

ELECTRONIC SPREADSHEET MODEL FOR COMPARING
CONSERVATION PLANS FOR DONIPHAN COUNTY, KANSAS

by

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A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

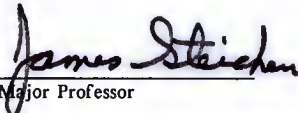
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ELECTRONIC SPREADSHEET MODEL FOR COMPARING
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 (Jerold Dean Neufeld, B.S. 1986)

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Statement of Problem	1
Objective	1
History of Government Conservation Policy.	2
Earliest Government Policy.	2
Establishment of the Soil Bank	4
Major Shift in Conservation Policy.	5
Conservation Policy in the 1980's	6
Description of the Study Area	9
Scope of the Problem	11
REVIEW OF LITERATURE	13
Electronic Spreadsheets	13
Universal Soil Loss Equation.	16
History of the Universal Soil Loss Equation	16
Factors of the Universal Soil Loss Equation	18
Conservation Structures.	19
Terraces	19
Terrace Cross Section.	22
Terrace Alignment.	24
Terrace Outlets	26
Diversions	28
Water and Sediment Control Basins.	29
Conservation Tillage and Crop Rotations	29
Enterprise Budgets.	31
Off-Site Costs of Nonpoint-Source Pollution	33
PROCEDURE	37
Universal Soil Loss Equation.	37
Conservation Structures.	39
1988 Government Farm Programs.	40
Calculators for Land Cost, Machinery Amortization, and Machinery Insurance Housing	42
Conservation Reserve Program Bid Worksheet.	43
Enterprise Budgets.	43
RESULTS	45
DISCUSSION.	51
CONCLUSION	54
SUGGESTIONS FOR FUTURE RESEARCH	54
REFERENCES	56
Appendix A. Users Guide for CONSPAN.WK1.	58
Appendix B. Model Development.	90
Appendix C. Spreadsheet Printouts	108
Appendix D. Formulas Used in Spreadsheet.	149

LIST OF FIGURES

Figure		Page
1	Location of Doniphan County in Kansas	10
2	Average Monthly Rainfall, Troy Kansas	10
3	Cornfield on Steep Land, No Conservation Treatment, Corn after Corn	12
4	Lotus 1-2-3 Spreadsheet	15
5	Steep Backslope Terrace Cross Section	23
6	Narrow Base Terrace Cross Section.	23
7	Broad Base Terrace Cross Section	25
8	Cross Section of a Pipe Terrace Outlet System	25
9	Whole Farm Enterprise Budget Template	32
10	Whole Farm Enterprise Budget	44
11	Diagram of the cell location of major sections in spreadsheet.	49

INTRODUCTION

Statement of Problem

The Food Security Act of 1985 includes major conservation provisions aimed at reducing crop surpluses and environmental damages associated with cropland use. The act states that all land which produces agricultural commodities must reduce erosion rates to levels which are technically and economically achievable (USDA Fact Sheet, 1986a). Conservation Reserve and Conservation Compliance, two provisions of the act, were designed to target "highly erodible land" and retire it from annual crop production. If highly erodible land is not removed from production, farmers are required to develop and implement conservation plans which reduce erosion losses to acceptable levels, or they will lose eligibility for future participation in the government commodity programs. Conservation plans are to be developed by January 1, 1990, and implemented by January 1, 1995.

Objective

The objective of this study was to develop a model on an electronic spreadsheet which can be used by Soil Conservation Service personnel in Doniphan County, Kansas, to assist farmers in developing economically feasible conservation plans that meet the requirements of the Food Security Act.

History of Government Conservation Policy

Soil conservation issues have long been of concern to farmers and government alike. The most visible concerns date back to the dust storms of the early 1930's. During those years, large dark dust clouds attracted the attention of legislators, bringing them to the realization that soil erosion posed a real threat to American agriculture. In recent years, concern has expanded to include not only soil erosion issues, but water conservation and water quality issues as well.

Earliest Government Policy

The government's earliest soil erosion policies came into being during the New Deal era, a time of struggle for many people. Unemployment rates were high and farmers were having a difficult time making ends meet financially. In an effort to reduce unemployment and to help out struggling farmers, the Roosevelt administration established the Soil Erosion Service (Griffin and Stoll, 1984). The primary goals of the SES were to provide jobs and to prop up the income of farmers - not to reduce soil erosion. However, dust storms during 1934 and 1935 convinced the government of the need to increase soil conservation measures. As a result, the Soil Conservation Service (SCS) was formed as part of the United States Department of Agriculture (USDA), and the SES was merged into the SCS. Responsibilities of the SCS were to: 1) provide technical assistance to farmers; 2) educate the public on soil conservation matters; 3) assist and establish soil conservation districts; and 4) develop demonstration projects. In essence, then, as new land was being put under the plow, the need for soil conservation was increasing; however,

this was not the original purpose of soil conservation programs.

Another attempt by the Roosevelt administration to support farm income during the early 1930's was the Agriculture Adjustment Act (AAA) of 1933 (Kramer and Batie, 1985). Under this act, farmers received payments from the federal government in compensation for removing land from production; however, the AAA made no mention of soil conservation. On January 6, 1936, the Supreme Court declared the AAA unconstitutional, stating that it was using economic pressure to coerce farmers to participate. The USDA was aware that the AAA might be declared unconstitutional, and therefore was already working on an alternative income support program for farmers.

After discussions with farm leaders, the Administration proposed the Soil Conservation and Domestic Allotment Act of 1936, which was enacted by Congress on February 29, 1936 (Kramer and Batie, 1985). This act, in direct contrast to the AAA, based farm income supports on soil conservation measures. Land rental payments were made to farmers for withdrawing land from production. In return, farmers were required to enroll in the Agriculture Conservation Program and undertake soil conservation practices. Prescribed soil conservation practices included the installation of conservation structures, for which cost sharing was available, and/or shifting production from "soil-depleting" crops to "soil-conserving" crops. Switching to soil-conserving crops was also viewed as a way to reduce stocks of surplus commodities. As a result of the Soil Conservation and Domestic Allotment Act, soil conservation was now linked to a program of income supports. Needless to say, the SCS was not happy with this act. They objected to the fact that income supplement payments were

disguised as conservation payments" (Simms, 1970).

Establishment of the Soil Bank

During the 1940's, conservation and acreage reduction programs were temporarily put on hold because of World War II. Existing programs were redefined and quotas on crop production were relaxed in return for increased production of "war crops". However, at the conclusion of the war, crop surpluses once again began to accumulate. In order to reduce the surpluses the Soil Bank was established.

The Soil Bank was an acreage reduction program that consisted of an acreage reserve as well as a conservation reserve (Kramer and Batie, 1985). Farmers participating in the acreage reserve received government payments in compensation for reducing production levels below their allotted acres. Participation in the conservation reserve, on the other hand, required farmers to enter into long term contracts with the USDA. They would then receive annual payments for putting their land into a conserving use, such as perennial grasses or trees, or for implementation of conservation practices. Cost-sharing money was available for costs incurred during installation of conservation practices. Once again, an emphasis was placed on conservation in order to receive income support payments. Eventually, this program proved to be too expensive, and at the end of the decade the government went back to a more traditional income support program.

Major Shift in Conservation Policy

During the 1970's, the public's attitude toward farmers began to change. Society became more concerned with water quality issues and non-point pollution sources, and less concerned with supporting farm income. Priorities of soil conservation programs broadened from stressing only long-term agricultural productivity of the soil, to also including water quality and pollution abatement issues.

Economics caused another change in the way soil conservation programs were implemented. Prior to the 1970's, soil conservation programs had been available to all farmers because cost-sharing was used as a means of supporting farm income. This policy improved soil conservation; however, it used cost-sharing funds inefficiently since they were often used on land that had minimal erosion rates. It was becoming increasingly clear that society would require taxpayer dollars be used in a more constructive and efficient manner in the area of soil conservation and pollution abatement.

Water quality issues were addressed in the 1970's by acts such as the Federal Water Pollution Control Act of 1972 (FWPCA), the Clean Water Act of 1972, and the Soil and Water Resources Control Act of 1977 (RCA). These acts were undertaken because of society's desire to reduce the pollution of lakes and streams. Agriculture was affected because non-point pollutants (those whose direct source is impossible or to impractical to determine) such as sediment, chemicals, and animal wastes were washing off of farmland and creating pollution hazards.

Section 208 of the FWPCA resulted in banning the use of some pesticides, and planners considered regulating certain farming practices in

order to improve water quality and reduce erosion (Griffin and Stoll, 1984). The RCA had as its highest priority the reduction of excessive soil erosion on crop, range, pasture, and forest lands. The National Resource Inventories of 1977 and 1982 revealed that five percent of the cropland acreage accounted for 36 percent of the total erosion, and 66 percent of the excessive erosion (Batie, 1986). Thus, the RCA proposed targeting of funds to reach those areas with the most severe erosion problems. It was hoped that these programs would satisfy society's desire to use tax dollars more efficiently in the area of soil conservation.

Conservation Policy in the 1980's

Conservation Compliance prior to the 1980's has been voluntary. Peter C. Myers, Assistant Secretary of Agriculture for Natural Resources and Environment, stated that the "USDA is skeptical about the regulatory approach to correcting non-point source pollution problems" (Myers, 1986). The USDA felt that although the voluntary approach was far from perfect, it was more effective and less expensive than invoking mandatory programs. The government has, however, provided a great deal of funding and technical assistance to farmers as an incentive to increase soil conservation.

Despite the government's efforts, there has still been a lack of participation in soil conservation programs. One reason for this is the fact that farmers are less likely to spend money on conservation practices in the present if they feel that they will not receive increased benefits in the future. Another reason is that the federal government encourages farmers to participate in soil conservation programs, while at the same

time the commodity program indirectly encourages farming fence row to fence row.

In an attempt to bring about a more consistent and fairer farm policy, the 1985 Farm Bill links commodity program objectives with the soil conservation objectives of the USDA. Part of this bill, the Conservation Title of the Food Security Act, is a landmark piece of legislation in the fight to reduce soil erosion losses and crop surpluses while at the same time improving environmental quality. It contains four major conservation provisions:

- 1) The Conservation Reserve Program
- 2) Swampbuster Provisions
- 3) Sodbuster Provisions
- 4) Conservation Compliance.

The Conservation Reserve Program (CRP) is different than the Soil Bank of the 1950's in that only land which has been declared "highly erodible land" by the SCS is eligible to be accepted into the program. Highly erodible land is defined as any soil with an erosion index of eight or greater (i.e. potential to erode at eight times its tolerable erosion rate) (USDA Fact Sheet, 1986b). In this program, farmers submit bids to enter eligible cropland into ten year contracts with the USDA. If the bid is accepted, the land is converted to a permanent vegetative cover, and the farmer receives annual rental payments from the Agricultural Stabilization and Conservation Service (ASCS) for ten years for that land. The CRP serves two functions; it takes highly erodible land out of production, and it helps to reduce production of surplus commodities.

Swampbuster provisions apply to farmers who have converted naturally occurring wetlands to annually tilled crops after December 23, 1985. In order to maintain eligibility for future USDA farm program benefits, the farmer must discontinue crop production on that land.

Sodbuster provisions apply to farmers who, after December 23, 1985, planted annually tilled crops on highly erodible land that was not in production from 1981 through 1985. For the farmer to remain eligible for future USDA farm program benefits, the land must have a conservation system installed that reduces soil erosion losses to acceptable levels and is approved by the local conservation district.

The final provision, Conservation Compliance, states that any farmer who produces a crop on highly erodible land must develop and implement an approved conservation plan for that land in order to receive future USDA farm program benefits. The SCS will provide technical assistance to farmers in order to develop the plans, and the ASCS will provide a limited amount of cost sharing money for the installation of conservation structures which are called for in the plans. Local conservation districts will approve the plans. Conservation plans must reduce soil losses to levels which are technically and economically achievable. In most cases this is T, the tolerable soil loss (Wischmeier and Smith, 1978); however, there are a few exceptions for extreme cases. Producers have until 1990 to develop their plans, and until 1995 to fully comply with the plans. If producers farming highly erodible land choose not to comply, they will no longer receive USDA farm program benefits.

As we have seen, society's attitudes toward farmers have changed drastically in the last fifty years. While income support for farmers has

in the past been provided with no strings attached, this is no longer the case. Due to budget deficits and attacks on income support policies, we are now demanding that farmers comply with non-point pollution and water quality goals in order to receive USDA farm program benefits.

Description of the Study Area

Doniphan County is located in the extreme northeast corner of Kansas (Figure 1). The county has a land area of 248,576 acres, 170,000 of which are under cultivation. Agriculture is the most important enterprise in the county. Major crops are corn and soybeans; however, there is also some wheat and grain sorghum. Apples and vegetables have been important cash crops in the past, and today a small amount are still grown in the eastern part of the county (USDA Soil Conservation Service, 1987).

The main livestock animals are cattle and hogs. Rock quarries producing limestone, sand, and gravel also constitute a vital segment of the county's economy.

The climate of Doniphan County is a typical continental climate (Sallee, 1980). Daily and annual temperatures show large fluctuations. Winter lasts from December to February, and the spring and fall seasons are relatively short. Warm summer temperatures can last six months, thus providing a long growing season. Average annual precipitation is 35.03 inches, a great deal of which falls in late spring and early summer when soils are exposed to the elements (Figure 2).

The soils of Doniphan County are predominantly deep loess. Loess soils originated in outwash from glaciers and moved down stream in

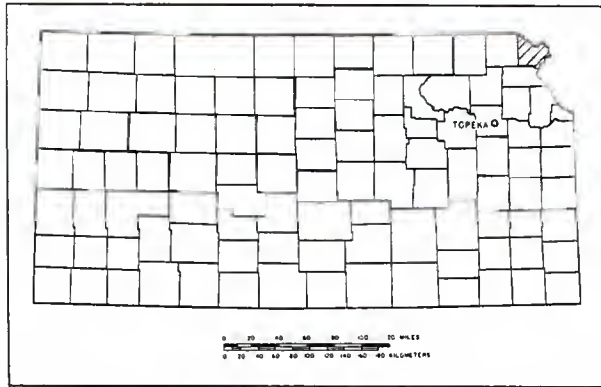


Figure 1. Location of Doniphan County in Kansas.
Sallee, 1980

AVERAGE MONTHLY RAINFALL Troy Kansas

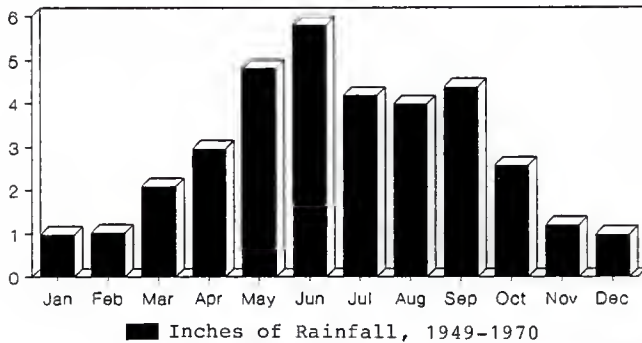


Figure 2. Average Monthly Rainfall, Troy Kansas.
Sallee, 1980

glacial rivers. Eventually, the loess particles settled out and were deposited onto the flood plains. During the winter seasons, when the glacial rivers dried up, these particles were picked up by the wind and deposited in upland areas such as Doniphan County.

