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Development Of Soil Conservation Measures In Ellis County With Respect To Economic Gains

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DEVELOPMENT OF SOIL CONSERVATION MEASURES IN ELLIS COUNTY WITH RESPECT TO ECONOMIC GAINS

HARRIS

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DEVELOPMENT OF SOIL CONSERVATION MEASURES IN ELLIS COUNTY WITH RESPECT TO ECONOMIC GAINS

By

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DEDICATION

To the memory of my mother, Mrs. Ardonia Harris, this work is affectionately dedicated.

J. D. H.

ACKNOWLEDGEMENT

It is within this paragraph the section called the "acknowledgement" that the people who are interested in the writer know his personal feelings toward them. I wish to pay to my advisor, Dr. J. M. Coruthers, professor of Agricultural Economics at Prairie View A. and M. College, an expression of gratitude and loyalty for his most effective suggestions and comments which have been of great value to the composition of this thesis. To Mr. W. M. Love, County Agent, Waxahachie, Texas; Mr. J. L. Henry, Head Triple A Office, Waxahachie, Texas; and Mr. Aubry L. Thompson, Soil Conservationist, Italy, Texas, without the data they assisted the writer in assembling, this work would have been impossible, I express my sincere appreciation.

It is inspiration by which great men work. Perhaps this would not touch the writer because of his insignificance, but great or small, it is by inspiration and encouragement that this organism of human nature moves, diligently and pleasantly the task set before him.

James D. Harris

OUTLINE

DEVELOPMENT OF SOIL CONSERVATION MEASURES IN ELLIS COUNTY WITH RESPECT TO ECONOMIC GAINS

CHAPTER PAGE

CHAPTER I

INTRODUCTION

The earth is a sphere 8,000 miles in diameter, 25,000 miles in circumference, with a surface of approximately 200,000,000 square miles of which about one-third is land and two-thirds water.

All life is supported mainly by a thin layer of top soil which covers the land at an average plow depth of about seven inches. Largely from this soil layer comes the world's annual production of food and fiber products. Less than half of the earth's soils are suitable for crop production. The soil that supports life is created by the forces of nature —— the action of the sun, atmosphere and water on the materials that comprise the earth. Soil is a residue of weathered rocks, minerals and decaying organic matter which supply mechanical support for vegetation and some raw materials for plant foods.

From 500 to 1,000 years are required by nature to produce a single inch of top soil. Yet, all of this good work of nature may be destroyed by man in a relatively few years by careless land management.

Technicians have developed methods of control, and good land use. They have shown many thousands of farmers how to diagnose the physical ills on their own farms. They have shown them how to use this diagnosis to shape an intergrated conservation program tailor-made for each individual farm —— a program using whatever combination is necessary for terracing, strip-cropping, crop rotations, shifts in land use, and so on.

Moreover, nationwide demonstrations have proved that this integrated

program, which reduces soil and fertility loses to neglible proportions, also brings more profits for the farm operator in the vast majority of cases. Far from costing him money, a properly installed conservation program makes money for the individual farmer. And it does so within the first 5 years!

Yes, we have the physical know how. But there remains a social problem to plague us — the problem of shaping a sound conservation program and policy, and of achieving quickly a nationwide application of that program.

The word "conservation", in the last decade, has broken out of the dictionary and is becoming a household word from coast to coast. It is as likely to be heard on main street as at a Farm Bureau meeting in a rural school house. Books have been written about it, societies have formed to promote it, women's clubs are studying it and men's civic organizations are boosting it. This sudden interest in conservation has taken many city people into the country where they have become familiar with the problems of conserving soils, forest, water and wildlife. It has opened up new fields of study for both scientists and non-scientists. It has framed the question of whether or not the United States can remain a healthy and prosperous nation and continue to abuse the natural resources that nature provided. This conservation consciousness is the result of various ideas that have been handed up to the public in books and speeches and articles.

Many of the theories and doctrines of conservation are backed with a note of alarm:

1. If the loss of the nation's top soil isn't stopped by erosion control, there isn't going to be enough good agricultural land

left to feed the nation in, say, 20 years.

2. Or, if forest fires and poor forestry management in the United States aren't stopped, the country is going to wake up before long with no timber supply at all.
3. That poor soil cannot produce food of a quality that will keep a nation healthy.
4. That prospects for lasting supplies of good water are disappearing fast because of the take-it-far granted attitude of the country's farm producers.

The term conservation takes in a lot of territory. Specific conservation needs vary with different sections of the country.

"Erosion"and "conservation" have been spoken so long in the same breath that the impression exists that conservation's one aim is to combat erosion. Always conservation means good farming, and that in turn means taking care of the soil. When a coastal farmer drains a piece of land to get the excess water off, he is doing just as much conservation as an East Texas farmer who terraces his sloping fields to stop soil losses.

Whether you use conservation in its wide or narrow sense, it all goes back to care of the soil.

The Ellis - Prairie Soil Conservation District had in its beginning the following purposes and reasons:

1. To put into operation a coordinated and cooperative conservation program which provides for the proper use and conservation of the soil and water resources of the District as a means of improving the general welfare of the people living

within the District at the present time and of generations to come.

2. Many of the land owners and other people living within the District realized that under the existing conditions of land use and treatment much of the land was being ruined by erosion, water,resources were being wasted away, wildlife was being exterminated, timber was being destroyed, native grasses were almost abolished and the general welfare of the people living within the District was being lessened.
3. The land owners and operators in this District realize that the soil and water resources are their most important basic assets and the proper care and use of these natural resources are absolutely essential to the well being of the people living now, and of generations to come.

To determine the extent to which these purposes or goals have been attained by showing economic gains resulting from the practice of certain conservation measures shall be the aim of this paper.

CHAPTER II

GENERAL DESCRIPTION OF THE DISTRICT BOUNDARIES AND APPROXIMATE SIZE

The Ellis - Prairie Soil Conservation District is approximately 637,500 acres in size, comprising about ninety-two per cent of Ellis County (561,200 acres), about the southeast one-tenth of Johnson County (51,200 acres), and approximately the northeast one-twenty-fifth of Hall County (25,100 acres) and included the following boundaries: begin at the northeast corner of Ellis County, then follow down the meanderings of the Trinity River to the southeast corner of Ellis County, then go southwest along the south county line of Ellis County to Mill Creek, then go up Mill Creek to the road crossing about 0.5 mile southeast of Pluto, then go southwest along the meanderings of the Pluto-Itasca road to Itasco, then follow the M. K. and T. Railroad to Alvarado, then go along the Gulf Colorado and Sante Fe Railroad to the point where it crosses the north line of Ellis County to the Trinity River and the point of beginning.(1)

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(1) "Soil Conservation", District Work Program and Plan No.504, January, 1941, p.5

CHAPTER III

A DESCRIPTION OF CONDITIONS WHICH AFFECT THE SOIL AND WATER CONSERVATION PROBLEMS AND NEEDED ADJUSTMENTS

Physical Conditions, Land Uses, and Treatment

Climate

The average rainfall for Waxahachie, which is near the center of the District, is 35.02 inches per year for the last 22 years. This ranges from a high of 53.10 inches in 1929 to a low of 18.82 inches in 1924. The heaviest day's rainfall was on the 27th. of September, 1936 when over 8.5 inches were recorded. Of the total rainfall, an average of 33 percent falls during the three spring months of March, April, and May.

