Abstracts of Concurrent Presentations

Factors Influencing Successful Sod Seeding of Winter Annuals Into Perennial Grass Sods in Texas

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Overseeding cool season annual forage species into perennial grass sods can provide high-quality forage during fall, winter, and spring months. Overseeding cool season annual legumes can provide nitrogen for use by sod the following season.

Tests have been conducted on seeding rate, date of seeding, row width, fertilization, and other cultural practices. Timely incorporation of practices that affect optimum growth are discussed.

Conservation Tillage Systems for Maximizing Profitability On The Texas Souther High Plains

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Conservation tillage systems offer potential for reducing production costs, increasing yields, reducing risks, and providing a means for satisfying conservation compliances provisions for the highly erodible soils of the Texas Southern High Plains. Cropping systems plots were established in 1985 at Lubbock and Halfway and in Terry County in 1986 to evaluate various conservation tillage/crop rotation systems under irrigated and dryland conditions. New weed control programs are being developed using preemergence and post-emergence applications to replace traditional preplant herbicide applications and tillage operations.

Systems being evaluated include continuous cotton and sorghum, cotton-sorghum, cotton-sudangrass, cotton-wheat, and sorghum-wheat conservation tillage systems, which are compared to conventional cotton and sorghum production. In 1986, yields were increased 13 percent and net returns increased 30 percent with conservation tillage systems for cotton at Lubbock. At Halfway, cotton yields were increased 12 percent and returns 43 percent when compared to conventional cotton production. Sorghum yields were increased 25 percent and net returns increased 100 percent at Lubbock, while yields were increased 34 percent and net returns by 80 percent at Halfway when compared to conventional sorghum production.

Relay Planted Soybeans: An Alternative Doublecropping System

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A soybean-wheat doublecropping study was conducted in 1984-86 to evaluate tractor wheel track width and soybean relay planting date effect on wheat and soybean yield. Soybeans were planted in 16- and 32-inch wide rows with two 24-, 28-, and 32-inch wide spaces per 20-foot planter width for tractor wheel tracks. Soybeans were planted as a monocrop in mid-May, between 16-inch wide wheat rows in a relay planting system in mid- and late May, and in wheat stubble in mid-June and early July. Wheat yield from soybeans relay-planted into wheat with 28- and 32-inch wide wheel tracks was 10 percent greater than the 24-inch wide wheel track in 1985 but not in 1986. But these yields were equal to 24-, 28-, and 32-inch wheel track wheat treatments harvested before soybean planting in 1985 and 1986. The three-year average wheat yield for the relay doublecropping system was 88 percent of the monocrop wheat in 7-inch rows. Relay-planted soybean two-year (1984-85) average yields were not different from monocrop soybeans. But yields were 11 percent and 214 percent greater than soybeans planted in wheat stubble about June 19 and July 2, respectively.

Grain Sorphum, a No-Till Crop in Mississippi

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A 3-year (1983-85) study was conducted on Catalpa silty clay and Ora fine sandy loam soils to evalute grain sorghum response to tillage systems (conventional and no-till) and nitrogen rates (0,40, 80, and 120). Conventional tillage consisted of chisel plowing 6-8 inches deep followed by disking in the spring and then harrowing before planting. Nitrogen was broadcast on the soil surface within 25 days after sorghum emergence. Three-year average grain sorghum yield on both soils indicated no difference due to tillage system. However, average yield was 23 percent greater on the fine sandy loam than on the silty clay. Nitrogen rates and tillage had no effect on sorghum plant population and grain test weight on either soil. Grain sorghum on the fine sandy loam soil showed little response to nitrogen rates. However, grain sorghum showed a yield response up to 80 lb N/a on the silty clay. Results on these two soil types indicate no-till grain sorghum can be grown successfully in Mississippi.