Knox, Marshall, and Monona silt loam are the predominant soils in the county (Sallee, 1980). Together they comprise about 65.5 percent of soils. Slopes with these soils range anywhere from 3 to 30 percent. Permeability is moderate to high, and available water holding capacity is high. However, surface runoff is also high due to the steep slopes. Organic matter content is generally low because the surface soil is often lost to erosion. All things considered, these soils provide a good environment in which to produce high yielding crops.

Scope of the Problem

Slopes on cultivated land in Doniphan County range from 0 to 30 percent. There are 102,000 acres with slopes in excess of ten percent and 53,600 acres with slopes between 18 and 30 percent. According to the 1982 National Resource Inventory, 78,000 acres have sheet and rill erosion rates greater than ten tons per acre per year (USDA Soil Conservation Service, 1987). Ephemeral gullies, a common occurrence in Doniphan County, can result in soil losses of 200 tons per acre per year (Figure 3).

Due to the structure of farm programs in the past, farmers have been encouraged by economic incentives to plant mostly corn and soybeans. Yields of 130 bushels per acre for corn are common. This encourages farmers to plant the maximum base acres allowed by the farm



Figure 3. Corn Field on Steep Land, No Conservation Treatment, Corn after Corn.

program. The rest of a farmer's land is commonly planted in soybeans, a non-program crop. Using this cropping pattern year after year in combination with the existing tillage practices leaves soil residue levels low, but maximizes returns to the farmer.

REVIEW OF LITERATURE

In order to remain eligible for continued participation in government farm programs, farmers must be able to choose the most economical alternatives that will help them meet the compliance provisions of the Food Security Act (FSA). To help facilitate this process, a Lotus 1-2-3 spreadsheet has been developed. With this model, farmers, with technical assistance from the Soil Conservation Service, can develop and compare conservation plans which include changes in tillage systems and/or installation of conservation structures. Plans can also be checked to see that they meet the minimum soil erosion requirements established by the FSA. If the plans meet the soil conservation requirements, the net returns of each plan can be compared and the best one selected.

Electronic Spreadsheets

Electronic spreadsheets are extremely useful as decision-making and problem-solving tools. They are the equivalent of the financial manager's worksheet, except that paper, hand held calculator, and pencils have been replaced by the microcomputer. Spreadsheets have a broad range of uses because large quantities of information can be organized in an easy to understand format, and can then be easily manipulated.

A spreadsheet consists of a matrix of rows and columns (Figure 4). At the intersection of each row and column is a cell that has a unique address. Lotus 1-2-3 contains 2048 rows and 256 columns for a total of 524,288 cells. If each cell were 1/4 inch high and 1 inch long it would take a piece of paper 42.6 feet high and 21.3 feet wide to hold all of the cells (Duffy, 1986). All cells cannot appear on the screen at one time; however, each can be easily accessed by some simple keystrokes.

Cells in the spreadsheet can contain one of three types of data. They are: 1) text, 2) numeric, and 3) formula. Text is used to identify segments of the spreadsheet so that they are easier to understand. Numeric data, either constants or variables, can then be entered in each cell. Examples of numeric data include sales figures, interest rates, or costs. Once numeric data is entered, formulas which describe the mathematical relationships between the numeric data can be constructed. If any of the cells are incorrect or need to be changed in any way, they can be easily erased or edited.

Spreadsheets are not only useful for business managers; models can also be constructed for engineering and countless other applications as well. A few examples are:

- 1) Enterprise Budgets
- 2) Sales Forecasting
- 3) Sizing Terrace Outlets
- 4) Developing Conservation Plans

Once the spreadsheet is developed, it can be used to carry out a "what if" analysis. For example, what if I increase the selling price of

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Figure 4. Lotus 1-2-3 Spreadsheet.

corn, or what if variable costs were greater? The operator can simply change the contents of the appropriate cells containing numeric data, and examine the resulting changes. Planning done in this manner saves time and money, is accurate and efficient, and makes management planning more productive.

One of the major weaknesses of spreadsheets is that they have a limited amount of error checking. In cases where large amounts of data must be entered with no errors, this can present a problem. Another weakness is that spreadsheets are not as "user friendly" as languages such as BASIC when they are used by people other than those who developed them. In addition, spreadsheets are not in compiled form, which requires the user to have a copy of the appropriate parent spreadsheet.

In this case, a Lotus 1-2-3* spreadsheet was deemed the most reasonable software to use, given the flexibility needed for the project and the limited availability of funds for development of a more sophisticated software program.

Universal Soil Loss Equation

History of the Universal Soil Loss Equation

The first comprehensive research efforts to quantify soil erosion losses in the U.S. were made by M.F. Miller at the University of Missouri Agricultural Experiment Station in 1914 (Browning, 1979). Miller conducted his research experiments on "erosion plots". Each plot measured 90.75 feet long and 6 feet wide (1/80 th acre). He attempted to

* Any mention of trade names or commercial products in this thesis does not constitute an endorsement by Kansas State University.

quantify erosion losses that resulted from the many factors and relationships affecting soil and water losses. Some of the factors he studied were cropping systems and management, type and amount of rainfall, steepness of slope, and erodibility of the soil. As a result of this early work done at the University of Missouri, Congress appropriated money in the 1930's for the establishment of ten additional experiment stations.

Techniques and experimental designs developed in Missouri were used at the new experiment stations. This was important in order to insure unbiased results; it also allowed researchers to evaluate how the same variables affecting erosion changed as a result of different locations. Eventually, erosion data dealing with a wider range of conditions became available from more experiment stations and from state and federal research projects in all areas of the U.S.

Throughout the years, a variety of soil loss equations, derived by many people, have been used; however, the complete Universal Soil Loss Equation (USLE) as we know it resulted from the work of Wischmeier and Smith. The development of the USLE took place during the 1950's at the National Runoff and Soil Loss Data Center at Purdue University (Wischmeier and Smith, 1978). During development of the USLE, researchers followed recommendations from many soil and water conservation agencies. Results collected from research projects in 49 states contributed 10,000 plot years of basic runoff and soil loss data. Additional data were collected from the SCS, U.S. Weather Bureau, Agriculture Research Service, and several other agencies.

Factors of the USLE

The USLE is used to estimate long term average annual soil losses due to sheet and rill erosion for specific fields and specific cropping and management factors (Wischmeier and Smith, 1978). The factors of the USLE and their definitions are:

$$A = R K L S C P \quad [1]$$

A is the estimated average annual sheet and rill erosion losses measured in tons per acre per year. It does not measure soil losses from gullies or ephemeral gullies. Soil losses can also be calculated in other units; however, these units are the most common.

R is the rainfall and runoff factor. It is the number of "erosion index" (EI) units in a normal year's rainfall. In 1959 Wischmeier determined that when all other factors were held constant, soil erosion losses were proportional to two rainfall characteristics. Thus, EI is equal to the total kinetic energy of a storm times the maximum 30 minute intensity.

K is the soil erodibility factor. Soils erode at different rates even when cropping management, tillage practices, rainfall, etc., remain the same. This is due to the chemical and physical properties of the soil and is referred to as soil erodibility. The soil erodibility index is determined experimentally for each soil type. It is expressed in soil loss per unit area per erosion index unit (R) as measured on a unit plot. A unit plot is 72.6 feet long with a uniform nine percent slope and is farmed up and down the slope in continuous fallow.

L, the slope length factor, is the ratio of soil loss from a given slope length to that of a slope 72.6 feet long, all other factors remaining

the same. Slope length is determined by the origin of overland flow to either 1) the point at which the slope decreases and deposition starts, or 2) the point where runoff enters a defined channel.

S is the slope gradient factor. It is the ratio of soil loss from an actual field gradient to that of a nine percent slope, all other conditions remaining the same. As the slope becomes steeper, runoff water increases in velocity as well as in erosive power.

C is the cropping management factor. It is the ratio of soil loss from the cropping practice of interest to that of a continuous fallow condition. Two major conditions which affect the C factor are vegetal cover and cropping practices.

P is the erosion control practice factor. P is the ratio of soil loss from practices using terraces, strip cropping, etc., to that of farming straight up and down the slope.

Another term commonly associated with the USLE is soil loss tolerance (T). This is the maximum amount of soil erosion losses for a given field which will permit a high level of crop productivity to be sustained economically and indefinitely (Wischmeier and Smith, 1978). For the majority of Doniphan County, the soil loss tolerance is five tons per acre per year.

Conservation Structures

Terraces

Terracing is one of the oldest and most effective soil conservation practices known. The Soil Conservation Society of America Resource Conservation Glossary (1982) defines a terrace as "an embankment or

combination of an embankment and channel constructed across a slope to control erosion by diverting and temporarily storing surface runoff instead of permitting it to flow uninterrupted down the slope." Terraces have been used very effectively for thousands of years in some areas, while in other areas the lack of terraces has resulted in disastrous consequences. As an example of the effective use of terraces, farmers in the Andes mountains are continuing to successfully use terraces that were constructed by their ancestors thousands of years ago (Beasley et al., 1984). The soil and water conservation provided by these terrace systems is sufficient to maintain cultivation of annual crops even though soil and water resources are limited.

Syria, on the other hand, has severe erosion problems which can be attributed to deforestation of the hillsides centuries ago (Beasley et al., 1984). Following the removal of the forests, the land was cultivated; however, no soil conservation measures were taken to insure that the soil remained on the hillsides. Thus, what was once a fertile and prosperous agricultural region is a wasteland today.

Although terraces serve several functions, one of the most important is to reduce the erosiveness of surface water on the interval between the terraces, thereby reducing soil erosion losses. This can be done by placing individual terraces at the proper distance apart (spacing), and at the proper grade, so that surface water never reaches erosive velocities.

Another way to slow down surface water on a terrace system is to include a good residue management system. Dense vegetative cover greatly reduces the erosiveness of surface water by reducing its velocity and by intercepting and dispersing the energy of falling raindrops before

they come in contact with the soil surface. Proper residue management also increases surface water infiltration and allows for wider terrace spacing. When installed properly, terraces also reduce non-point source pollutants and reduce losses of expensive seed and fertilizers.

Terrace design and construction have changed greatly over the centuries. One of the oldest known terrace designs is the bench terrace (Troeh et al., 1980). This terrace was built up on the back side by a nearly vertical stone retaining wall, providing a narrow interval which could be cultivated. Bench terraces were designed to conserve soil and water and enabled cultivation of land that otherwise would have been impossible to cultivate. Construction was done by manual labor and took years to complete.

Modern terrace systems are a far cry from their predecessors. Terrace systems have evolved from predominately bench-type to broad-base, steep backslope, and others. Today, terrace designers must consider factors such as alignment, cross section, outlet systems and a host of other factors. Construction requires a relatively small amount of manual labor and can be completed in a few days. However, while design and construction methods have changed through the years, soil and water conservation remain the basic functions of a terrace system.

Due to the present farming practices and the highly variable topography of Doniphan County, it was decided to include three terrace cross sections in this conservation planning model. They are 1) broadbase 2) narrow base and 3) steep backslope. These types will be discussed in detail below. In addition, other factors which should be considered are terrace alignment and terrace outlet system.

Terrace Cross Section

Steep backslope, or grassback, terraces (Figure 5) are becoming increasingly popular in Doniphan County because they are well suited to the terrain of the area. The SCS Engineering Field Manual (1969) states that steep backslope terraces are best suited to slopes greater than six percent. The backslope is generally 2:1, and is planted to some type of permanent vegetation. Backslopes remove approximately 10 to 20 percent of a field from cultivation (Beasley et al., 1984); however, the backslope can be an excellent wildlife habitat.

Farming operations on steep backslope terraces are done on the interval between two adjacent terraces. Because machinery can only turn around at the ends of the field, it is important to select the proper terrace interval and to use parallel terrace alignment, especially for row crops. With steep backslope terraces, the slope of the terrace interval can be reduced by up to two percent, or even more on steeper land, because earth is pushed up from the bottom side of the terrace during construction (Powell and Steichen, 1981b). Reduction of the slope allows for the terrace interval to be widened.

Maintenance is required on steep backslope terraces when the terrace channel becomes full of sediment. Sediment in the channel is usually pushed up the terrace ridge, thus lengthening the backslope. When maintenance is done in this manner, the steep backslope terraces will eventually approach a level bench system.

Narrow base terraces (Figure 6) are used less frequently in Doniphan County. However, they do provide some useful features that steep backslope terraces do not provide. During construction, earth is moved

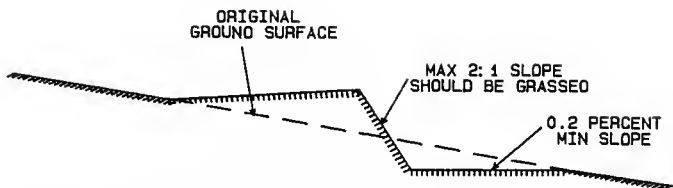


Figure 5. Steep Backslope Terrace Cross Section
 ASAE Standard: ASAE S268.3

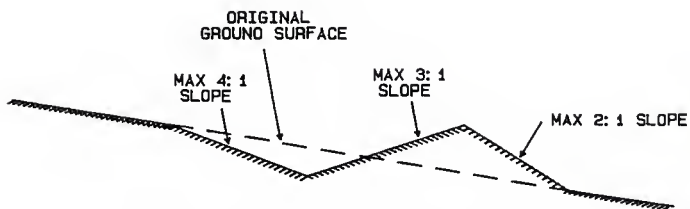


Figure 6. Narrow Base Terrace Cross Section
 ASAE Standard: ASAE S268.3

from above the terrace to build the terrace ridge. The terrace ridge and channel is then seeded to some type of permanent vegetation. The ridge is relatively small, thus reducing construction costs. These terraces are better adapted to the existing equipment complement because the terrace channel is not cultivated. Risers for underground outlet systems are located in the grassed channel, so there is no need to worry about hitting them during farming operations.

Maintenance of narrowbase terraces can present a problem. When sediment in the terrace channel reaches the point where it needs to be removed, it is normally placed on the terrace ridge. When this practice is followed on narrow base terrace systems, care should be taken since the vegetation on the terrace ridge may be killed. Sediment should be placed on the terrace ridge in a sufficiently shallow layer so that existing vegetation can grow up through it.

Broadbase terraces (Figure 7) are best suited to relatively flat slopes, usually less than eight percent (SCS Engineering Field Manual, 1969). During construction, earth is pushed from above to build the terrace ridge. This can increase the slope of the terrace interval up to two percent (Powell and Steichen, 1981b). Broadbase terraces are approximately 45 feet wide; however, some are even wider. Wide, flat terraces such as these are popular because the farmer can use large modern machinery without removing cropland from production.

