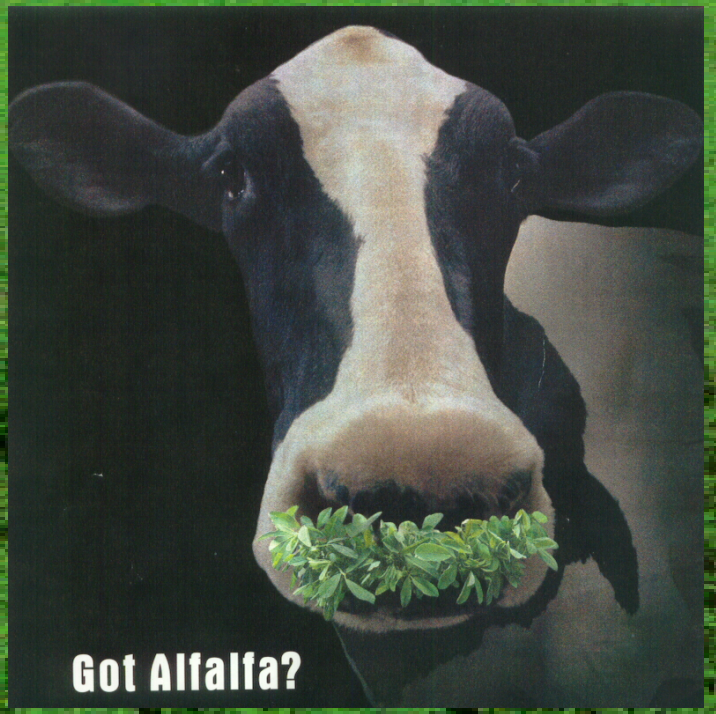
# Alfalfa Production

## Texas High Plains/Far West Texas

Calvin Trostle
Extension Agronomy,
Lubbock
806.746.6101
ctrostle@ag.tamu.edu

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# Observations in West Texas

- Our best alfalfa producers don’t have a massive farm operation for other crops
- The understand quality, how to enhance/ensure it, and they make the time for sound, timely production practices
- Lots of water!

# Current West Texas Problems

- Misunderstanding of:
  - Irrigation requirement
  - Spring planting vs. Fall planting
  - How to market and what the market is

# Alfalfa Quality

- This is what will make or break large producers
- What is your goal?  What is your market?
- $$$ Can you get compensated for quality?

# Alfalfa Spring Fever

- Alfalfa calls in January/February are not a good sign
- **Spring planting** not recommended--
  - less developed roots and crowns
  - more water required for unit of production
  - weed and insects tend to be more severe
  - large reduction in first year yields, 50% or more

# Water Use & Irrigation

# Sizing Alfalfa Fields to Irrigation

- Many prospective alfalfa growers can't comprehend amount of water needed for alfalfa production
- Irrigation capacity--Can you grow corn? Can you grow peanuts? Can you grow 4 bale cotton?
- ~8 gpm per acre for good production is a good target (High Plains)
- Drip Irrigation?

# Sizing Alfalfa Fields to Irrigation

- Rule of thumb in South Plains:  6-7” of water required for 1 ton production
  - Clovis area, 5-6” per ton
  - Far West Texas:  flood, ~10”/ton; ~8”/ton?
- Consult ‘Texas Alfalfa Production’ for guideline on calculating target acreage for your irrigation capacity/efficiency
- ET: avg. 0.35”/day,
  - 0.40” in Far West TX

# TX High Plains Alfalfa Water Use

- Water use calculations for Panhandle target about 5.5 gpm per acre (use, not efficiency of applied water!) (Leon New, A&M)
- Add about 0.5 gpm per acre for Littlefield, Plainview, Muleshoe
  - Increases steadily to the south
- If using Center Pivot irrigation with spray >30” above canopy, add 1.0 gpm/A

# TX High Plains Alfalfa Water Use A&M/USDA-Bushland

- For LESA (heads 18” above ground), WUE is running at 500 lbs. per inch of irrigation

- Side rolls averaging about 360 lbs. per inch

# Alfalfa & Drip Irrigation

- No gap in irrigation frequency (water after cutting, before baling) (Sweetwater, Idalou area)
- Super efficient water use, but emitter clogging more a problem with perennial root system?
- Getting stand established--
  - Prepare field further ahead for packing rain
  - Seed earlier if rain comes & risk hotter weather

# Varieties

- No West Texas testing
- NMSU extensive testing
- Also, limited testing in western Oklahoma

