Alfalfa in Low-Irrigation and Rainfed Grass-Based Pastures in West Texas

Rancher's Thursday Lunchtime Series, August 13, 2020

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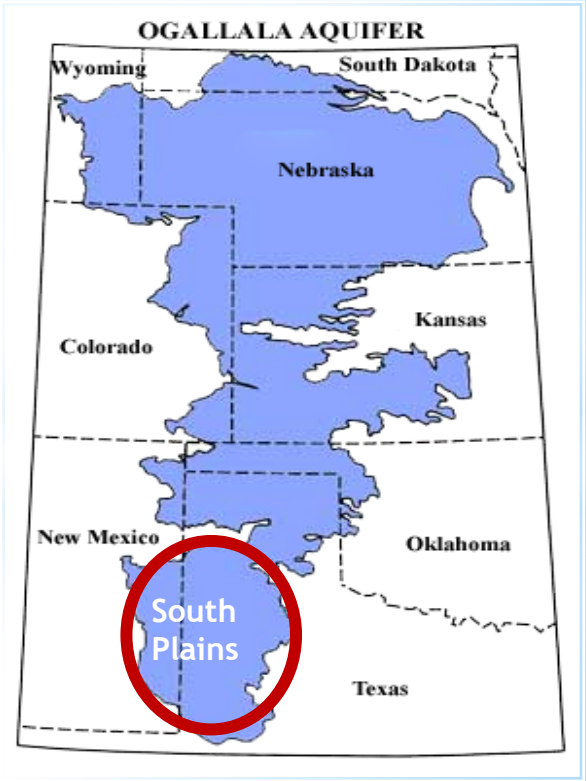

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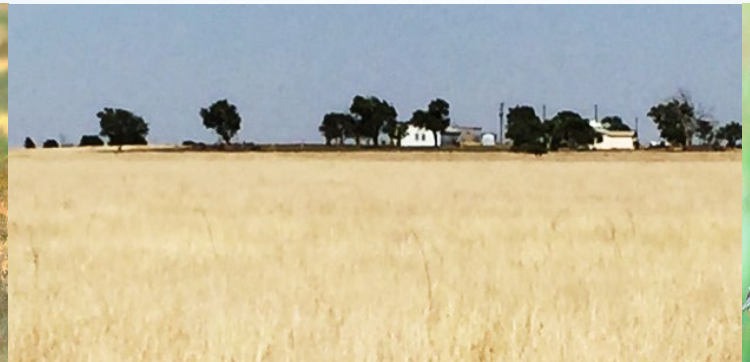
Overall Aim:

Transition Texas High Plains agriculture toward lower water use by integrating grazing into cropping systems.

- ✓ **Why alfalfa with grasses?**
- ✓ **How to leverage alfalfa traits into water efficiency**
  - **Fixing its own nitrogen**
  - **High nutritive value**


Why alfalfa?

- Alfalfa is native to semi-arid SW Asia. Deep roots.
  Can go summer dormant.
  Boosts forage yield and quality.
  Concern about its water use.
  Mix with perennial grasses and as a protein bank.

- Old World bluestem 'WW-B.Dahl'
  Low water use, late flowering,
  Supports ADG 1.0-2.5 lbs/day

- Native grasses, rainfed, persistent.