Terrace Alignment

Regardless of the terrace cross section that is chosen, the farmer must select a terrace alignment. Parallel terraces are growing in

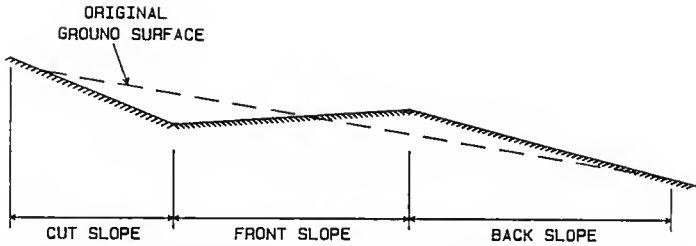


Figure 7. Broadbase Terrace Cross Section
ASAE Standard: ASAE S268.3

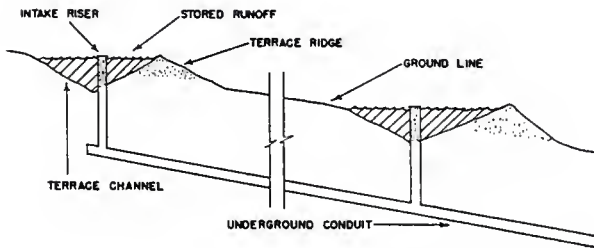


Figure 8. Cross Section of a Pipe Terrace Outlet System.

Cooperative Extension Service, Kansas State University, AF70

popularity because of their increased farmability. According to the Soil Conservation Society of America Resource Conservation Glossary (1982), farmability is defined as "the ease of efficiently farming a field or terrace system; [it] can also refer to field size, shape, and topography as well as terracing or conservation systems."

Parallel terraces are especially well suited to row crop cultivation because they reduce time consuming point rows and require less machinery maintenance. The best terrace spacings are multiples of 120 feet because they will best fit the largest variety of machinery.

Powell (1980) states that the time required to farm a field can be reduced by 10 to 20 percent by installing parallel terraces, increasing row length, and making terraces parallel to field boundaries. When all things are considered, parallel terraces systems provide a distinct advantage over non-parallel systems.

Terrace Outlets

As stated earlier, one of the functions of a terrace system is to reduce the erosiveness of surface water on the terrace interval. However, once this is accomplished and the water reaches the terrace channel, it needs to be disposed of properly. If waterways are used, water moves slowly down the terrace channel into the waterway. If underground outlets are used, water again moves slowly down the terrace channel to the riser where it enters the underground outlet system. Each outlet system has advantages and disadvantages, and selecting the proper one depends on different factors.

Grassed waterways are used to conduct and transport water from one location to another without causing soil erosion (Beasley et al., 1984). They are frequently used as water outlets for terrace systems and are designed to carry runoff from a once in ten year storm. Waterways are usually 30 to 100 feet wide and can carry water one to two feet deep.

Waterways are seeded to either cool season or warm season grasses. Cool season grasses take less time to establish and are less expensive; however, they are not as well-liked by wildlife as warm season varieties. Warm season grasses require up to six years to achieve an adequate stand, but require less maintenance once they are established.

A disadvantage of waterways is that they allow less flexibility when designing an outlet system for maximum farmability. For economic as well as soil conservation reasons, they are usually constructed in natural depressions in the field. This takes cropland out of production and dissects large fields into smaller ones, thereby reducing farmability. Whenever possible, they should be located at the field boundaries, which increases farmability. The advantages of waterways are that they are relatively inexpensive, easy to install, and provide a source of forage.

Underground pipe outlets (Figure 8) are designed to release surface water runoff from the terrace channel through an underground pipe system. Terraces are constructed across the field and pipe outlets are installed in areas of natural depressions. Water flows down the terrace channel into detention storage at the depression areas. At these areas, the terrace ridges serve as dams and the water is temporarily impounded. Detention storage is normally sized to hold runoff from a once in ten year storm. Water in detention storage is then released through the

intake riser. This takes place over a period of 6 to 48 hours depending on the soil type and the crop's ability to withstand submersion. Discharge from all risers enters an outlet conduit and is transported to, and then released at, a suitable location.

Underground outlets have several advantages over grassed waterways. They increase farmability because they make it easier to install parallel terrace systems. Terraces can be installed across depressions in the field because the depressions are used as detention storage areas; thus, no land is removed from production. They can also be installed on steep slopes on which it would be too difficult or impossible to establish and maintain a grassed waterway. Finally, the farmer can expect the outlet system to have a long life with a minimum amount of maintenance.

Diversions

A diversion is defined as "a channel, embankment, or other man-made structure constructed to divert water from one area to another" (SCSA Resource Conservation Glossary, 1982). Diversions are commonly used to divert excess water to a location where it can be disposed of safely. Permanent vegetation is established in the diversion channel so that water can move down the channel at a rate faster than water in a terrace channel, but not fast enough to cause soil erosion.

A few situations where diversions are useful are:

- 1) In diverting water away from active gullyheads.
- 2) In protecting expensive engineering structures, such as terraces, by diverting runoff from uplands where there are no terraces,
- 3) In diverting water around farmsteads.

Diversions should never be used in place of terraces when terraces are needed.

Water and Sediment Control Basins

Water and sediment control basins are used to temporarily store surface runoff water. Basins can be excavated or can be made by constructing a dam across a waterway. The purpose of the basin is to trap sediment moving into the basin while allowing the water a chance to infiltrate. They are usually constructed level; however, on less permeable soils they may have a slight grade. Some basins use an underground pipe outlet system to release water from the basin at a controlled rate. This prevents damage below the basin from water and sediment and minimizes damage to the crop in the basin.

Conservation Tillage and Crop Rotations

Conservation tillage and crop rotations are alternatives which can be used to reduce erosion losses instead of, or in combination with conservation structures. A conservation tillage system is "any tillage sequence that reduces loss of soil or water relative to conventional tillage" (SCSA Resource Conservation Glossary, 1982). This is accomplished by using tillage operations that leave crop residue levels high and the soil surface very rough, often in ridges.

Conservation tillage systems range from reduced tillage to no-tillage, with several variations in between. Reduced tillage systems involve the use of a primary tillage operation such as plowing to prepare the seed bed. Following this, crops are planted directly into the plowed

land, thus eliminating secondary tillage operations. No-tillage systems eliminate all tillage operations. Crops are planted directly into the undisturbed residue left by the preceding crop. Usually this involves opening a narrow slot in the soil surface or punching a hole through the surface.

Conservation tillage operations have several advantages with regard to soil and water conservation over conventional tillage methods. The increased levels of crop residue which are left on the soil surface assure better water and wind erosion control, in addition to increasing water infiltration into the soil and reducing evaporation losses from the soil surface (Brady, 1984). The biggest disadvantage of conservation tillage is the increased amount of herbicides that must be used in most cases in order to control weeds. However, this must be weighed against the lower labor, energy, machinery, and time requirements of conservation tillage systems.

Crop rotation is the practice in which two or more crops are grown in a repetitive sequence on the same land area. It offers erosion and disease control as its greatest advantages (Troeh et al., 1980). A common crop rotation is a row crop (corn) followed by a soil conserving crop (wheat). The soil conserving crop not only protects the soil surface while it is growing; it also has a residual effect. Residue left over from the conserving crop protects the soil surface while the row crop is growing. Rotations such as this also reduce insect, weed, and disease problems that are associated with monoculture cropping systems.

Enterprise Budgets

Enterprise budgets (Figure 9) can be used to project annual costs and returns for different conservation systems, enabling the farm manager to compare several conservation plans and select the most profitable one. For example, enterprise budgets for conventional tillage and no-tillage systems can be developed and compared. Assuming production is for an equal land area, the budget would show differences in several inputs such as labor, herbicide, fertilizer, and fuel costs. The budgets would also show differences in fixed costs such as machinery amortization and machinery insurance and housing, and in the gross and net returns. Management decisions could now be made based on the information contained in the budget.

Enterprise budgets contain two types of costs - variable costs and fixed costs. Variable costs are expenses for production inputs which are used in one production period. The amount of inputs consumed depends on the level of output desired, and in this case, the components of the conservation plan. Variable costs do not occur unless the operator attempts to produce a product (Boehlje and Eidman, 1984). Examples of variable costs include labor, seed, fuel, and fertilizer.

Fixed costs are expenses borne by the producer regardless of the level of output. If output is reduced to zero, these costs still occur. Examples of fixed costs are real estate taxes, interest on land and machinery owned by the farmer, machinery costs, and insurance and housing for machinery.

Income from the farming enterprise is entered in the gross returns section of the budget. Income can come from either the sale of farm

	CASE 1	CASE 2	CASE 3
	CURRENT		
VARIABLE COSTS			
1. Labor	\$0	\$0	\$0
2. Seed	\$0	\$0	\$0
3. Herbicide	\$0	\$0	\$0
4. Insecticide	\$0	\$0	\$0
5. Fertilizer	\$0	\$0	\$0
6. Fuel	\$0	\$0	\$0
7. Oil	\$0	\$0	\$0
8. Machinery Repair	\$0	\$0	\$0
9. Drying Costs	\$0	\$0	\$0
10. Custom Hire	\$0	\$0	\$0
11. Current Land Maintenance	\$0	\$0	\$0
12. Annualized Conservation Structure Operation and Maintenance (Alt C)	\$0	\$0	\$0
13. CRP Maintenance	\$0	\$0	\$0
14. Set Aside Maintenance	\$0	\$0	\$0
15. Miscellaneous	\$0	\$0	\$0
16. Miscellaneous	\$0	\$0	\$0
17. Interest on Variable Costs	\$0	\$0	\$0
Interest Rate = 0.0%			
TOTAL VARIABLE COSTS	\$0	\$0	\$0
FIXED COSTS			
18. Real Estate Taxes	\$0	\$0	\$0
19. Interest on Owned Land (Alt L)	\$0	\$0	\$0
20. Rent - Cash and Share	\$0	\$0	\$0
21. Amortized Machinery Costs (Alt L)	\$0	\$0	\$0
22. Mach. Insurance, Housing (Alt L)	\$0	\$0	\$0
23. Annualized Conservation Structure Cost (Alt C)	\$0	\$0	\$0
24. Annualized CRP Est. Exp. (Alt F)	\$0	\$0	\$0
TOTAL FIXED COSTS	\$0	\$0	\$0
TOTAL COSTS	\$0	\$0	\$0
GROSS RETURNS (Alt F)			
25. Wheat	\$0	\$0	\$0
26. Corn	\$0	\$0	\$0
27. Milo	\$0	\$0	\$0
28. Soybeans	\$0	\$0	\$0
29. Total Non-Program Income	\$0	\$0	\$0
30. CRP Income	\$0	\$0	\$0
31. Total Commodity Program Payments	\$0	\$0	\$0
32. Hay or Graze Income	\$0	\$0	\$0
TOTAL RETURNS	\$0	\$0	\$0
NET RETURNS	\$0	\$0	\$0

Figure 9. Whole Farm Enterprise Budget Template

products or from participation in government farm programs. Finally, net returns to management can be calculated by subtracting total costs from gross returns. After the farmer has developed several possible conservation plans, the net returns of each plan can be compared, and informed management decisions can then be made based on these budgets.

Off-Site Costs of Nonpoint-Source Pollution

Nonpoint-source pollution of the waters in the U.S. remains an impediment to achieving the goals of the water quality programs established during the 1970's. Sources of nonpoint pollutants include urban runoff and runoff from roads and construction sites; however, the primary contributor is the agricultural sector. The primary pollutants involved include animal wastes, nutrients, pesticides, and sediment. The National Resource Council (1974) states that "sediment carried by water runoff clearly represents the dominant form of soil loss in the U.S., delivering approximately 4 billion tons per year of sediment to waterways in the 48 contiguous states. Three quarters of the sediment comes from agricultural lands."

This sediment-loading into our waterways results in tremendous off-site costs (costs occurring away from the area in which the soil originally eroded). Off-site costs due to erosion of cropland in the U.S. are estimated to be 2.2 billion dollars per year (Table 1). However, on-site costs (damages which occur on the farm field), the root of the problem, are estimated to be one third of the off-site costs (Myers, 1985).

Off-site costs are divided into two categories, in-stream effects and off-stream effects. In-stream effects refer to damages which occur in

Table 1. National Off-Site Costs of Soil Erosion (Clark et al., 1985)

(millions 1980 dollars)

Type of Impact	Range of Estimates	Single-Value Estimate	Cropland's Share
INSTREAM EFFECTS			
Biological impacts		no estimate	
Recreational	950-5,600	2,000	830
Water storage facilities	310-1,600	690	220
Navigation	420-800	560	180
Other instream uses	460-2500	900	320
Subtotal Instream (rounded)	2,100-10,000	4,200	1,600
OFF-STREAM EFFECTS			
Flood damages	440-1,300	770	250
Water conveyance facilities	140-300	200	100
Water treatment facilities	50-500	100	30
Other off-stream uses	400-920	800	280
Subtotal-Off-stream (rounded)	1,100-3,100	1,900	660
Total--All effects (rounded)	3,200-13,000	6,100	2,200

lakes, rivers, and estuaries. These include damages to biological ecosystems, siltation of reservoirs, dredging of rivers, and several other effects (Table 2). Off-stream effects, on the other hand, refer to damages which occur after water is removed from a waterway. These include flood damages, as well as damages to water treatment and power facilities. When all of the damages from erosion related pollutants are added up, the total comes to approximately 6.1 billion dollars per year (Clark et al., 1985).

The Food Security Act of 1985 established the Conservation Reserve Program as one of the devices which the government is using to fight nonpoint-source pollution. As was stated in the Introduction, the CRP targets land that is already eroding excessively and offers financial incentives to farmers to remove it from annual crop production. The CRP serves two main functions. First, it helps to reduce the stocks of surplus commodities. Secondly, it reduces on-site damages while at the same time reducing the more expensive off-site damages.

If we are to meet the goals of the Clean Water Act, the Federal Water Pollution Control Act, and the Resource Conservation Act, many sectors of the economy will have to participate in the clean up of nonpoint-source pollutants. The agricultural sector has shown its willingness to help solve this problem by implementing the Food Security Act of 1985.

Table 2. Checklist Of Costs Due To Of-Site Damage Of Soil Erosion

I IN-STREAM IMPACTS

- A. Biological Damages
 - 1. Fish Habitats
 - 2. Food Chain Effects
 - 3. Protection of Endangered Species
- B. Recreational Damages
 - 1. Fishing
 - 2. Boating
 - 3. Swimming/Picnicking/Camping
 - 4. Waterfowl Hunting
- C. Water Storage in Lakes and Reservoirs
 - 1. Dredging and Excavating
 - 2. Construction of Sediment Pools
 - 3. Replacement Capacity
 - 4. Water Quality Treatment
- D. Navigation
 - 1. Dredging/Dredge Spoil Removal
 - 2. Delays to Commercial Shipping
 - 3. Accidents
 - 4. Damage to Engines
- E. Other In-Stream Impacts
 - 1. Commercial Fisheries
 - 2. Property Values
 - 3. Intrinsic Values

II. OFF-STREAM IMPACTS

- A. Flood Damages
 - 1. Increased Flood Heights from Channel aggradation.
 - 2. Increased Flood Volume and Effect on all Damage
 - 3. Direct Sediment Damages to Crops-Swamping
- B. Water Conveyance Facilities
 - 1. Sediment Removal from Drainage Ditches
 - 2. Irrigation Canals
 - 3. Pumping Costs
- C. Water Treatment
 - 1. Municipal
 - 2. Industrial
- D. Power Facilities

From: The Economics of Soil Erosion: A Handbook for Calculating the Cost of Off-Site Damage. 1986. American Farmland Trust and the Minnesota Soil and Water Conservation Board.