# Alfalfa Variety Trial Data

- For Texas Panhandle: NMSU (Tucumcari, older Clovis data) and Oklahoma State (Tipton, Goodwell); consider NMSU Artesia and Las Lunas; KSU-Garden City
- For Texas South Plains: NMSU (Artesia, Tucumcari, older Clovis data, maybe Las Cruces); consider Oklahoma State (Tipton, southwest; Goodwell, Panhandle)
- Far West, TX: NMSU @ Artesia & Las Cruces

# Alfalfa Variety Choice

- Well-tested variety vs. new varieties on the market that represent the latest in plant breeding
- Multiple test locations, representing diverse production areas
- The more a variety is tested the more confidence we have in its performance

# Alfalfa Variety & Forage Quality

- Forage quality varies little among alfalfa varieties
- Harvest timing and management is much more important that variety selection in determining forage quality
- Lower Fall Dormancy (FD) rated alfalfa with dormancy, e.g. 4 (compared to non-dormant 7) may have higher quality

# Variety Selection Criteria?

- Fall Dormancy
- Multiple insect and disease resistance
- Breeding company
  - In contrast to the marketing company
  - Have a seed dealer you like?
- Cost of seed?
- Availability of seed you want?
- How long you hope to keep the stand?

# Alfalfa Varieties & Pests

- Ample disease ratings info. is available
- Data is not necessarily independent
- “2007-2008 Fall Dormancy & Pest Resistance Ratings…”
  - http://www.alfalfa.org
- Many good varieties available
  - NMSU has switched from ‘MR’ to ‘R’ ratings as a target for alfalfa variety selection

# Alfalfa Pest Ratings

| Resistance Class | Abbr. | % Resistant Plants |
|---|---|---|
| Susceptible | S | 0-5 |
| Low Resistance | LR | 6-14 |
| Moderate Resist. | MR | 15-30 |
| Resistance | R | 31-50 |
| High Resistance | HR | >50% |

National Alfalfa Alliance, 2002

# Alfalfa Pest Ratings

- <u>Diseases</u>
- Bacterial Wilt (Bw)
- Fusarium Wilt (Fw)
- Phytophthora root rot
- Verticillium wilt (Vw)
- Anthracnose (Race 1)
- Southern Root Knot Nematode (SRKN)

- <u>Insects</u>
- Spotted alfalfa aphid (SAA)
- Pea aphid (PA)
- Blue alfalfa aphid (BAA)
- Relatively new in NM: Cowpea Aphid (CA)

# Yield Data Comparisons

- With few exceptions alfalfa varieties that perform well in “high yield” tests (high fertility, good soil, irrigated) also perform well in other tests (moderate fertility, shallow soil, rainfed) (OSU)
- Irrigated vs. rainfed alfalfa tests--no trends among varieties (good in one, good in the other)

# Alfalfa Fall Dormancy Ratings

- Texas High Plains needs FD ratings 4 to 7
  - Far West, TX:  likely FD 7-9
- The further north you are (Nebraska, Dakotas), the lower FD rating required
- In other words:  the higher dormancy rating, green earlier, green later
  - more potential harvests, but possibly at the expense of stand longevity (only 3-4 years?)
- High FD rated alfalfas may not persist as long

# Alfalfa Fall Dormancy Ratings

- Trend away from using solely Fall Dormancy as a selection criteria
  - NMSU, OSU, KSU don't list FD ratings directly in their reports
- Breeding more important than the Fall Dormancy
- Also, new Winter Survival (WS) ratings
  - e.g. FD 6 variety with a WS rating that makes the variety equivalent to FD in winter hardiness/survival

# Winter Survival (WS)

- Disease and insect resistance is a given--we need these parameters
- Winter survival; some alfalfas on the market now advertising, for example, *FD rating of a ‘6’, but winter hardiness of an ‘FD 4’*
  - WS, 1 = no injury, 6 = plant death
- “We lose more plants in summer instead”

