2019 Forage & Livestock Field Walk

Sponsored by the Texas Coalition for Sustainable Integrated Systems &
Texas Alliance for Water Conservation
Texas Tech University

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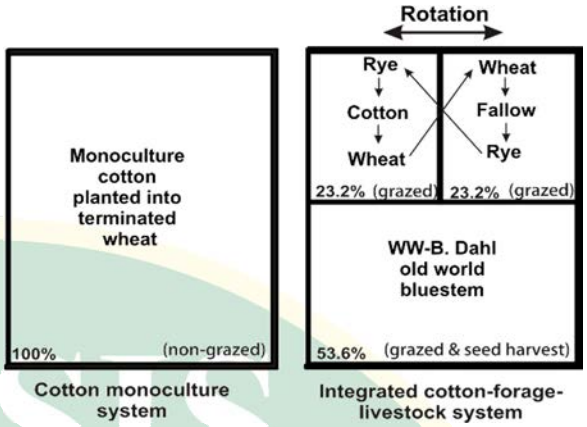
N

WW- B. Dahl OWB/Alfalfa/YSC
Native grasses
Alfalfa/ Wheat-grass
WW- B. Dahl OWB/Alfalfa/YSC
Alley
Alley
Alfalfa/ Wheat-grass
Native grasses
WW- B. Dahl OWB/Alfalfa/YSC
Alfalfa/ Wheat-grass
Native grasses

Buffalograss/ Blue grama/ Sideoats grama
Teff
Teff
WW- B. Dahl OWB/Alfalfa
Millet
WW- B. Dahl OWB
Millet
WW- B. Dahl OWB/Alfalfa
Millet
WW- B. Dahl OWB
Millet
Buffalograss/ Blue grama/ Sideoats grama
Teff
Teff
WW- B. Dahl OWB/Alfalfa
Millet
WW- B. Dahl OWB
Millet
Buffalograss/ Blue grama/ Sideoats grama
Teff
Teff

Integrating Beef Cattle and Forages with Cotton Production in the Texas Southern High Plains (1998-2008)



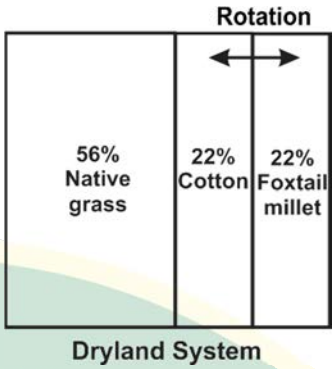
Cotton monoculture system

Integrated cotton-forage-livestock system

System Summary and animal performance (during growing season):

- 53.6% of total system land area was the perennial warm-season grass WW-B. Dahl OWB established once in 1998 at 3 lb PLS/acre.
- WW-B. Dahl provided grazing in winter, spring, and early summer and a seed crop in October.
- The remaining 46.4% of area was divided into two equal size pastures where cotton grew in rotation with the small grains rye (planted in September) and wheat. Because there were two pastures in rotation, cotton alternated each year between pastures and both rye and wheat were available for grazing in sequence each winter (rye) and spring (wheat). Cotton was no-till planted into grazed- out rye in May. Wheat was no-till planted into cotton stalks following harvest in November or December.
- Irrigation water was applied through a sub-surface drip irrigation system 12-14 inches deep on 40 inch spacing with emitters spaced every 2 feet.
- **Water Use:** Integrating cattle and cotton reduced irrigated water use by 25% (Cotton: 15.6 inches; Integrated System: 11.7 inches).
- The integrated system has less economic risk associated with variation in profitability as water scarcity increases. Other benefits include ecological diversity and improved soil health.
- **Nitrogen Fertilizer:** The cattle/cotton system required 36% less nitrogen fertilizer than cotton alone. Fewer pesticides and herbicides were also required by this system. Individually the forage crops received 60 lbs of N yearly.
- **Animal Performance:** Steers grazed 185 days from January to mid-July when feed-lot ready.
- Approximate grazing days by crop: Rye 43 days, Wheat 22 days, and Dahl OWB 120 days.
- Average initial body weight: 505 lb. Daily gain: 1.74 lbs. Total gain per steer: 306 lbs
- Total gain per system acre: 231 lbs. Over all stocking rate: 0.72 steers per acre.