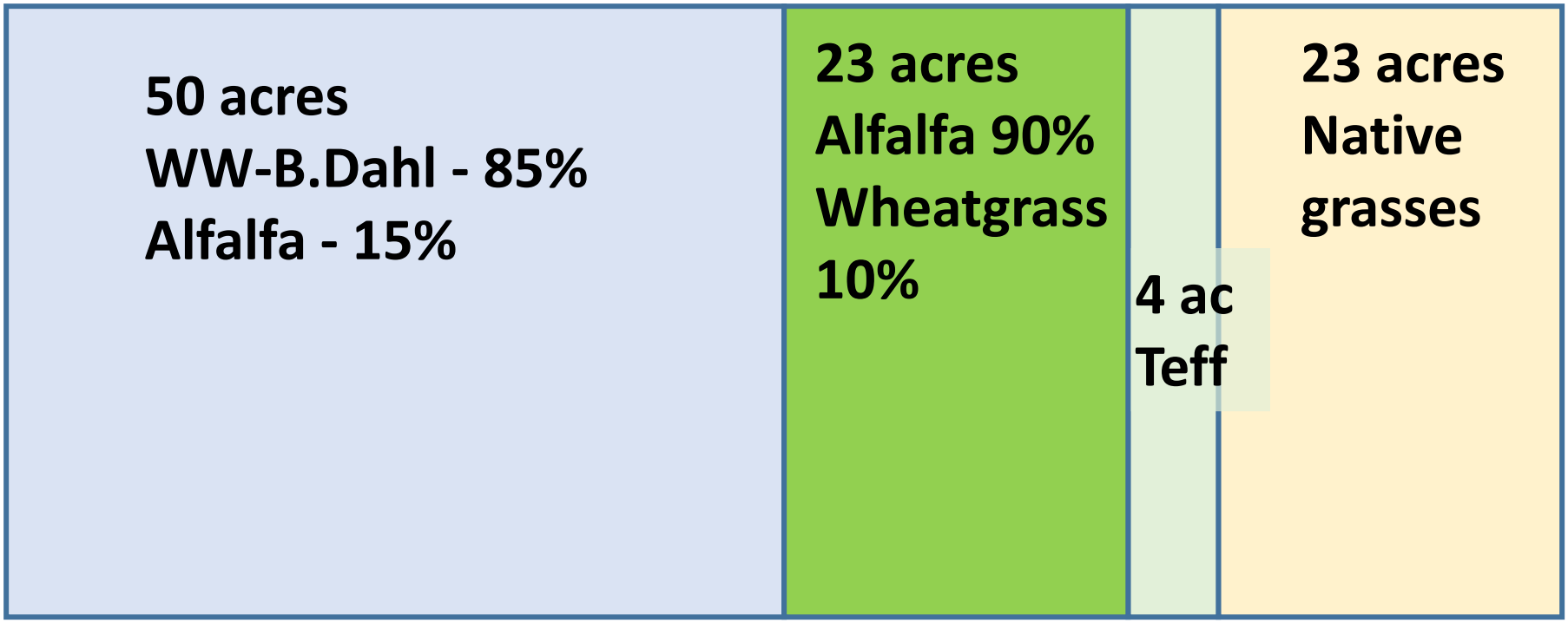
Alfalfa as a grazing legume in a grass system

- Omit fertilization with nitrogen, saves money!
- Boost forage quality and yield
- Will it use too much water?

What is a protein bank?

- Small acreage of high-protein forage for limit-grazing, in rotation with a large acreage of low-protein forage.
- Rye/wheat with winter-dormant warm-season grass.
- Alfalfa – up to 10-12” irrigation, 1-2 days/week

Alfalfa as *Protein Bank* in a 100-acre system



Time spent: 65% 20% 5% 10%

WW-BDahl bluestem-legume pasture

Alfalfa with OWB

Alfalfa with tall wheatgrass

Animal Performance and Water Use

System	ADG	Gain /acre	Protein	Irrigation	Water use per wt. gain
	lbs/day	lbs/ac	%	inches	Gallons/lb gain
Alfalfa-grass	2.1	168	14.4	8.8	364
Grass only	1.7	105	7.0	8.1	501

Similar trial in 2018 – 2019

System	ADG	Gain /acre	Protein	Irrigation	Water use per wt. gain
	lbs/day	lbs/ac	%	inches	Gallons/lb gain
Alfalfa-grass	2.4	266	13.2	9	1900
Grass only	2.1	225	9.0	9	2500

Value of including legumes in stocker grazing, 5 yr.

Item	Grass-Alfalfa	Grass Only
Value of added gain $/lb.	$ 1.15	$ 1.05
Value of liveweight gain $/acre	$ 108	$ 74
Varied with market. Alfalfa advantage 3 / 5 yr		

- **Inclusion of legumes increased beef stocker gain per animal-day (ADG) and per acre**
- **Grass-Alfalfa system received slightly more water**

[Lisa Baxter]

Alfalfa effect on native grass water relations

Is there a tradeoff between alfalfa benefit to yield-quality and water use?