PROCEDURE

This model is designed to be used by Soil Conservation Service personnel in Doniphan County, Kansas, for assisting farmers in developing economically feasible conservation plans which meet the requirements of the Food Security Act of 1985. The model contains six major sections which can be used to estimate costs and returns for the various components of a conservation plan. They include:

- 1) Universal Soil Loss Equation
- 2) Conservation Structures
- 3) 1988 Government Farm Programs
- 4) Calculators for Land Cost, Machinery Amortization, and Machinery Insurance and Housing
- 5) Conservation Reserve Program Bid Worksheet
- 6) Enterprise Budgets

Following is a description of each section in the model. A complete list of the data inputs needed for each section and the equations used are located in appendix B.

Universal Soil Loss Equation

The ULSE is used to determine whether conservation plans meet the soil loss requirements established by the Food Security Act. If the plan under consideration meets the requirements, the user may proceed with development of it. However, if the plan has excessive erosion losses, it will need to be modified until it meets the requirements.

Tables and worksheets containing the factors of the USLE are located in this section so that the appropriate factors can be easily selected and entered in the equation. Selection of the correct factors for any conservation plan requires some knowledge of how to use the USLE.

Rainfall, soil erodibility, and slope gradient factors for a specific field are determined by the geographic characteristics of the field and are not changeable. These factors can be easily found and entered into the appropriate locations. However, slope length, cropping management, and support practice factors are changeable and are dependent upon the farm manager's decisions.

Slope length is defined as beginning at the point of overland flow and ending at either the point where the slope gradient decreases and deposition begins, or the point where runoff enters a well defined channel (Beasley et.al., 1984). As the slope length decreases, soil erosion losses are also reduced. Slope length and soil erosion losses can be reduced by the installation of conservation structures such as terraces or diversions.

The cropping management factor takes into account the complex relationships between vegetal cover and management practices. Crops which are close growing and have a dense canopy, such as small grains, reduce soil erosion losses more than crops such as soybeans, which have less canopy and are planted in widely spaced rows. Increased surface residue also results in lower soil erosion losses. Management practices such as no-tillage and crop rotations increase the amount of surface residue over practices such as conventional tillage. When farm management includes a combination of these practices, the soil erosion reduction that results is greater than when they are used separately.

Support practice factors are the final factor of the USLE that the farm manager can change in order to reduce soil erosion losses. When sloping land is under cultivation, the protection which is offered by close growing crops needs to be supported by practices that will slow surface runoff and thus reduce the amount of soil it can carry (Wischmeier and Smith, 1978). This can be accomplished by the use of contouring, strip cropping, or by the installation of terraces.

After all of the factors have been selected and entered, the model will calculate the soil erosion losses for that particular field. If erosion losses are too great, it will be necessary to change one or all of these factors (slope length, cropping management, and support practice) in order to develop an acceptable conservation plan.

Conservation Structures

Annualized installation costs for several conservation structures which are used to reduce soil erosion losses can be calculated in this section. The structures include:

- terraces (steep backslope, narrowbase, and broadbase)
- waterways
- diversions
- water and sediment control basins

Not all of these structures will be needed in every conservation plan; however, all of them will be needed in conservation planning at some time.

Practices such as cropping management and contour farming are more effective when they are used in combination with terracing. This is because the terraces divide the length of the entire slope into lengths equal to the terrace interval. As mentioned earlier, this slows down surface runoff and reduces soil loss. Choosing the terrace cross section which best suits the characteristics of the field will also greatly enhance the terraces' effectiveness.

Diversions and water and sediment control basins should be included in conservation plans under certain circumstances. Diversions are constructed across the slope and are used to transport surface runoff water from one location to another where it can be disposed of safely. Water and sediment control basins are used to store surface runoff until it can infiltrate into the soil.

Conservation structures which collect or divert surface runoff need an outlet system to safely transport the runoff water to a disposal area. Waterways and underground outlets will be used to perform this function in this model. As outlined in the Review of Literature, each of these outlet systems has advantages and disadvantages, and choosing the most appropriate one for a conservation plan depends on many factors.

1988 Government Farm Programs

Farmers have several options with regard to participation in the 1988 Government Farm Programs. These programs provide a large source of income for many farmers and thus will be included in many conservation plans. The programs that are used in this model are the Conservation Reserve Program and the 1988 Wheat and Feed Grains Program. This

section is used to estimate the costs and returns of participating in these programs. In addition, it can also be used to estimate income for producers who choose not to participate in any farm programs.

The Conservation Reserve Program is designed to target highly erodible land and remove it from annual crop production. As an incentive to do this, the USDA will pay farmers annual land rental payments for each acre entered in the CRP. In return, farmers are required to enter into ten-year contracts with the USDA, and to plant the CRP acres to permanent vegetation such as trees or perennial grasses. The government will help to establish the permanent cover by assuming up to 50 percent of the cost of establishment, but will not exceed 50 percent of the average agricultural value of the land (USDA Agricultural Stabilization and Conservation Service, 1988). Soil Conservation Service personnel will be available to provide technical assistance to insure that the conservation reserve acres are in compliance with the provisions of the Food Security Act.

Participation in the wheat and feed grains program is also dependent upon compliance with the soil erosion provisions of the Food Security Act. Farmers who choose to participate in the wheat program are required to enter 27.5 percent of their wheat base into the Acreage Reduction Program (ARP). In return, they will receive loans, deficiency payments, and other benefits from the USDA. Farmers who participate in the feed grains program are required to enter 20 percent of their combined base acreage for corn and grain sorghum into the ARP in order to receive USDA farm program benefits. In addition, feed grain producers may enter up to 15 percent of their combined base acreage into

the Paid Land Diversion Program. This will enable them to receive Diversion Payments from the USDA.

Another option for farmers who are participating in the commodity program is the 0/92 participation option. This is a program which allows producers to plant between 0 to 92 percent of their permitted acreage to a farm program crop and still remain eligible to receive deficiency payments on 92 percent of their permitted acreage for that crop.

The final option for the producer using this model is non-participation in the Government Farm Programs. In this case, the farmer need only know yield, price, and acreage information for the farm in order to determine his or her income.

Calculators for Land Cost, Machinery Amortization, and Machinery Insurance and Housing

This section can be used to calculate interest on land that is owned by the farmer, the annual amortization costs of owning machinery, and the insurance and housing costs of the machinery complement.

Interest on land owned by the farmer is regarded as an opportunity cost to the farmer. An opportunity cost is the benefit that is foregone by using resources in a particular venture, and not using them in their best alternative use. In this model, the opportunity cost associated with owning farm land is assumed to be an interest rate that could be received on a very safe investment such as a savings account or a certificate of deposit.

The Machinery Amortization Calculator is used to determine the farmer's annual cost of owning machinery in the current equipment complement, and in any equipment complements associated with potential conservation plans. The farmer must provide the purchase price, expected life, and salvage value of each piece of machinery. Once again, an interest rate is needed to calculate the farmer's true cost of owning machinery. In this case, an interest rate for borrowed money or owner's equity is used.

Machinery insurance and housing costs are simply one percent of the value of the machinery complement (Bauscher and Willett, 1986).

Conservation Reserve Program Bid Worksheet

This worksheet can be used to calculate a bid which the farmer can submit to the USDA for entering highly erodible land into the CRP. In most cases, the rate the USDA is using for acceptance of land into the CRP is already known. In those cases, using this worksheet will be of little additional value.

Many of the costs and returns that are associated with determination of a bid will come from the farmer's records. Others may be provided by the Soil Conservation Service or can be obtained from commercial businesses. Still other costs and returns will have to be determined by using a best estimate.

Enterprise Budgets

Enterprise budgets (Figure 10) are used to project annual costs and returns for each conservation plan under consideration. In the first

	CASE 1 No Gov't Participation	CASE 2 Terraces Program	CASE 3 No-till Program
VARIABLE COSTS			
1. Labor	\$2,691	\$2,384	\$1,679
2. Seed	\$7,440	\$6,591	\$6,696
3. Herbicide	\$9,814	\$8,694	\$14,705
4. Insecticide	\$0	\$0	\$0
5. Fertilizer	\$10,208	\$9,043	\$9,188
6. Fuel	\$2,336	\$2,069	\$1,195
7. Oil	\$352	\$312	\$178
8. Machinery Repair	\$8,624	\$7,640	\$6,799
9. Drying Costs	\$0	\$0	\$0
10. Custom Hire	\$1,805	\$1,599	\$3,375
11. Current Land Maintenance	\$900	\$0	\$0
12. Annualized Conservation Structure Operation and Maintenance (Alt C)	\$0	\$560	\$0
13. CRP Maintenance	\$0	\$0	\$0
14. Set Aside Maintenance	\$0	\$0	\$0
15. Miscellaneous	\$0	\$0	\$0
16. Miscellaneous	\$0	\$0	\$0
17. Interest on Variable Costs Interest Rate = 14.0%	\$3,092	\$2,722	\$3,067
TOTAL VARIABLE COSTS	\$47,262	\$41,614	\$46,882
FIXED COSTS			
18. Real Estate Taxes	\$602	\$602	\$602
19. Interest on Owned Land (Alt L)	\$7,223	\$7,223	\$7,223
20. Rent - Cash and Share	\$36,252	\$36,252	\$37,033
21. Amortized Machinery Costs (Alt L)	\$34,260	\$34,260	\$25,447
22. Mach. Insurance, Housing (Alt L)	\$2,919	\$2,919	\$2,167
23. Annualized Conservation Structure Cost (Alt C)	\$0	\$1,509	\$0
24. Annualized CRP Est. Exp. (Alt F)	\$0	\$0	\$0
TOTAL FIXED COSTS	\$81,256	\$82,765	\$72,472
TOTAL COSTS	\$128,518	\$124,379	\$119,354
GROSS RETURNS (Alt F)			
25. Wheat	0	\$0	\$0
26. Corn	\$68,693	\$55,150	\$56,418
27. Milo	\$0	\$0	\$0
28. Soybeans	\$60,509	\$60,509	\$61,741
29. Total Non-Program Income	\$0	\$0	\$0
30. CRP Income	\$0	\$0	\$0
31. Total Commodity Program Payments	\$0	\$10,010	\$10,010
32. Hay or Graze Income	\$0	\$0	\$0
TOTAL RETURNS	\$129,202	\$125,669	\$128,169
NET RETURNS	\$684	\$1,290	\$8,815

Figure 10. Whole Farm Enterprise Budget

column of the budget, the farmer will enter cost and return information as it pertains to the current farming situation. The farmer will have to provide much of the information required; however, some information may be calculated in other parts of the model. The net returns for this situation are shown in the final line of the budget.

In this case it will be assumed that changes are needed in the CURRENT situation in order to comply with soil loss provisions of the Food Security Act. In order to make these changes, a conservation plan will need to be developed. At this point, the farmer and the SCS personnel who are assisting can devise a plan which they think will comply. The values for this plan are then entered in the column labeled CASE 2 of the budget. Some of the values needed, such as labor and seed, will have to be estimates; others, such as interest on owned land and annualized conservation structures costs, can be calculated using the model. This process can be repeated as many times as necessary.

When all the viable conservation plans have been developed, the farmer can analyze the net returns and other components of the plans and choose the one that best fits his or her situation.

RESULTS

This study was undertaken in order to develop a spreadsheet model to assist farmers in developing conservation plans. The model contains sections for estimating costs and returns associated with the various aspects of conservation planning. It can also be used to determine whether proposed conservation plans meet the compliance provisions of the Food Security Act of 1985. Finally, the costs and returns of the

farming enterprise are integrated in the Enterprise Budget of the spreadsheet so that net returns can be compared. However, there is more to consider than net returns when developing conservation plans.

The first matter of concern for many farmers is conservation compliance. For those farmers who choose not to participate in government programs, this will not be a worry. Those who do participate need to determine if they meet the compliance provisions of the Food Security Act. The local SCS office should be able to assist in this matter. Farmers already in compliance need not be concerned with conservation planning. However, farmers not in compliance will have to determine what must be done to comply, or whether non-compliance is the better option.

The second matter of concern involves the components of the conservation plan. Due to the state of the agricultural economy, farmers who do not currently comply are limited with regard to conservation plans which they can undertake. The Doniphan County District Conservation Board estimates that many farmers will need over 100,000 dollars to implement the practices which would bring them into compliance (USDA Soil Conservation Service, 1987). If corn-soybean farmers using conventional tillage cannot afford this, or cannot obtain financing to implement the needed practices, their options are limited. In that case, they may be forced to implement a less expensive practice such as no-tillage, or switch to a different cropping system in order to comply.

Another factor to consider when developing conservation plans is the CRP. Farmers may come into compliance by entering all of their highly erodible land in the CRP. In doing this, the income of farmers in

Doniphan County may be reduced substantially, depending on the bid rate received by the farmer. This may not appear as an attractive alternative on the Enterprise Budget. However, the farmer may be able to find employment off of the farm in order to compensate for the lost farm income. The farmer might also reduce machinery expenditures by decreasing the size and amount of machinery needed to carry out the farming operations on the remaining land. In conclusion, there are many factors to consider when developing conservation plans. This model will help to consider many, but not all of them.

In order to develop a viable conservation plan, it is necessary to have an understanding of the manner in which costs and returns change as a result of different conservation plans. Example Enterprise Budgets (Figure 10) will be used to demonstrate some of these changes. The values contained in these budgets are in no way reflective of actual conditions in Doniphan County or anywhere else. They are used solely for demonstration purposes.

The farm used in these examples is a 640 acre farm with 320 acres of corn and 320 acres of soybeans. The corn acres include 90 acres of highly erodible land. The farmer owns 192 acres (96 corn and 96 soybeans), rents 448 acres (224 corn and 224 soybeans), and does not participate in the government programs.

Case 1 is the current farming situation. Variable costs are entered in the first 16 lines of the budget. Fixed costs are entered in lines 18-24 and Gross Returns are entered in lines 25-36.

The first conservation plan which will be considered is Case 2. In this case, the farmer wishes to continue conventional tillage and participate in the farm programs. He or she proposes installing steep backslope terraces on the 90 acres of highly erodible land in order to maintain compliance. At this point, the user of the model should go to the USLE to determine what parameters of the USLE (Figure 11) are needed in order to meet the compliance provisions of the Food Security Act. For this example, it was determined that it is possible to come into compliance by installing steep backslope terraces.

Notice that in Case 2 the variable costs are lower than in Case 1. This is because the farmer reduced his or her cultivated land by 64 acres as part of the Acreage Reduction Program, and because the grassed backslopes on the terraces take approximately 10 percent of the terraced land out of production. Current land maintenance costs in Case 2 have been reduced to zero. This is based on the assumption that the terraces have eliminated erosion problems on the highly erodible land; hence, there is no need for current land maintenance. However, an operation and maintenance cost is now added because of the installation of terraces.