Tillage Effects on Fertilizer Rate and Placement Requirements of Dryland Grain Sorghum

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Reduced-tillage and no-till systems of crop production have encouraged either shallow banding or broadcast applications of fertilizer nutrients. Nutrient-use efficiency may be significantly affected by these alternate fertilization techniques. Studies evaluating fertilization methods included starter and pop-up fertilizers, broadcast and knife placements as well as sidedress applications. Fertilization rates included soil test recommendation and 1.5X recommended rates. Reduced, conventional, and chiselbedder systems of tillage were compared as major plots (main effects) while fertilization techniques were studied in split plot design within each tillage system. Grain yields averaged across all fertility rates in the first season of the three-year study showed the chiselbedder system produced significantly more than the reduced-tillage system. This was primarily because of low yields from the broadcast fertilizer treatment with reduced tillage. Reduction in the yields because of broadcasting was less severe in the second and third years when plant stress for moisture was not a problem. In 1984-85, tillage treatment effects were non-significant. However, grain maturity measured by a moisture test at harvest showed that reduced tillage delayed maturity in 1984. Although grain yields were substantially higher in 1985 because of optimum soil moisture conditions, tillage effects were non-significant. Substantial response to low rates of fertilizer were measured in all seasons. Splitting band applications of fertilizer into 2/3 preplant and 1/3 as either starter or sidedress had only slight effects on grain yields and maturity. Yield data indicate that tillage methods used in seedbed preparation will have minimal impact on grain sorghum response to fertilizer nutrients when materials are knifed in a preplant application.

Effect of Different Tillage Practices on Surface Residue and Soil Physical Properties

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An experiment was conducted to determine the effects of continuous cropping of corn, sorghum, and cotton under three different tillage systems (conventional, minimum, and no-till). The study was conducted in the Coastal Bend region of South Texas on an Orelia sandy clay loam. A split plot design with four replications, tillage systems in the whole plots, and crops in the split plots was used. Plots were generally planted in early to mid-March and harvested in early August. After harvest, conventional and minimum tillage plots were generally shredded and disked. The conventional tillage plots were bedded and rebedded with middlebusters. Middles and beds were rerun three to four times during the fallow period to control weeds. Weeds were controlled on the minimum tillage and no-till plots using periodic herbicide applications. The conventional and minimum tillage plots have been sustained for 10 years, while the no-till plots have been in place for eight years. Surface penetrometer readings indicate that decreased tillage has resulted in higher bulk densities. Little difference in surface residue can be observed between the conventional and minimum tillage treatments. However, the use of no-till has resulted in large increases in surface residue compared to the conventional tillage plots. Data will be presented describing the effect of treatments on aggregate size distribution, aggregate stability, and water infiltration.

Cover Crops in Conservation Tillage: Benefits and Liabilities

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Several of the benefits of conservation tillage are derived from the presence of a vegetative mulch cover on the soil surface. One of the most effective ways to ensure a mulch cover is to use a winter cover crop that can be chemically killed in the spring at or before grain planting. Along with the benefits derived from the mulch, such as erosion control, soil water conservation, and nitrogen fixation (if a legume), there are definite liabilities associated with a cover crop and its subsequent mulch. Perhaps the most important, potentially yield-limiting effect that we have identified in our studies is depletion of stored soil water.

Cover crops depleted soil water to at least 24 inches depth before corn planting. However, a water conservation effect of killed cover crops was obvious with no-tillage two weeks after planting corn. Greater soil water content was present at planting where the cover crop was chemically killed three weeks before planting corn than where it was allowed to grow until the corn was planted. The additional water used by the late-killed cover crop appeared to be more important than the additional tonnage of mulch produced in the case of a non-legume cover crop.

A hairy vetch cover crop gave the offsetting advantage of providing biologically fixed nitrogen to the corn. This was estimated by yield comparisons to be equivalent to about 80 to 90 Ibs/acre of fertilizer nitrogen. Over a five-year period, average corn yields increased at a rate of about 8 bushels/acre/year with the hairy vetch cover crop treatment when compared to corn residue alone. At least part of the increase in potential yield appeared to result from some unidentified factor or factors that were additional to increased nitrogen.