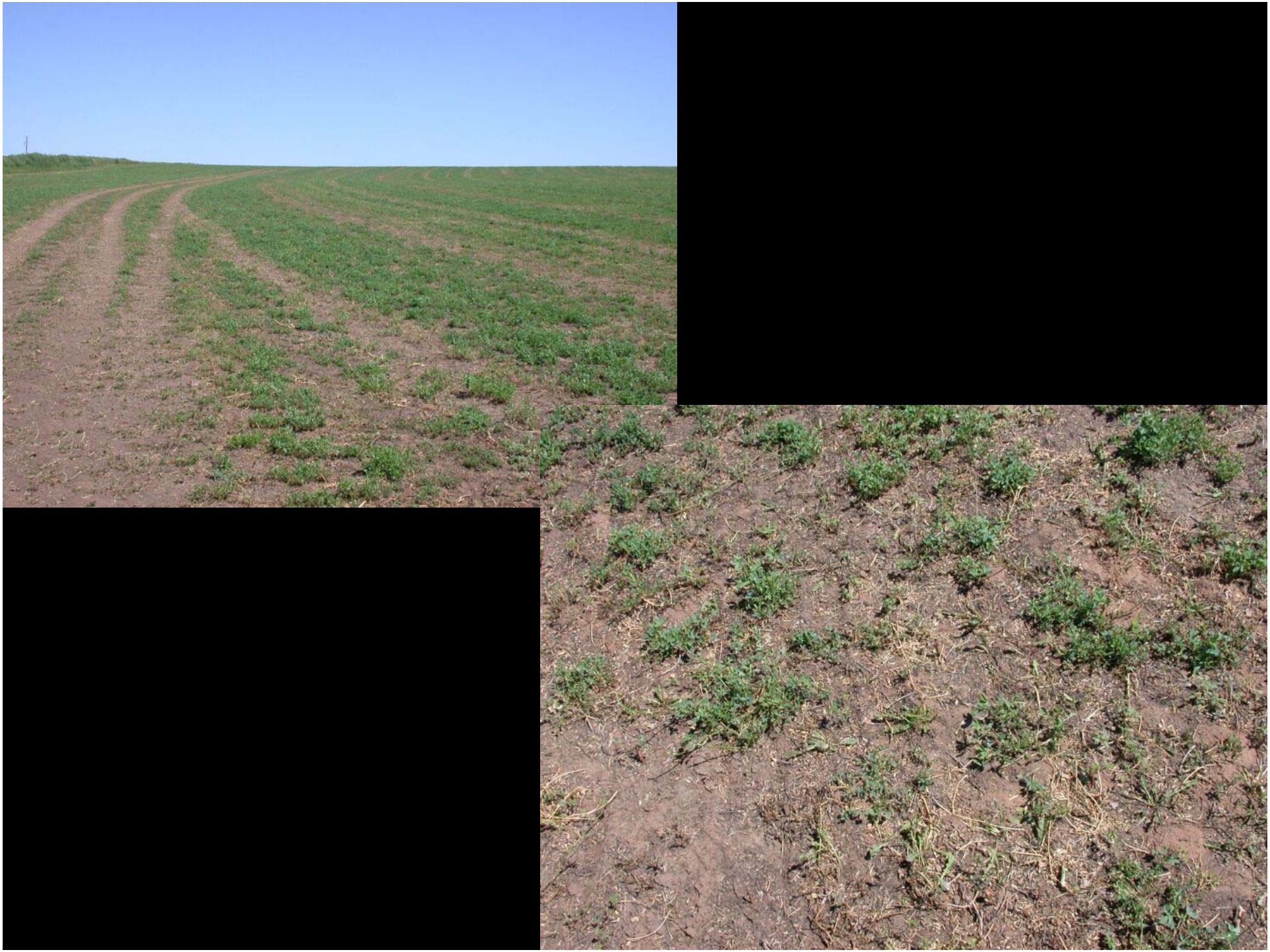
# Major Breeding Companies

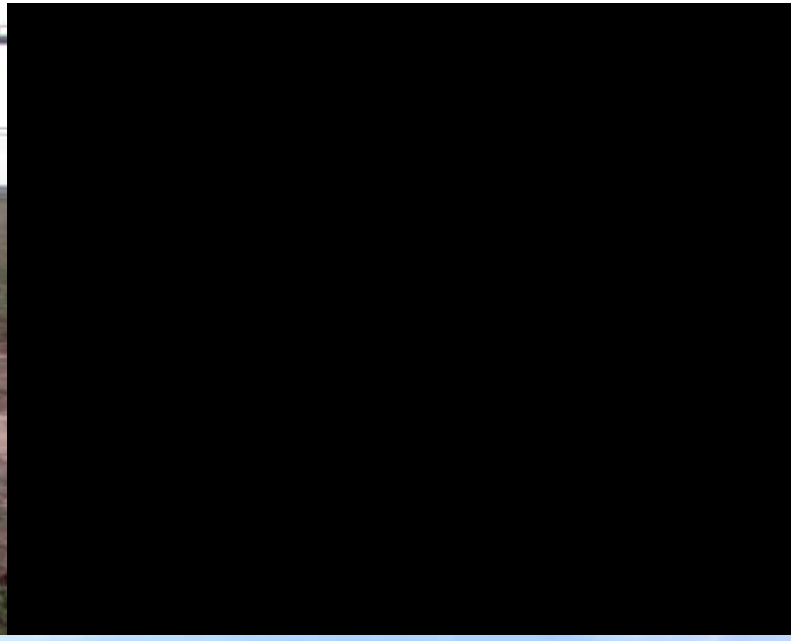
- Forage Genetics (bags for others)
- Cal/West (bags for others, incl. Wilson)
- Great Plains (sells their own)
- Pioneer (sells their own)
- Dairyland (both)
- America's Alfalfa (now owned by Forage Genetics
- Target Seed Co.
- Others:  Roth? Johnston?