In this case, the farmer uses the same land and machinery complement as in Case 1. The only fixed costs that change from Case 1 are reflected in the Annualized Conservation Structure Cost which results from the installation of the terraces.

The final section of the budget in Case 2 is the Gross Returns section. Gross returns for corn in Case 2 are less than in Case 1. This is due once again to the decrease in the number of acres which are cultivated in this plan. Returns from soybeans remain unchanged since

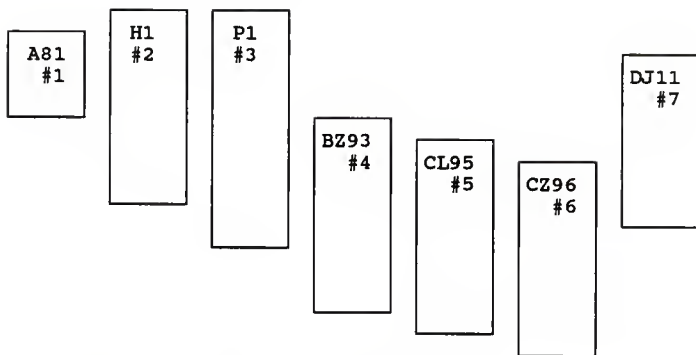


Figure 11. Diagram of the Cell Location of Major Sections in spreadsheet

- #1.- Index
- #2.- Universal Soil Loss Equation
- #3.- Conservation Structures
- #4.- 1988 Government Farm Programs
- #5.- Enterprise Budgets
- #6.- Calculators for Land Cost, Machinery Amortization, and Machinery Insurance and Housing
- #7.- Conservation Reserve Program Worksheet

Cell locations are located at the upper left hand corner of each section.

they are not a program crop. The farmer also receives a deficiency payment for corn. This is shown in the Total Commodity Program Payments line.

The final case which will be considered is Case 3. In this case, the farmer has decided to use a no-tillage operation in order to come into compliance with the Food Security Act. Once again, the user should go to the USLE to determine if it is possible to reduce erosion losses to acceptable levels using this practice. It is again assumed that compliance can be reached with this conservation plan.

There are several changes which need to be noted in this case. Labor, fuel, oil, and machinery repair under the no-tillage system are decreased due to the reduced amount of time and field operations required with no-tillage systems. Seeding and fertilizer costs are the same on a per acre basis for all three cases. The actual differences which are entered in the Enterprise Budget are due to the different number of acres farmed in each plan. The greatest changes that occur with this system are the herbicide and custom hire costs. These costs result from the fact that no-tillage systems often require increased amounts of herbicide in order to keep weed problems under control. The increased custom hire costs result because, in this case, the farmer needed to contract an applicator to apply the extra amount of herbicide.

The system with the lowest fixed costs is the no-tillage system. Although the rent has gone up slightly due to an increase in yields, the biggest change is in the machinery costs. No-tillage systems do not require as much machinery as conventional systems. In this case, the farmer was able to sell unneeded conventional-tillage machinery and

purchase the necessary no-tillage machinery. The ending result is that the total machinery costs for Case 3 are lower than in the first two cases.

Total returns in Case 3 are less than in Case 1 because the farmer is farming less total acres with this plan. Total returns in Case 3 are higher than in Case 2 because the no-tillage operation has a slightly higher yield.

Many of the conservation plans which are possible in Doniphan County were not considered in these examples. That was not the objective of this project. The purpose of these examples was to make users of this model aware that as conservation plans change, the costs and returns that make up the plans also need to change to reflect the new conditions. If this is done correctly, this model can be used quite effectively to evaluate conservation plans.

DISCUSSION

Procedures used in this conservation planning model require the input of a large amount of information associated with the development of conservation plans. Soil Conservation Service personnel and participating farmers must work together to supply this information in order to develop viable plans. Once the information is supplied, the SCS should provide technical assistance to farmers in order to complete the conservation planning process.

Information entered in the USLE will determine if conservation plans are in compliance with the Food Security Act. To accomplish this, the operator must be familiar with the application of the USLE. This will

enable the operator to enter the factors of the USLE which most accurately reflect the conditions of the conservation plan. For plans which do not meet the compliance provisions of the Food Security Act, the farmer and SCS personnel can discuss possible options for the farmer, and can then reenter the new factors in the equation.

Determination of accurate costs for conservation structures depends on several factors. First of all, it must be determined which fields need structures installed on them and what type of structure to use. Once these decisions have been made, an estimate is needed for the size of each structure and the costs associated with construction. In addition, structures which require underground outlets will require an estimate of the amount of hardware needed to complete the outlet system. Several estimates are used in this process. Care should be taken to make them as precise as possible.

The 1988 Government Farm Program section calculates several returns which have a large impact on the viability of each conservation plan. In order to use this section the farmer must assemble the necessary farm program information as it applies to his or her own farm. This information can be acquired from the county ASCS office. It is also necessary to know the prices which are used in the farm programs (12-month price, loan rate, etc.). To maximize returns to the farmer, it is essential that those people who provide technical assistance be familiar with the farm programs available and how they work.

Values generated in the machinery amortization section depend on the machinery complement owned by the farmer. To calculate current amortization costs, the farmer must provide the purchase price or the

current value of each piece of machinery he or she presently owns. In addition, the expected life or the remaining life of each piece is also needed. In order to calculate machinery amortization costs for the conservation plans, the machinery needed in each plan must be determined. The farmer can then determine which pieces he or she must buy, and which ones can be sold from the current machinery complement, in order to arrive at the necessary machinery complement.

In order to calculate a bid for entrance of land into the CRP, it is necessary to become familiar with the way the program is implemented. With some planning, farmers in certain locations may be able to collect fees from hunting and camping on the CRP land, or may be able to salvage products off the land at the close of the ten year CRP contract. These are just a few of the important factors which must be considered when estimating a bid. Whichever route the farmer chooses, it is wise to make sure before installing any practices that they are eligible for cost sharing from the USDA.

It is recognized that the off-site costs of soil erosion in Doniphan County are substantial. However, due to the enormity of that problem, this model does not attempt to quantify any of those costs. The model only attempts to quantify the costs and returns to farmers for the conservation plans they select.

The net returns which are calculated in the Enterprise Budget should not be expected in actuality. They should be used only for purposes of comparing conservation plans. There are several reasons for this:

- 1) Selling prices for commodities are unknown.
- 2) Records supplied by the farmer may be incomplete.

- 3) Actual interest rates may be different than those used in the model.
- 4) The model has several locations where estimates must be used.

It is important that the values used in this model reflect actual conditions as closely as possible since the net returns which are generated are only as good as the values used in generating them.

CONCLUSION

The objective of this project has been achieved. An electronic spreadsheet model for evaluating conservation plans in Doniphan County has been developed.

The model contains several sections in which the costs and benefits associated with the development of conservation plans are estimated. Farmers, with technical assistance from the Soil Conservation Service, can use the model to evaluate and compare conservation plans which meet the conservation provisions of the Food Security Act of 1985.

SUGGESTIONS FOR FUTURE RESEARCH

The model that was developed in this project can be used to determine the costs and benefits of complying with the conservation provisions of the Food Security Act of 1985. Previously, much of this information was unavailable in a form in which these values could be readily determined. Now, however, a framework has been developed which can determine these values.

For example, Congressman Jim Slattery's office recently contacted us requesting information regarding terrace installation. Specifically, they

wanted to know which types of terraces should be used on various slopes and soil types in Doniphan County. They also inquired about the cost of installing such systems. We were unable to answer their questions at the time; however, this model could now be used to determine such information.

Although the model was designed to evaluate conservation plans specifically for Doniphan County, farmers all over Kansas need to develop conservation plans. With a few minor changes, this model can be adapted to each county. Once this is completed, the model can determine the types of conservation plans which are most economically feasible for specific situations.

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Appendix A.

User's Guide for CONSPLAN.WK1

USER'S GUIDE FOR CONSPLAN.WK1
AN ELECTRONIC SPREADSHEET MODEL FOR COMPARING
CONSERVATION PLANS FOR DONIPHAN COUNTY, KANSAS

Agricultural Engineering Department
Agricultural Economics Department

Kansas State University

April 1988

Development of this spreadsheet was made possible with funding from the Kansas Soil Conservation Service in cooperative agreement with the Departments of Agricultural Engineering and Agricultural Economics, Kansas State University.

CONSPLAN.WK1 (Figure 1) is designed to evaluate conservation plans for Doniphan County, Kansas. Acceptable conservation plans must meet the requirements established by the Food Security Act (FSA) of 1985. The FSA requires that soil erosion on all "highly erodible land" be reduced to levels which are technically and economically achievable by January 1, 1995 (USDA Fact Sheet, 1986). If conservation plans meet this requirement, the farmer will remain eligible for future participation in USDA farm programs. If conservation plans do not meet the requirement, the farmer will no longer receive USDA benefits. With this spreadsheet several conservation plans for a single farm can be analyzed and the best one chosen.

The file that is used for this evaluation is called CONSPLAN.WK1. If a double disk drive computer is used, place the disk containing this file in the B drive and then retrieve it. If a computer with a hard disk is used, store the file on the hard disk and retrieve it from there. Each time the file is used, save the newly created file containing the conservation plans to a new file name.

After the file has been retrieved, the spreadsheet will automatically move to the introduction screen (Figure 2). At this point, follow the instructions which are given on the screen, as well as the instructions in the User's Guide. As you proceed down through the spreadsheet, the index will appear (Figure 3). The index contains the macro instructions which enable the user to move quickly from one section of the spreadsheet to another. The screens following the index contain instructions for printing the major sections of the spreadsheet and for saving the working file, as well as a list of the function keys with which the user

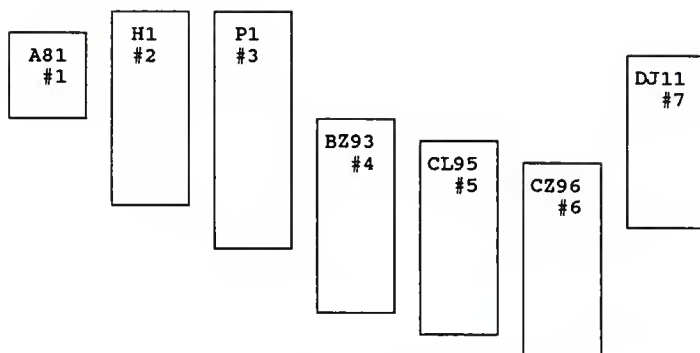


Figure 1. Diagram of the Cell Location of Major Sections in spreadsheet

- #1.- Index
- #2.- Universal Soil Loss Equation
- #3.- Conservation Structures
- #4.- 1988 Government Farm Programs
- #5.- Enterprise Budgets
- #6.- Calculators for Land Cost, Machinery Amortization, and Machinery Insurance and Housing
- #7.- Conservation Reserve Program Worksheet

Cell locations are located at the upper left hand corner of each section.

```

41  A          B          C          D          E          F          G
42  *****
43  ELECTRONIC SPREADSHEET MODEL FOR COMPARING CONSERVATION
44  PLANS FOR DONTIPHAN COUNTY, KANSAS
45
46
47  DEVELOPEMENT OF THIS SPREADSHEET WAS MADE POSSIBLE WITH
48  FUNDING FROM THE
49
50  KANSAS SOIL CONSERVATION SERVICE
51
52  IN COOPERATIVE AGREEMENT WITH THE DEPARTMENTS OF
53  AGRICULTURAL ENGINEERING AND AGRICULTURAL ECONOMICS
54  KANSAS STATE UNIVERSITY
55
56
57
58
59  (PAGE DOWN)
60  *****

```

Figure 2. Introduction Screen for CONSPLAN.WK1

```

81  A          B          C          D          E          F          G
82  ***** INDEX *****
83
84  Alt I   INDEX
85
86  Alt E   ENTERPRISE BUDGET
87
88  Alt U   UNIVERSAL SOIL LOSS EQUATION
89
90  Alt C   CONSERVATION STRUCIURES
91
92  Alt F   FARM PROGRAM
93
94  Alt L   CALCULATORS FOR LAND COST, MACHINERY AMORITIZATION
95  AND MACHINERY INSURANCE AND HOUSING
96
97  Alt R   CONSERVATION RESERVE PROGRAM
98  BID WORKSHEET
99
100 (PAGE DOWN)
*****

```

Figure 3. Index Screen

should be familiar. The function keys needed for this model are: F5, which is used to quickly move the cell pointer from one area of the spreadsheet to another, and F9, which is used to manually recalculate the spreadsheet.

CONSPLAN.WK1 has been placed in the Lotus 1-2-3** global protection mode. This means that the entire model has been protected from further revisions of any kind. Any attempt to edit or delete existing cells results in the program going into the ERROR mode. The user will also receive the error message "Protected Cell." Lotus 1-2-3 indicates which cells are protected by adding the abbreviation PR before the display of the cell's literal contents on the first line of the Control Panel. Those cells which do not have the PR abbreviation on the Control Panel may have data entered into them. In order to insert new data in areas of the spreadsheet which are protected, simply turn off the global protection and insert the new values. However, be certain to reactivate the global protection before resuming use of the model.

As the user proceeds to work through the model, data will be entered in some cells, while other cells will contain formulas. Unless otherwise noted, those cells which contain formulas will be denoted in the User's Guide by an asterisk (*) following the line number.

The spreadsheet has six major sections. In the following pages, a brief description of how to use each section will be given.

** "LOTUS 1-2-3" is a trademark of Lotus Development Corporation. Any mention of trade names or commercial products in the User's Guide does not constitute an endorsement from Kansas State University.

ENTERPRISE BUDGET (Alt E)

Enterprise budgets (Figure 4) are used in this model to project annual costs and returns for each conservation plan, enabling the farm manager to compare several conservation plans and select the one which is most economically achievable. For example, enterprise budgets for conventional tillage and no-tillage systems can be developed and compared. Assuming production is for an equal land area, the budget would show differences in several inputs such as labor, herbicide, fertilizer, and fuel costs. The budgets would also show differences in fixed costs such as machinery amortization, machinery insurance and housing, and in gross and net returns. After the necessary information has been entered in the budget, the farm manager can evaluate the pros and cons of each plan and then make a decision as to which plan to pursue. It is important when developing conservation plans to enter values which reflect the conditions of the conservation plans as accurately as possible.

