

## Decreasing Runoff to Conserve Ogallala

By: Jarrott Wilkinson

The U.S. Department of Agriculture's research station at Big Spring just may be the model of things to come in the future for areas overlying the Ogallala Aquifer. Finding tillage and rotation systems that results in optimal infiltration of rainfall and decreased erosion will be the key to extending and increasing the region's economic prosperity.

Big Spring is in the hottest, driest area of the Southern High Plains that is underlain by the Ogallala. The USDA research station in Big Spring is at the very edge of the Ogallala. Only three small wells have been located at the northern edge of the 228 acres on the station farm.

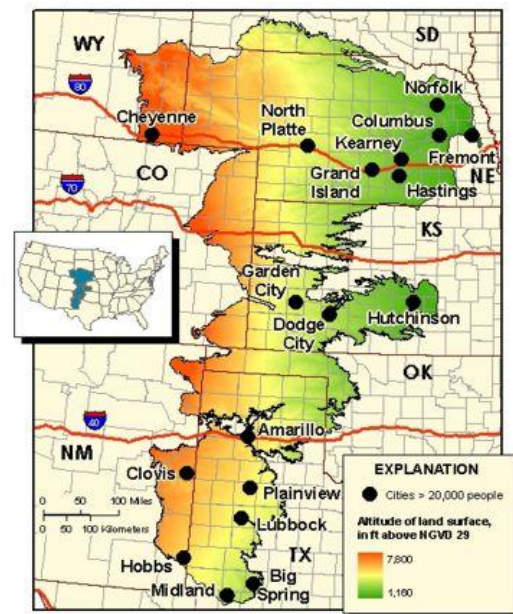
As the aquifer continues to decline, more and more of the region's agriculture will depend on the efficient capture and soil storage of the average 19 inches of rainfall received each year.

Scott Van Pelt, a USDA soil scientist, in collaboration with Drs. Veronica Acosta-Martinez, USDA, and Ted Zobeck, USDA, are looking at four different tillage practices and crop rotations on a 48-acre field of Amarillo fine sandy loam to see if they can find the right combination for the future.

Van Pelt and his team are working with three wells at the research station that produce only 33 gallons of water per minute when all three are running. Toward the end of the irrigation season, researchers often have to shut down the pump in one well because it ceases to produce enough water to keep the pump motor from overheating.

Most of the rainfall that falls comes in the form of short-duration, high-intensity thunderstorms. Rainfall rates that may exceed 2 inches per hour are not uncommon for this area and over 25 percent of the annual average may fall in a single day.

This high intensity rainfall often results in large amounts of the rain running off of the soil



surface and into natural drainages such as ravines and creeks this is widely known and held truth. Rainfall that runs off of the soil surface and into streams is water that the crops cannot use to grow. The runoff also erodes the soil and results in decreased soil productivity and costs to the taxpayers as roadways, culverts and reservoirs become filled with the eroded sediment.

Estimates of the rainfall lost to runoff range from 30 percent in dry years to more than 60 percent in wetter years.

If the region is to remain prosperous, researchers must minimize runoff and maximize the rainfall that soaks into the soil and is stored there for the crops to use. In order to maximize the amount in storage for plant growth, farmers must find ways to increase the water-holding capacity of the soil and limit evaporation from the surface.

“In areas where there is an underlying aquifer such as the Ogallala, we must learn how to use that water in concert with the natural rainfall to extend the economic life of the aquifer and gain the greatest economic good from the aquifer for generations to come,” Van Pelt said. “We are trying to minimize the dependence of the Ogallala Aquifer and find practices that can do that, but we have just started looking at it,”



Van Pelt’s research deals with the long-term effects of four different tillage practices on equal area square plots of approximately 4 acres each:

- Plowing the soil twice in a conventional manner.
- Doing very little tillage - only once a year by making beds around the previous year’s crop stalks in the winter and allowing the soil to settle before spring planting.
- Mow the previous year’s crop stalks to 4” in height and don’t disturb the soil at all.
- Don’t disturb the previous year’s crop stalks after harvest and don’t disturb the soil either.

The last two treatments are termed no-till because there is no soil tillage and all weeds are controlled with chemicals.

In each of the 4-acre plots, half (2 acres) is always planted to a crop rotation where sorghum is grown in even numbered years and cotton is grown in odd numbered years in a two-year rotation scheme. The other half is always planted to a crop rotation where a year of sorghum is followed by two years of cotton in a three-year rotation scheme.

In many areas of the United States and even around the world, the no-till treatments have been shown to increase the infiltration of rainfall, and even increase the capacity of the soil to hold water between rain events.

The two-year rotation is considered the higher-residue rotation of the two and, in other regions, has been shown to result in more rapid changes in the soil properties.

Finding a tillage and rotation system that results in optimal infiltration of rainfall and decreased erosion will result in extending and increasing the region’s economic prosperity.

This program has six years of data and will be looked at for another six.

In the first four years, the conventionally tilled area resulted in much greater economic yield and total dry matter production. In 2006 and 2007, that difference was less visible. It is unclear whether the initial response of the “no till” is slowing or if the rainfall of the last two years has resulted in growing conditions where tillage is less important to crop



growth.

“In the future, I plan to continue the research. I will also turn my attention to issues related to increasing the soil infiltration rate and water-holding capacity of the soil under multi-use crops grown for food and bio-energy,” Van Pelt said.

Top photo is an example of no till by David Nance  
Bottom photo is a more conventional method of farming by Bob Nichols