Overseeding cool-season grains on a summer grass pasture. An overview.

Austin County, TX

Fernando Guillen-Portal

May, 21, 2021

Topics that will be addressed:

- The Small Grains Extension Program
- Cool-season small grain forages
- Overseeding cool-season grains on warm pastures

The Small Grains Extension Program at TAMU AgriLife

Goals:

- Effective transfer of research-based information on topics of practical relevance in small grain production in Texas to producers, extension educators, and agricultural communities.
- Finding practical solutions to current challenges in small grains production in Texas through the implementation of applied agricultural research.
Program components

- Variety testing
- Outreach and education
- Applied research

Winter wheat production in Texas

- 4.5 M acres planted in 2019
- 2.1 M acres harvested

- Grain
- Dual-purpose (Grain + Grazing)
- Total grain production: ~70 M Bu (6th in the US)
- Avg. grain yield: 34 Bu/ac

Major issues:
- Drought
- Disease/insect pressure
- Variable growing conditions
- Market price fluctuations

Wheat production systems in Texas

- Grain
- Grain & grazing
- Graze-out
- Hay production

Major considerations:
- Reduce risk & maximize returns per acre
- To increase profitability
Dual-purpose wheat production: A Complex system

Environmental conditions
- Seasonal conditions (temperature, precipitation)

Crop management practices
- Planting time
- Seeding rate
- Soil fertility
- Choice of variety

Grazing practices
- Grazing initiation
- Animal stocking rate
- Grazing termination

Choice defined by
- Farm system
- Commodity price fluctuations (wheat & beef)
- Growing conditions – Effect on the crop

Small Grains Uniform Variety Trials (UVT)
TAMU Pick's list 2021

T. Reid, R. Godwin-Roach, D. Holley, J. Kimura, R. Nolan

Top 10 Witches' Fears in 2019 and 2020

<table>
<thead>
<tr>
<th>Variety</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Witches</td>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
<tr>
<td>Witches' Tale</td>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
</tbody>
</table>

http://varietytesting.tamu.edu/wheat
2020 Small grains forage variety trials – Variety performance

<table>
<thead>
<tr>
<th>College Station</th>
<th>Comanche</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-entry trial</td>
<td>55-entry trial</td>
</tr>
</tbody>
</table>

Comanche County Variety Trial - Three-year results (2018 – 2020)

http://varietytesting.tamu.edu/forage

2020 Small Grains Variety Trials – County Extension Efforts

<table>
<thead>
<tr>
<th>Forage Strip Trial – Atascosa County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Nelson</td>
</tr>
<tr>
<td>Trical 131</td>
</tr>
<tr>
<td>Trical 83</td>
</tr>
<tr>
<td>Trical Hyb 53</td>
</tr>
<tr>
<td>Trical Surge</td>
</tr>
<tr>
<td>NF201</td>
</tr>
<tr>
<td>Maton II</td>
</tr>
<tr>
<td>Elbon</td>
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<tr>
<td>Dikson</td>
</tr>
<tr>
<td>TAM0408</td>
</tr>
<tr>
<td>TAM0432</td>
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<tr>
<td>TX350186142</td>
</tr>
<tr>
<td>TX350186163</td>
</tr>
<tr>
<td>Collier 207</td>
</tr>
</tbody>
</table>
Applied research
Crop production: A complex enterprise

Growing conditions

Light
Water
Nutrients
Biotic stress

Crop management practices

Variety yielding & stability

Applied research: Reducing the Yield Gap in Winter Wheat

Need complementary strategies to increase yield

Narrowing the yield gap

Increased global food demand
Limited arable land
Climate change (reduced water for agriculture, increased temperatures, disease pressure)

Strategy to increase yield: Genetic improvement through breeding

~ 1% genetic gain/year, reached a plateau

The yield gap

Crop yield data from 2011 to 2019, comparing potential yield, farm yield, and yield gap (% of potential yield):