In the first column of the Enterprise Budget enter information as it pertains to the farmer's current situation. In the subsequent columns enter information as it pertains to the conservation plan which is under consideration. Each row of every conservation plan in the budget might not contain a value, depending on the contents of the plan. Some information for a conservation plan, e.g. labor costs, may not be known. In these situations, an estimate will need to be made.

```

          CL             CM      CN      CO      CP
95 *****
96 WHOLE FARM ENTERPRISE BUDGET
97 *****
98
99 The Enterprise budget is used to calculate costs and returns for the
100 whole farm. In the first column enter values from the current farming
101 situation. In the following columns enter information as it pertains
102 to the conservation plan that is presently being considered.
103
104
105
106             For examples go to CR113
107
108             RESULTS ARE TO BE USED FOR COMPARISON PURPOSES ONLY,
109             YOUR ACTUAL INCOME MAY BE DIFFERENT
110
111
112             Alt H to Print Enterprise Budget
113
114
114                                     (PAGE DOWN)

```

Figure 4. Whole Farm Enterprise Budget Screen

```

          H      I      J      K      L      M      N      O
1 *****
2             UNIVERSAL SOIL LOSS EQUATION
3 -----
4
5 The USLE is used to determine if conservation plans meet the require-
6 ments of the Food Security Act of 1985.
7 -----
8
9
10 1. RAINFALL (R) FACTOR for DONIPHAN COUNTY:                200
11
12 *****
13             SOIL ERODIBILITY (K) FACTORS FOR DONIPHAN COUNTY
14
15             Choose a soil profile and enter its number in line 2.
16
17
18 2. Soil Profile Number:                1
19                                     _____
20

```

Figure 5. Universal Soil Loss Equation Screen

Variable Costs

Variable costs are expenses for production inputs which are used in one production period. The amount of inputs consumed depends on the amount of output desired, and in this case, the components of each conservation plan. Variable costs that apply to the current farming situation are entered in the first column. The farmer must provide the information needed in this column. In the subsequent columns of the Variable Costs section, estimates that reflect the conditions of each conservation plan must be made. In the last row of the variable cost section, enter an interest rate which could be received on a short term loan.

Fixed Costs

Fixed costs are expenses borne by the producer regardless of the level of output desired. If output is reduced to zero, these costs still occur. Fixed costs that apply to the current farming situation are entered in the first column. In the subsequent columns of the Fixed Costs section, enter fixed costs that reflect the conditions of the conservation plans under consideration. In this model, some fixed costs will come from the farmer's records, while others can be calculated by using the appropriate sections of the model.

- 18) Real Estate Taxes: These will come from the farmer's records.
- 19) Interest on Land: Go to the Land Cost Calculator (Alt L) to calculate this value.
- 20) Rent - Cash and Share: Total rent paid out by the farmer.

- 21) Amortized Machinery Costs: Go to the Machinery Amortization Calculator (Alt L) to calculate this value.
- 22) Machinery Insurance and Housing: Go to the Machinery Insurance and Housing Calculator (Alt L) to calculate this value.
- 23) Annualized Conservation Structure Cost: Go to the Conservation Structures section (Alt P) to calculate this value.
- 24) Annualized Conservation Reserve Program Expenses: Go to the Farm Program (Alt F) to calculate this value.

Gross Returns

In order to calculate Gross Returns go to the Farm Program Section (Alt F).

Net Returns generated for each conservation plan should be used for comparison purposes only. Actual net income that can be expected by the farmer may be different than the net returns calculated with this model.

UNIVERSAL SOIL LOSS EQUATION (Alt U)

The USLE (Figure 5) is used to determine if proposed conservation plans meet the requirements of the Food Security Act of 1985. Instructions and tables are included in this section so that each factor of the USLE (RKLSCP) can be easily determined and entered in the appropriate cell. A summary at the conclusion of the USLE shows all the selections which have been made. Located below the summary are cells containing the maximum allowable soil loss for this soil type, and the actual soil loss in tons per acre per year for this field. If soil losses are not acceptable,

the conservation plan can be modified until it becomes acceptable.

Rainfall (R) Factor for Doniphan County: The rainfall factor for Doniphan County is 200.

Soil Erodibility Factors (K) for Doniphan County: Soil types for Doniphan County are listed in this section. Choose a soil profile from the choices provided and enter the soil profile number in line 2. Several profiles have the same names but different abbreviations; be sure to choose the correct one. The chosen profile and its K value are shown in line 3.

Slope Length and Gradient Factors (LS): Enter the slope length (feet) in line 4, and the slope gradient (feet per 100 feet) in line 5. The LS factor is calculated in line 6.

Cover and Management Factor: A C factor may be selected from the table that is provided, or a weighted C factor may be calculated. Weighted C factors can be calculated by moving to row 113 and entering the crop, acres, and C factor for each crop. The weighted C factor is shown in line 7. After a C factor is chosen, enter it in row 142 under either high, average, or low production. Be sure that the unused columns contain zeros.

High Production: 100 bushels per acre Corn or Sorghum, or
40 bushels per acre Soybeans or Small Grain.

Low Production: Less than 60 bushels per acre Corn or Sorghum, or
less than 20 bushels per acre Soybeans or Small
Grain.

The adjusted C factor which is used in the USLE is shown in line 8.

Support Practice (P) Factors: Select a Terrace P Factor from Table A and a Support Practice Factor from Table B; enter them in row 197. The P factor which is used in the USLE is shown in line 9.

Summary of the USLE: The summary of the USLE shows all selections which have been made. Line 10 shows the maximum allowable soil erosion losses for this soil type, while line 11 shows the actual soil erosion losses for this field.

CONSERVATION STRUCTURES (Alt C)

This section (Figure 6) is used to calculate annualized installation costs and annualized operation and maintenance costs for terraces, waterways, diversions, and water and sediment control basins. Some of these structures may not be needed in each conservation plan. If this is the case, simply disregard the unused sections; however, make sure that each OUTPUT section contains all zeros. This can be done by placing zeros in line seven of the terrace INPUT section and in the first line of each INPUT section of the other structures.

Terraces

Three types of terrace cross sections are available for conservation plans. They are steep backslope (grassback) (Alt G), narrowbase (Alt N), and broadbase (Alt B). Terrace cross sections can be chosen by invoking the appropriate macro. After a terrace cross section is chosen, enter the needed information in the INPUT sections; results will be calculated in the OUTPUT sections.

```

1      P      Q      R      S      T      U      V      W
2      *****
3      CONSERVATION STRUCTURES
4      -----
5      This section is used to calculate annualized costs for Terraces,
6      Waterways, Diversions, and Water and Sediment Basins.
7
8
9      -----
10     TERRACES
11     -----
12
13     Terracing plans can be made for up to three separate fields. After
14     plans have been made for a field, invoke the appropriate macro. Macros
15     are listed below the OUTPUT section.
16
17     Enter the appropriate information in the INPUT sections; results will
18     be calculated in the OUTPUT sections.
19
20
(PAGE DOWN)

```

Figure 6. Conservation Structures Screen

```

          BZ      CA      CB      CC      CD      CE      CF      CG      CH      CI
93     *****
94     ** 1988 GOVERNMENT FARM PROGRAMS **
95     -----
96     COMBINED CROPS
97
98     CRP BASE ADJUSTMENT - Complete this section regardless of participation
99     in the Conservation Reserve Program. If land is entered in the CRP, the
100    correct base acreage for the Commodity Program will be calculated.
101
102    CRP INCOME & EXPENSES - This section is used to calculate annual income
103    and annualized expenses from participation in the CRP.
104
105    COMMODITY PROGRAM - Income from the Government Commodity Program can be
106    calculated in this section. Two types of farmer participation are pos-
107    sible: 1) Participation in the Acreage Reduction Program, or 2) 0/92
108    Participation. After completion go to BZ198 for a summary.
109
110    NON-PARTICIPATION - Income from non-participation in the Government
111    Commodity Program can be calculated by going to cell BZ 223.
112
113
Alt J to Print Farm Program (PAGE DOWN)

```

Figure 7. 1988 Government Farm Programs Screen

Each conservation plan may include up to three separate fields. This is done by first choosing a terrace cross section, then completing the INPUT section for that field. After this is done, invoke the macro for the first field. For succeeding fields, repeat the same process, except use the second and third field macros.

The field macros are:

Alt A - Field 1

Alt D - Field 2

Alt M - Field 3

Input Section

- 1) Terraced Area: Acreage of the field on which the terraces are installed.
- 2) Land Slope: Slope of the field in decimal notation.
- 3) Earthwork Cost: For broadbase terraces, this is the construction cost in dollars per linear foot of terrace. For steep backslope and narrowbase terraces, this is the construction cost in dollars per cubic yard of earth moved.
- 4) Cost of Seeding Backslope: Total cost of seeding the backslopes of steep backslope and narrow base terraces on a per acre basis (seed, fertilizer, etc.).
- 5) Interest Rate: Use an interest rate for borrowed money or owner's equity.
- 6) Life of Structure: Number of years terrace system is expected to last.

- 7) Length of Terraces Installed: Total length of terraces which will be installed on this field (lin.ft.). An estimate will need to be made using topographic maps or some other method.
- 8) Miscellaneous Costs: Costs such as land clearing, etc.
- 9) Costs of underground outlets: If underground outlets are used on this field, go to the Terrace Underground Outlet Worksheet (Alt T). Complete this worksheet by choosing the appropriate hardware (pipe, risers, hand tamping, etc.) and entering the quantity in the QUAN column. When this section is complete, return to cell P38. The total will automatically be transferred back to the OUTPUT section. Use of this section requires an approximate estimate of the amount of hardware needed for each field.

The source of the prices used in the terrace and basin outlet systems is Attachment 1 to Kansas Bulletin No. KS300-7-25, 8/21/87. In order to change these values, go to cell BE130 and turn off the global protection. Insert the new prices in the appropriate cells and reactivate the global protection.

Output Section

Information entered in the INPUT section is used to calculate values contained in this section.

Summary of Terrace System Costs: This section summarizes the total terrace system costs. It also calculates annualized terrace payments and annualized operation and maintenance costs.

- 1)* Installation cost for this field: Total installation cost for the field on which planning was just completed.

- 2)* Installation Costs: Installation costs for each field.
- 3)* Total Installation Costs: Total installation cost for all fields.
- 4) Cost Sharing Rate: Enter the cost sharing percentage that the government will use to assist farmers in the construction of conservation structures.
- 5) Cost Sharing Annual Limit: Enter the total annual limit the government will pay each farmer for construction of conservation structures.
- 6) Terrace Cost Sharing
- a)* Terrace Installation Cost: Total installation cost for all fields.

Distribute the total installation cost throughout the Installation Cost column (col. 2). Allocate according to the amount the farmer wishes to spend on the construction of terraces for each year. Costs do not have to be distributed equally, nor do all years have to be used; however, keep in mind that conservation plans must be fully implemented by 1995. One scenario would be for the farmer to spend the minimum amount for a given year, so that the annual cost sharing limit for that year is used up. Repeat this procedure in each of the following years until the entire terrace system has been installed.

- 7)* Present Value of Column 4: This is the present value of the stream of payments (after cost sharing) that are made over the years (col. 4) for the installation of the terrace system.
- 8)* Annualized Terrace Payment: The value in line 7 is amortized over the life of the structure at the interest rate entered in the INPUT section.

9)* Annualized Terrace Operation and Maintenance Costs: Annual O & M costs are obtained by multiplying the present value of the stream of installation costs (col. 2) by two percent.

The source of the Operation and Maintenance percentages is USDA-SCS Section V-A TG Notice KS-127, 7/85. In order to change the O & M values go to cell X5, turn off the global protection and insert the new values. When finished reactivate the global protection.

Waterway

Input Section

- 1) Waterway Area: Total area of the waterway (acres). If more than one waterway is to be installed, use the total area of all waterways.
- 2) Shaping Cost: Cost in dollars per acre that a contractor charges for shaping waterways.
- 3) Seeding Costs: Seeding costs in dollars per acre (seed, fertilizer, etc.).
- 4) Interest Rate: Use an interest rate for borrowed money or owner's equity.
- 5) Life of Structure: Number of years the waterway is expected to last.
- 6) Miscellaneous Costs: Costs such as land clearing, etc.

Output Section

Information entered in the INPUT section is used to calculate the values in this section.

- 4) **Waterway Cost Sharing:** This section works the same as the terrace cost sharing section. Enter values in exactly the same manner. One difference to notice, however, is the output in column 3. If the annual cost sharing limit for any year is reached with the terrace system, there will be no money left over to apply to the waterway system for that year. If only a portion of the annual limit is used on the installation of terraces for any year, the balance will be applied to the waterway for that year. This process works in the same manner for the diversions and the water and sediment control basins.

Diversion

Input Section

- 1) **Amount of Earth Moved:** Total amount of earth moved to construct the diversion (cu. yds.). If more than one diversion is to be constructed, use the total amount of earth moved for all diversions.
- 2) **Earthwork Cost:** Cost in dollars per cubic yard for construction of the diversion.
- 3) **Total Seeding Cost:** Seeding cost for the entire diversion (seed, fertilizer, etc.).
- 4) **Interest Rate:** Use an interest rate for borrowed money or owner's equity.
- 5) **Life of Structure:** Number of years diversion is expected to last.
- 6) **Miscellaneous Costs:** Costs such as land clearing.

Output Section

Values in this section are calculated from information entered in the INPUT section.

- 3) Diversion Cost Sharing: Complete this section in the same manner as the two previous cost sharing sections.

Water and Sediment Basins

Input Section

- 1) Amount of Earth Moved: Total amount of earth moved for one or more basins (cu. yds.).
- 2) Earthwork Cost: Cost in dollars per cubic yard for construction of the basin.
- 3) Total Seeding Cost: Seeding Cost for the entire basin (seed, fertilizer, etc.).
- 4) Interest Rate: Use an interest rate for borrowed money or owner's equity.
- 5) Life of Structure: Number of years the basin is expected to last.
- 6) Miscellaneous Costs: Costs such as land clearing, etc.
- 7) If an underground outlet system is to be used, go to the Basin Underground Outlet Worksheet (Alt O) and complete it in the same manner as was done with the terrace underground outlet system.

Output Section

Values in this section are calculated from the information entered in the INPUT section.

4) Water and Sediment Basin Cost Sharing: Complete this section in the same manner as the three previous cost sharing sections.

A.* TOTAL ANNUAL CONSERVATION STRUCTURE COST: This is the total annual installation cost for all structures. Transfer this value to the appropriate column in line 23 of the Enterprise budget.

B.* TOTAL ANNUAL OPERATION AND MAINTENANCE COSTS: This is the total annual operation and maintenance cost for all structures. Transfer this value to the appropriate column in line 12 of the Enterprise budget.

1988 GOVERNMENT FARM PROGRAMS (Alt F)

Use this section (Figure 7) to estimate income from participation and non-participation in government farm programs.

Conservation Reserve Program Base Adjustment: When land is entered in the CRP, the base acreage of the farm is affected. CRP base adjustment is used to calculate a new base acreage. Complete this section regardless of participation in the CRP.

- 1) Total Acres of Cropland on Farm: This is not the base acres; however, they may be the same.
- 2) Base Acres: Available from the county ASCS office.
- 3) Acres Entered in the CRP: Number of acres you plan to enter in the CRP.
- 4)* Base Acreage Reduction: Number of acres the base is reduced because of land entered in the CRP.

5)* Adjusted Base: Total base acreage available for use in the commodity program.

6)* Available Acres of Non-Participation Crop: These acres can be planted to a non-program crop such as soybeans. In order to determine income from this crop, enter the acres, yield, and price in the NON-PARTICIPATE column of the COMMODITY PROGRAM section.

CRP Income and Expenses: Use this section to determine income and expenses from participation in the Conservation Reserve Program. Disregard if not participating in the CRP.