- Don’t’ be concerned about seed cost (WHAT?). You get what you pay for.
- Cheaper seed may not be true to varietal designation.
- Older varieties and commons usually don’t produce as well and are less likely to persist as well because they have little resistance to pests and environmental factors.

- Quality improvements have not been as dramatic as the improvements in yield and stress tolerances.

- Your harvest management will have the greatest effect on yield, quality, and persistence.





# Alfalfa Seed Quality

- Reputable company vs. ‘Common,’ ‘Variety Not State (VNS),’ or possibly blends:  a risk to you the producer?
- Certified seed (blue tag on bag), or Plant Variety Protected (see PVP labeling)
- Seed tag--variety, purity, weed seed, % germination, test date (> 9 months?)
- *Rhizobium* inoculated?

# 2003 Example, West Texas

- A February call from the Lubbock area
- Believed to be ‘Mesilla’ alfalfa, (NMSU release in 1978), some insect & disease resistance
- How do you even know it is still ‘Mesilla?’
- Replaced by several other releases, including ‘Dona Ana’

# 2003 Example, West Texas

- ‘Mesilla’ at $2.00/lb.
- No *Rhizobium* inoculant
- No seed treatment (metalaxyl; Apron; etc.)
- Compare to newer, improved variety, at $3.25/lb.
- Target seeding rate of 20 lbs./A

# 2003 Example, West Texas

- Cash differential, $25/A
- Alfalfa hay @ $120/ton (2004 New Mexico average = $130/ton, but very high quality; price )
- Four year stand
  - Some Far West TX producers use three years; many High Plains producers shoot for 5+ years
- **<u>Question</u>: how much increased yield is required for the modern variety to pay for itself?** *A lot? A little?*

- Only 104 lbs./year for four years
- Higher priced seed represents newer genetic resistance to insects, disease
- Known variety (vs. uncertainty of older, cheaper offering)
- Inoculated and treated seed
- The best of many things you want as a producer

# NMSU Testing Results--Suggestions

## 1999-2006 (Nondormant FD 7 or more)

| Variety | Company | FD | WS | Misc. |
|---|---|---|---|---|
| 801S | America's Alfalfa | 8 | N/R | Salt tolerant |
| 802 | Am's Alfalfa | 8 | N/R | High 'HR' |
| Rio Grande | Great Plains | 8 | N/R | Good 'HR' |
| 58N57 | Pioneer | 8 | N/R | Some 'HR' |
| Magna 901 | Dairyland | 9 | N/R | 'HR' |
| DS 8181 | Dairyland | 9 | N/R | 'HR' |

Criteria include broad pest resistance ratings and trial yield results.

# NMSU Testing Results--Suggestions
## 1999-2006 (Semi-Dormant FD 6 or less)

| Variety | Company | FD | WS | Misc. |
|---|---|---|---|---|
| HybriForce 400 | Dairyland | 4 | 1.6 | 'HR' |
| HybriGreen 41 | Dairyland | 4 | 1.9 | 'HR' |
| Archer II | America's Alfalfa | 5 | 4 | 'HR' |
| Wilson | NMSU | 6 | N/R | High yields, drought tol. |
| 56S82 | Pioneer | 6 | 5 | Replaces 5681 |
| Magna 601 | Dairyland | 6 | 3 | Very 'HR' |
| NC+ 605 | NC+ | 6 | 4 | --- |

# Alfalfa Variety Testing Data

- NMSU annual ‘Alfalfa Variety Test Report’ (Leonard Lauriault et al.)
  - http://cahe.nmsu.edu/pubs/variety_trials/welcome.html#alfalfa
- Updated annually
  - Tucumcari
  - Artesia
  - Las Cruces
  - Also:  Los Lunas, Alcalde, Farmington

# Oklahoma St. Varietal Performance

Suggestions from Dr. John Caddel based on results through 2006

- All are Fall Dormant 4 varieties unless noted
- Garst 6420
- DairyLand:  Magnum V, Magna 601 (FD 6)
- OK 49
- Pioneer 55H05 (FD 5)
- Good-as-Gold II
- Info. Summarized from “Alfalfa Varieties for Oklahoma, 2007”
  - At http://www.alfalfa.okstate.edu/var-test/2007/ALFVAR07.pdf

- Many good alfalfa varieties on the market
- Unless a particular variety offers something you really need (improved insect or disease resistance; over-the-top weed control), you manage risk by
  - using known varieties
  - focusing efforts on top-notch management.

