The Dust Bowl of the 1930s had several contributing factors, including misadvised and failed government programs; using humid-region management systems and clean tillage on semiarid-region lands; widespread use of fallow to decrease risk of crop failures; and drought.

The recent extended drought produced events along the length of the western margins of the Great Plains that brought back memories of the black blizzards of the “Dirty Thirties.” The average annual windspeed in this region ranges from about 12 to 18 mph. Days with sustained 30-mph winds and gusts exceeding 60 mph occur every year.

In the following discussions, the term dryland differs from rainfed production in that annual cropping on growing season precipitation alone is not possible. Fallow is the practice of leaving the land idle during a growing season and is practiced to store additional soil water to be available to the following crop.

Which practices are being used, and which ones are working and which ones are not in these drier regions where wind erosion is always a concern? I asked producers, CCAs, a researcher, and an NRCS conservation agronomist for their insights.

Mark Watson, Alliance, NE, producer

Watson: We farm nine center pivots along with approximately 2,500 ac of dryland. All our acres are farmed using continuous no-till crop production. The groundwater savings with reduced irrigation requirements using no-till is the only way we are going to save our groundwater for future generations in my opinion if we are going to maintain all of the center pivot irrigation we currently have in the High Plains.

Crops & Soils: You once said the best erosion control method in your part of the world was the blanket of native, prairie vegetation. What management techniques do you use to mimic that system?

Watson: A perennial stand of prairie grass and legumes that is mob-grazed briefly is the only system that doesn't erode. If we are going to produce crops and/or forage annually, I think the best we can do is try to minimize wind and water erosion. Through continuous no-till crop production, we have been able to minimize soil erosion but not eliminate erosion. I have had only one instance in 25 years of continuous no-till crop production where we had serious wind erosion. We planted winter wheat in the fall following field peas. It was extremely dry, the wheat did not provide cover, and we had a two-day wind event with winds of 60 to 90 mph day and night. We had to break out our old chisel plow and rough the ground.
where we had planted wheat to prevent additional erosion over the winter. I guess I feel pretty good about our success rate in preventing wind erosion, but I also proved nothing works all the time.

Crops & Soils: Many producers in this region use fallow to store some water in the soil profile and reduce the risk of crop failure. Have you ever used fallow?

Watson: We used fallow prior to adopting continuous no-till crop production. Research has shown that fallow is really inefficient at storing moisture during the fallow period. To stay profitable, we moved to a continuous no-till crop production system to better utilize our soil and moisture resources.

Crops & Soils: Do you do anything special in your crop selections to manage residues?

Watson: I think we need to produce high-residue crops at least two out of three years and maybe three out of four. Even then, when we get into extremely dry conditions, we can expect to have some erosion problems.

Crops & Soils: Some are promoting cover crops as an option for maintaining surface cover. What do you think about that?

Watson: The only place I see a fit on dryland is to make a forage crop part of your crop rotation and graze the forages, leaving at least 50% of the forage to protect the soil. Any other attempt at cover crops is doomed to failure economically in my opinion.

Dietrick Kastens, Herndon, KS, producer

Crops & Soils: In your blog (www.kastensinc.com), you list several long-term management goals and suggest optimal soil surface protection will help you attain them. Why?

Kastens: Keeping the soil surface protected is the difference between success and failure in our area. Long-term no-till management leaves the soil surface friable, nutrient rich, and biologically active. Excessive surface heat, wind, and water can quickly destroy a soil environment that took years to build.

Crops & Soils: Are there times when you cannot maintain surface cover? What then?

Kastens: Stacking hot and dry years together, extreme hail, and extreme wind can quickly create an environment where maintaining surface protection is very difficult. Aside from rescue types of things (like planting a grain, forage sorghum, or cover crop to stabilize a field), I think the optimal solution is to manage crop types (never put too many low-residue crops in rotation), minimize soil disturbance, and create a situation where the next crop has the highest probability of success. We can go from wetter than normal to extreme drought over the course of a few months; with no ability to forecast the change. As
such, pushing the system with new crops, more intensive cropping, and/or more low-residue crops has to be done very judiciously. We can be heavily penalized for years with a wrong decision in a single year. But you won’t last long if you are too conservative and manage as though each year will be a drought year.

Crops & Soils: How does fallow fit with managing residues for soil cover?

Kastens: During drier-than-average years, the increased yield/residue associated with wheat after fallow can buffer negative weather effects as well as provide adequate soil protection. Everything starts and ends with wheat on our farm as wheat residue is by far our best source of dense, long-lasting residue. Wheat after fallow will outyield any other type of wheat rotation on average. Using fallow gives us an opportunity to maximize the wheat crop, and thus the associated surface protection for a field. The hard decision to make is when to use it. In our operation, we simply balance it based on the current conditions. When we come out of fall wet, we use less fallow, while if we are dry, we will have a higher percentage of our wheat in fallow in the following year.