<table>
<thead>
<tr>
<th>Year</th>
<th>Potential yield</th>
<th>Farm yield</th>
<th>Yield gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>21.9</td>
<td>13.1</td>
<td>8.8</td>
</tr>
<tr>
<td>2012</td>
<td>37.3</td>
<td>21.7</td>
<td>15.6</td>
</tr>
<tr>
<td>2013</td>
<td>22.4</td>
<td>14.4</td>
<td>8.0</td>
</tr>
<tr>
<td>2014</td>
<td>24.7</td>
<td>14.1</td>
<td>10.6</td>
</tr>
<tr>
<td>2015</td>
<td>33.6</td>
<td>22.5</td>
<td>11.1</td>
</tr>
<tr>
<td>2016</td>
<td>35.8</td>
<td>26.0</td>
<td>9.8</td>
</tr>
<tr>
<td>2017</td>
<td>39.9</td>
<td>23.4</td>
<td>16.5</td>
</tr>
<tr>
<td>2018</td>
<td>28.8</td>
<td>20.1</td>
<td>8.7</td>
</tr>
<tr>
<td>2019</td>
<td>39.5</td>
<td>33.4</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Mean: 31.5, 21.0, 10.6, 66

Yield gap decrease: 0.23 Bu/ac per year

Cropping intensity systems assessed in College Station and McGregor:

Two cropping systems:
- Grain, Grain + Grazing

Three adapted HRWW varieties with contrasting agronomic attributes:
- TAM 114, TAM 304, Gallagher

Nine management intensity systems:
- Seeding rate (0.5, 0.9, 1.3 M seeds/ac)
- Top-dress N application rate (0, 60, 120 lb N/ac)
Overseeding cool-season small grains on warm pastures

- Dormancy of warm-season grasses (Bermudagrass) during winter
- Need of supplemental pasture during winter
- Small grains (wheat, barley, cereal rye, oats, triticale) and ryegrass: Good sources of forage supplement

To consider:
- Climatic fluctuations during fall/winter/spring
- Soil pH and fertility status (N)
- Small grain, variety selection
- Class and type of cattle to be grazed

Purpose

- Increase the forage production and the quality of perennial grass forage late in the fall and during early spring
- Reduce cash expenses for winter supplementation of livestock
- Efficient use of available land (case of warm-season grass)
- Increase profits at the farm/ranch
- Thicken up a perennial grass field to prevent erosion and increase soil stability

Small grain forages

Barley  Oats  Rye  Triticale  Wheat  Ryegrass
Small grain forages – Winter wheat

- Most common and flexible crop for forage production in Texas
- Excellent winter hardiness
- Provides good forage quality
- Well adapted to most soils, except very sandy ones
- Will stand wetter soil conditions, but less tolerant to poorly drained soils
- Variety selection depends of purpose (grain, grazing & grain)
- Weed-free seed (certified seed) should be used to prevent weed contamination

Choice of variety

- Forage yielding ability
- Tillering ability
- Grazing tolerance
- First-hollow stem
- Disease resistance package
- Germination sensitivity
- Coleoptile length

Small grain forages – Winter barley

- Enhanced tolerance to drought and heat stress and/or saline soils
- Reduced winter hardiness
- Relative reduced forage production
- Provides shorter grazing period than wheat or rye in the fall
- Only awnless varieties should be used
Small grain forages – Winter oats
- Adequate for no‐tilt management systems, requires (relative) low N
- Good source of forage during fall season
- Excellent palatability
- Great competitive ability against seasonal weeds due to increased tillering ability
- Ability to germinate under limited moisture
- Good re‐growth capacity after drought stress periods
- Particularly susceptible to crown and root damage when grazing under wet soil conditions
- Relative poor cold tolerance

Small grain forages – Winter triticale
- Excellent grazing tolerance
- Can be planted early in the fall (minimal risk of WSMV)
- Provides good forage quality late in the spring
- Relative lower forage yielding capacity
- Greater resistance to foliar diseases

Small grain forages – Winter Rye
- Excellent tolerance to drought, heat, winterkill, and poor soil conditions
- Quick pasture establishment in the fall
- Requires less water than other forage grains
- Unpalatable earlier in the spring
- Good forage source during early spring
- Enhances soil health conditions (permeability, moisture, biodiversity, prevents excess leaching of soil N)
Small grain forages – Ryegrass

- Reduced forage production in the fall
- Excellent forage production in the spring
- Less expensive to establish
- Well adapted to poorly drained soil conditions
- Competes with Bermudagrass in the spring due to its late maturity

