Post-CRP Land Management and Sustainable Production Alternatives for Highly Erodible Lands

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Introduction

Oklahoma has 1.2 million acres enrolled in the Conservation Reserve Program (CRP). Eighty-eight percent of the acreage is in the Panhandle and in counties along the Texas-Oklahoma border. Prior to the CRP, much of this land was cropped annually to winter wheat. Dryland cotton production in southwestern Oklahoma and dryland sorghum production in northwestern Oklahoma were also important. Wind erosion, water erosion, and associated particulate nutrient discharge were significant production problems with these crops. Removing these soils from crop production and establishing perennial grass cover has significantly reduced soil erosion.

Old World bluestem (OWB), a perennial bunchgrass, was used extensively for soil cover on many of the contract acres because of an abundant, relatively inexpensive seed supply and ease of establishment. Unfortunately, most producers do not fully understand the forage potential of the grass and will be unaware of how to manage the grass after the CRP.

Literature

Government contracts to retire highly erodible land for 10 years were established in Title XI1 of the Food Security Act of 1985. However, soon after the program's inception, the very nature of its merit; the program's implementation strategies, benefits and deficiencies; and its future use have been extensively debated (Cacek, 1988; Dicks and Coombs, 1993; Dicks, 1994; Mitchell, 1987; Osborn, 1993; Ribaudo, et al., 1989).

As Congress begins addressing the 1995 Farm Bill, the future of these acres is still uncertain. Most certainly this program will see changes and the acreage will not likely be expanded. Some fear a total elimination of the program may occur, and with it, the benefits of a long-term CRP. Although the political and societal attitudes toward sustainable use of land resources and market forces are difficult to predict, impediments to sound use of fragile, environmentally-sensitive lands must be addressed before the expiration date of contracts.

A number of state projects have been implemented, primarily to evaluate the potential use of CRP lands in forage-livestock and/or seed production enterprises (Prinz, 1993). Although that approach appears to be the most consistent for future use, there is increasing evidence that many producers will revert to annual crop production systems.

A recent survey conducted by the Soil and Water Conservation Society (Nowak, Schnepf, and Barnes, 1991) suggests that as many as 46 percent of respondents have plans for using their CRP land after the contracts expire and will return one-half to crop production.

Conservation tillage, including no-till cropping systems, is seen as a way of preserving many of the benefits of CRP, and, at the same time, allowing commodity crop production on highly erodible land. A large information base has been developed on conservation tillage over the past decades (Dao and Nguyen, 1989; Stiegler, 1987; Unger and McCalla, 1980.)

It is apparent that many soil processes require several years to establish a new equilibrium when tillage is reduced or eliminated. Tillage operations significantly alter the ecological balance both above and below ground. Tillage operations mix soil, therefore increasing microbial oxidation of soil organic matter and the degradation of soil structure. While a great deal will depend on economics and the market condition in 1996 and 1997, it is apparent that some of the land will return to crop production.

Research and Demonstration

In 1994, a multi-agency (USDA-ARS, Oklahoma State University, Noble Research Foundation, UDSA-NRCS and USDA-CFSA, Oklahoma Conservation Districts, and others) project was initiated with funding provided by the Southern Region SARE/ACE program. This is a 3-year project. The objectives of this farm-scale, research and demonstration study are designed to answer the following questions.

(1) What are the best management practices for the existing grass cover to maximize grass production and potential beef weight gains?

(2) What soil quality improvements in the soil resource base have been made during the CRP, and what is the relative persistence of the improvements under alternate land management practices after CRP?

(3) How and when is the best time to kill existing grass cover if a commodity crop is to be successfully produced in the transition year out of CRP?

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(4) What are the best management options and guidelines for enironmentally-sound, sustainable, alternative cropping systems?