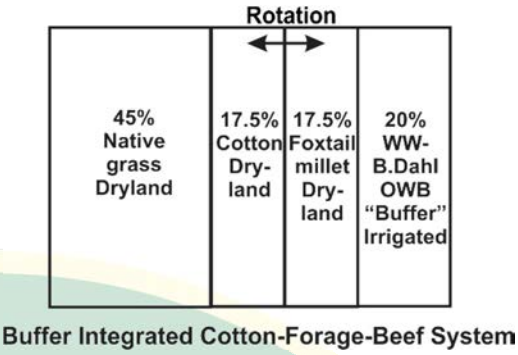
Dryland Integrated Cotton-Forage-Beef Cattle System (2004-2008)



System summary and animal performance (during growing season):

- 56 % of total system land area was established to Native grasses consisting of buffalograss, blue grama, sideoats grama and green sprangletop and were planted in June 2002 with grazing beginning in 2004. Planting rates were 2, 1, 2 and 0.5 lb PLS/acre respectively.
- The remaining 44% was divided into two equal sized pastures. One was planted to foxtail millet (forage sorghum planted and grazed in 1 year) and the other was planted to cotton. Crops rotated annually.
- Cotton yields averaged 506 lbs/acre over the years it was grown with complete crop failures in 2006 and 2007.
- The dryland system required no water input and spreads economic risk across multiple products including beef, hay production, and cotton.
- **Fertilization of grasses:** Native grasses were fertilized in 2004 with 30 lbs N and 15 lbs P and again in 2006 with 26 lb N and 30 lb S. In 2009 Native grass pastures received 54 lbs N, 10 lbs P, 16 lbs of sulfur and various micronutrients Zn, Mn and Bo.
- **Animal performance:** From 2004 to 2008 cattle grazed on dryland native grasses and foxtail millet (forage sorghum in 2008). Native grass only in 2004 and 2006 from approximately May and varied in duration from June through October.
- Stocking rate: 0.23 hd/system acre; 0.41 hd/native grass acre in years no annual grasses were available.
- Total average grazing days: Native grass averaged 77 days; Millet or forage sorghum 20 days. Grazing days spent on native grasses ranged from 43 to 128 days and is highly dependent on rainfall.
- Average initial body weight of steers was 508 lb. Daily gains were 2.22 lbs/day (1.9 to 2.4 lbs ADG)
- Total gain per system acre: 51; Total gain per grazed system acre: 65; Total gain per steer: 219.
- Salt, mineral tubs/blocks and 41% CP Cotton seed cake was supplemented to meet animal nutrient requirements as required.

Buffer Integrated Cotton-Forage-Beef Cattle System (2009-2010)



Buffer Integrated Cotton-Forage-Beef System

System summary and animal performance (during growing season):

- The all Dryland System was modified (see also Low-Water Warm Season Perennial/Annual Grass System) to include an irrigated buffer field of WW-B. Dahl OWB. This represented 20% of the new total system area to allow a "buffer" area to extend the opportunity for grazing and provide a safety net during long periods without rainfall when the native grass areas would no longer provide sufficient grazing.

- **Fertilization:** The WW-B. Dahl received 60 lbs N through the drip system.

- **Water Use:** Irrigation on the "buffer" WW-B. Dahl was limited to 7-10 inches for the season as in other trials. As a result, on a system area basis irrigation was considered to be a very low input for the overall system and only used 1.7 inches/system acre of irrigation.

- **Animal performance:** Steers grazed an average of 117 days from May through September.

- Total grazing days for the Native grass was 30 days, 11 days on the millet and 76 days on the irrigated buffer WW-B. Dahl OWB pasture.

- Initial steer weights were 598 lbs

- Stocking rate was approximately 0.43 hd/grazed system acre excluding the cotton acres.

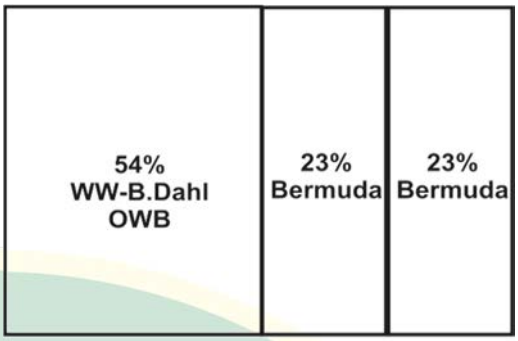
- Average Daily gains were 2.25 lbs/day and ranged from 2.14 to 2.38 lb/day.