The average temperature for an 18 year period, 1913 through 1930, is 65.5 degrees. The temperature ranges from a high average of 84.1 degrees in July to a low average of 45.2 degrees in January. The coldest weather on record was -3 recorded in January of 1930, and the hottest weather on record was 105 degrees in July of 1925.

The average growing season for a 34 year period, 1897 through 1930, was 220 days. The greatest number of growing days in any one year was 276 days in 1905, and the lowest number of growing days in any one year was 187 days in 1910.(1)

The latest frost to occur over this period was on April 30, 1908, and the earliest frost to occur was on October 9, 1917.

The rainfall, temperature, and length of growing season influences the conservation problem in several ways. First, due to a long favorable

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(1) The Texas Almanac, Published by the Dallas Morning News, 1945-46, pp.42-44.

growing season row crops, such as cotton and corn, are well adapted to the District and because they are both clean cultivated crops, their cultivation leaves the land subject to erosion. Second, because of a relatively large number of days when the ground is not frozen, and therefore subject to erosion, erosion goes on practically the entire year. Third, due to the fact that 33% of the total rainfall falls during March, April and May, a time when there is usually little or no protective covering on the ground, erosion during those three months is particularly heavy. Fourth, extremely heavy rains are frequent and cause serious soil losses on the heavier blacklands due to their peculiar habit of sealing over when a certain saturation point is reached; also rainfall is more apt to go to the extremes than to be near the average; for example it is not uncommon in the Spring to have very dry periods of 30 to 60 days; these periods are often broken with rains of torrential proportions causing a proportionately higher damage than a more evenly distributed rainfall would cause. Fifth, due to very dry summers pastures are often heavily overgrazed which increases erosion, particularly on the steeper slopes. Sixth, due to the fear that most farmers hold for spring droughts few farmers attempt to plant cover crops to be turned under before planting cotton; the few who have seeded legume cover crops for this purpose have also been handicapped by dry falls which delay germination so long that a good growth of the cover crops has not been secured in time to turn it under ahead of planting cotton; this makes the problem of providing organic matter to the soil a difficult one to solve; summer cover crops are also affected by weather conditions because of late summer droughts; if the green manure is turned under while there is still sufficient

moisture in the soil to permit easy breaking it is so early in the summer that most of the organic matter is oxidized out of the soil by high summer temperatures; if the crop is permitted to stand until fall often there is not sufficient moisture to allow the breaking of the field and the crop dries up on the top of the ground and looses much of its value. Seventh, due to mild weather conditions livestock are permitted to run out a majority of the year, a practice which almost eliminates the accumulation of any quantity of manure. The lack of green manure crops and also of barnyard manure coupled with the fact that commercial fertilizer does not pay in the blackland affords a serious problem is increasing soil fertility depleted by erosion. Eighth, since some parts of the District do not have an underground supply of water, farmers in these sections are forced to depend upon surface tanks for their water supply; because of frequent long dry spells many of these farmers have limited their livestock to the very essential minimum; this has a tendency to increase cultivated acreage and to decrease the amount used for pasture; this of course increases the erosion hazard and also makes the solution of terrace outlet problems rather difficult.

As the climatic conditions are very similar over the entire District the problem is uniform.

Since there is nothing which can be done about the weather conditions there is no solution to offer. However, if the facts are generally known in regards to the hazards offered to conservation by the climatic conditions, certain steps can be more logically taken to meet these problems.

Soils

Since there are several kinds of soils in the district, it is con-

sidered practical to divide the district into four general soil groups; namely, blackland, white rock, gray land, and bottom land.

Approximately 57.6 per cent or 366,700 acres of the district consists of blackland soils that are dark gray to almost black in color. Their deep soil layers show little change in color or texture to a depth of 3 to 5 feet. All the blackland soils are heavy clays which are crumbly and loose on the surface when dry but are sticky when wet. Clods turned up when plowed wet crumble and fall apart on drying. Deep cracks which form during extremely dry periods close up when the soil becomes wet and the surface seals over. This and the fine texture of these soils cause them to be very susceptible to erosion, especially on the moderately steep to steep slopes devoted to clean cultivated crops.(1)

These very productive soils still produce moderate high yields of adapted crops after 40 to 60 years of continuous cultivation when not too badly eroded. As a rule they occupy long gentle slopes but there are few areas of short steep slopes; however, for the most part these soils are found in slopes suitable for cultivation. They are well suited to the growing of general field crops such as cotton, corn, and small grains, grain sorghums, sweet clovers, and alfalfa. They are excellent pasture lands but generally only the more steeply sloping, eroded areas are devoted to pasture. A few native pastures and meadows are found scattered over the blackland but practically all land suitable for cultivation has been broken out. These soils are as a rule not suitable for woodland although some elm, hackberry, pecan, and Bois d'Arc trees are found along small creeks and in large bottoms; considerable value is placed on pecan and Bois d'Arc trees by farmers in this area.

(1) "Soil Conservation", District Work Program and Plan, N. 504, January, 1941, pp.6 - 7

Approximately 14.7 per cent or 94,200 acres of the district consists of white rock soils, which are underlain by soft white chalky limestone at a depth of 6 to 18 inches. Numerous small fragments of chalky materials are scattered over the surface of the very shallow areas, while the chalk is exposed in places. These are brown to gray crumbly soils that have a thin top soil layer 6 to 10 inches deep. This grades through a chalky marl layer into limestone at 6 to 18 inches. These soils absorb rainfall at a fairly rapid rate but like most heavy clay soils, they do not absorb water rapidly enough to prevent runoff during periods of excessive or extended rainfall. They are susceptible to erosion because of their fine texture and shallow soil layers. Generally, these soils are moderately productive in their present state but they produce good yields of practically all crops where the soil is 12 inches or more in depth. Generally, they are found on moderate to moderately steep slopes, but some areas are too steep for the usual row crop system of farming. Probably the best use for soils in this group is cotton, feed and grain crops on the deeper, more level areas, and pastures on the shallow and more eroded sections. Fair to good growths of the adapted grasses can be grown on these thin soils though it is very difficult to reestablish vegetation on retired or overgrazed slopes. These soils are entirely unsuited to the growing of timber.