Effect of Tillage, Water Quality, and Gypsum on Infiltration and Water Storage

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Improved water conservation practices are needed in the Texas High Plains because of the variable rainfall and declining water table. The first step in conserving water applied to the soil is to increase infiltration. In this study, the effect of tillage, water quality, and gypsum on the infiltration of simulated rainfall, water storage, and soil density were evaluated on Paleustoll soils. In a lab experiment, gypsum was mixed with soil at 0 or 3 Mg/m3, packed into columns (0.5 m long x 0.3 m wide x 0.15 m deep) to a density of 1.0 Mg/m3, placed on a turntable, and exposed to simulated rainfall (intensity = 5 0 mmlhr) using water with SARs of 0.0, 0.487, or 4.217. Gypsum did not change the amount of infiltration; however, water treatments with SARs of 0.0 or 4.217 had lower infiltration. In field experiments, rainfall was simulated (intensity = 65 mm/hr) over a 1.2 m2 area on both crusted or uncrusted soil that had been disk- or chisel-disk tilled with or without furrow dikes, and on soil that had been cropped to continuous cotton or sorghum under conventional or reduced tillage, wheat, or fallow. Infiltration was reduced by the surface crust and the absence of furrow dikes. Tillage treatments, including less costly reduced tillage systems, did not affect infiltration, water storage, or soil density. Less soil water was stored where wheat was growing in the spring. The data indicate that cumulative infiltration can be limited by water quality and the soil surface conditions regardless of the amount of tillage.

Rating Long-Term Soil Productivity

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There is documented evidence that long-term cropland soil productivity declines under certain management systems. A combination of factors, including excessive wind and water erosion, loss of soil organic matter, and deterioration of soil structure, can affect this decline. Tools are available to predict erosion (Universal Soil Loss Equation and Wind Erosion Equation). A tool is needed to rate the effect of other components of a cropland management system. Using these tools, one can predict the trend and comparative rate of improvement or degradation in long-term soil productivity. Soil condition rating indices offer a useful and usable approach to rating long-term productivity under alternative cropland management systems.

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Influence of Cover Crops On Fertilizer-N Requirements of No-Till Corn and Grain Sorghum

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The objective of this study was to determine the influence of cover crops such as winter legumes or small grains on the fertilizer-N requirement of subsequent crops of corn (*Zea mays* L.) or grain sorghum (*Sorghum bicolor* L. Moench). Five cover crop treatments (three legumes, wheat, and no cover crop) were studied on two soil types (Rome loam and Greenville sandy clay loam) in Georgia. Five fertilizer-N rates (0, 28, 56, 112, and 224 kg ha' for corn and 0, 22, 45, 90, and 180 kg ha' for grain sorghum) were superimposed on each cover crop treatment. Corn or grain sorghum were no-till planted following desiccation of the cover crops in 1985 and 1986. Results show that optimum fertilizer-N rates for corn were 67, 89, 92, 184, and 188 kg ha^{-1} following hairy vetch (*Vicia villosa* L. Roth), crimson clover (*Trifolium* incarnatum L.), winter pea (*Pisum sativum),* fallow, and wheat (*Triticum aestivum* L.), respectively. For grain sorghum, optimum fertilizer-N rates were 0, 0, 48, 72, and 109 kg ha^{-1} following hairy vetch, crimson clover, berseem clover (*Trifolium alexandrinum* L.), fallow, and wheat, respectively. Mean grain yields at the optimum N rates for each cover crop treatment were 10.25 and 5.37 Mg ha^{-1} for corn and grain sorghum, respectively. We conclude that a well-adapted legume can replace as much as 120 kg of fertilizer-N ha^{-1}, while corn or sorghum following a non-leguminous cover crop may require 20 to 40 kg ha^{-1} more N than no cover crop.