# Texas Panhandle

- Fall Dormant (FD) 4 and 5, maybe 6, especially above 3000’
- Within this range of FD, breeding is more important than FD
- Winter survival may not be that important here

# Alfalfa Varieties and Seed

- BOTTOM LINE:
  - You get what you pay for!

After variety selection, proper establishment techniques will ensure that more of your seed will actually become plants that you can harvest as high quality forage.

# Establishing Quality Alfalfa

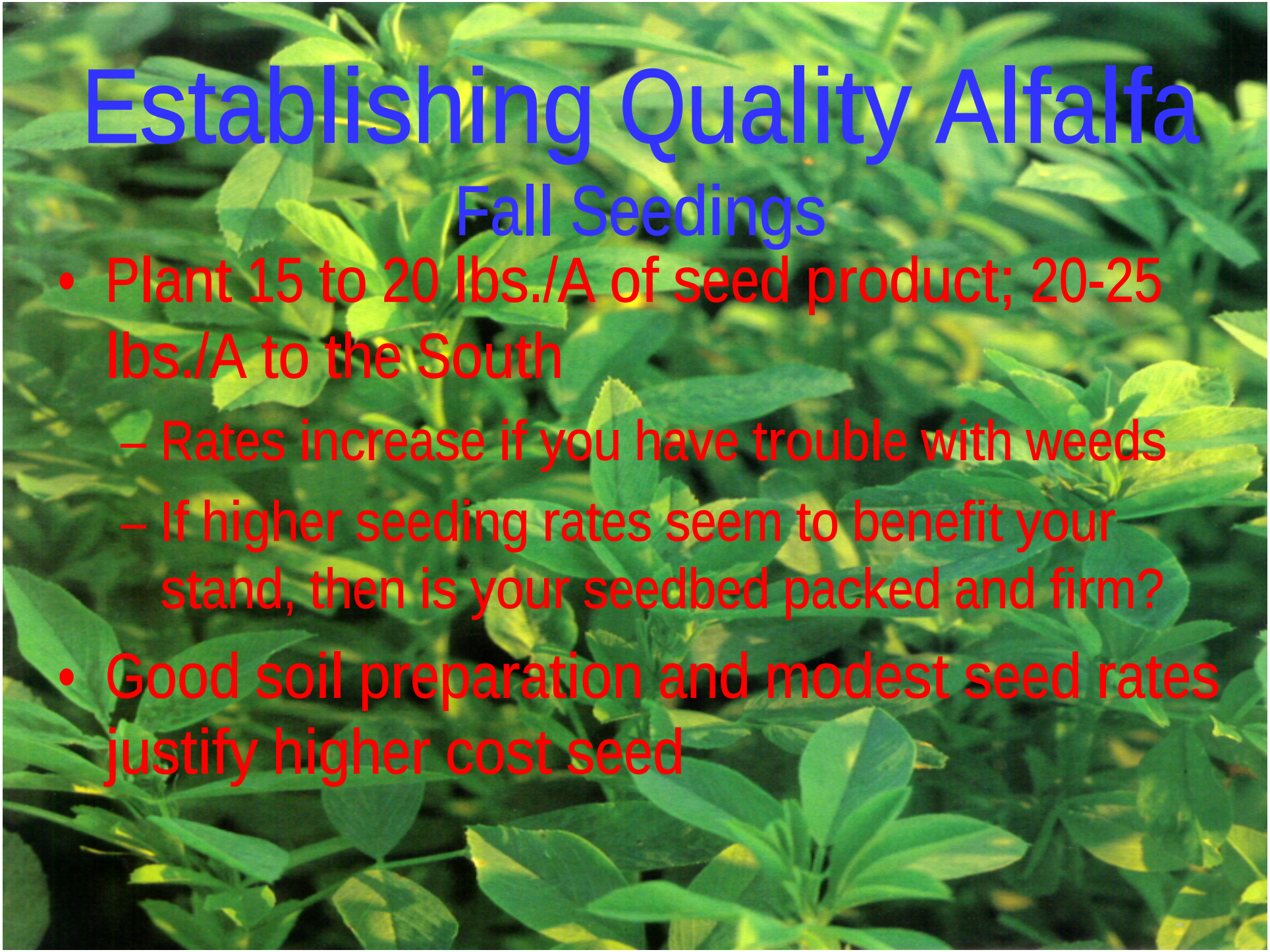
Whatever tillage method is used, proper planting depth and good seed-soil contact are essential to establishing a uniform stand.

