ADF is the percentage of fiber in a feed (cellulose and lignin) not including hemicellulose. There is a high correlation between ADF and digestibility.

TDN % - Total Digestible Nutrients

TDN is the preferred value for expressing the energy content of feeds despite some fundamental flaws with its use. TDN is generally calculated using the ADF value. One of the issues with TDN is it tends to overestimate the livestock performance consuming roughages.

NE – Net Energy

The NE system divides the energy use into three categories based on the production stage of the animal. The three categories are NE for maintenance (**NE_m**), NE for growth (**NE_g**) and NE for lactation (**NE_l**). The efficiency in which animals use the feed energy will change depending on bodily function. For example, energy is used more efficiently to meet maintenance requirements than for muscle/tissue growth. The accuracy of the NE system relies on the ability to predict animal intake.

RFV – Relative Feed Value

RFV is a value used solely for identifying the quality of hay.

Comparing Prices of Livestock Feeds

Feeding livestock makes up the majority of the costs associated with livestock production. The ability to compare and price one feed to another gives livestock producers the ability to choose least cost feeding solutions and save money. This table allows the user to compare the price of feeds on a nutrient or feed analysis basis.

To use the feed price calculator, enter information that you know about the feed in the feed analysis table. Feed Costs,

Pounds per unit, and Dry Matter must be entered to perform calculations. Crude protein, TDN, and Net Energy values are optional, but are valuable in balancing rations for livestock. For descriptions of these values, see the terms and definitions on the previous page.

Next, use the Feed Price Comparison table to calculate prices per nutrient/analysis value. Use the numbers in the calculations column to complete the Feed Price Comparison table. The price of the feeds in the Feed Price Comparison section can then be compared horizontally between feed #1 and #2.

Table 1. Comparing Prices of Livestock Feeds

Feed Analysis Information	Feed #1	Feed #2	Example	Calculation #	
<i>Feed Name</i>			Ex. Alfalfa	1	
<i>Feed Cost per unit (\$)</i>			240	2	
<i>Pounds per unit (pounds, ex: 2000 lbs)</i>			2000	3	
<i>Dry Matter (%)</i>			91	4	<i>*Use decimal form of percent's in calculations</i>
<i>Crude Protein (%)</i>			20	5	
<i>TDN (%)</i>			58	6	
<i>Net Energy for maintenance (Mcal/lb)</i>			0.56	7	
<i>Net Energy for gain (Mcal/lb)</i>			0.31	8	

Feed Price Comparison	Feed #1	Feed #2	Example	Calculations	
<i>Price per pound of DM (\$/lb)</i>			0.132	2/(3*4)	<i>*Use calculation #'s from above to perform the calculations.</i>
<i>Price per pound of CP (\$/lb)</i>			0.659	2/(3*4*5)	
<i>Price per pound of TDN (\$/lb)</i>			0.227	2/(3*4*6)	
<i>Price per pound of NEm (\$/lb)</i>			0.235	2/(3*4*7)	
<i>Price per pound of NEg (\$/lb)</i>			0.425	2/(3*4*8)	

**Use the "Calculations" column on the right to find feed prices for specific nutrients.*

Animal Unit Equivalents for Grazing

Grazing management is crucial for rangeland health in Golden Plains Area. Using a stocking rate too high can lead to overgrazing and damage the ecology of the rangeland. Effective grazing strategies identify forage availability and the animal units the pasture can support. The following table allows

livestock producers, who know their pasture's forage availability and the appropriate stocking rate, to determine the appropriate number of grazing animals by species. Animal intake may fluctuate between animals and on a day-to-day basis. The data on following table are averages, and the assumption is that 1 animal unit (AU) will consume 26 pounds per day of air dried forage.

Table 2. Animal Unit Equivalents for Grazing

Animal Class	AU Equivalent
<i>Cattle</i>	
Cow (1,000 lb non-lactating)	1.00
Pregnant heifer (> 18 months)	1.00
Bull (> 24 months)	1.50
Bull (< 24 months)	1.20
Cow and Calf	1.30
Yearling (> 18 months)	0.90
Yearling (< 18 months)	0.80
Calf (< 12 months)	0.60
<i>Sheep and Goat</i>	
Ewe/Doe (non-lactating)	0.20
Ewe/Doe (with lamb/kid)	0.30
Weaned lamb/kid	0.15
<i>Horse</i>	
Draft	1.50
Saddle	1.25
<i>Others</i>	
Deer	0.20
Elk	0.65
Pronghorn	0.12
Bison	1.00

Estimated Livestock Water Requirements

Livestock use water for temperature regulation, digestion, growth, and many other bodily functions, making it very important for producers to know how much their livestock will drink. The ambient temperature, water temperature, diet,

growth, lactation and the animal's activity all play a part in how much the animal will drink. The following table contains average water consumption for livestock at various temperatures. Actual water consumption may vary.