Conservation Tillage: Corn, Grain Sorghum, and Wheat in Dallas County, Texas

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Conservation tillage is a practice that will cut production expenses and control erosion. Conservation tillage corn is being grown, but systems using wheat and grain sorghum need to be developed for North Texas Blackland Prairies.

A study was initiated comparing conservation tillage to conventional tillage with corn, wheat, and grain sorghum. The comparison evaluated stand establishment, grain yield, and production costs. A no-till drill was used to plant the crops in about 8,000 pounds of residue.

Conservation tillage corn yielded 10 percent to 15 percent higher than conventional tillage with $15 to $20 per acre less production cost. Wheat yields have not been obtained to date, but plant stand and growth was good. Conservation tillage wheat production costs are 30 percent less than conventional tillage wheat. Conservation tillage grain sorghum production costs are significantly reduced compared to conventional tillage. Conservation tillage farming appears to work well in the North Texas Blackland Prairies.

Growth of Conservation Tillage in Blacklands

Bob Kral

Despite problems encountered with tough, sticky soils, farmers in the Blackland Prairie region of Texas are gradually using conservation tillage on more acres each year. Reduced expenses of production is the chief incentive for changing from conventional tillage to conservation tillage, with reduced time input and reduced soil loss also being factors. All major crops of the region (grain sorghum, cotton, wheat, and corn) are being successfully produced with conservation tillage. Specifically, mulch tillage or reduced tillage are the conservation tillage methods used most with no-till being used on a relatively minor acreage.

In past years, resistance to change from traditional tillage methods may have prevented many farmers from using conservation tillage. Today, however, farmers are more likely to hesitate changing to conservation tillage because of the expense of purchasing a different kind of planter. Other factors limiting greater use of conservation tillage include concerns about adequate weed control or how to place fertilizer into crop root zones without destroying surface residues. While no rapid or dramatic shift to conservation tillage is anticipated, the steady increase experienced in the past 10-15 years is expected to continue.

Measuring Yield Difference and Stand Establishment As It Relates to Percent Ground Cover

By Horace D. Hodge, DC, SCS, Navasota, and
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The Blacklands of Texas are capable of producing large amounts of crop residue ranging from 30 percent to 100 percent ground cover at planting. Farmers have reported difficulty with planting ability and stand establishment in heavy residues. A system was designed to measure stand establishment and yield differences as it relates to percent ground cover. Three residue management treatments using three soil insecticides were evaluated on seven 1-acre plots.

Treatments were evaluated for required break-even yields. Conclusions were that total yields exceeded all break-even yields on conservation tillage plots. The amount of residue had little effect on stand establishment. This study shows the greater the amount of residue, the greater the yields, primarily because of available moisture at grain filling.

GRAMOXON® SUPER Herbicide in a Conservation Tillage System

Milton A. Sprague and Glover B. Triplett[1]

With the discovery of paraquat in the late 50's, the implementation of a successful conservation tillage system was greatly increased. With the ability to kill existing vegetation and plant directly into it, soil conservation was realized.

According to Sprague and Triplett (1986), "Stand Establishment is regarded as the single most important stage of growth in the life cycle of a crop."' The use of paraquat, now known as GRAMOXONE SUPER, as a preplant or preemergence contact herbicide allows the seed to be planted directly into a cover crop. The cover crop is then noncompetitive, the soil basically undisturbed, and moisture is retained. This is in an excellent environment for stand establishment.

GRAMOXONE SUPER can be fit into virtually every type of conservation tillage program. This versatiligy allows GRAMOXONE SUPER to be used alone as a burndown herbicide or in tank mixes with residual herbicides to give both contact and residual control of competitive weeds.

Recent data indicate that often better weed control of tough annuals and some perennial weeds is achieved through the addition of certain residual herbicides. The residual herbicides, such as the triazines and metalachlor, in addition to their residual control, act as photosynthetic inhibitors. Since GRAMOXONE SUPER requires active photosynthesis to be activated, these inhibitors slow the activity of the GRAMOXONE SUPER without shutting it down completely since they do not cause a 100% plant shutdown. This reduction in photosynthesis allows a localized translocation of the paraquation to increase the active area. The tank mix of the two products, therefore, gives a synergized effect: 1 + 1 = 3 .