Soil should be firm enough at planting for a footprint to sink no deeper than ⅜ inch.

# Seeding Conditions

- If > 1/2” deep, emergence is difficult
  - up to ¾” might be needed on sandy soils

- Need firm seedbed
- No clods
- No trash on surface…
- The day you seed is the most important day in the life of the alfalfa plant
  - Its not easy to go back and undo a mistake



# Establishing Quality Alfalfa

## Fall Seedings

- Plant 15 to 20 lbs./A of seed product; 20-25 lbs./A to the South
  - Rates increase if you have trouble with weeds
  - If higher seeding rates seem to benefit your stand, then is your seedbed packed and firm?
- Good soil preparation and modest seed rates justify higher cost seed

# Establishing Quality Alfalfa

## Planting Times

- Spring--understand the problems
- Late summer/early fall
  - Mid-August to late-September
  - Opportunity to destroy summer weeds after they germinate
  - Summer weeds may germinate post-planting but make little growth and few will produce seed
  - Irrigate once or twice to establish only
  - Allow stand to achieve 25% bloom next year before harvest
  - No yield loss in first production year

# Fertility

# Establishing Quality Alfalfa

## Pre-plant Fertility

**Suggested Application of Fertilizer Nutrients for I**

(Modify the rates of fertilizer applications suggested here by your own and management practices)

| Crop | Pounds per Acre N | $P_2O_5$ | $K_2O$ | Remarks |
|---|---|---|---|---|
| **Alfalfa** | | | | |
| New seedings | 20 | 120 | 50 | A starter of up to 20 pou |
| Established stands | 0 | 120 | 50 | recommended for new se for new seedings and top |

NMSU usually recommends against starter nitrogen for alfalfa.

# Mixed Feelings about Nitrogen Fertilizer and Alfalfa?

- Is your current crop well nodulated?
  - From Dalhart to Littlefield to Lamesa to Ft. Stockton/Pecos, *Rhizobium* nodulation appears to decrease
- Annual or multiple mid-season N fertilizer (e.g., 25 lbs. N/A after each cutting)?
  - I believe some producers are seeing favorable results
  - Is stand longevity being compromised?

# Nutrient Content of Alfalfa Hay

## Equal to pounds of yearly soil nutrient removal

| ***Per ton*** ➔ | *~50 lbs.* *N* | *12-14 lbs.* *$P_2O_5$* | *50-60 lbs.* *$K_2O$* |
|---|---|---|---|
| Ton yield/A | N | $P_2O_5$ | $K_2O$ |
| Up to 4 | ~200 | 50 | 230 |
| 5 to 6 | 310 | 78 | 350 |
| 7-8 | 430 | 108 | 500 |

Penn State Univ.

# P Fertility

- Soil test for high input crops
- P fertility ahead of seeding
  - soil test and incorporate up to 3 years of needed $P_2O_5$ before establishing the stand
  - many regional soil tests will call for ~120 lbs. of $P_2O_5$
  - P through pivot is iffy--must be careful

# Crop Salinity Tolerance

## Total Soluble Salt Content

| mmhos/cm | | **Soil EC** | **Soil EC** | **Water EC** | **Water EC** | **Salinity** |
|---|---|---|---|---|---|---|
| dS/m | | *Normal* | *Yield* | Normal | Yield | Thresh. |
| Salts? | Crop | *100%* | *75%* | 100% | 75% | ppm $Cl^-$ |
| Tolerant | Cotton | *7.7* | *13.0* | 5.1 | 8.4 | 1625 |
| | Wheat | *6.0* | *9.5* | 4.0 | 6.4 | 2100 |
| | Sorghum | *4.0* | *7.2* | 2.7 | 4.8 | 2450 |
| Sensitive | **Alfalfa** | *2.0* | *5.4* | 1.3 | 3.6 | 700 |

Irrigation Water Quality Standards & Salinity Management Strategies, TCE B-1667

# Sodium & Alfalfa

- Exchangeable Sodium Percentage (ESP)
- The more calcium and magnesium in the soil the less the problem
- Alfalfa, especially young seedlings and first year crop, is sensitive
- ESP <8 is best; yield limited significantly as ESP approaches 16