Approximately 15.2 per cent or 96,500 acres of the district consists of tight gray land soils. These are brownish gray to dark gray soils with well defined shallow to moderately deep soil layers, although not as deep as the blackland soils; this group includes both sandy loam and clay soils. Sandy soils of this group readily absorb moisture except

during periods of excessive or extended rainfall when the runoff is rapid due to their tight clay subsoils. Heavier soils in this group absorbs water very slowly due to their tendency to crust over after each period of rainfall.

These soils are moderately susceptible to erosion and the damage from this cause usually varies in proportion to the slope, the steeper longer slopes usually being the most affected. They are only moderately productive. However, they are well suited to growing of cotton, corn, sorghums, some small grains, cowpeas, and other crops. Although not as productive as blackland these soils show more response to soil improving methods including fertilizers. Relatively unproductive subsoils cause erosion to be very noticeable on soils in this group. Pasture establishment on land retired from cultivation is rather difficult especially if the remaining top soil is thin. Generally these soils are unsuited to the growing of timber except for firewood and fence posts; wasteland along small streams and in overflow bottoms can be used to good advantage in this way.

Since approximately 12.5 per cent or 88,100 acres of this ditrict consists of bottom land soils, their importance is recognized in developing a program for this district. These soils are dark brown to dark grey heavy clays made up of deep deposits of soil material washed from surrounding hills. Although crumbly and loose on the surface when dry they are very sticky when wet. Their ability to absorb and hold large quantities of water enables them to withstand short periods of drought. They occupy almost level areas but generally have enough slope for adequate drainage except in the local areas of a few acres in size.

These soils are not often subject to erosion, however, crops are sometimes damaged by overflows and deposits of soil material. These highly productive soils will grow practically all crops found on the upland except small grains; in some cases these do well. Besides being excellent pasture land, they are suitable for some hardwoods such as pecan, Bois d'Arc, elm, and hackberry. A cash income from pecans as well as firewood and fence posts can sometimes be secured from otherwise unproductive areas.

The soil groups described in the paragraphs above are the predominating factors in determing the different kinds of farming in the district since the climate is fairly uniform throughout.

Based on the statement in the preceding paragraphs and due to the fact that 57.6 per cent of the district is blackland, 14.7 per cent is white rock land, 15.2 per cent is gray land, and 12.5 per cent is bottom land it is fairly obvious that the soil groups and their distribution have a very definite influence on the conservation problems, since they determine to a great extent land use. Naturally, where a high per cent of the land is used for clean cultivated crops, erosion is much more serious than where sufficient land is devoted to pasture to provide adequate terrace outlet protection. Different crop adaptations due to various soil groups determine to a large degree proper conservation measures.

These four major soil groups make up two major types of farming areas in the district. Throughout the remainder of this paper, present existing conditions, how these conditions affect the conservation problems, and what needs to ne done as regards the various physical, economic, and social factors will be discussed where significant differences exist,

according to type of farming areas, namely, blackland and white rock. The gray land and bottom land will be discussed under blackland except when there are definite differences in which case each major soil group will be discussed separately.

Slopes

There is a wide variation of slopes considering the district as a whole; however, in general, long gentle slopes are the most common, but moderately steep to steep slopes in narrow strips occur along the south banks of practically all major drainage ways. A considerable area in the southeastern part of Ellis County in the vicinity of Leland is for the most part unsuitable for row crops. Based on detailed surveys made on several hundred farms in various parts of the district and a general survey, table I, shows the slope groups for each of the major type farming areas.

TABLE I

			Per Cent	Acreage
A. BLACK LAND	366,700 Acres			
Gentle Slopes		1% or less	12%	44,000
Moderate Slopes		1% to 4%	48%	176,000
Moderate Steep Slopes		4% to 7%	33%	121,100
Steep Slopes		7% and over	7%	25,600
			Per Cent	Acreage
B. WHITE ROCK LAND	94,200 Acres			
Gentle Slopes		1% or less	3%	2,800
Moderate Slopes		1% to 4%	45%	42,400
Moderate Steep Slopes		4% to 7%	38%	35,800
Steep Slopes		7% and over	14%	13,200
			Per Cent	Acreage
C. GRAY LAND	96,500 Acres			
Gentle Slopes		1% or less	19%	18,300
Moderate Slopes		1% to 4%	52%	50,200
Moderate Steep Slopes		3% to 7%	23%	22,200
Steep Slopes		7% and over	6%	5,800
			Per Cent	Acreage
D. BOTTOM LANDS	80,100 Acres			
Gentle Slopes		1% or less	100%	80,100

The percent of slopes as used in table I means the amount of fall per 100 feet of land. Thus a 4% slope would mean that for every 100 feet down slope there is a fall of four feet.

According to results of studies made on the Blackland Experiment Station at Temple and the Sandy Land Experiment Station located at Tyler, the length of slope and per cent of slope have a decided influence on the conservation problem. The studies at Temple revealed the soil losses on a 2% slope to be approximately 60% less than a 4% slope. Results from the Tyler station show that in one case doubling the slope length increased the soil losses from 25 tons per acre per year to 38 tons per acre per year; in another experiment doubling the percent of slope increased the soil loss from 26 tons per acre per year to 58 tons per acre per year. The fact that some farms are largely made up of rather steep slopes makes it difficult to plan them both from the standpoint of erosion control and a properly balanced farm program. Too, there are areas in the district where long gentle slopes occur; these will present another conservation problem.

There is a need for retirement from cultivation to pasture or meadow of the steep and rough broken lands in the district. Lands with moderate to moderately steep slopes which are to be used for cultivation need to have applied to them all known erosion control measures such as terracing, cover crops, contour tillage and crop rotation; the same is true of cultivated lands on long gentle slopes of more than 600 to 800 feet in length; gentle slopes shorter than 600 feet may need only strip cropping and contour tillage.

Erosion, Flood, and Siltation Damage

Sheet erosion is the most serious type of erosion in the county.

Practically all cultivated upland has been affected by sheet erosion while most slopes over 4% have been affected by gully erosion.