- Total average weight gain per animal was 262 lbs.

- Total gain per system acre 95 lbs; Total gain per grazed system acre 115 lbs

- Adding one irrigated paddock to the former all-dryland system increased flexibility to meet challenges of low rainfall. This insured the ability to keep cattle in the system through periods of drought. Irrigating only 20% of the system reduced total water used to a level that could be sustained over a much longer time period.

All-Perennial Irrigated Grass System (2005-2010)

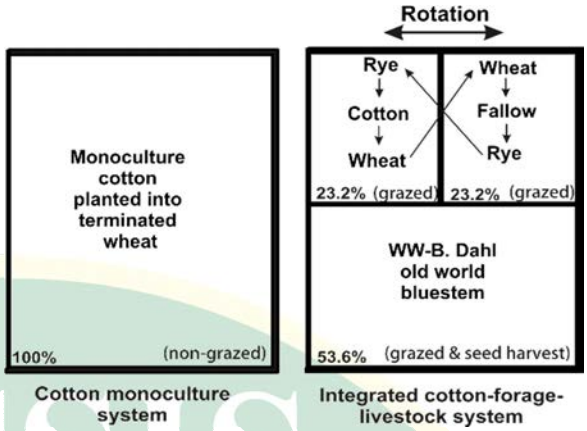


All-Perennial Irrigated System

System summary and animal performance (during growing season):

- 54% of system consisted of the perennial warm season grass WW-B. Dahl OWB and was planted at 3 lb PLS/acre in June 2003 and reseeded due to difficult establishment in this year.
- The other 46% consisted of 2 equal-sized pastures of Tifton 85 bermuda grass which was sprigged at 3 plants/foot in June 2004.
- All pastures were irrigated using sub-surface drip irrigation 14 inches deep, spaced on 40 inches with emitters spaced 2 feet apart.
- **Fertilization:** WW- B. Dahl received 60 lbs N/acre /year and Bermuda grass received approximately 200 lbs N total with injections spread equally across 4 months. Fertilizer for bermuda grass was adjusted down in low rainfall years as there was water limited opportunity for forage growth.
- **Water use:** Irrigation for WW-B. Dahl was held at 6-10 inches total for season and Tifton 85 bermuda grass was held to a maximum of 12 inches (ranging from 6-12 inches). System irrigation was 8.7 inches/system acre over the time period.
- **Animal performance:** From 2005 to 2010 cattle grazing period from May to October averaged 1.6 lb ADG ranging from 1.2 to 2.2 ADG.
- Total grazing days for system averaged 135 days with an average of 53 days on the WW-B.Dahl with 82 days on the Tifton 85 bermuda grass.
- Average initial body weight of 546 lb steers. Total gain per steer 241; Total gain per system acre 336 lbs.
- Salt, mineral tubs/blocks and 41% CP Cotton seed cake was supplemented to meet animal nutrient requirements as required.
- Stocking rate was approximately 1.4 hd/system acre.
- In addition to cattle gains, a WW-B. Dahl seed harvest was made in 4 of the 6 years and hay was produced from excess forage bermuda grass in 3 of the 6 years producing an average of 2500 lbs/acre/harvest ranging from 2000 to 3700 lbs/acre.

Perennial Irrigated Grass/Legume System (2010-present)



Original Integrated Cotton/Beef Production System

System summary and animal performance (during growing season):

- In 2008 the original Integrated Cotton and Beef Production in the Texas Southern High Plains study began reconfiguration and in 2008 and 2009 the wheat/rye pastures from the original work were replanted to native grass mixtures including blue grama, sideoats grama and green sprangletop in 2008 to one of the rotation pastures and a 50:50 mixture of Jose Tall Wheatgrass and Alfalfa (RSI 707) in 2009 to the other pasture in rotation. The original stands of the perennial WW-B. Dahl OWB planted in 1998 where inter-seeded with alfalfa (RSI 707) and yellow sweet clover (Madrid) in 2010 to achieve about 20 % legume in the grass mixture. In 2014 these pastures were over-seeded to increase legume content to approximately 50% legume. The original cotton area was planted to a BMR sorghum/sudan for grazing in the newly re-configured system.