Table 3. Estimated Livestock Water Requirements

Weight in lbs	Temperature in ° F					
	40	50	60	70	80	90
<i>Growing Beef Calves</i>						
400	4.0	4.3	5.0	5.8	6.7	9.5
600	5.3	5.8	6.6	7.8	8.9	12.7
800	6.3	6.8	7.9	9.2	10.6	15.0
<i>Finishing Beef Cattle</i>						
600	6.0	6.5	7.4	8.7	10.0	14.3
800	7.3	7.9	9.1	10.7	12.3	17.4
1,000	8.7	9.4	10.8	12.6	14.5	20.6
<i>Wintering Pregnant Beef Cows^b</i>						
900	6.7	7.2	8.3	9.7	---	---
1,110	6.0	6.5	7.4	8.7	---	---
<i>Lactating Beef Cows</i>						
900 and up	11.4	12.6	14.5	16.9	17.9	16.2
<i>Mature Beef Bulls</i>						
1,400	8.0	8.6	9.9	11.7	13.4	19.0
1,600 and up	8.7	9.4	10.8	12.6	14.5	20.6
<i>Lactating Dairy Cowsc</i>						
75 lbs/d milk	17.1	18.8	20.6	22.3	24.1	25.9
<i>Horses and Mules</i>						
---	8.0	8.8	9.6	10.4	11.2	12.0
<i>Sheep</i>						
---	1.5	1.9	2.3	2.7	3.1	3.5
<i>Goat</i>						
---	1.5	1.9	2.3	2.7	3.1	3.5
<i>Swine</i>						
per 100 lbs	1.0	1.1	1.2	1.3	1.4	1.5
<i>Turkey</i>						
per 100 lb	10.0	11.0	12.0	13.0	14.0	15.0
<i>Chicken</i>						
per 100 lb	6.0	6.6	7.2	7.8	8.4	9.0

^cCalculation from Murphy et al., 1983. Variables include typical temp fluctuations, dry matter intake, milk production, and salt intake.

Table 4. Body Condition Score Description

	BCS	Description
Thin	1	Bone structures are sharp to the touch. Little evidence of fat deposits or muscling.
	2	Little evidence of fat deposition but some muscling in hindquarters. Spinous process are sharp to the touch and easily seen with space between them.
	3	Slight fat cover over loin, back and foreribs. Backbone highly visible and spinous processes are identifiable by touch. Spaces between processes are less pronounced.
Borderline	4	Foreribs not noticeable. 12th and 13th rib still noticeable. Transverse processes identifiable only by palpation (slight pressure), feel rounded rather than sharp. Full but straightness of muscling in hindquarters.
	5	12th and 13th ribs not visible unless animal has been shrunk. The transverse spinous processes can only be felt with firm pressure to feel rounded—not noticeable to the eye. Spaces between the processes not visible and only distinguishable with firm pressure. Areas on each side of the tail head are fairly well filled but not mounded.
Ideal	6	Ribs fully covered, not noticeable to the eye. Hindquarters plump and full. Noticeable sponginess to covering of foreribs and on each side of the tail head. Palpation of the transverse process requires firm pressure.
	7	Ends of the spinous processes can only be felt with very firm pressure. Spaces between processes can barely be distinguished at all. Abundant fat cover on either side of tail head with some patchiness evident.
Fat	8	Animal taking on a smooth, blocky appearance; bone structure disappearing from sight. Fat cover thick and spongy with patchiness likely.
	9	Bone structure not seen or easily felt. Tail head buried in fat. Animal's mobility may actually be impaired by excess amount of fat.

Figure 1. Body Condition Score Palpation Guide (over the loin)

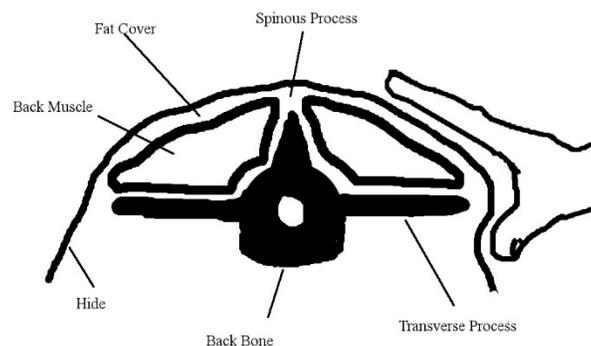


Figure 2. Cross Section of Body Condition Scores for Beef Cattle (over the loin)