Based on conservation surveys and on general observation, it is estimated that the soil groups have been affected by erosion about as follows:

	Per Cent	Acreage
A. Blackland Soils ——— 366,700 Acres		
No erosion	3%	11,000
Slight erosion less than 25% top soil lost	40%	146,830
Moderate erosion 25% to 75% top soil lost	47%	172,200
Severe erosion over 75% top soil lost	10%	36,670
B. White Rock Soils ——— 94,200 Acres		
No erosion	2%	1,880
Slight erosion less than 25% top soil lost	18%	16,920
Moderate erosion 25% to 75% top soil lost	63%	59,400
Severe erosion over 75% top soil lost	17%	16,000
C. Gray Land Soils ——— 96,500 Acres		
No erosion	12%	11,580
Slight erosion less than 25% top soil lost	40%	38,540
Moderate erosion 25% to 75% top soil lost	36%	34,800
Severe erosion 75% top soil lost	12%	11,580
D. Bottom Land Soils ——— 80,100 Acres		
No erosion	100%	80,100

Bottom land soil have not been directly affected by erosion. They, are however, subject to frequent overflows and some deposition of soil material. Some scouring and cutting has been noticed in small local areas, but it is generally considered that very little damage is caused from erosion in the bottom lands.

The above estimates indicate that the shallow chalky prairie soils are more severely eroded than any other group in the county. It is probable that as much or more soil has been lost from the dark crumbly prairie soils, but it is not so noticeable of their deep productive soil layers. For example, the loss of three inches of top soil from the dark prairie soils does not appreciably lower their production, but the loss of an equal amount of top soil from the shallow soils would practically ruin them for further row crop use. However, all groups of upland soils have been seriously damaged by erosion.

The average estimate annual erosion, flood and siltation damages which occur to county property are:

TABLE II

ESTIMATED ANNUAL EROSION, FLOOD AND SILTATION DAMAGES

Kind	Amount	Per Cent
Decrease in land value	$ 706,421	30.5
Fences	18,000	0.8
Livestock	4,633	0.2
Roads	8,700	0.4
Bridges	8,700	0.4
Railroads	4,600	0.2
Urban Properties	6,300	0.3
Public Utilities	2,100	0.1

TABLE II (CONT'D.)

ESTIMATED ANNUAL EROSION, FLOOD AND SILTATION DAMAGES

Kind	Amount	Per Cent
Wells, Springs, Lakes and Drainage Ditches	$ 16,000	0.7
Farm Buildings	4,700	0.2
Machinery and Equipment	2,100	0.1
Annual Loss Through Reduced Crop Yields	1,529,932	66.1
Total Annual Loss	2,312,186	100.0

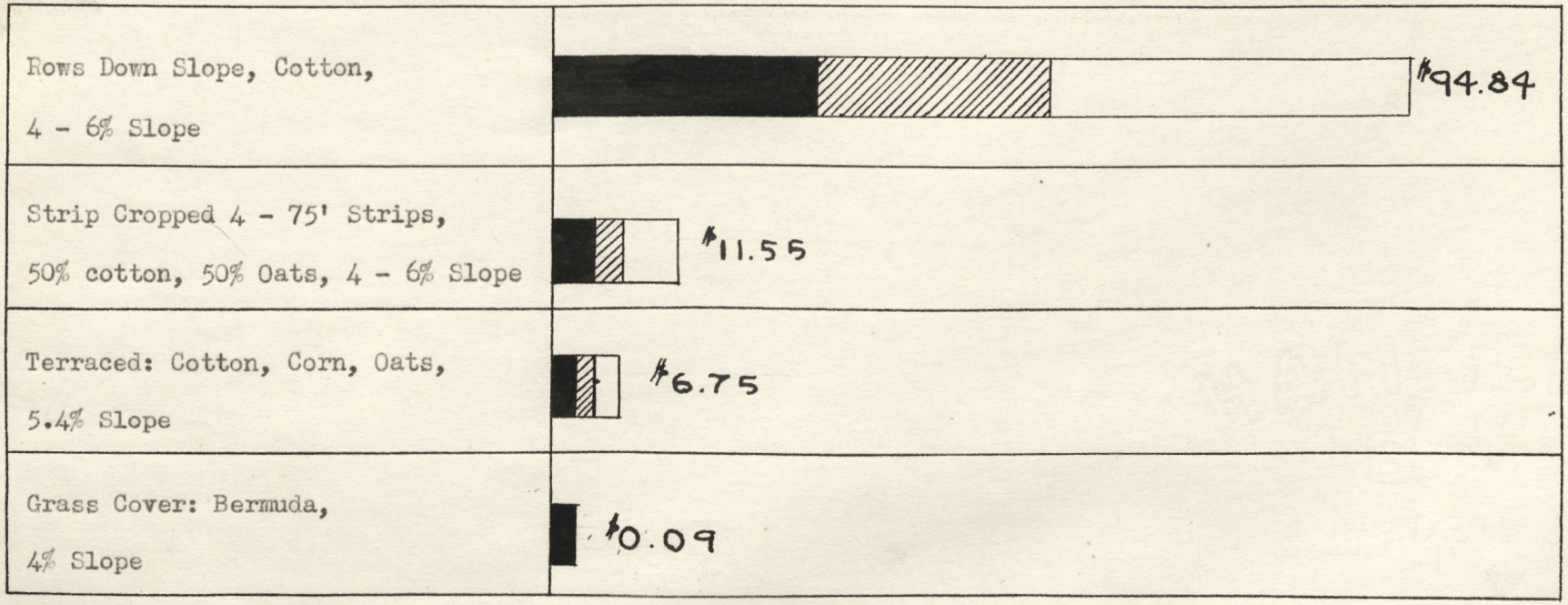
The losses shown in the above table are approximate and were computed by the following methods: in decrease in land values, it was assumed that the present value, from the 1935 census, of $53.00 per acre would be doubled if the land was as good as the virgin soil was the first year it was broken out. This total was divided by forty years, the average time which erosion has taken plave. The annual loss through reduction of crop was computed by assuming that for every two bales of cotton and two bushels of feed now produced, it would be possible to produce three bales or bushels on virgin soil. This difference multiplied by the average price gives the annual loss. Other figures in this table were taken from a report made at a hearing on Trinity Flood Control in Corsicana, Texas, in 1937.