- The alfalfa/yellow sweet clover introduced into the WW-B. Dahl is intended to increase forage quality and reduce chemical inputs such as nitrogen to the system. The alfalfa/wheatgrass is intended to provide a protein bank for cattle and thereby reduce need for supplementation and improve cattle gains. High quality forage is essential to increase cattle gains and reduce the amount of time required to spend on a feedlot and approach forage finished beef production.

- All pastures are irrigated using sub-surface drip irrigation 14 inches deep and spaced 40 inches with emitters on 2 feet spacing.

- **Water use:** Irrigation for the tall wheatgrass/legume mixture is being held to a maximum of 12 inches of irrigation, while the WW-B. Dahl/legume mixture is being held to a maximum of 9-10 inches. The native grass stands are capable of irrigation but only minimal irrigation is applied. Introduction of a dryland component can potentially reduce water inputs on a system area basis. System water in 2010 was 7.2 inches of irrigation/system acre.

- Irrigation followed normal self-imposed research irrigation goals in 2011, 2012 and 2013.

- **Animal performance and drought:** Cattle grazed in 2010, but no grazing occurred during 2011, 2012 or 2013 as the drought in 2011 and 2012 prevented adequate forage for grazing by livestock. 2013 allowed the forages to be evaluated and recover for resumption of cattle grazing studies in 2014.

- Hay harvest were made in June 2012 for wheatgrass/alfalfa mixture and made approximately 1600 lb/acre. The WW-B. Dahl yielded a 1700 lb/acre hay harvest in July of 2013. Again no seed harvest was made.

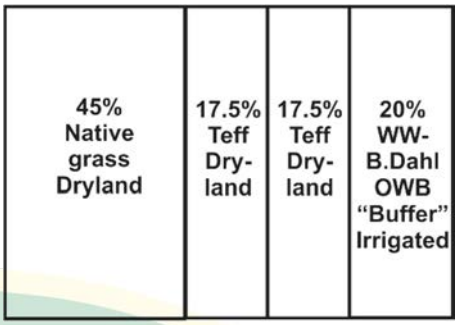
Animal performance for 2010:

- Bloat guard blocks were provided 7 days prior to and during grazing on legume pastures to reduce risk of bloat.
- Cattle averaged 595 lbs initial weight and grazed a total of 128 days on the system.
- Cattle spent a total of 33 days on native grass, 40 days on the OWB/legume pastures, 25 days on the alfalfa/wheatgrass and an additional 27 days on a combination of BMR sorghum and adjacent alfalfa/wheatgrass and 15 days on a combination of BMR sorghum and adjacent native grass pasture.
- Stocking rate was approximately 0.77 hd/system acre
- Overall ADG for this period was 2.0 lb/day.
- Wheatgrass/alfalfa mixture yielded 2200 lb/acre hay in May with another cutting of 2100 lb/acre in July.
- WW-B. Dahl yielded 1900 lb/acre hay harvest in July but there was no seed harvest made in fall.

Animal performance for 2014:

- Bloat guard blocks were provided 7 days prior to and during grazing on legume pastures to reduce risk of bloat.
- BMR Sorghum was replaced with the annual warm season grass Teff.
- Cattle initial weights averaged 501 lbs and grazed a total of 86 days on the system. Grazing days were cut short due to early season rainfall and a necessary hay harvest. Following hay harvest, rain stopped and forage became limited under the study irrigation regime.
- Cattle spent a total of 32 days on native grass, 36 days on the OWB/legume pastures, 3 days on the alfalfa/wheatgrass and an additional 15 days on a combination of Teff and adjacent native grass pasture.
- Stocking rate was approximately 0.77 hd/system acre
- Overall ADG for this period was 1.8 lb/day.
- Hay was harvested from wheatgrass/alfalfa at approximately 2100 lbs/acre. Teff yielded 1300 lbs/acre and the WW-B. Dahl yielded 2400 lbs/acre hay. No seed was obtained in 2014.

