Extreme Cover Crop Use for Transition of Erosive West Texas Sandy Soils to Permanent No-till Cropping

Calvin Trostle(806-746-6101; ctrostle@ag.tamu.edu), Jonathan Shockey, Ray White
Texas A&M AgriLife Extension, Lubbock, Texas USA

ABSTRACT

Approximately two million acres in the Texas South Plains region is dryland agriculture, much of it highly erosive sandy loam and even loamy sand soil, especially south of Lubbock. The objective of this project is absolute biomass production using sorghum/sudan in a dryland cropping system to quickly generate a blanket of plant residues to protect the soil surface. This work focuses on Year 1 and Year 2 of the transition phase for bare-soil farming in the lower Texas South Plains. In 2014 & 2016 sorghum/sudan hybrid SX-17 (Sudax Forages) was drilled at Lamesa, TX on a Amarillo fine sandy loam at 20 kg/ha on flat land. September harvest biomass ranged from 0.4-1.2 Mg/ha. Regrowth from this area yielded 1.4-3.6 Mg/ha, whereas season-long growth was 2.6-4.9 Mg/ha. Biomass measures represent different potential cropping scenarios if the forage is harvested for hay (or grazed), and if so how much regrowth occurs. By the following spring (2015), biomass was mostly on the ground, but proved more than adequate to prevent erosion by soil or rain, and conventional planter equipment was able to cut the forage and plant cotton without plugging of the planter. The high-biomass approach appears sufficient to initiate a higher level of soil protection in transition to dryland, no-till farming in this region.

BACKGROUND

- Two million acres of mostly bare ground farming in the Texas South Plains, which is likely highly eroded (though many don't realize it)
- From Lubbock south and southwest, predominant soil type is Amarillo fine sandy loam and then Brownfield loamy sand
- Typical soil OM is 0.3% (0.7% in native range)
- USDA work in Wellman, TX area demonstrates difficulty in both building soil organic matter and the near futility of retaining it if any tillage occurs
- Where will this land be in 20 years?
- Some lower South Plains producers concerned land now not as productive since it has been irrigated for years (Na^+?)

APPROACH BEGINNING 2012; REFINED 2014

Among tillage and cropping sequences established in 2012 at Lubbock (sandy clay loam) & Lamesa (sandy loam), Texas a biomass-centric sorghum/sudan cover crop treatments was drilled in an effort to produce as much biomass as possible. Though maximum biomass is desirable leaving the forage on the field with no harvest generates no income (though perhaps long-term benefits are better). Work was initiated to evaluate the crop value of forage produced through late summer, when hay harvest near Sept. 1 would allow sufficient time for regrowth to occur and re-establish the cover, provided rainfall is sufficient.

Objective

Compare dryland sorghum/sudan biomass growth and forage hay value with and without late summer harvest to gauge soil erosive protection potential.

Methods

Sorghum/sudan SX-17 (Forage First) was drilled at 20 kg/ha in May 2014 & 2016 at both Lubbock & Lamesa, Texas. The Lubbock 2014 site failed due to drought conditions with roughly 20% stand. Due to an excessively warm October, 2016, no killing frost has occurred at either site thus data is not available. In 2014 at Lamesa on Sept. 3, three replicates of sorghum/sudan were harvested (2.5 m X 4. 2 m) and air-dry biomass determined. Season-ending growth was determined for these three plots as well as three season-long plots for total biomass. Crop value as forage was determined based on regional USDA hay prices.

Figure 1. Progression of seasonal sorghum/sudan biomass-centric cover crop treatment for in preliminary research, AGCARES, Lamesa, TX, 2013-2014.

RESULTS

Initial results in 2013-2014 indicated that when rainfall is sufficient ample sorghum/sudan biomass can be produced, which can be planted into the following spring with a coulter rig planter unit (Fig. 1).

Biomass Cover System (2014)	Biomass Yield--Range (Mg/ha)
Sept. 3 Harvest (Hay Value)	0.41-1.17 ($111-319/Acre)
Regrowth (Nov. 20)	1.45-3.63
Full-Season	2.59-4.85

In 2014, annual year-to-date rainfall of 196 mm through Sept. 3 was 32% below average, but 163 mm of September rainfall was 3X above average thus significantly driving fall growth. The test area chosen in advance to represent typical field forage levels were highly variable. Fall biomass production was ~3X of summer growth (Fig. 2), which would not be expected most years. We expect that fall forage growth would likely be about 1/3 to ½ of summer growth, and would achieve ~1 m in height, sufficient for soil erosion protection the following year.

Figure 2. Seasonal cover crop treatment for early September harvest (top), regrowth (middle), and final growth (bottom center), AGCARES, Lamesa, TX. After a harsh freeze Nov. 12-14 (-7°C), plants were still alive lower in the canopy (lower left) and in fact this biannual crop began regrowth (lower right) in early December, providing extended favorable cover crop/soil health potential benefits..

CONCLUSIONS

This data suggests that a mid-season sorghum/sudan harvest if growth is sufficient may be economical if rainfall is moderate, but low biomass due to poor growth should be left in the field for minimal protection, which is more valuable than low forage income. Full-season biomass is much higher than normal with the heavy September rains. A disadvantage of potential forage harvest, however, is the common practice that forage growers receive ½ payment for the hay and the person swathing/baling/selling hay receives half. So the income in the Table is in fact only half. This points landowners/farmers in this situation toward considering livestock grazing as a more efficient, economical means to gain benefit from the cover. Grazing would need to be moderate at most so that some cover remains and sufficient time exists for regrowth.

ACKNOWLEDGEMENTS

We thank the USDA Ogallala Aquifer Project, Texas State Support Committee of Cotton,, Inc., and Texas Sorghum Board for support of this work.