Along with the versatility of GRAMOXONE SUPER for various cropping programs, new burndown and residual products from ICI that fit into conservation tillage programs include the following:

SUREFIRE™ herbicide for corn, cotton, wheat and orchard crops.
COLONEL® herbicide for corn and grain sorghum.
PRELUDE® herbicide for sorghum and soybean.
GFU 477B, an experimental for corn, trees and vines and alfalfa.

So whether it is conservation tillage, no-till, or CRP or other government programs, products from ICI fill the need for total weed control.

[1]No-Tillage and Surface Tillage Agriculture: The Tillage Revolution, John Wile). & Sons, Publisher. New York, New York.

Insecticidal Performance of Terbufos In Continuous and Noncontinuous use Cornfields

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In 1985, a study of 28 cornfields in Illinois, Iowa, Nebraska, and Wisconsin was conducted to examine the performance of COUNTER systemic insecticide-nematicide (turbufos), Twenty-one of these fields had a history of terbufos use; seven fields with non-terbufos use served as controls. This study was repeated in 1986. Fourteen of the original 21 history fields were included again in the second year. Again, seven fields with non-terbufos use served as controls. The performance and rate of degradation of the insecticide was examined throughout the season.

Residue analyses and rootworm bioassays were performed on soils collected prior to treatment and at 0, 30, 60, and 90 days after treatment. Root ratings (1-6 scale) were made in the field to measure performance. Root protection provided by terbufos in terbufos history fields was similar to those in the control fields. The degradation rate of terbufos in history fields was similar to the control fields. Bioassays revealed high corn rootworm mortality through the 90-day sampling period. In summary, banded and in-furrow application data indicate no evidence of enhanced microbial degradation of terbufos.

No-Till Corn and Sorghum Production in Texas Blacklands

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In recent years many crop producers across the country have considered the reduction of tillage as a means of reducing production costs. The Texas Blacklands is an extensively cropped area of the state. The following question has been frequently asked by producers: "Will No-Ti11 work with corn and sorghum in the Blacklands?".

A replicated tillage study was begun in the Fall of 1983. This study included crop rotation sequence of corn-sorghum-wheat on 51 foot wide strips (16-38"rows). The tillage treatments used were (1)No-till and (2) conventional tillage.

The results show that over the first 3 years of the study crop stand establishment has been the major factor affecting the relative advantage of the tillage treatments. Another factor of interest of this crop rotation was the killing of sorghum plants after harvest. Essentially the same herbicides were used to control weeds on both tillage treatments for the respective crops.

Soil compaction in no-till plots is an important factor in crop stand establishment and may impact crop performance and yield. Therefore, an evaluation of this problem needs to be made.

An interesting observation has been that in 1985 and 1987 the greenbug population on the sorghum in the conventionally-tilled plots were sufficient to merit insecticide applications for control, while the greenbug presence was near zero in the no-till plots.

PROWL: A Perfect Fit for Conservation Tillage

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The chemical properties of PROWL Herbicide fit into the conservation tillage practices for cotton on the High Plains of Texas. PROWL Herbicide provides excellent weed control utilizing two pass incorporation techniques with field cultivators and rolling cultivators.

PROWL Herbicide applied pre-emergence to cotton through a center pivot provided excellent control of Pigweed and Watergrass in 1986. The pre-plant application of PROWL through the center pivot irrigation system provided good to excellent control of Pigweed and Crabgrass in cotton in 1987.

Agitation of the PROWL solution in the nurse tank is required. The addition of an emulsifier to the PROWL solution is recommended when applying PROWL through the center pivot.