Small grain forages – Suggested varieties

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variety</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>TAM 114, TAM 115, TAM 205, WB 4303</td>
<td>Westbred</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>DH 140793, DH 140760</td>
<td>Omega Seeds</td>
</tr>
<tr>
<td>Oat</td>
<td>Bob, Harrison, Dallas, Heavy Grazer</td>
<td>Justin Seed, Co.</td>
</tr>
<tr>
<td>Triticale</td>
<td>NF972226, NO101</td>
<td>Noble Research Foundation</td>
</tr>
<tr>
<td></td>
<td>Trical 813, Trical 31</td>
<td>Trical Superior Forage</td>
</tr>
<tr>
<td></td>
<td>Sliktnn II</td>
<td>Waterley Seed</td>
</tr>
<tr>
<td>Rye cereal</td>
<td>Eibon, Marion, Maton II</td>
<td>Texas Seed Company</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>Nelson, TAM90, TAM9BO, Jumbo</td>
<td>TAMU</td>
</tr>
</tbody>
</table>

The benefits of using Certified Seed

Benefits
- Genetic purity - off types eliminated.
- Clean seed - no weed seed contamination no seed-borne diseases. (smuts, bunts, black chaff).
- Seed quality - high germination, uniform size, no damaged kernels. Enhanced uniformity, vigor, and establishment.
- Yield potential - rapid stand establishment ⇒ higher yields.

Encourages investment in Research – Yield, genetic resistance, grain quality.
Small grain forages – Relative forage production

![Graph showing relative forage production for various crops over the months of September to June.](image)

Small grain forages – Nutritional quality

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Barley</th>
<th>Oat</th>
<th>Rye</th>
<th>Triticale</th>
<th>Wheat</th>
<th>Bermuda grass</th>
<th>Alfalfa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Matter (%)</td>
<td>25</td>
<td>26</td>
<td>17</td>
<td>32</td>
<td>30</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>Crude protein (N DM)</td>
<td>11</td>
<td>11</td>
<td>15</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Crude fiber (N DM)</td>
<td>28</td>
<td>30</td>
<td>29</td>
<td>28</td>
<td>31</td>
<td>31</td>
<td>27</td>
</tr>
<tr>
<td>NDF (N DM)</td>
<td>58</td>
<td>54</td>
<td>89</td>
<td>50</td>
<td>56</td>
<td>67</td>
<td>39</td>
</tr>
<tr>
<td>ADF (N DM)</td>
<td>33</td>
<td>31</td>
<td>--</td>
<td>31</td>
<td>32</td>
<td>37</td>
<td>31</td>
</tr>
<tr>
<td>Ash (N DM)</td>
<td>12</td>
<td>10</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Gross energy (MJ/kg DM)</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

www.feedipedia.com

Crop resilience/value gradients

<table>
<thead>
<tr>
<th>soil pH</th>
<th>soil fertility</th>
<th>soil drainage</th>
<th>soil moisture</th>
<th>fall temperatures</th>
<th>abiotic stress</th>
<th>biotic stress</th>
<th>disease pressure</th>
<th>weed pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>limiting</td>
<td>Rye</td>
<td>Triticale</td>
<td>Wheat</td>
<td>Barley</td>
<td>Oat</td>
<td>Rye grass</td>
<td></td>
<td></td>
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<tr>
<td></td>
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</tbody>
</table>
Site management

- Cool-season small grains should be planted in fields with the best drained pasture
- Prior to planting the warm-season grass should be grazed to 2-3 in.
  - Minimizes competition with overseeded small grains
  - Allows easier planting
  - Provides enhanced sunlight to emerging small grain seedlings
- Consider the application of a non-selective contact herbicide (Paraquat) to temporarily suppress pasture growth and control weeds

Planting

No-till drill
- Most appropriate
- Row space of 7.5 inches or narrower
- Provide good seed-soil contact
- Have closing wheels linked to the disk openers

Conventional drill
- Conventional drill with double disk openers

Broadcasting
- Disking
- Broadcast seeding

Seeding rates

Higher seeding rates than solo crop

<table>
<thead>
<tr>
<th>Crop</th>
<th>Seeding rate (lb/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley</td>
<td>80 - 120</td>
</tr>
<tr>
<td>Oat</td>
<td>80 - 120</td>
</tr>
<tr>
<td>Rye</td>
<td>80 - 120</td>
</tr>
<tr>
<td>Triticale</td>
<td>90 - 150</td>
</tr>
<tr>
<td>Wheat</td>
<td>120 - 150</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>20 - 40</td>
</tr>
</tbody>
</table>

http://osufacts.okstate.edu
Texas Agricultural Extension Service SCS 2098 36
Planting time