There is a direct connection between these damages and the conservation problem. This is particularly true of the losses to land value and reduced crop yields. In many cases these two losses have become so burdensome that now, even though owners of the land most seriously affected realize the need for conservation practices, income from such lands are in-

CHART NO. I

COST TO REPLACE PLANT FOOD ELEMENTS LOST BY EROSION

DOLLARS PER ACRE (6 YR. AVERAGE)



BLACKLAND EXPERIMENT STATION, TEMPLE, TEXAS

adequate for carrying out a conservation program. Because of the inability to prevent further inroads of erosion, the erosion on adjoining farms and on farms further down the watershed. Also increased erosion, flood, and siltation damage to public property, especially roads and bridges, has added greatly to an already heavy tax burden, which must be collected from farm land which are steadily decreasing in value and in productivity.

Flood and siltation damages have been particularly menacing to the levee districts of the county. Within the county there are 24,388 acres which are either now or have at one time been protected by levees. Part of this acreage is included in seven levee districts with outstanding lands valued at $604,900 and the remaining acreage is bottom land which has been levied by the building of approximately eleven miles of private levees.

Due to silting of channels and the rapid runoff from upstream due to lack of erosion control practices, flood crests are becoming higher and higher. Siltation of lakes is best illustrated by the siltation found in lakes near Ennis, the only municipality in the county using surface water for a city water supply; in the past forty-five years Ennis has been forced to add two lakes to the original one to supply the need for water. Siltation has almost completely destroyed the original lake and has materially reduced the storage capacity of the second lake. At the present time a new lake has just been completed at a cost of approximately $84,000. The total cost for the three lakes amounts to $147,000. Several smaller lakes in the county also show considerable siltation, but no exact data are available.

Erosion, flood, and siltation damages may be reduced to the minimum by a conservation program which will give consideration to the proper land use to which each farm of the county is best suited. Such mechanical and vegetative methods as are necessary to prevent erosion on the individual farm when collectively applied to a watershed, an effective in preventing heavy erosion losses, serious flood conditions, and excessive silting of bottom lands.(1) When land is so treated as to cause the rain waters to spread over and be absorbed by the land on which it falls, and when such rainfall which might be termed surplus or runoff water is handled in such a manner as to cause it to drain slowly and orderly into natural drainage ways, the erosion, flood, and siltation problem will be materially decreased. At the Temple Experiment Station, soil losses on strip cropped and contour cultivated land averaged 7.65 tons per acre over a six-year period while unprotected land lost an average of 58.55 tons per acre per year. The rainfall loss through runoff from the two plots over the same period was 7.3 per cent on the protected plot and 16.5 per cent on the unprotected. Such data form the basis for the assumption that conservation measures will decrease losses from floods and siltation.

Land Uses, Practices and Proposed Adjustments

Woodland

The acreage of woodland of the county composes only 0.3 of one per cent of the total area of 2558 acres. All of the woods are hardwoods. The woodlands are found mostly along the streams of the county and because of this fact no large ownership of strictly woodland is to be

(1) Burges, Austin, E., Soil Erosion Control, Atlanta, Ga., Turner E. Smith and Company, 1937.

CHART NO. II

COST OF EROSION

A 14 - Year Study of the Effects of Soil Erosion Conducted By the Missouri Experiment Station (1918-1932) on a Fairly Loose Type of Soil With A Fall of About 4 Feet to 100 Feet (3.68% Grade) And With An Average Rainfall of 40.37 Inches Per Year Showed That:

Field Treatment	Soil Loss	Nitrate Of Soda	Super-phosphate	Muriate of Potash	Lime-stone	Total Cost
	Tons	Lbs.	Lbs.	Lbs.	Lbs.	
Plowed 4" And Kept Bare	41.64	738	543	2492	1870	$72.83
Plowed 8" And Kept Bare	41.08	625	514	2404	1690	68.25
Continuous Corn	19.73	413	257	1210	844	36.29
Continuous Wheat	10.10	200	129	528	416	16.47
Crop Rotation (Corn, Wheat, Clover)	2.78	163	86	428	317	9.15
Continuous Bluegrass	.34	4	2	6	4	0.12

U. S. Department of Agriculture
Soil Conservation Service

CHART NO. II (CONT'D.)

REMOVAL OF PLANT FOOD BY CROPS

The Removal of Plant Food By Crops As Contrasted To The Loss Through Erosion (Missouri Experiment Station 1926 - 1928) Is Shown In The Following Table:

Crop Standard Yields	Nitrate of Soda	Super-Phosphate	Muriate of Potash	Limestone	Total Cost
Corn 35 bushels per acre	189	90	14	6	$ 4.97
Wheat 20 bushels per acre	144	43	12	5	3.56
Clover Hay 2 tons per acre		143	120	189	4.11

U. S. Department of Agriculture
Soil Conservation Service

found within the county. Because of the insignificance of the woodland in this county, very little or no attention has been given to their case except in case of some pecan timber. Occasional fires cause some damage, but because of the small scattered acreages, fires are not as damaging as they are in some more heavily wooded section of the state. Because a majority of the woodland is located adjoining or upon the flood plains of the streams they have very little effect upon the conservation problems.

Very little adjustment in the method of handling woodland is needed. However, there is a need for a continuation of the pecan improvement program and more careful selection of timber used as firewood would tend to increase the value of the woods left standing. There are many small areas of woodland which need to be protected from fire and overgrazing in order that they will provide some fence posts, fuel wood and windbreaks for livestock.

Cropland

The following table gives acreage and yields of the principal cultivated crops for the county as a whole. This information was taken from the 1935 census, except for the figures given on cotton and commercial vegetables which were taken from the 1939 A A A records:

TABLE III

ACREAGE AND YIELDS OF PRINCIPAL CULTIVATED CROPS

Crop	Acreage	Yield Per Acre
Cotton	187,135	190 lbs.
Corn	75,840	23 bu.
Wheat	10,000	12 bu.
Oats	56,206	26 bu.

TABLE III (CONT'D)

ACREAGE AND YIELDS OF PRINCIPAL CULTIVATED CROPS

Crop	Acreage	Yield Per Acre
Grain Sorghum	7,644	19 bu.
Tame Hay	28,407	2 tons
Commerical Vegetables	2,132	
Barley	1,384	16 bu.
Mixed Grain	233	21 bu.
Temporary pasture	10,187	

A high percentage of the total acreage in the blackland area, gray land area, and bottom land area is used for the production of cotton, corn, and a limited acreage is used for the production of small grain, grain sorghum and tame hay; farmers in these areas are reluctant to devote much acreage to permanent pasture, woods, or meadows. As has been stated, the soil and water conservation problems are more serious on land planted to clean cultivated crops and spring hay crops than on land devoted to permanent grass fall planted grain or woods; this is true since the first mentioned crops afford very little vegetative cover for the land during the three months of heaviest rainfall; namely, March, April, and May. In one experiment at the Temple Experiment Station, the soil loss on land planted to corn with the rows running up and down the slope was 21 tons per acre per year.(1) In still another experiment on a similar field where strip cropping and contour cultivation were used in combination the soil loss was 7.6 tons per acre per year; the results of these experiments show to some extent the value of broad cost crops in reducing soil losses.