Low-Water Warm Season Perennial/Annual Grass System (2011-present)



Low-Water System

System summary and animal performance (during growing season):

- **Drought conditions:** No grazing occurred during 2011, 2012 or 2013 as the drought in 2011 and 2012 prevented adequate forage for grazing by livestock. 2013 allowed the forages to be evaluated and recover for resumption of cattle grazing studies in 2014.

- Irrigation followed normal self-imposed irrigation goals regardless of drought conditions during this time for all irrigated pastures.

- System includes the original 2002 planted dryland native grass mixtures comprising 45% of the area. Teff annual warm season grass (replaced foxtail millet from previous Dryland System described) planted to 2 equal size dryland pastures representing 35% of the area. And irrigated WW-B.Dahl OWB buffer pasture comprising the remaining 20%.

- **Drought recovery and evaluation:** In 2013, rye was planted dryland then over-seeded to Teff. The rye was harvested for hay in April producing 1500 lbs/acre and the Teff was harvested in August producing nearly 1300 lbs/acre hay crop. The perennial forage WW-B. Dahl stockpiled forage was harvested for hay in March and produced approximately 3100 lbs/acre. The dahl was harvested again in late July and produced over 4700 lbs/acre. In addition, a seed harvest on the dahl was made in October.

- **Fertilization:** The WW-B. Dahl OWB buffer receives 60 lbs N through the drip system yearly. In 2015 Teff pastures were fertilized with 60 lbs of N over the top. Typically native grass pastures are not fertilized however, monitoring of fertility levels through soil test and application in good rainfall years can be a benefit for the grass and cattle.

- **Water Use:** Irrigation on the "buffer" WW-B. Dahl was limited to a maximum of 9-10 inches for the season as in other trials. As a result, on a system area basis irrigation was considered to be a very low input for the overall system and only used 1.7 inches/system acre of irrigation.

- **Animal performance:** In 2014, cattle were reintroduced to the system in June at an average 500 lb initial body weight.

- Cattle spent 52 days on WW-B. Dahl and 34 days on the Teff for a total of 86 days. Early rainfalls resulted in a flush of growth for all pastures and as a result cattle did not graze on the native grass in 2014 but they were harvested for hay in late July producing over 3100 lbs/acre. The WW-B. Dahl was harvested for hay in July producing 1500 lbs following grazing. Hay harvest was made to control over maturity and patch grazing, however the rains stopped and forages became limited resulting in early termination of grazing. Fall rains resumed and a flush of growth on the Teff pastures resulted in a hay harvest in mid-October producing 3600 lbs/acre hay crop. The WW-B. Dahl also produced a seed crop of around 90 bulk lbs/acre.

- Salt was provided with no additional supplementation.
- Overall average daily gains for this period were 1.95 lbs/day.

NOTES:

Forage/Livestock Systems Research Unit
Dept. Of Plant & Soil Science
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http://www.orgs.ttu.edu/forageresearch

'WW-B. Dahl' Old World Bluestem
Bothriochloa bladhii (Retz) S.T. Blake

'WW-B. Dahl' Old World Bluestem is a warm-season, perennial 'tufted' bunch grass. This grass was collected originally near Manali, India and tested at the Oklahoma Agricultural Experiment Station at Stillwater, OK beginning about 1960. In the mid-1960's, plants were sent to the Southern Regional Plant Introduction Station, Experiment, GA and from there seed were sent to the Southern Plains Range Research Station, Woodward, OK where the grass was tested in the program under the direction of Chet DeWald. Bill Dahl, a professor in Range Science at Texas Tech University, conducted tests with this grass under dryland conditions at the TTU Range Research Ranch at Justiceburg, TX. In 1994, WW-B. Dahl, named for Dr. Bill Dahl, was released jointly by the USDA-ARS, USDA-SCS, Texas Tech University, and the Texas Agricultural Experiment Station.

Plant Characteristics

Dahl is a warm-season perennial 'tufted' bunchgrass with an upright growth habit. A single plant, when mature, can cover as much as a square yard. Stand longevity appears excellent with 10-year old stands now documented with no indication of stand losses. It has dark green leaves and plants reach a mature height of 2.3 to 3 feet with stems and flowers reaching heights of over 5 feet. In trials at Texas Tech, dry matter yields of Dahl were similar to those of 'Caucasian' Old World Bluestem *[B. caucasica* (Trin.) C.E. Hubbard 'Caucasian'] but were higher than yields from several varieties of *B. ischaemum* [(L.) Keng. var. *ischaemum*] including 'Plains', 'Spar' and 'Iron Master.' Unlike the other old world bluestems, Dahl remains leafy and vegetative throughout much of the growing season and only begins to reach a flowering stage in September with seed maturity and seed shedding in October. Observations suggest that various stresses including drought stress can result in earlier flowering, however.