Research Approaches and Methods

Project Area

The research and demonstration study is being conducted at two sites. One is located in a semi-arid region on a wind-erosion-prone Dalhart fine sandy loam (Aridic Haplustalf) soil in northwestern Oklahoma near Forgan. The average rainfall is 18 inches annually. The other site is located in a sub-humid region on a water-erosion-prone La Casa clay loam (Pachic Paleustoll) soil in southwestern Oklahoma near Duke. The average rainfall is 26 inches annually.

The sites are located on producer farms, on land that has been in CRP grass for 7 to 8 years. Enough land was acquired so that a completely new study area will be used at each site in each of the 3 years of the project as well as following the initial plots through a 3-year cycle.

Producer involvement in the project was stressed by SARE/ACE; however, because CRP guidelines forbid haying, tilling, or otherwise destroying the sod on contract acres, permission from Consolidated Farm Services Agency (CFSA) was requested and received for the use of the land. Landowners continue to receive annual rental payments. The only CFSA restriction is that the landowner cannot benefit for the sale of any hay or crop from the acres; however they can receive payments for services provided to the investigators.

Research Approach and Treatment

At the northwestern site, eight one-acre replicated treatments are being evaluated. They are **(1)** OWB hay production from unimproved plots; **(2)** OWB hay production from managed and fertilized plots; **(3)** minimum-tilled and annually planted winter wheat production for forage; **(4)** minimum-tilled and annually planted winter wheat for forage and grain; **(5)** no-till and annually planted winter wheat in killed sod for forage; **(6)** no-till and annually planted winter wheat for forage and grain; **(7)** no-till wheat-fallow-sorghum rotation; and **(8)** conventionally tilled annually planted sorghum.

The OWB biomass was burned in the spring of 1994 before the plots were installed. No-till plots were sprayed with glyphosate at 1 lb ai/acre + ammonium sulfate. Minimum tillage was performed using an offset disk (small plots) or a large V-blade (large plots).

At the southwestern site, the plot sizes are different but the first six treatments are the same as the northwestern site. Two other treatments, conventionally tilled and row or strip-tilled cotton, will be planted into a killed winter wheat cover crop. The OWB biomass was mowed and hayed in the spring before the plots were installed. No-till plots were sprayed with glyphosate at 1 lb ai/acre + ammonium sulfate two times during the OWB growing season. The minimum tillage was performed using an offset disk twice prior to wheat seeding.

Accumulated benefits of CRP lands such as enhanced organic matter content, hydraulic properties, and other pertinent physical characteristics such as aggregate stability will be monitored. Their changes under the various management options will be determined to illustrate the relative persistence of accrued benefits to the soil resource. It is intended that the project will illustrate the relative costs of production for the various management options. The economic returns from cropping highly erodible lands will be compared with the returns from maintaining the grass cover for grazing livestock.

In addition to the large plots, four small-plot studies are being conducted at each location. These small plots are designed to study an array of tillage methods, mowing, and herbicide options for killing the OWB grass. Studies to determine the influence of fertilizer on residue decomposition, weed populations, and crop yields are being conducted. Also, the effects of fall- and spring-applied weed control options in the crops being grown and their effect on crop production are being studied.

Educational activities will be organized for local producers. Field days, workshops, and tours of research and demonstration areas will be conducted for end-users' first-hand evaluation. In addition, progress reports, technical articles, and popular literature will be prepared to summarize achievements and provide management guidelines.

Results and Discussion

Considerable data are being collected and the plots are being monitored on a regular basis, but none of the data are ready for release at this time. The project was just initiated in the spring of 1994. A few items can be discussed.

Killing of OWB, regardless of pretreatment (burning or mowing) proved more difficult with glyphosate because of the climate and moisture stress conditions. Moldboard plowing was an effective means for killing the OWB sod. Disking gave somewhat reduced kill. The large V-blade plow provided a good kill on the large plots at the northwestern site but could not be used on the fine-textured soils at the southwestern site.

Wheat stands at both sites were rated as adequate in all treatments, partially due to timely rains after planting. Moldboard and disk plots (planted with conventional drill) had somewhat better stands than the no-till plots (planted with a no-till drill).

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