Crops & Soils: Your blog mentions cover crops. What has been your experience so far?

Kastens: Using cover crops (in a non-rescue situation) is very risky for us. We maximize our system by taking advantage of rainfall across crop years, and since our soils are capable of holding 10 acre-inches of water, any water used for cover crops directly reduces the next years’ crop yields. We had cover crop plots in 2011, which was the year before our 30-month drought. We took a huge yield hit following cover crops in both 2012 and 2013 and had to take those fields back to fallow wheat so that we could rebuild adequate soil residue to the surface.

Crops & Soils: Are you going to keep trying cover crops?

Kastens: Using cover crops in dry, semiarid regions is very high risk, with little upside at this point in time. I think anyone messing with them around here will be looking at supporting cattle by using forage blends.

Dave Green, CCA, Haxtun, CO, Northwest Territory Manager, Servi-Tech, Inc.

Crops & Soils: You have been a crop consultant and are now responsible for hiring, training, and supporting crop consultants that service 400,000 ac and have about 450 customers. What is the mix of dryland and irrigated acres among those customers?

Green: The territory consulting acres are 75% irrigated and 25% dryland.

Crops & Soils: What tillage and residue management techniques do those producers use?

Green: As much as possible, dryland is no-till to very minimum till with our growers. Irrigated ranges from no-till, strip-till, to conventional. Residue management is critical to dryland production, especially due to the minimization of surface soil temperature, which reduces evaporation and keeps the wind away from the soil surface. The same effects apply in irrigated cropping when using minimum till. Getting the soil to warm up and dealing with the heavier soils leads some growers to farm conventionally in those situations.

Crops & Soils: Do any government programs affect your advice and maybe run counter to what is best for erosion control in your region?

Green: There is lots of talk and pressure about using cover crops from the national NRCS. In a cropping environment where the normal situation is a moisture deficit for maximum crop production, having soil cover is one way to mitigate that low-moisture situation. In most situations, we cannot afford to use the precipitation to grow any-
thing that isn’t marketable since we so rarely have excess moisture. If we lose one crop due to moisture deficit and lose the surface cover that crop would have given, it may take years to get back to that situation even without any soil loss. Our best cover is the residue from other crops in the rotation. At times, we need to resort to summer fallow to reduce risk but strongly recommend doing it no-till or with one light tillage to break the soil surface to assist in drill penetration. Even after long-term no-till, the soil surface can bake during the summer to the point we can’t penetrate the soil surface with no-till drills. We can use cover crops on irrigated situations behind low-residue crops very effectively.

David Reinart, CCA, Wilbur-Ellis, Dumas, TX

Crops & Soils: You provide soil fertility advice to growers with both irrigated and dryland acreage. Do you consider wind erosion control when you give production advice?

Reinart: Always—wind erosion and residue management for soil moisture retention go together.

Crops & Soils: What tillage and residue management techniques do your growers use?

Reinart: Chemical fallow with pre-plant burndown in strip-tillage, no-till, and still some conventional tillage with chisel- and disk-type equipment. It seems weird, but the irrigated growers use more of the new conservation techniques than the dryland growers, even though it’s obvious that it is needed more in dryland production.

Crops & Soils: Are there any other issues that affect your advice and maybe run counter to what is best for erosion control in your region?

Reinart: At this time, the biggest issues are the harvest of corn stover and increase in forage production for the growing livestock industry and for feedstock for cellulosic ethanol production. These industries are paying to harvest crop residues. I am advising growers interested in this added income flow to refrain from complete removal and still maintain enough residue for wind control and some ground cover.

Brandt Underwood, USDA-NRCS Texas, Conservation Agronomist, Lubbock, TX

Crops & Soils: You are the Soil Health Ambassador for the Texas High Plains and Southern Plains. Does that involve promoting a given set of management practices?

Underwood: NRCS’ mission in the field is to support and promote sound conservation management practices to benefit and improve all natural resources. To improve soil health, a total management system is needed. In most cases, the conservation practices used are crop rotation, residue management systems, nutrient management, pest management, and irrigation water management for irrigated fields. NRCS has worked with many farmers and ranchers who have successfully applied good management systems that develop healthy soils. It’s important to remember good soil health comes from a comprehensive management system aimed at addressing all natural resources on a farm or ranch.