# Alfalfa Harvest ‘Balancing Act’

- Forage yield vs. Quality vs. Plant Persistence
- Optimum balance is 1-10% bloom (NMSU)
- Continued harvest at pre-bloom reduces stand life (plant unable to replenish root reserves for subsequent growth and overwintering)

# When ‘Pre-Bloom’ is Specified

- Producers should weigh price vs. decreased yields and shorter stand life
- Pre-bloom harvest of middle cuttings less likely to harm longevity than first, last cuttings

# Harvesting High Quality Alfalfa

1st Harvest: Swath when you see the first flower--that is longer than for other cuttings.

Last Harvest: Allow six weeks of fall growth to replenish root carbohydrates.

# Establishing Quality Alfalfa

## What about renovation?

**Alfalfa After Alfalfa**

Beware of allelopathy a.k.a. autotoxicity

Renovate unproductive or weedy alfalfa fields by rotating to another crop for one year. Plow during winter. Plant a short-season crop like single-cut haygrazer for hay or silage and replant alfalfa in late summer.

Alfalfa planted above in soil from a corn field (no autotoxicity) and below from an alfalfa field (autotoxicity).

# When to terminate the stand?

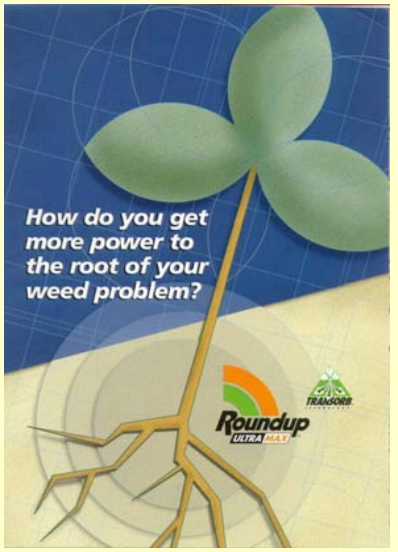
- Yields declining?
- Health of roots?

- Plants per square foot (<5)
- Stem number per square foot (~50 or less)

# New Trends in Alfalfa Varieties

- Grazing alfalfas--tolerance is for real, but nothing to do with bloat
  - no harvest costs!
- Tolerates frequent defoliation, hoof damage
- True grazing-tolerant varieties have broad crown set below soil surface (less hoof damage, more root carbohydrate retention)
- Less equipment traffic damage
- Leaf area below grazing plane

# Round-Up Ready Alfalfa




- Monsanto:  03-06 TX South Plains trials
  - Reduced amount of weeds in hay; yields the same
- Currently under Federal injunction with targeted sale for Fall 1009
  - Many FD 4, but now also up to FD 8
- Max annual application ~3.5 gal/A of old “4-pound” material
- Label anticipates up to two quarts/A per application
- Grass control option, other early results

Plant species competition

# Forage Quality

- Forage quality improves as you move from
  - perennial to annual
  - grass to legume
  - warm season to cool season

# What is RFV?

# Relative Feed Value

- For dairy cattle, prime alfalfa hay has
  - >19% CP, <30% ADF, <40% NDF, and >151 RFV
- Varietal quality improvements less dramatic than improvements in yield and stress tolerances.
- Your harvest management will have the greatest effect on yield, quality, and persistence.
- Most dairies want RFV > 170, even >180

# Harvesting Alfalfa Quality

**Table I: Proposed Quality Standards for Legume, Grass, and Legume-Grass Mixed Hays**

| | Analysis | | | | | |
|---|---|---|---|---|---|---|
| Quality Standard | CP (%) | ADF (% of DM) | NDF | DDM (%) | DMI (% of BW) | RFV |
| Prime | >19 | <31 | <40 | >65 | >3.0 | >151 |
| 1 | 17-19 | 31-35 | 40-46 | 62-65 | 3.0-2.6 | 151-125 |
| 2 | 14-16 | 36-40 | 47-53 | 58-61 | 2.5-2.3 | 124-103 |
| 3 | 11-13 | 41-42 | 54-60 | 65-57 | 2.2-2.0 | 102-87 |
| 4 | 8-10 | 43-45 | 61-65 | 53-55 | 1.9-1.8 | 86-75 |
| 5 | <8 | >45 | >65 | <53 | <1.8 | <75 |