Ratoon Grain Sorghum: An Alternative Cropping System for Conservation Tillage

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SORKAM, a dynamic grain sorghum growth and development model, was used to evaluate the potential of dryland ratoon grain sorghum production in Texas. Eleven independent data sets from Georgia and Texas were used to determine the model's accuracy. Simulated grain yield estimates were within 25 percent of the observed yield (RMSE = 877 kg/ha) for the cultivars that consistently produced the highest yields at each location. This level of accuracy is similar to that experienced by simulations of grain yield for the first or "plant" growth phase of sorghum with SORKAM. Results of multiple-year (10-30) simulation of ratoon grain yields from 14 locations in Texas using location-specific meteorological data indicated that ratoon sorghum (grain yields of more than 1,500 kg/ha) could be profitable more than 50 percent of the time in East Central and East Texas (College Station, Temple, Dallas, Beeville, Angleton, Columbus, Center, Corpus Christi, and Beaumont). The probability of obtaining profitable ratoon yields increases to more than 80 percent for areas on the coastal plain. Although soil water was the primary factor limiting ratoon grain yield, rainfall during the late fall, winter, and spring months usually replenished the soil profile to that normally obtained without ratoon cropping. Simulated estimates of grain moisture at the harvest of the ratoon crop indicate that supplemental drying facilities would be required to augment natural grain drying, thus increasing related expenses. The area best suited for ratoon cropping sorghum is south and east of a line running from west of Corpus Christi to Beeville to College Station to west of Center. About 1 million to 1.2 million hectares of land currently under cultivation would fall into this zone. If ratoon grain sorghum were grown on 20 percent of this total area and produced grain yields of 3,000 kg/ha (at $4/cwt), about $32 million could be added to the agricultural economy of the state.

Interaction of Tillage on Corn Yield and Quality of the Runoff Water

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An inherent part of conservation tillage (CT) is the presence of residue and the reduction or complete lack of tillage. Fundamental soil physical properties such as bulk density, temperature, and moisture are influenced along with important chemical and biological properties. Thus, the first step in making CT work is selecting the specific system to fit individual soil type. Corn yields from long-term tillage studies on benchmark soils of Wisconsin are summarized. Generally, no-till works well on soils that are droughty, such as sands, with the yield advantage being attributed to increased moisture. On heavy textured, poorly drained soils, the increased moisture coupled with the reduction in temperature common under no-till results in decreased yields. However, systems such as the chisel plow evidence no yield reduction under these conditions when compared to the conventional system. Because the environment under CT differs from that of the conventional system, traditional fertilizer management techniques also differ. The importance of corrective and maintenance P and K will be emphasized with particular attention being paid to starter fertilizer response. Water quality implications of CT are presented. Simulated rainfall studies indicated that CT systems reduce erosion by 80 percent to 90 percent when compared to conventional. The quality of the runoff water under CT is generally higher, especially with respect to dissolved P loadings. While all CT systems resulted in increased pesticide concentration in the runoff water, total loads were comparable to conventional because of decreased runoff from CT.

No-till Winter Wheat Production in the Texas Blackland Prairie

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The Blackland Prairie of Central Texas is an extensive area of productive soils with a diverse cropping mixture including wheat, sorghum, corn, cotton, and oats. Much of this production region is characterized by rolling land, which under clean tillage is subject to considerable erosion during heavy rains.

No-till wheat offers an attractive alternative to wheat planted in conventionally prepared seedbeds in the Blacklands of Texas due to reduced soil erosion, increased soil water storage, and reduced labor and land preparation costs. Higher herbicide costs in no-till, particularly as wheat follows sorghum, offset savings associated with reduced land preparation costs. No-till wheat exhibited more symptoms of nitrogen deficiency than wheat in tilled plots, but yields were not correspondingly reduced. In the 1984-85 crop year, no-till wheat averaged three to five days earlier in maturity and exhibited considerably less lodging than wheat in tilled plots. A cultivar with a stronger straw was used in 1985-86, and no difference in maturity or lodging was observed. No difference in yield was measured over the three-year study between no-till and wheat planted in a prepared seedbed. Attempts at double-cropping sorghum after wheat failed because of inadequate rain.