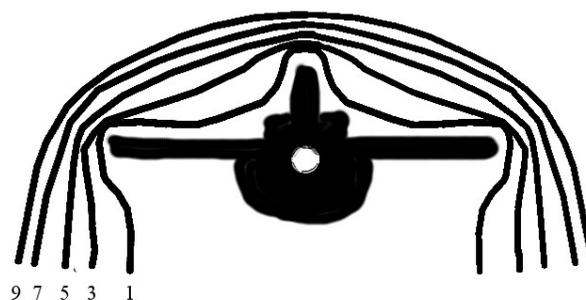


Figure 3. Temperature Humidity Index for Livestock

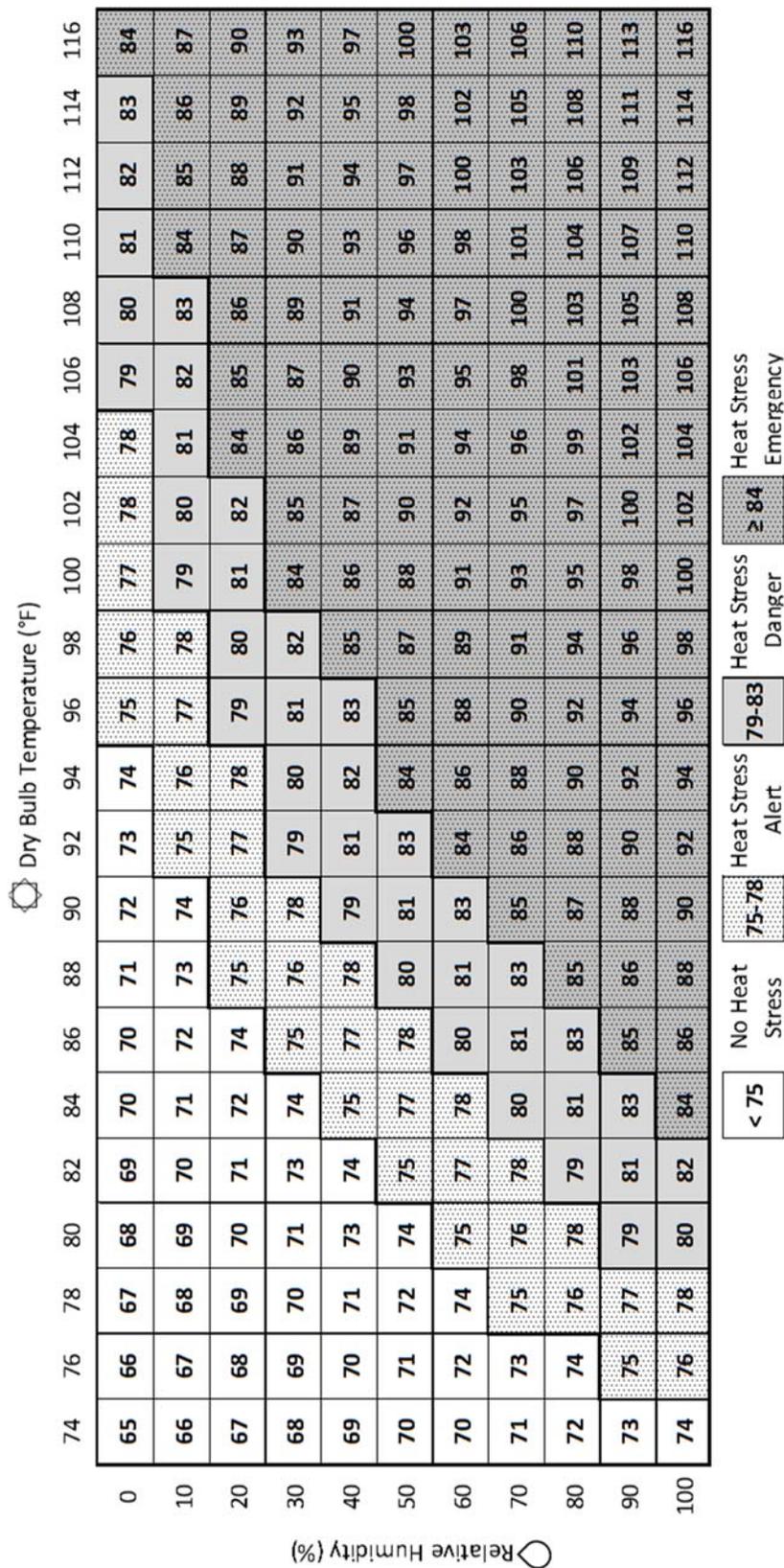


Table 5. Livestock Gestation Calendar

Date of Service	Date Animal is Due to Give Birth				
	Cow	Mare	Ewe	Doe	Sow
1-Apr-14	9-Jan-15	7-Mar-15	26-Aug-14	29-Aug-14	25-Jul-14
15-Apr-14	23-Jan-15	21-Mar-15	9-Sep-14	12-Sep-14	8-Aug-14
1-May-14	8-Feb-15	6-Apr-15	25-Sep-14	28-Sep-14	24-Aug-14
15-May-14	22-Feb-15	20-Apr-15	9-Oct-14	12-Oct-14	7-Sep-14
1-Jun-14	11-Mar-15	7-May-15	26-Oct-14	29-Oct-14	24-Sep-14
15-Jun-14	25-Mar-15	21-May-15	9-Nov-14	12-Nov-14	8-Oct-14
1-Jul-14	10-Apr-15	6-Jun-15	25-Nov-14	28-Nov-14	24-Oct-14
15-Jul-14	24-Apr-15	20-Jun-15	9-Dec-14	12-Dec-14	7-Nov-14
1-Aug-14	11-May-15	7-Jul-15	26-Dec-14	29-Dec-14	24-Nov-14
15-Aug-14	25-May-15	21-Jul-15	9-Jan-15	12-Jan-15	8-Dec-14
1-Sep-14	11-Jun-15	7-Aug-15	26-Jan-15	29-Jan-15	25-Dec-14
15-Sep-14	25-Jun-15	21-Aug-15	9-Feb-15	12-Feb-15	8-Jan-15
1-Oct-14	11-Jul-15	6-Sep-15	25-Feb-15	28-Feb-15	24-Jan-15
15-Oct-14	25-Jul-15	20-Sep-15	11-Mar-15	14-Mar-15	7-Feb-15
1-Nov-14	11-Aug-15	7-Oct-15	28-Mar-15	31-Mar-15	24-Feb-15
15-Nov-14	25-Aug-15	21-Oct-15	11-Apr-15	14-Apr-15	10-Mar-15
1-Dec-14	10-Sep-15	6-Nov-15	27-Apr-15	30-Apr-15	26-Mar-15