*Source: Taylor, Richard W. 1995, 3.*

# Alfalfa Information

- Website, for West Texas, http://lubbock.tamu.edu/othercrops

- Early February, usually Ruidoso, annual meeting of the New Mexico Hay Association

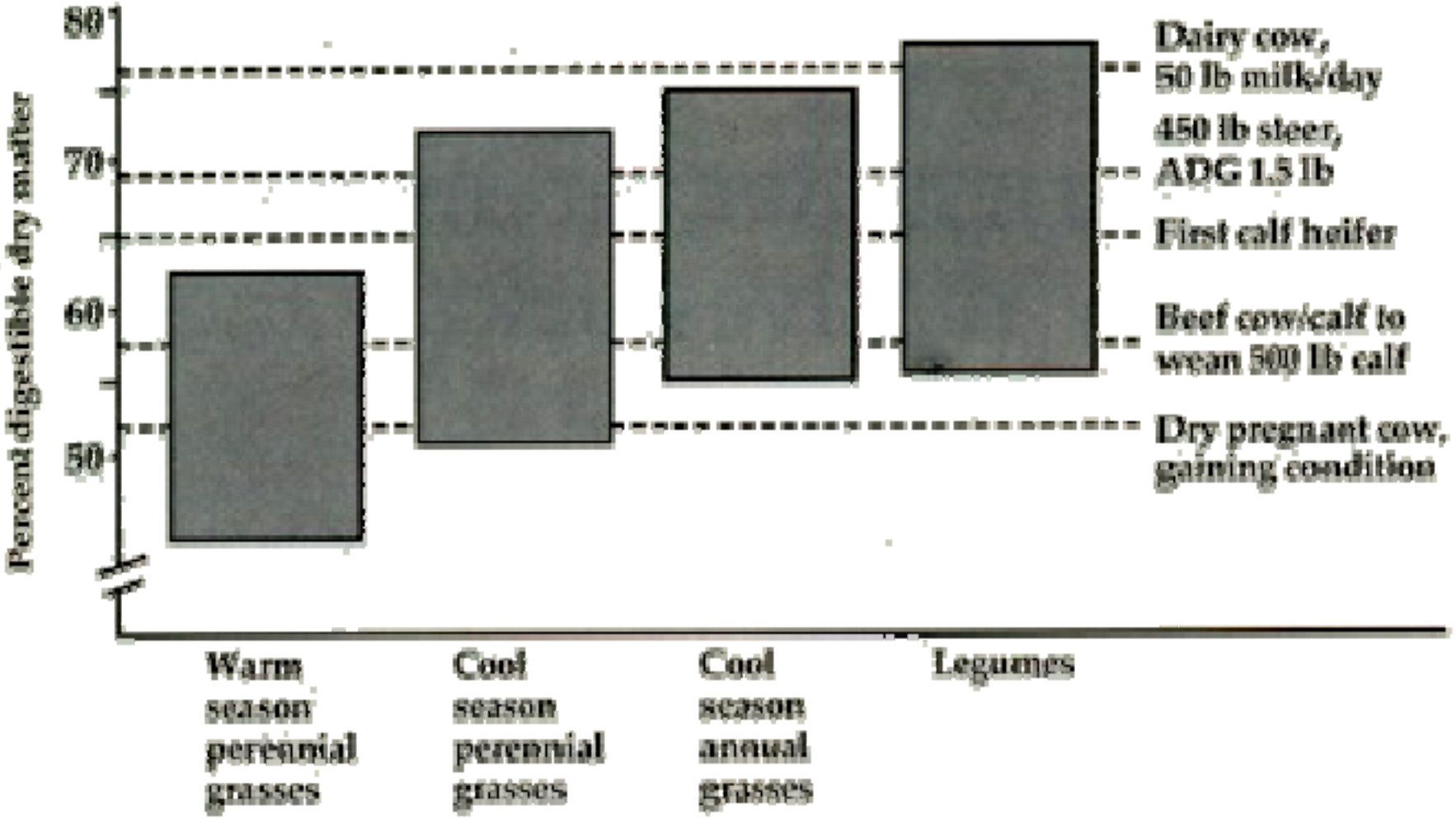



**Figure 17.1. Forage digestibility ranges and their suitability for different classes of livestock.**
Adapted from: H. Lippke and M.E. Riewe. 1976. Texas Agric. Exp. Stn. Res. Monograph RMGC: 169-206.

# Alfalfa Market Considerations

- Kind of bales the market wants vs. what you can provide
- Weed control ahead of time--pesky perennials and annuals that are hard to control
- How much labor is involved?
- Do you understand quality? (e.g., what is RFV?)