1) CRP Payments: Bid rate that can be expected for land accepted into the CRP (\$/ac.).

2) Interest Rate: Use an interest rate for borrowed money or owner's equity.

3) Cost of Establishing CRP Acres: Your total cost to establish the CRP acres. Remember to subtract the government share of the establishment cost.

4)* Income from CRP Acres: Total income from the CRP acres. Transfer this value to the appropriate column in line 32 of the Enterprise budget.

5)* Annual CRP Establishment Expense: Annual establishment expense paid out over the ten years of the CRP contract. Transfer this value to the appropriate column in line 24 of the Enterprise budget.

Commodity Program: Income from participation in the government commodity program is calculated in this section. A farmer can choose to

either Participate or 0/92 Participate in the commodity program. If the current conservation plan includes Participation, work through only that section, then transfer the appropriate values to the budget. If the next conservation plan uses 0/92 Participation, work only that section, then once again transfer the appropriate values to the budget. Enter values in the INPUT section; results are calculated in the OUTPUT section. A summary of the values which should be transferred to the Enterprise Budget is located at the conclusion (cell BZ199) of the Farm Program section.

Input Section

- 1) Base Acres: Enter the base acres allowed for each crop. Total Base Acres cannot exceed the Adjusted Base which was calculated in the CRP Base Adjustment.
- 2) Proven Yield: Established for each crop by the county ASCS office.
- 3) Expected Yield: Yield expected by farmer at harvest.
- 4) Percent to Idle (ARP): Established by the government Acreage Reduction Program.
- 5) Percent Diversion (optional): These are additional acres which can be idled and still receive government payments. For feed grains, percent diversion ranges from zero to fifteen percent. If the maximum percent diversion changes, go to cell BX202 and insert the new value.
- 6) Diversion Payment per Bushel: Payment per bushel for acres idled by the diversion program. Available from the ASCS office.
- 7)* Permitted Program Acres: Acres of each crop you are allowed to plant while participating in the ARP.

- 8) **Planted Acres:** Enter number of acres you intend to plant for each crop. Planted Acres cannot exceed the Permitted Program Acres.
- 9)* **Need to Idle:** Number of acres you need to idle under the ARP.

Prices in lines 10 through 14 change frequently and need to be periodically updated.

- 10) **Sell Price:** Market price at which you expect to sell the crop.
- 11) **12-Month Price:** Price the government uses to calculate the deficiency payment, if higher than the loan rate. Available from the ASCS office.
- 12) **Announced Loan Rate:** Loan rate used by the government for the current crop year. Available from the ASCS office.
- 13) **Statute Loan Rate:** Loan rate called for by the Secretary of Agriculture in the Food Security Act of 1985. Available from the ASCS office.
- 14) **Target Price:** Price level established by law and announced by the Secretary of Agriculture. Available from the ASCS office.
- 15) **Total Hay/Graze Income:** Income expected from haying or grazing of total acres being analyzed.

Non-Program Crop Acres and Income if Underplanted

- 16)* **Acres Available:** If the base acres for each crop are not fully planted, these acres will be available for planting to a non-program crop.
- a. **Crop:** Enter the name of the crop.
- b. **Yield:** Yield expected at harvest.

c. Price: Price at which you expect to sell the crop.

d.* Gross Return: Total returns for the crop.

Output Section

Values entered in the input section are used to calculate the values in this section.

Summary of Government Commodity Program: This section summarizes income from participation in the commodity program. Transfer these values to the appropriate columns in the Gross Returns section of the Enterprise Budget.

Income from Non-Participation: Use this section to calculate income for conservation plans which do not include participation in the commodity program. Enter crop, acres, yield, and price in the correct columns. Once again, transfer these values to the appropriate columns in the Gross Returns section of the Enterprise Budget.

LAND COST CALCULATOR (Alt L)

This section (Figure 8) is used to calculate interest on land owned by the farmer.

- 1) Land Value per Acre
- 2) Interest Rate: Use an interest rate which could be received on a very safe investment such as a savings account or a certificate of deposit.
- 3) Total Acres Owned: Acres owned by the farmer.

```

      CZ          DA          DB          DC          DD          DE
96 *****
97 LAND COST CALCULATOR - This section is used calculate interest costs on
98 land owned by the farmer.
99
100 AMORTIZED MACHINERY COSTS (current situation) - In this section, costs
101 of owning machinery are amortized over the life of the machine. Enter
102 the purchase price, life, and salvage value of each piece of machinery
103 in the current equipment complement.
104
105 ADJUSTMENTS TO AMORTIZATION COSTS FOR MACHINERY BOUGHT OR SOLD -
106 Conservation plans may require a different machinery complement than
107 the one that is currently being used. In this section enter the
108 purchase price, life, and salvage value of each piece of machinery that
109 is bought or sold as a result of changing conservation plans.
110
111 MACHINERY INSURANCE AND HOUSING CALCULATOR - This section calculates
112 insurance and housing values for the original machinery complement and
113 makes adjustments for new machinery complements.
114
115
                                     (PAGE DOWN)

```

Figure 8. Calculators for Land Cost, Machinery Amortization, and Machinery Insurance and Housing Screen

```

      DJ          DK          DL          DM          DN          DO          DP          DQ
11 *****
12 CONSERVATION RESERVE PROGRAM
13 BID WORKSHEET
14 -----
15
16 This worksheet is used to estimate a bid which can be used to enter
17 highly erodible land into the CRP. If the going rate for acceptance
18 into the CRP is already known, disregard this section.
19
20 Go to DR18 for an example
21
22 Alt K to Print CRP Section
23 *****
24 Acres to Enter in CRP                                0
25
26 *****
27
28 1. Estimated Average Annual Returns to Farm Without CRP Participation
29
30

```

Figure 9. Conservation Reserve Program Bid Worksheet Screen

- 4)* Interest on Land: Transfer this value to the appropriate column in line 19 of the Enterprise Budget.

AMORTIZED MACHINERY COSTS (Alt L)

Use this section for the CURRENT equipment complement only.

In this section, costs of owning machinery are amortized over the life of the machines. Enter information as it pertains to the current farming situation.

- A) Interest Rate: Enter an interest rate which can be received on borrowed money or owner's equity.

Tractors

- 1-5) Enter the name of tractors in the CURRENT equipment complement in the first column. In columns 2 through 4 enter the purchase price, life, and salvage value of each tractor.

Other Implements

- 1-10) Enter the names of implements in the CURRENT equipment complement in column 1. Enter the purchase price, life and salvage value for each piece of equipment in the same manner as was done for the tractors.

- 11)* Total: Enter the total in line 11, column 5, into cell CN148.

Adjustments to Amortization Costs for Machinery Bought or Sold: As different conservation plans are considered, the machinery complement may change. Use this section to calculate amortization costs for machinery which is bought or sold (from the CURRENT equipment complement) as a result of the conservation plans. Enter the name, purchase price, life, and salvage value of each piece of machinery in the

same manner as was done in the earlier amortization section.

Enter the Adjusted Amortization value from line 6, column 5, into the appropriate conservation plan in the range of cells CO148..CQ148.

MACHINERY INSURANCE AND HOUSING CALCULATOR (Alt L)

This section calculates insurance and housing for the original equipment complement, and makes adjustments for new ones.

Enter the value in column 1 into cell CN149, and the value in column 2 into the appropriate conservation plan in the range of cells CO149..CQ149.

CONSERVATION RESERVE PROGRAM (Alt R)

The CRP worksheet (Figure 9) is used to establish a bid which can be submitted to the USDA for entering highly erodible land into the CRP. If the going rate for land accepted into the CRP is already known, disregard this section.

Acres to enter in CRP: Enter the number of acres the farmer wishes to enter into the CRP.

- 1) Estimated Average Annual Returns to Farm Without CRP Participation
 - a) Receipts From Sale of Farm Products: From the farmer's records or estimated with the Farm Program section.
 - b) Deficiency and Diversion Payments: From the farmer's records or estimated with the Farm Program section.
 - c) Total Variable Costs: From the farmer's records for the current situation.

- d) Total Fixed Costs: From the farmer's records for the current situation.
 - e)* Returns to farm without CRP participation.
- 2) Estimated Average Annual Returns to Farm With CRP Participation
- a) Receipts From Sale of Farm Products on Reduced Acres: These must be estimated taking into consideration the number of acres entered in the CRP.
 - b) Deficiency and Diversion Payments on Reduced Acres: These must also be estimated taking into consideration the number of acres entered in the CRP.
 - c) Receipts from Hunting, etc. on CRP land: The only permitted income from CRP acreage is from recreational uses such as hunting and camping. These receipts come from those activities.
 - d) Misc. Costs for Hunting etc: Costs incurred during preparation of CRP land for approved recreational activities.
 - e) Maintenance Costs for CRP Acres: Costs incurred during routine maintenance (mowing or spraying) of CRP acres.
 - f) Total Variable Costs on Reduced Acres: These must be estimated taking into account the change in the need for such things as fuel, seed, and fertilizers, depending on the amount of land entered in the CRP.
 - g) Total Fixed Costs on Reduced Acres: These must be estimated taking into account the change in the need for machinery. This depends on the amount of land entered in the CRP.
 - h)* Returns to farm with CRP participation

- 3) Cost of Establishing Conservation Practices on CRP Acreage
- a) Expected Costs for Establishing Perennial Grass, Wildlife Planting, Windbreaks, Trees, etc: Enter all costs incurred during establishment of a vegetative cover on the CRP acreage.
 - b) Government Share of Establishment Cost: Cost share assistance to establish a permanent vegetative cover on CRP land is limited to 50 percent of the establishment cost; however, it may not exceed 50 percent of the current average agricultural value of the land (USDA ASCS KS Notice CRP-103, 1988).
 - c)* Net landowner cost of establishing CRP

4) Cost to Re-Establish Cropland in Year 10

ENTER CURRENT COSTS AND RETURNS

- a) Costs of re-establishing cropland: This includes seedbed preparation, fertilizer, chemicals, etc.
 - b) Other re-establishment costs
 - c) Salvage value of products harvested from CRP acres: This may include timber, grazing, etc.
 - d)* Cost to re-establish in year 10
- 5) Change in Off Farm Income Due to CRP participation
- a) Off-farm income with CRP participation: Income earned off the farm due to the increase in available off-farm working hours.
 - b) Off-farm income without CRP participation: Income which the farmer is currently earning off the farm.
 - c)* Change in off-farm income due to CRP participation
- 6) Calculation of Breakeven Bid
- a)* Returns to farm without participation (1e)

- b)* Returns to farm with participation (2h)
- c)* Annual Cost of establishing CRP (3c)
- d)* Present value to re-establish cropland in year 10 (4f)
- e)* Change in off-farm income (annual) (5c)
- f)* Acres in CRP
- g) Interest rate: Enter an interest rate for borrowed money or owner's equity.
- h)* Per acre breakeven bid rate in dollars per acre.

REFERENCES

- USDA Agricultural Stabilization and Conservation Service. KS Notice
CRP-103. February 1, 1988. Washington, D.C.
- USDA Fact Sheet. Conservation provisions of the 1985 farm bill.
December 1986.
- USDA Soil Conservation Service. Attachment 1 to Kansas Bulletin No.
KS 300-7-25, 8/21/87
- USDA Soil Conservation Service. Section V-A TG Notice KS-127, 7/85

Appendix B.
Model Development

The data inputs needed, and the equations used in each section of the model are outlined below. Refer to appendix C to examine each section as it appears in the actual spreadsheet.

Universal Soil Loss Equation

In order to adapt this model to other areas of the state, the user need only insert new Rainfall and Soil Erodibility Factors.

USLE input data needed:

- 1) Rainfall factor (R) for Doniphan County
- 2) Soil erodibility factor (K) for the field under consideration
- 3) Slope length (L) in ft
- 4) Slope gradient (S) in feet per 100 ft
- 5) Cropping management factor (C)
- 6) Erosion control practice factor (P)

Equations:

$$7) \quad LS = (L/72.6)^m * (65.41 \sin^2 A + 4.56 \sin A + 0.065) \quad [1]$$

where: L = slope length in ft; A = angle of slope; and m = 0.5 if the percent slope is 5 or more, 0.4 on slopes of 3.5 to 4.5 percent, 0.3 on slopes of 1 to 3 percent, and 0.2 on uniform gradients of less than 1 percent. (Wischmeier and Smith, 1978)

$$8) \quad \text{Actual soil loss} = R * K * LS * C * P \quad [2]$$

Conservation Structures

Terrace input data needed:

- 1) Terraced area of the field under consideration (ac.)

- 2) Land slope (%)
- 3) Earthwork cost: steep backslope and narrow base (\$/cu.yd.); broad base (\$/lin.ft.)
- 4) Cost of seeding backslope (\$/ac.)
- 5) Interest rate for borrowed money or owner's equity (%)
- 6) Life of structure (yrs.)
- 7) Length of terraces to be installed on this field (lin.ft.)
- 8) Miscellaneous costs associated with the installation of terraces (\$)
- 9) Quantity of hardware needed for an underground outlet system (\$) (optional)
- 10) Cost sharing rate for conservation structures (%)
- 11) Cost sharing annual limit (\$)

Equations:

$$12) \text{ Steep backslope: } Af = 0.89 + (7.41 * S / (1 - 2 * S)) \quad [3]$$

$$\text{Narrow base: } Af = 0.59 + (2.67 * S / (1 - 2 * S)) \quad [4]$$

Af = amount of earth moved (cu.yds./lin.ft.), S = average land slope (%), USDA Soil Conservation Service, Area 1, 1988

$$13) \text{ Total volume of earth moved (cu.yds.)} = Af * \text{linear feet of terraces} \quad [5]$$

$$14) \text{ Total earthwork cost steep backslope and narrow base terraces} = \text{earthwork cost} * \text{total volume of earth moved} \quad [6]$$

$$\text{Total earthwork cost for broad base terraces} = \text{earthwork cost} * \text{linear feet of terraces} \quad [7]$$

$$15) \text{ Cost of seeding backslope} = \text{S.A.} * \text{linear feet of terraces} * \text{cost of seeding backslope} \quad [8]$$

S.A. = seeded area (ac.) per 1000 linear feet of terraces (Table 1)

- 16) Area used by backslope (ac.) = S.A. * linear feet of terraces [9]
- S.A. = seeded area (ac.) per 1000 linear feet of terraces (Table 1)

Table 1. Grassed Area for Grass Backslope and Narrow Base Terraces

S.A. (Seeded area (ac.)/1000 linear feet)		
Land Slope %	Steep Backslope	Narrow Base
8-10	0.3	0.4
11-14	0.4	0.5
15-18	0.5	0.6
19-21	0.7	0.7
22-23	0.8	0.7
24-25	0.9	0.8

Soil Conservation Service, Area 1

- 17) Total terrace installation cost = miscellaneous costs + total earthwork cost + outlet system cost + cost of seeding backslope [10]

The total terrace installation cost must be distributed according to the amount the farmer wishes to spend on the installation of terraces for each year between the present year and 1995. After the farmer makes this decision, the cost sharing dollars that are available for each year are subtracted from the installation cost.