- Depends on:
  - The grain crop used
  - The growth-suppression measures on bermudagrass
- Early enough to enable good establishment and provide opportunity for long fall grazing
  - (6 - 8 weeks prior to first frost)
  - Early planting in wheat increases the likelihood of disease and pest pressure

Management recommendations

Planting time

- Considerations for early planting:
  - Ability to germinate and emerge in relatively hot soils
    - Germination sensitivity
    - Coleoptile length

Coleoptile length

- Early planting (hot soils)
  - Germination sensitivity
  - Deep planting (> 1.5") not an option
  - Reduced coleoptile length in seed of modern wheats
    - (effect of semi-dwarf genes)
  - Emergence significantly affected
Effect of planting date on grain yield and forage winter wheat production

Sidney, NE
1993 - 1995

- Grain yield
- Total forage yield

Adapted from Holman et al., 2011, UNL

Weed control
- If forage is the only purpose, no weed control may be necessary
- If grain is to be harvested, weed control might be necessary
  - Critical to know the type of weeds present
  - For chemical control follow label directions

Soil nutrient requirements
- Small grain - warm season grass systems remove more soil nutrients than solo crops
- Nitrogen, phosphorous, and potassium are essential for optimum forage production
- Split application of N optimizes forage yields
- A soil test is recommended
  - Ryegrass does not tolerate acid soils (pH < 5.7)
Recommended application rates:

- Nitrogen  30 - 40 lb N per 1000 lb/ac forage
- Phosphorous  5 - 10 lb P₂O₅ per 1000 lb/ac forage
- Potassium  30 - 35 lb K₂O per 1000 lb/ac forage

- Apply P₂O₅ and K₂O at planting (furrow banding)
- Split N application
  - 1st application: Pre-plant or at planting
  - 2nd application: late winter
  - 3rd application: early spring
- For ryegrass: additional application in May

Grazing management

- Grazing initiation
- Animal stocking rate
- Effects on crop/soil

Grazing – Initiation

- 6 – 12 inches of top growth
- Crown root well developed
- Secondary roots developed
- 5 – 6 weeks after emergence
- Usually starts on early December to mid-May
Animal stocking rate

- Year to year variation
- Depends on
  - climatic conditions
  - cool-season grain used
  - management practices

Stocking rate options
To maximize steer average daily gain under an efficient pasture management system

**Continuous**
- Paddock is rarely rested
- Constant number of livestock can be grazed throughout the year
- Supplementary feeding might be necessary

**Rotational**
- Livestock rotates through paddocks
- Allows for higher stocking rates
- Opportunity for summer grass and cool season crop to rest and regrow
- Requires more infrastructure and management

Example: Rye cereal – ryegrass pasture

<table>
<thead>
<tr>
<th>Initial steer weight: 600 lb</th>
<th>Rotational system: 8-paddock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking rate</td>
<td>Steer ADF</td>
</tr>
<tr>
<td></td>
<td>continuous</td>
</tr>
<tr>
<td>low</td>
<td>1.6</td>
</tr>
<tr>
<td>medium</td>
<td>2.2</td>
</tr>
<tr>
<td>high</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Grazing problems

• Cattle sickness
  • Bloat
    - Gas accumulation in the rumen
    - Occurs in the fall and when the plant comes out of dormancy
    - Decreasing pre-plant N fertilization can reduce bloat frequency (Dr. Pinchak William, TAMU Vernon)
    - Supplement with hay or grain with Rumensin
  • Grass tetany
    - Low blood magnesium caused by grazing lush grass
    - Provide mineral supplement with 6 – 8% Mg

• Nitrate poisoning
  • Higher levels of N fertilization
  • Abiotic stress (freeze, drought)
    After freeze, wait for clear, warm days before putting cattle back to graze

• Soil compaction
  Problem accentuated when conditions are wet (early spring)
  • Monitor soil moisture conditions, graze quick-draining fields first
  • Graze wheat pastures with tough root systems first
  • Give wheat pasture field time to heal – rotate grazing areas
  • Pull out cattle from field if conditions too wet
  • Long term measure: Build soil health
    - Adopt no-till or minimal tillage practices
    - Include cover crops in your cropping systems
Thank you

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