(1) "Soil Conservation", District Work Program and Plan, No. 504, pp.9-11.

The yields of cotton in the blackland area, the gray land area, and the bottom land area will average from 200 to 225 pounds of lint per acre and the yields of corn in these same areas will average from 25 to 35 bushels per acre; yields of other field crops such as oats, barley, grain sorghum, and sorghum for hay in these same areas will compare favorably with cotton and corn yields. These yields have two very important influences on the conservation problem; first, the yields are high enough that most farmers will feel justified in keeping a high per cent of their land in cultivation; second, the yields are not high enough based on present market prices to furnish sufficient income to pay for the installation of the many needed conservation practices.

In the white rock area the average yield of cotton is about 126 to 140 pounds per acre and the average yield of corn is between 12 to 16 bushels per acre.; the yield of small grain in this area is fairly satisfactory but the yields of other common field crops is in comparison to the yields of cotton and corn. Due to the average low yields of these crops farmers in this area are more interested in the development of permanent pastures and the growing of small grain than are farmers in other parts of the county. Also, the yields of major crops now being grown in this area have resulted in a low income on most farms; hence there are many farmers who are not financially able to pay for the installation of a complete conservation program.

The conservation practices needed in part or in full on all cultivated land in the county are: (1) the use of more winter cover crops, (2) the planting of more growing crops, (3) terracing, (4) terrace outlet protection, (5) strip cropping, (6) contour tillage, (7) soil im-

proving crops, (8) crop rotation, and (9) the retirement of the steep slopes and badly eroded land to permanent pasture or meadows. More of the cultivated land in the white rock area especially needs to be used for the production of small grain and sweet clover and only the very best fields should be used for growing cotton and corn.

Pasture Land

The present condition of the pastures in this county affects the conservation problems in several ways. First, due to the small amount of well sodded permanent pastures, there are very few farms which have sufficient pasture properly located on which to empty terrace water. Second, the limited amount of pasture on most of the farms has been one of the main causes for the general lack of a livestock program; this condition means that many farm families do not have sufficient livestock products for home use and very little feed is utilized on the farms, being sold most often at harvest time on a low market, all of which results in a lack of proper diets. Lack of a source of income from livestock and a lack of manure for soil improvement. Third, due to the poor condition of most of the pastures, the income from them is very low which causes many farmers not to want more pasture. Fourth, the soil and water losses from much of the land used for pasture are heavy since these pastures do not have a good cover of desirable grasses, And fifth, the lack of fences and stock water has retarded the establishment of more pasture land.

The adjustments, pasture management and conservation practices needed on the pasture land in the county are: (1) a larger acreage needs to be devoted to pasture not only from the standpoint of increasing places to empty terrace water but in order to get permanent vegetation on the steep and badly eroded land and to make possible the use of live-

stock on more farms, (2) where possible, permanent pastures should be so located as to provide a place to empty terrace water as well as to protect land which is frequently overflowed by runoff water from some other farm or group of farms, (3) wood and brush control, (4) proper amounts and kinds of livestock, (5) adequate, deferred and rotated grazing system, (6) proper fencing, (7) provision of sufficient stock water, (8) use of contour furrows and ridges where adapted, and (9) overseeding with adapted and desirable grasses and clover.

There is a need in the white rock area for the establishment of sweet clover on the land being used for pasture and the establishment of Buffalo grass where possible. In all other parts of the county, a complete stand of either Bermuda grass or Buffalo grass needs to be established on all old and new pastures where they do not already exist.

Idle Land

In 1935 there were 62,307 acres of idle and crop failure land in the county. Of this acreage approximately 30,076 acres were classified as idle. Since 1935, this acreage has increased considerably.

Much of this land is idle because erosion has damaged it so much that it is unprofitable to continue cultivating it. In many cases sheet erosion has removed the entire layer of top soil so that nothing but the unproductive subsoil remains. This is quite true in the area of shallow white rock land which runs through the west central part of the county. In some communities in this area large acreages are idle, areas which often include several adjoining farms. In most of the county nearly every farm has a few acres which have been rendered unprofitable due to sheet erosion. On the more steeply sloping and in the blackland area some of

the land has been so badly gullied that it is impossible to use the ordinary method of cultivation. Much of this land has been abandoned. Badly gullied areas occur through the county near the larger natural drainage ways. Some very fertile bottoms are idle because of overflows and broken levees.

Some of the idle land has been kept idle due to the A A A program. On some cotton farms the nondepleting base is sometimes not used for any kind of cultivated crops. These cases are comparatively few, however, and the tendency is away from such a practice. However, even these cases the land not used consists of the lands rendered least productive by erosion.

Because of the eroded character of much of the idle land, it influences the conservation problem in several ways. First, because of the severe erosion on some of the idle land, it is a constant threat to all adjoining lands because of the likelihood of the destroyed areas spreading. This is particularly true of gully erosion. Second, because of the threat to adjoining lands, most of the broadcast crops are planted adjoining these severly eroded areas in an attempt to prevent the rapid spreading of the erosion. Third, it is often the case that such a percentage of the land is idle as to make the farm an uneconomical unit to operate. Fourth, continued severe overflows threatened to increase the area of land rendered unfit for cultivation because of their wet condition.

Due to the shortage of pasture much of this idle land should be retired to permanent pasture and protected with a year round cover of vegetation. This is very often true when viewed in the light of results gained from the Blackland Experiment Station at Temple. At Temple, land sod-

ded to Bermuda grass has lost only 0.025 tons of soil per year as compared to 23.8 tons of soil lost per year on corn land. At this rate of soil loss it would require 31.5 years to lose 5 inches of top soil per acre on corn land while the Bermuda grass requires 30,000 years to lose the same amount. Some of the idle land can profitably be used for permanent hay meadows, since only 2,000 acres of meadows are found in the county and meadows also provide erosion control.

The adjustments and conservation practices needed are the sodding of much of the acreage to Bermuda and Buffalo sod for pasture, the seeding of part of the acreage to some of the native prairie grasses, namely, bluestems for hay meadows, the construction of terraces on the limited acreage kept in cultivation for use as temporary pasture and where feasible, the use of eroded areas as protection for wildlife.

Permanent Hay Land

There were in 1939, 2,000 acres in native meadow in the county. Practically all of this acreage was in a mixture of the native prairie grasses. The chief among these grasses are: big and little bluestems, drop-seed, and side oats grama.