Can alfalfa survive on 18” of rain.

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Methods

Research design: 3 years

Varieties

NuMex Bill-Melton
WL 440HQ
} **Upright, hay types**

Falcata-Rhizoma blend – **Low, grazing type**

Row spacing

14 inches

28 inches

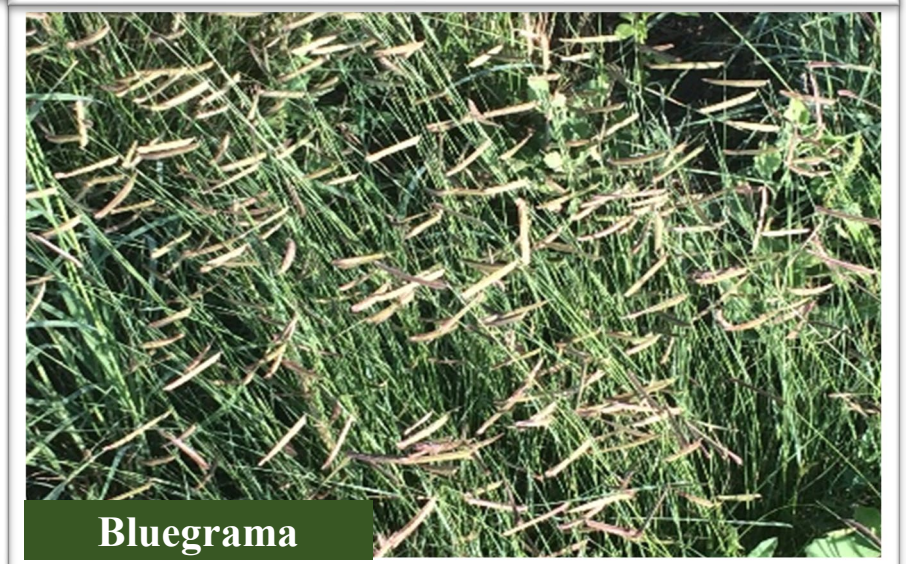
Control: No alfalfa, grass-only

Native grasses

Green Sprangletop

Sideoats grama

Buffalograss



Bluegrama

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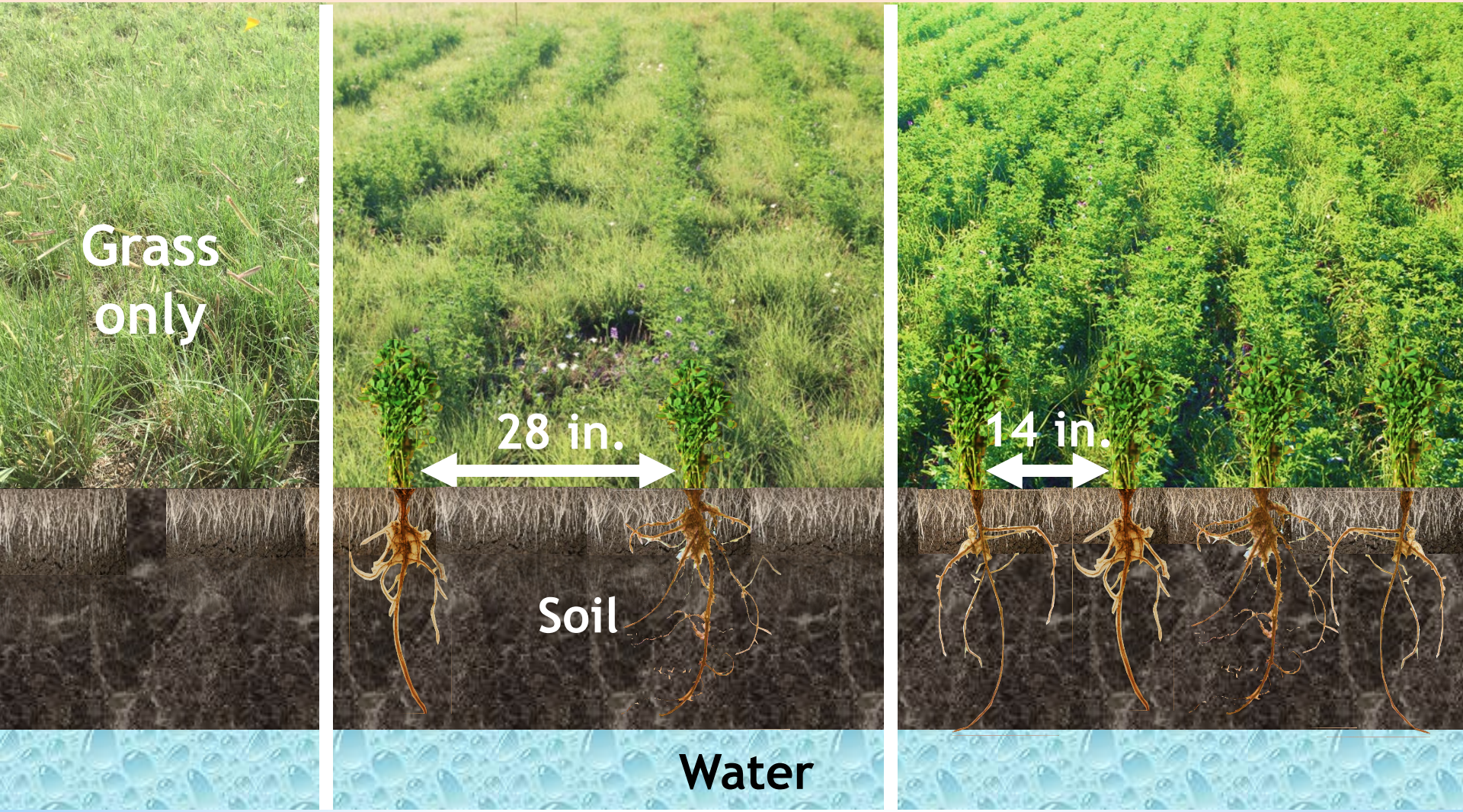


[Madhav Dhakal]