Crops & Soils: Lubbock and Amarillo often alternate for the windiest major city in the USA and are always in the top five. How does that affect the way you approach your job?
Underwood: Wind erosion is always a major concern and challenge on the High Plains and South Plains regions of Texas. Since this region of the Great Plains has an abundance of cropland where soils are dry and winds are sufficiently strong, the soils are more susceptible to wind erosion, and therefore, it is more likely soil erosion can occur unless control measures are applied. I work with NRCS field staff and farmers and ranchers to help plan and implement conservation practices to address wind erosion on a regular basis. NRCS works primarily with private landowners and managers voluntarily and provides technical assistance to help reduce and eliminate wind erosion on their farms and ranches. Some of the ways we do this is by helping producers incorporate high-residue crops into a rotational cropping system and encouraging implementation of residue management practices to leave the maximum amount of crop residue on the soil surface. Additionally, we promote conservation tillage practices as a way to leave enough crop residue on the surface to significantly reduce soil erosion. This job can be challenging in an area where conventional farming practices still exist; however, over the past 20 years, there has been a 70% increase in reduced tillage practices statewide.

Crops & Soils: Nationally, the NRCS is promoting cover crops as a tool to improve soil health. Do you think cover crops are a viable option to limit wind erosion and improve soil health in your region?

Underwood: Cover crops certainly have benefits to improving soil health and ultimately reducing wind erosion. One of issues we face in this region is the limited amount of annual rainfall. While farmers continually try to improve their soil with help from NRCS, cover crops are one of the options a farmer can implement in a total resource management system to address soil health.

Scott Van Pelt, Big Spring, TX, USDA-ARS wind erosion research scientist

Crops & Soils: According to the USDA-NRCS Natural Resources Inventory, the Southern Plains has the highest cropland erosion rates, more than twice as much as the Corn Belt, and states east of the Mississippi River. What factors do you think contribute most to this problem?

Van Pelt: The erosion problem on the Southern High Plains (SHP) can be attributed primarily to bare sandy soils with little structure or organic matter. Water availability is the most limiting growth factor for both crops and soil microbes in much of this region, and added organic matter simply doesn’t last very long. We have a warm-season, bimodal late spring and early fall pattern of maximum precipitation. There is not enough winter precipitation in most years to support cover crops without sacrificing yield of the cash crop in the following growing season.

Crops & Soils: Surface cover is always the main theme in discussions of erosion control. What options do producers in your region have to maintain cover?

Van Pelt: Except where irrigation is possible, our producers have very few options for maintaining surface cover. You must first be able to produce sufficient crop residues to protect the soil surface from the winter/spring winds. Further north, wheat and sorghum edge out cotton as the cash crops. With a wheat–sorghum–fallow rotation, dryland producers utilizing no-till can maintain a protective cover of standing residue in most years, but the recent drought resulted in bare fields where crops had failed for two years and the soil loss was, in places, massive.

Crops & Soils: Surface cover is always the main theme in discussions of erosion control. What options do producers in your region have to maintain cover?

Van Pelt: Except where irrigation is possible, our producers have very few options for maintaining surface cover. You must first be able to produce sufficient crop residues to protect the soil surface from the winter/spring winds. We receive too many heat units before our spring rains for wheat or other winter small grains to be a cash crop. Limited rainfall precludes corn in the warm season. Cotton pays the bills but leaves very little durable residue.

Since the prevailing winds during
the growing season are from the south or southeast, flat ground is listed in an east–west direction to protect the seedling plants from sand burn. Unfortunately, our erosive winds during the fallow season are primarily from the west, and erosion occurs between the rows in spite of standing residue.

Crops & Soils: Are cover crops a viable option to maintain surface cover?

Van Pelt: In most years, there is simply not enough rainfall for two crops here in the SHP. Just 300 miles to the east, double cropping is common and cover crops are successful. In Texas, the general rule of thumb is that for every 25 miles travelled west, mean annual rainfall decreases by an inch. Cropping systems that are possible on 32 inches of mean annual rainfall are not possible when only slightly more than half that is received in a year. Remember, too, the mean is a mythical value between the extremes, and there are more years with below-average rainfall that with above-average rainfall.

Crops & Soils: When all else fails, what options are left?

Van Pelt: Tillage remains an effective tool against wind erosion. When plant residue and growing crop cover are insufficient to protect the soil surface, raising ridges perpendicular to the direction of erosive winds or simply raising large aggregates on the flat surface will prevent the cascading of saltating particles and the significant movement of soil beyond the field margins. Even no-till systems may need to be tilled periodically to prevent the redistribution of the topsoil from a production field to the fencerow or surrounding landscapes. Returning highly erodible or marginal production fields back to grazing land may protect from erosion but will do little to feed and clothe a growing world population. In an increasingly unpredictable climate, there can be no single “silver bullet” to protect or restore the soil.

Interested in this topic? Watch the Erosion Webinar Series

The Soil Science Society of America is broadcasting a four-part erosion webinar series starting January 22. This webinar series will address agents, processes, factors, and control principles for wind and water erosion; models used to predict erosion and help determine BMPs; and how the NRCS uses the models in developing conservation plans.

- January 22: Erosion basics: Factors, processes, types, control principles
- January 29: Wind erosion and the WEPS model: Is it useful?
- February 5: Predicting water erosion: RUSLE2 and WEPP
- February 12: Erosion models and the NRCS

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