This small acreage of meadow land has very little if any effect on the conservation problem with the possible exception of the fact that most of the land now devoted to meadow would prove to be very susceptible to erosion because of the average steepness of the slopes, should it be broken out and put into cultivation.

In a readjustment of land use to reduce erosion damage, it is possible that more land now in cultivation should be used for meadows. Also the practice of burning and grazing meadows, if discontinued would aid in increasing cover for wildlife, and it would also add to the value

and erosion-control effectiveness of these meadows.

Wild Game

At the present time there is a marked scarcity of all kinds of game within the county. This is in contrast with original conditions when all kinds of game thrived in abundance. Game now found consists mostly of dove, opossum, skunk, squirrel, gray fox, and rabbit. Very few quail, ducks or raccoons remain; no prairie chickens, deer, buffalo, or wild turkey are found although these were once abundant all over the county. Fish are limited mostly to small perch and mud cats with a few game fish in some of the larger lakes.

Very little effort is being made to replace the wildlife that has been destroyed. While a considerable acreage has been signed up for co-operative game preserves and a few quail have been released, no concerted effort has been made to provide food and shelter for the birds released. The burning of crop residue, of meadows, of pasture and fence rows is still a common practice. This destruction of cover and food is one of the major limiting factors in increasing the amount of wildlife. All of the major streams have become so choked with silt as to render them unfit for game fish. This coupled with the fact that they usually dry up each year has reduced the amount of fish to be found in the streams. Most tanks also dry up periodically. The few fishing places left are usually overfished each year due to the increased demand made upon these places.

Wild game has only a minor affect upon the conservation problem, however, many of the practices which reduce wild game, also increases erosion damage.

If good conservation practices are followed wild game would show a corresponding increase. Such practices as burning over meadows, pastures, and fence rows should be eliminated. The increasing acreage of broadcast crops, especially is used as strips and harder strips will furnish more cover and food for upland game. The development of stock ponds which furnished water the year round will increase fish life and also furnish water for upland game. Also the reduction of erosion and corresponding siltation will aid in decreasing the drainage to streams, while conservation methods will be instrumental in increasing the length of flowing period of these streams.

More cooperation and a better understanding between landowners and sportsmen is needed. Care should be exercised by both to see that game is not depleted below a reasonable supply of seed stock each year. The application of conservation as a whole will materially increase the number of wild game over the district.

Tillage Practices

Tillage practices in all parts of the county are very similar. From 75 to 85 per cent of the cultivated land is farmed with straight rows up and down the slope resulting in severe soil and water losses. On land of four per cent slope at the Temple Experiment Station such losses amount to 24 tons of soil per year and 15 per cent of the rainfall. Contour cultivation alone did not prove to be any great advantage ubless supported with strip crops or terraces. On a large percentage of the farms crop residue is burned rather than turned under. This practice has, over the years, reduced the organic matter and the water holding capacity of the soil, thus speeding up erosion. Shallow plowing is a common practice. Such a practice affords very poor storage for surplus moisture; "one way"

plows are used more or less extensively over the area and are the most common cause for shallow plowing.

Over most of the county much of the land preparation is done as soon as the crops are harvested. In the case of small grains this leaves such areas unprotected for a long period of the year which is a practice that encourages erosion.

There is a need for contour tillage on all sloping land in the county. Where terraces or strip crops are used, rows should run parallel to such practices. Deep plowing should be encouraged and flat broken land should be bedded on the contour as soon as possible to assist in preventing soil and moisture losses through runoff. The planting of clovers in small grains, to give vegetative protection after grain harvest and to increase the amount of organic matter turned under, should be recommended as a good practice. Burning of crop residue needs to be discouraged and the turning under of crop residue encouraged. While the supply of manure is small, a more profitable use should be made of it.

Rodents and Predatory Animals

At present harmful rodents are not in the county in sufficient quantities to cause a problem of any consequence as regards a conservation program.

Crop Diseases

The most damaging crop disease in the county is cotton rot, sometimes called "alkali soil" by farmers. This disease affects the yield of cotton and also makes the use of strip crops and crop rotation impractical on some farms where more than half of the cultivated land is seriously affected with root rot. Smuts and rusts of grain, reduce grain yields and tend to discourage growing of grain. San Jose scale of peaches,

scab of pecans, and blight of pears are diseases which have a tendency to reduce the amount of fruit and nuts produced. Information on the control and prevention of these diseases is needed.

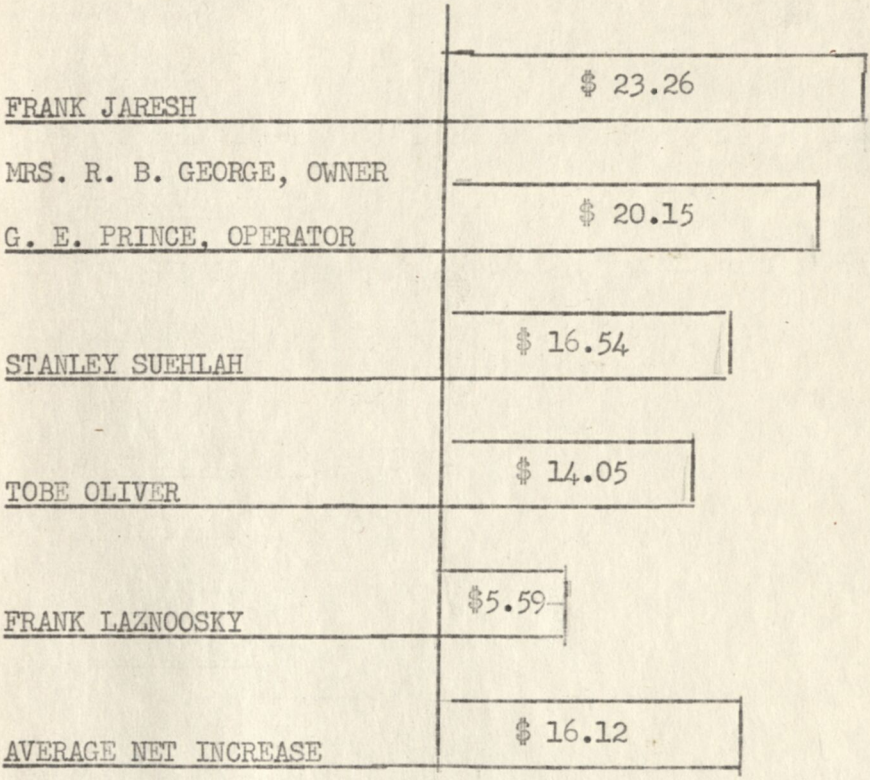
Planned Land Uses and Conservation Practices To Be Applied

Land Use Capability Classes and Accompanying Recommendations

Table IV on the following page shows a simple division of all land in the county into classes based on the maximum use that can safely be made of the land over a long period of time as determined by physical factors such as soil type, extent of erosion, slope, climate, and natural environment such as overflows. Also given in this same table are recommendations for appropriate conservation practices for classes of Land I,II, and III when used for cultivation, permanent grassland, woodland, or wildlife or for classes of land VI and VII when used for permanent grassland, woodland, or wildlife.