Peak growth of Dahl can be expected to occur by mid- to late-July but is influenced by timing and amount of available moisture and fertilizer applications. Total seasonal dry matter

production under dry land conditions in a single seasonal harvest ranged from 1 to 2 tons/acre at Woodward, OK (http://www.sprrs.usda.gov/owbmanage.htm). At New Deal, TX, total dry matter yields under dryland conditions averaged about 1.5 tons/acre when harvested twice (late July and September) while with irrigation to replace 100% of ET, yields averaged about 8 tons/acre.

Dahl is rich in essential oils that gives it its distinctive odor generally described as a pleasant smell. There is evidence that *Bothriochloa* species, characterized by containing these oils, have insect deterrent properties including resistance to the fall army worm (*Spodoptera frugiperda*) and other insects (see Insect Deterrent Properties below).

Forage Quality

Research at TTU has consistently shown that concentrations of crude protein in Dahl forage are about 1 to 2% higher than in the other old world bluestems listed above. Concentrations of crude protein have averaged between 3.5 to 4% during December and January in dormant forage while concentrations range from 9 to 12% during the active growing period from May to July. Crude protein concentrations begin to drop rapidly by July, however, and supplementation of crude protein to grazing animals may be needed in the later part of the growing season as well as to livestock grazing winter dormant forage. Mineral concentrations in Dahl indicate that grazing animals may need supplementation with phosphorus, copper, and zinc. Plant concentrations of sulphur suggest that both the plant and the grazing animal could benefit from sulphur fertilization.

Fertilization

Applications of about 60 to 90 lbs of nitrogen/acre annually has generally been sufficient to optimize yields. Based on research with other old world bluestems and limited water resources, higher nitrogen fertilization rates appear unwarranted in most cases. Phosphorus is needed for a healthy root system and should be applied per soil test recommendations. Phosphorus may also be important for seed production of this grass and for seed germination and early seedling growth at establishment. Other nutrients should be applied as the soil tests indicate. In calcareous soils, some iron deficiencies have been observed which result in a yellowing of the leaf material. Zinc deficiency may also occur and should be monitored. Recommendations for sulphur fertilization are best based on plant tissue analysis. Concentrations of sulphur in plant tissue should generally be at least 0.2% for plant and animal nutrition and both plant and animal responses in growth and live weight gains have been observed in response to applications of about 30 to 60 lbs of sulphur/acre annually, when leaf tissue samples are much below 0.2% sulphur.

Establishment of Dahl Old World Bluestem

WW-B. Dahl should be planted in late April or early May at a rate of 2 lbs pure live seed (PLS)/acre. Establishment can be by broadcast or drilling into a prepared seedbed or can be no-till established. Seed should be planted NO deeper than 1/4 inch with 1/8 inch the ideal depth.

Seeds are more often planted too deep than too shallow. A firm seedbed is essential for establishment and cultipacking the soil is usually necessary. If a pickup truck driven across the area leaves noticeable wheel track depressions, then more packing of the soil is likely necessary.

Broadcasting seeds onto a granular surface of a well-prepared seedbed and cultipacking is adequate to get good establishment. If using a drill, it must be equipped to handle 'fluffy' seeds. These drills usually have paddles or fingers that push the seed down into the drill box openings. Drilling seeds will generally have a higher success rate and has the advantage of being able to identify seeds germinating in rows as opposed to random placement from broadcasting. Young seedlings are very small, are hairy at the leaf collar, and generally lie prostrate on the ground often being overlooked at this stage of development. It is easy to not recognize plants until the fall when this grass goes through stem elongation and flowering.