Self-thinning after 3 years

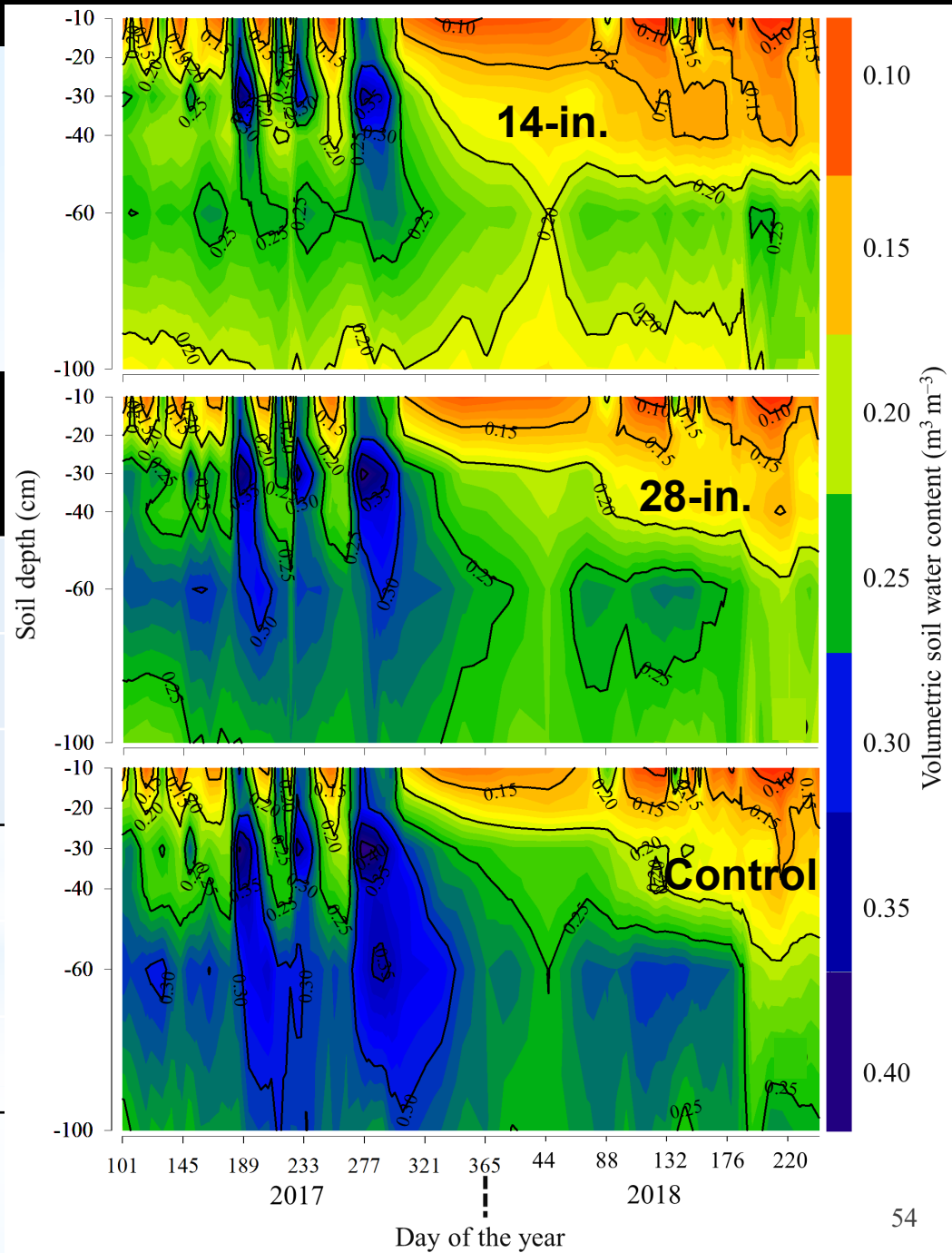
28-inch showed <u>less</u> thinning

14-inch showed <u>more</u> thinning

[Madhav Dhakal]

Soil Water Content

Year Season	Row spacing	% water content	
		0-16 in.	16-40 in.
2017	14-inch	22	23
	28-inch	24	27
	Control	24	29
2018	14-inch	15	21
	28-inch	16	23
	Control	18	27



Forage production, quality, and water use

Row spacing	Forage yield	Digest. energy	Protein content	Soil water depletion	Water use per lb. forage
	lbs/ac	%	%	inches	Gallons/lb
No alfalfa	2200	62	8	7	290
28 inches	2900	68	13	8	240
14 inches	3100	71	14	10	230

Marginal cost of revenue increment due to alfalfa, mean of 3 yr.

Treatment		MC of revenue increment			
Row spacing	Cultivar	2016	2017	2018	
		US$ US$$^{-1}$$			
14-inch	FR	1.36a	0.52a	0.60a	
	NuMex	0.86b	0.16b	0.47bc	
	WL	0.78b	0.21b	0.50b	
	Mean	1.00	0.30A	0.53A	$0.42
28-inch	FR	0.77b	0.20b	0.36c	
	NuMex	1.63a	0.21b	0.34c	
	WL	0.80b	0.29b	0.47bc	
	Mean	1.07	0.23B	0.39B	$0.31

What happened?

Low-density interseeding of alfalfa made large increases in forage yield and quality with fairly low trade-off in water depletion compared to high-density planting.

A modest amount of alfalfa in the system goes a long way toward improving native and non-native grass pastures and efficiency of converting water to forage and animal production.

SUMMARY

1. Alfalfa is the best legume option in low-input-irrigated stocker pastures in the Texas High Plains when grown as a minority component with grasses.
2. A persistent hay-type alfalfa has potential with dryland and low irrigation (6-9 in.) on good water-holding soils.
3. Use alfalfa on good soils where you can manage to avoid overgrazing. Control broadleaf weeds before planting alfalfa.
4. Interseed again in 4-5 years if needed.
5. In a good year, you can cut some hay off the alfalfa.

QUESTIONS?

[Lisa Baxter]

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