15-Dec-14	24-Sep-15	20-Nov-15	11-May-15	14-May-15	9-Apr-15
1-Jan-15	11-Oct-15	7-Dec-15	28-May-15	31-May-15	26-Apr-15
15-Jan-15	25-Oct-15	21-Dec-15	11-Jun-15	14-Jun-15	10-May-15
1-Feb-15	11-Nov-15	7-Jan-16	28-Jun-15	1-Jul-15	27-May-15
15-Feb-15	25-Nov-15	21-Jan-16	12-Jul-15	15-Jul-15	10-Jun-15
1-Mar-15	9-Dec-15	4-Feb-16	26-Jul-15	29-Jul-15	24-Jun-15
15-Mar-15	23-Dec-15	18-Feb-16	9-Aug-15	12-Aug-15	8-Jul-15
1-Apr-15	9-Jan-16	6-Mar-16	26-Aug-15	29-Aug-15	25-Jul-15
15-Apr-15	23-Jan-16	20-Mar-16	9-Sep-15	12-Sep-15	8-Aug-15
1-May-15	8-Feb-16	5-Apr-16	25-Sep-15	28-Sep-15	24-Aug-15
15-May-15	22-Feb-16	19-Apr-16	9-Oct-15	12-Oct-15	7-Sep-15
1-Jun-15	10-Mar-16	6-May-16	26-Oct-15	29-Oct-15	24-Sep-15
15-Jun-15	24-Mar-16	20-May-16	9-Nov-15	12-Nov-15	8-Oct-15
1-Jul-15	9-Apr-16	5-Jun-16	25-Nov-15	28-Nov-15	24-Oct-15
15-Jul-15	23-Apr-16	19-Jun-16	9-Dec-15	12-Dec-15	7-Nov-15
1-Aug-15	10-May-16	6-Jul-16	26-Dec-15	29-Dec-15	24-Nov-15
15-Aug-15	24-May-16	20-Jul-16	9-Jan-16	12-Jan-16	8-Dec-15
1-Sep-15	10-Jun-16	6-Aug-16	26-Jan-16	29-Jan-16	25-Dec-15
15-Sep-15	24-Jun-16	20-Aug-16	9-Feb-16	12-Feb-16	8-Jan-16
1-Oct-15	10-Jul-16	5-Sep-16	25-Feb-16	28-Feb-16	24-Jan-16
15-Oct-15	24-Jul-16	19-Sep-16	10-Mar-16	13-Mar-16	7-Feb-16