For no-till planting, surface residue should be minimized. Too much trash prevents good seed to soil contact. The trash is often pushed down in front of the coulter and seed are placed in the fold preventing them from germinating. At least 50% bare ground should be present if no-till planting is attempted. Be sure that existing vegetation is killed 6 to 8 weeks before planting. No-till planting can conserve moisture and soil, fuel, require less time, and reduce weed competition but requires excellent conditions of the soil and surface cover to insure success.

For any method of planting, the seedbed should be free of weeds. Weed control prior to planting is very important. This seedling is very slow to establish and growth is slow throughout the first several months after planting. Competition from weeds during this period can be severe. If weeds are present after plants begin to emerge, shredding frequently is helpful to reduce competition. Herbicides can be used. Consult your local herbicide specialist for recommendations. Precipitation in optimum amounts and times or the ability to surface irrigate newly planted stands are crucial to seed germination and establishment success.

Grazing Management

Growth of forage begins generally in early May with grazing available by mid-May. The response of this forage to water and fertility inputs is greater during the first part of the growing season than by August through September. Quality of the forage is also higher during the first half of the growing season than in later months. Thus, it is more efficient to optimize the use of the grass during May through July than in August and September.

Stocking rates should be high enough to maintain a canopy height of about 5 inches. Understocking leads to patch grazing and undergrazed areas become overmature and of low quality. This grass appears tolerant of close grazing but prolonged defoliation to canopy heights

of less than 3 inches is not recommended. Likewise, gains of grazing animals will be lower when there is too little forage for grazing. An intensive rotational stocking method does not appear to be needed or beneficial to either the plant or the animal. In fact, seed production later in the season may be reduced if defoliation is lax during the growing season. It appears to be more important to manage stocking rates to target a consistent defoliation height with an alternative complementary paddock to supplement grazing if forage becomes limiting. If undergrazing is occurring, consider confining livestock to a smaller area of the paddock and harvesting the remainder for hay. Grazing should be terminated at least by September 1 to allow plants to regrow and regain energy stores to survive through the winter.

Dahl old world bluestem can be accumulated (stockpiled) during August and September for grazing during winter as standing hay. Additional fertilizer may be applied in August along with supplemental irrigation to increase fall growth. Crude protein will be low (3.5 to 4%) by December and a crude protein and energy supplement will be needed for animals grazing the stockpiled forages during winter.

Animal Performance

Research at Texas Tech has shown daily gains of grazing steers of about 2.5 lbs/day during the early part of the grazing season (May and June). As the season progresses, daily gains will decrease without supplementation of crude protein. Daily gains of steers grazing the stockpiled forage during January and February have been low (0.4 lbs/day) even with supplementation but grazing this forage avoids the need to burn excess forage in spring and can provide a good source of roughage to compliment grazing of winter rye or wheat pastures and may lower the chance of bloat in animals grazing small grain pastures. In grazing trials at TTU, lambs grazing Dahl old world bluestem had higher daily gains and gains per acre than those grazing Plains, Spar, and Iron Master and were similar to lambs grazing Caucasian.

Hay Production

Dahl old world bluestem makes excellent hay that is palatable to livestock. Total seasonal yields can be expected to be between 1 to 8 tons/acre depending on rainfall and the ability to provide supplemental water through irrigation. Limited data from Texas Tech suggests that harvesting in mid-July is the optimum time for hay cutting. Harvesting either earlier or later appears to reduce total seasonal yields. After a seed harvest in October, the residual biomass can also be harvested as hay but quality will be lower at this point.

Seed Harvest

Managing Dahl for a seed harvest can provide additional income. Seed are mature and ready to harvest in October and can reach 50 lb PLS/acre. Stockpiling the forage for winter grazing allows for a seed harvest to occur with little effect on the winter forage supply. Seed yields and quality have been variable and more information is needed on management strategies to optimize seed production. Seed prices have ranged from less than $14 to more than $20/PLS

lb making this component a valuable commodity. The seed mature at different rates making multiple harvests necessary to maximize yields. Once approximately 50% of the seed is 'slipping' (seed strip off in response to light pressure when the flower slides through your hand), the initial harvest can be made. Once the seed is at this point of development, it is very vulnerable to wind and rain as the seed are easily shattered. If adverse weather occurs for an extended period, the potential for losing the seed harvest exists. If a freeze occurs, the seed must be harvested within 24 hours. Harvesting of this grass requires special harvest equipment and can be commercially harvested.