CHART NO. III

NET PER ACRE INCREASE OF COTTON FOLLOWING
(1)
AUSTRIAN WINTER PEAS



(1) Courtesy Chamber of Commerce, Ennis, Texas

TABLE IV

RECOMMENDED LAND TREATMENT BASED ON USE CAPABILITY

LAND SUITABLE FOR CULTIVATION AND

LAND NOT SUITABLE FOR CULTIVATION

Land Use Capability CLASS	GENERAL SOIL GROUP	WHEN CULTIVATED	WHEN USED FOR PERMANENT GRASSLAND	WHEN USED FOR WILDLIFE
I Land suitable for cultivation without special practices.	Bottom lands not subject to frequent overflows. Wide, relatively high, well drained bottom land along the larger streams. Blackland soils perfectly flat.	Cover crops. Crop rotation, including green manure crop, crop residue turned under. Drainage where needed.	Establish base grass sod. Over seed with suitable pasture mixture. Cultivate, if needed weed control control grazing water supply.	Exclude livestock, protect from fire, control hunting, food and cover plantings, where needed.
II Land suitable for cultivation with simple practices.	Black land soils. Gray land soils White rock soils less than $\frac{1}{4}$ top soil gone	Cover crops. Crop rotation, green manure crop. Crop residue turned contour cultivation strip cropping.	Same As Above	Same As Above

TABLE IV (CONT'D.)

Land Use Capability CLASS	GENERAL SOIL GROUP	WHEN CULTIVATED	WHEN USED FOR PERMANENT GRASSLAND	WHEN USED FOR WILDLIFE
III Land suitable for cultivation with complex or intensive practices	Black land soils Gray land soils White rock soils 25 to 75 per cent top soil gone	Cover crops. Crop rotation, including green manure crops. Crop residue turned under Contour cultivation , Terracing Terrace outlet protection	Gully treatment Contour furrowing and ridging. (in addition to the above)	Gully treatment with adopted food and cover species. (in addition to those above)
VI Land suitable for permanent vegetative cover without special practices.	Bottom lands, subject to frequent overflows. Narrow stream bottoms that are too frequently overflowed for practical cultivation.	Not suitable for cultivation	Same as above	Same as above
VII Land suitable for permanent vegetation with complex or intensive practices.	Blackland soils Gray land soils White rock soils 75 per cent or more of top soil gone	Not suitable for cultivation	Contour furrowing and ridging (in addition to the above)	Same as above

Summary

The aim of this study has been to determine the extent to which a-conomic gains have resulted from the practice of certain conservation measures; and, to present the progress made toward the ultimate goals as set up by the Ellis - Prairie Soil Conservation District.

Table V shows that around 30% of the total accomplishment to date was realized during 1948. This indicates that the rate of establishment of conservation practices is being stepped up. The per cent of the "planned amount" established to date on individual farms looks good in spots. Some spots need reinforcing. The cover crop, crop residue management and farm pond percentages look fairly good. The range improvement, seeding of ranges, seeding of pastures, terracing, and collective outlet percentages are low — to mention a few of the more important phases. More educational work needs to be done for range and pasture work. The collective phase needs to be stepped up which will in turn encourage more terracing.

There is ample evidence on our blackland soils that terraces with adequate terrace outlets slow down the rapid runoff from rainfall and permits more water to be absorbed and stored in the soil. This value is in addition to the reduction or stopping of erosion. The planting of legumes such as hubam, vetch, Madrid and winter peas have loosened the tight soils, improved the water holding ability, and increased the fertility. Higher yields on succeeding crops show up because of these benefits. These soil building legumes were planted by hundreds of farmers in 1948 who had never planted them before.

Approximately 33% of the farm and ranch land is under cooperative

agreement. At the rate of planning carried out during 1948, the planning job would be completed in about seven more years.

(1)

TABLE V

Practice	U-nit	Planned to Date	Estab-lished to date	% of "Plan" Estab-lished	Estab-lished 1948	% of to date in 1948	Goals for 1949
Conservation Plans	No.	1,111			306	27.5	330
Acres in Plans	Ac.	202,118			59,722	29.5	
Contour Farming	Ac.	105,121	26,992	25.6	7,953	29.4	8,946
Crop Residue Money	Ac.	101,136	36,136	36.2	8,648	23.5	13,848
Range Improvement	Ac.	6,121	508	8.3	508	100.0	
Cover Cropping	Ac.	116,638	47,675	40.8	16,460	34.5	15,607
Pasture Improvement	Ac.	71,019	27,027	38.0	3,510	12.9	
Seeding Range	Ac.	1,855	40	21.5	40	100.0	
Seeding Pasture	Ac.	49,590	7,681	15.4	2,145	27.9	
Wildlife Imprv. Area	Ac.	181	173	95.5	173	100.0	
Ponds	No.	340	198	58.2	61	30.8	39
Terraces	Mi.	4,708	981	20.8	312	31.8	585
Diversions	Mi.	96	36	37.5	15	41.6	
Farm Drainage	Ac.	1,492	947	63.4	866	91.4	
Open Drains	Mi.	12	7	58.3	7	100.0	
Water Facilities	No.	18	3	16.6	1	33.3	
Collective Outlets	No.	2,421	489	20.2	228	46.6	700
Terraces Served by	Mi.	3,855	824	21.3	416	50.4	

(1) Annual Report Board of Supervisors, Ellis-Prairie Soil Conservation District, 1948.

AUTOBIOGRAPHY

1925	May 31, Born in Italy, Texas
1930	Entered Public Schools, Italy, Texas
1942	May 29, Graduated from Public Schools , Abilene, Texas
1942	September 9, Entered Prairie View State College
1944	January 11, Entered Military Service
1946	March 3, Separated from Military Service
1946	June 3, Re-entered Prairie View University
1948	May 23, Bachelor of Science in Agriculture, Prairie View A. and M. College
1949	May, Candidate for Master of Science Degree, Prairie View, Texas

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