Insect Deterrent Properties

Dahl fields appear to have some resistance to the Red Imported Fire Ant (RIFA; *Solenopis invicta* Buren; Hymenoptera; Formicidae) and livestock grazing Dahl may have fewer pestiferous flies. Recent observations suggest almost complete absence of red imported fire ant mounds in Dahl bluestem fields (Britton et al., 2002). Conversely, RIFA mound population densities in nearby bermudagrass and other forage fields were very high on central Texas ranches. Additionally, observations suggest suppression of fly populations on cattle grazing Dahl bluestem pastures. Reduced fly populations would improve cattle performance and could reduce pesticide requirements. Information is needed to further define the effects of Dahl bluestem on fire ant populations and pestiferous flies. Insect resistance in several grasses of the genus *Bothriochloa* has been suggested previously (Zalkow et al., 1980; Pinder and Kerr, 1980). Volatile oils that give this grass its distinctive odor have been identified by several authors and may be related to insect deterrent properties. Perhaps these are the reasons why cattle grazing Dahl pastures appear less susceptible to pestiferous flies.

Conclusions

WW-B. Dahl is one of the most promising introduced warm-season perennial grasses in the Texas High Plains. It has excellent longevity and potential for grazing, hay, and seed production, drought tolerance under dryland conditions, and has exhibited excellent yields and weight gains for cattle under irrigation. Its growth pattern of remaining vegetative through most of the growing season while entering the reproductive stage in fall lends itself well to a combination of grazing, stockpiling for winter grazing, and seed production. This grass provides an excellent component of an over all grazing system that includes grazing of winter annual small grains, high in crude protein, as a compliment to stockpiled Dahl (Allen et al., 2005).

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Pasture Establishment Guidelines

Twain Butler, Forage Research Agronomist, The Noble Foundation

i. Variety Selection (ie. WW B-Dahl)
ii. Soil Test
    a. Fertilizer with P&K according to soil test prior to establishment
iii. Seed Quality (purchase seed based on PLS basis)
iv. Seedbed Preparation: SMOOTH, FIRM, &WEED-FREE
v. Type of Planter (to evenly meter out fluffy/chaffy seed)
    a. Clean-till Drill: (ie Horizon Drill etc)
    b. Broadcast/Drop Spreader (Brillion)
        i. MAY require drag harrow and packer)
    c. No-till Drill (ie Tye, Great Plains, Truax, etc.)
    d. Consider: Reduced Tillage: (**terminated** cover crop; ie sorghum the previous summer or small grain previous winter)
        i. Prevent wind erosion, and provide some shade to seedlings without losing moisture
vi. Planting Depth: ~ ¼ inch on loam or heavy soil; ~ ½ on sandy soils
    a. Rule of thumb: if you leave foot print greater than ideal depth, its too soft.
vii. Planting Date: April 15 to May 15
viii. Seeding Rate: 2-3 lb PLS per acre
ix. Pray for Rain!
x. Weed Control: http://www.cdms.net/Label-Database - ALWAYS READ THE LABEL
        i. Be aware of herbicide carry over from previous crops (ie Staple in cotton)
    b. PRE-emergent (Metcel/Cimarron, Cimarron Plus (metsulfuron + chlorsulfuron)
    c. Post-emergent: USE EXTREME CAUTION!
        i. IS your county regulated? 2,4-D, 2,4-DB, MCPA, dicamba, propanil, and quinclorac are regulated herbicides. https://texasagriculture.gov/RegulatoryPrograms/Pesticides/RegulatedHerbicides.aspx
        ii. Aminopyralid (Milestone), Triclopyr (Remedy), clopyralid (Reclaim), and PastureGard (triclopyr + fluroxypyr), Capstone (aminopyralid + triclopyr) are NOT regulated and are extremely effective on broadleaf weeds, BUT CAN drift to nearby cotton!
        iii. Consider drift reduction tips, use drift retardants, and never spray when wind exceeds 10 mph or in the direction of a sensitive crop like cotton.
        iv. Consider 2,4-D (Dow AgroSciences) and/or Dicamba (Monsanto) tolerant cotton next year (2016) to clean up weeds prior to establishing grasses (2017)!
            1. It is generally easy to establish pasture following row crops where weeds are managed.

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