- 18) Installation cost after cost sharing = terrace installation cost - cost sharing [11]

- 19) Present value of installation cost payments after cost sharing =
Sum of $(V_i/(1+int.)^i)$ [12]

where: $V_i...V_n$ = series of installation cost payments after cost

sharing, int. = interest rate, n = number of installation cost payments, i = the current iteration (1 through n)

$$20) \text{ Annualized terrace payment} = \text{prin.} * (\text{int.}/(1-(1+\text{int.})^{-j})) \quad [13]$$

where: prin. = present value of installation cost payments after cost sharing, int. = interest rate, j = life of structure

$$21) \text{ Annualized terrace operation and maintenance costs} =$$

$$\text{Sum of } (U_i/(1+\text{int.})^i) * \text{OM} \quad [14]$$

where: $U_i \dots U_n$ = series of installation cost payments before cost sharing, int. = interest rate, n = number of installation cost payments, i = the current iteration (1 through n), OM = Assumed Annual O&M Costs (Table 2)

Table 2. Assumed Annual Operation and Maintenance Costs

Conservation Practice	Assumed Annual Operation and Maintenance Costs (%)
Terrace	2
Waterway	3
Diversion	3
W & S Basin	5

USDA-SCS Section V-A TG Notice KS-127, 7/85

Waterway input data needed:

- 1) Waterway area (ac.)
- 2) Shaping cost (\$/ac.)
- 3) Seeding cost (\$/ac.)
- 4) Interest rate for borrowed money or owner's equity (%)
- 5) Life of structure (yrs.)
- 6) Miscellaneous costs associated with construction of waterways (\$)

Equations:

7) Total shaping cost = waterway area * shaping cost [15]

8) Total seeding cost = waterway area * seeding cost [16]

9) Total installation cost = total shaping cost + total seeding cost + miscellaneous costs [17]

Waterway installation costs are distributed in the same manner as in the terrace section. However there is one difference to note. For each year that the annual cost sharing limit is reached with the terrace system, there will be no cost sharing money left over to apply to the waterway. Installation costs and cost sharing are calculated in the same manner for the diversion, and water and sediment basin sections.

10) Present value of installation cost payments after cost sharing is calculated using equation 12.

11) Annualized waterway payment is calculated using equation 13.

12) Annualized waterway operation and maintenance costs are calculated using equation 14.

Diversion input data needed:

- 1) Amount of earth moved to construct diversion (cu.yds.)
- 2) Earthwork cost (\$/cu.yd.)
- 3) Total seeding costs (\$)
- 4) Interest rate for borrowed money or owner's equity (%)
- 5) Life of structure (yrs.)
- 6) Miscellaneous costs associated with construction of diversions (\$)

Equations:

- 7) Total earthwork cost = earthwork cost * amount
of earth moved [18]
- 8) Total installation cost = total earthwork cost + seeding costs +
miscellaneous costs [19]
- 9) Present value of installation cost payments after cost sharing is
calculated using equation 12.
- 10) Annualized diversion payment is calculated using equation 13.
- 11) Annualized diversion operation and maintenance costs are calculated
using equation 14.

Water and Sediment Basin input data needed:

- 1) Amount of earth moved to construct basin (cu.yds.)
- 2) Earthwork cost (\$/cu.yd.)
- 3) Total seeding cost (\$)
- 4) Interest rate for borrowed money or owner's equity (%)
- 5) Life of structure (yrs.)
- 6) Miscellaneous costs associated with installation of water and
sediment basins (\$)
- 7) Quantity of hardware needed for installation of an underground
outlet system (\$) (optional)

Equations:

- 8) Total earthwork cost = amount of earth moved *
earthwork cost [20]
- 9) Total installation cost = total earthwork cost + underground outlet
system cost + seeding costs + miscellaneous costs [21]

- 10) Present value of installation cost payments after cost sharing is calculated using equation 12.
- 11) Annualized water and sediment basin payment is calculated using equation 13.
- 12) Annualized water and sediment basin operation and maintenance costs are calculated using equation 14.

1988 Government Farm Program

Conservation Reserve Program Base Adjustment input data needed:

- 1) Total acres of cropland of farm
- 2) Base acres
- 3) Acres entered in the CRP

Equations:

- 4) Base acre reduction = (acres entered in the CRP / total acres of cropland on farm) * base acres [22]
- 5) Adjusted base = base acres - base acre reduction [23]
- 6) Available acres of non-participation crop = total acres of cropland of farm - acres entered in CRP - adjusted base [24]

CRP Income and Expenses input data needed:

- 1) CRP payments per acre
- 2) Interest rate for borrowed money or owner's equity (%)
- 3) Cost of establishing CRP acres (\$)

Equations:

- 4) Income from CRP acres = CRP payments per acre * acres entered in CRP [25]

- 5) Annual CRP establishment expense is calculated using equation 13, where: prin. = cost of establishing CRP acres, $j = 10$, int. = interest rate

Commodity Program input data needed:

- 1) Base acres for each program crop
- 2) Proven yield for each program crop (bu./ac.)
- 3) Expected yield for each program crop and for any non-program crop that is used in this analysis (bu./ac.)
- 4) Percent to idle for the Acreage Reduction Program (ARP) (%)
- 5) Percent diversion for feed grains (%)
- 6) Diversion payment per bushel (\$/bu.)
- 7) Actual planted acres for each program crop
- 8) Selling price for program and non-program crops that are used in this analysis (\$/bu.)
- 9) 12-month price (\$/bu.)
- 10) Announced loan rate (\$/bu.)
- 11) Statute loan rate (\$/bu.)
- 12) Target price (\$/bu.)
- 13) Total hay and graze income (\$)

Equations:

$$14) \text{ Participate: Permitted program acres} = \text{base acres} * (1 - (\text{percent to idle (ARP)} + \text{percent diversion})) \quad [26]$$

$$0/92 \text{ Participation: Permitted program acres} = \text{base acres} * (1 - (\text{percent to idle (ARP)} + \text{percent diversion})) * .92 \quad [27]$$

- 15) Participate: Need to idle = (percent to idle (ARP) + percent diversion) / (1 - (percent to idle (ARP) + percent diversion)) * planted acres [28]
- 0/92 Participation: Need to idle = (percent to idle (ARP) + percent diversion) / (1 - (percent to idle (ARP) + percent diversion)) * planted acres * .92 [29]
- 16) Production = planted acres * expected yield [30]
- 17) Sales = production * (the higher of the selling price or the announced loan rate) [31]
- 18) Cash deficiency payment = proven yield * planted acres * (target price - (the higher of the 12-month price or the loan rate)) [32]
- 19) Diversion payment = base acres * proven yield * percent diversion * diversion payment per bushel [33]
- 20) Total commodity payments = cash deficiency payment + diversion payment [34]
- 21) Estimated payment limit = (statute loan rate - announced loan rate) * proven yield * planted acre [35]

Income from Non-Participation input data needed:

- 1) Name of each crop
- 2) Acres
- 3) Yield (bu./ac.)
- 4) Price (\$/bu.)

Equations:

- 5) Total income = acres * yield * price [36]

Land Cost, Machinery Amortization, Machinery Insurance and Housing

Calculator

Land Cost Calculator input data needed:

- 1) Land value per acre (\$/ac.)
- 2) Interest rate on a very safe investment (%)
- 3) Total acres owned

Equation:

- 4)
$$\text{Interest on Land} = \text{land value per acre} * \text{interest rate} * \text{total acres owned}$$
 [37]

Amortized Machinery Costs input data needed:

- 1) Interest rate on borrowed money or owner's equity (%)
- 2) Name of each piece of machinery
- 3) The purchase price of each piece of machinery in the current equipment complement.
- 4) The expected life of each piece of machinery in the current equipment complement.
- 5) Salvage value of each piece of machinery in the current equipment complement.

Equations:

- 6)
$$\text{Depreciable balance} = \text{purchase price} - \text{salvage value}$$
 [38]
- 7) Annual Amortization Costs are calculated using equation 13, where:
$$\text{prin.} = \text{depreciable balance}, j = \text{expected life}, \text{int.} = \text{interest rate}$$
- 8)
$$\text{Total machinery value} = \text{the sum of the machinery purchase prices.}$$
 [39]

- 9) Total annual amortization costs = the sum of the annual amortization costs. [40]

Adjustments to Amortization Costs for Machinery Bought or Sold

Inputs and the equations for depreciable balance, and annual amortization costs, are identical to those used in the Amortized Machinery Costs section.

Equations:

- 1) New machinery value = total machinery value + total purchased-total sold [41]
- 2) Adjusted amortization = total annual amortization costs + total annual amortization costs (purchased) - total annual amortization costs (sold) [42]

Machinery and Insurance and Housing Calculator

Equations:

- 1) Current insurance and housing = total machinery value * 1 % (Bauscher and Willett, 1986) [43]
- 2) Adjusted insurance and housing = new machinery value * 1% (Bauscher and Willett, 1986) [44]

Conservation Reserve Program Bid Worksheet

Estimated average annual returns to farm without CRP participation input data needed:

- 1) Receipts from sale of farm products (\$)
- 2) Deficiency and diversion payments (\$)

- 3) Total variable costs (\$)
- 4) Total fixed costs (\$)

Equation:

- 5) Returns to farm without participation = receipts from sale of farm products + deficiency and diversion payments - total variable costs - total fixed costs [45]

Estimated average annual returns to farm with CRP participation input data needed:

- 6) Receipts from sale of farm products on reduced acres (\$)
- 7) Deficiency and diversion payments on reduced acres (\$)
- 8) Receipts from hunting etc. on CRP land (\$)
- 9) Miscellaneous costs for hunting, etc. (\$)
- 10) Maintenance costs for CRP acres (\$)
- 11) Total variable costs on reduced acres (\$)
- 12) Total fixed costs on reduced acres (\$)

Equation:

- 13) Returns to farm with participation = receipts from sale of farm products on reduced acres + deficiency and diversion payments on reduced acres + receipts from hunting etc. on CRP land - miscellaneous costs for hunting, etc. - maintenance costs for CRP acres - total variable costs on reduced acres - total fixed costs on reduced acres [46]

Cost of establishing conservation practices on CRP acreage input data needed:

- 14) Expected costs for establishing perennial grass, wildlife planting, windbreaks, trees, etc. (\$)

15) Government share of establishment cost (\$)

Equation:

16) Net landowner cost of establishing CRP = expected costs for
establishing perennial grass, wildlife planting, windbreaks, trees, etc.
- government share of establishment cost [47]

Cost to re-establish cropland in year 10 input data needed:

NOTE: Enter current costs and returns

17) Costs of re-establishing cropland including seedbed preparation,
fertilizer, chemicals, etc. (\$)

18) Other re-establishment costs (\$)

19) Salvage value of products harvested from CRP acres (\$)

Equation:

20) Cost to re-establish cropland in year 10 = costs of re-establishing
cropland including seedbed preparation, fertilizer, chemicals, etc. +
other re-establishment costs - salvage value of products harvested
from CRP acres [48]

Change in off-farm income due to CRP participation input data needed:

21) Off-farm income with CRP participation (\$)

22) Off-farm income without CRP participation (\$)

Equation:

23) Change in off-farm income due to CRP participation = off-farm
income with CRP participation - off-farm income without CRP
participation [49]

Breakeven bid input data needed:

24) Acres entered in the CRP

25) Interest rate in borrowed money or owner's equity (%)

Equations:

- 26) Annual cost of establishing CRP is calculated using equation 13,
where: prin. = net landowner cost of establishing CRP, $j = 10$, int. =
interest rate
- 27) Per acre breakeven bid rate = ((returns to farm without participation
- returns to farm with participation) + annual cost of establishing
CRP + present value to re-establish cropland in year 10 - change in
off-farm income) / acres in CRP [50]

Enterprise Budgets

Variable cost input data needed:

- 1) Labor (\$)
- 2) Seed (\$)
- 3) Herbicide (\$)
- 4) Insecticide (\$)
- 5) Fertilizer (\$)
- 6) Fuel (\$)
- 7) Oil (\$)
- 8) Machinery repair (\$)
- 9) Drying costs (\$)
- 10) Custom hire (\$)
- 11) Current land maintenance (\$)
- 12) Annualized conservation structure operation and maintenance
costs (\$)
- 13) CRP maintenance (\$)
- 14) Set aside maintenance (\$)

- 15) Miscellaneous costs (\$)
- 16) Interest rate on a short term loan (%)

Equations:

17) Total variable costs = sum of the variable costs [51]

18) Interest on variable costs = (total variable costs * .5) *
interest rate [52]

Fixed cost input data needed:

- 19) Real estate taxes (\$)
- 20) Interest on owned land (\$)
- 21) Rent - cash and share (\$)
- 22) Amortized machinery costs (\$)
- 23) Machinery insurance and housing costs (\$)
- 24) Annualized conservation structure costs (\$)
- 25) Annualized CRP establishment expense (\$)

Equations:

26) Total fixed costs = the sum of the fixed costs [53]

27) Total costs = total variable costs + total fixed costs [54]

Gross return input data needed:

- 28) Gross returns from wheat, corn, milo, soybeans, or any other crop
used in the conservation plan (\$)
- 29) Total non-program income (\$)
- 30) CRP income (\$)
- 31) Total commodity program payments (\$)
- 32) Hay or graze income (\$)

Equations:

33) Total returns = the sum of the gross returns [55]

34) Net returns = total costs - total returns [56]

REFERENCES

- Bauscher L.D. and G.S. Willett. 1986. The costs of owning and operating farm machinery in Washington. Cooperative Extension Bulletin 1055. College of Agriculture and Home Economics, Washington State University. Pullman WA.
- USDA Soil Conservation Service, Area 1. Topeka, KS.
- USDA Soil Conservation Service. Section V-A, TG Notice KS-127, 7/85.
- Wischmeier, W.H. and D.D. Smith. 1978. Predicting rainfall erosion losses: a guide to conservation planning. USDA Agriculture Handbook No. 537. Washington, D.C.

Appendix C.
Spreadsheet Printouts


```

41 *****
42
43 ELECTRONIC SPREADSHEET MODEL FOR COMPARING CONSERVATION
44 PLANS FOR DONIPHAN COUNTY, KANSAS
45
46
47 DEVELOPEMENT OF THIS SPREADSHEET WAS MADE POSSIBLE WITH
48 FUNDING FROM THE
49
50 KANSAS SOIL CONSERVATION SERVICE
51
52 IN COOPERATIVE AGREEMENT WITH THE DEPARTMENTS OF
53 AGRICULTURAL ENGINEERING AND ACRICULTURAL ECONOMICS
54 KANSAS STATE UNIVERSITY
55
56
57
58
59 (PACE DOWN)
60 *****
61 *****
62
63 This spreadsheet is designed to be used by Soil Conservation
64 Service personnel in Doniphan County to assist farmers in devel-
65 oping conservation plans which meet the requirements of the Food
66 Security Act of 1985.
67
68
69
70
71
72
73 ENTER THE LETTER OF YOUR WORKING DRIVE: b:
74 AND/OR THE DIRECTORY -----
75
76 ENTER THE NAME YOU WANT TO SAVE THIS FILE UNDER: -----
77
78
79 version 2 (PAGE DOWN)
80 *****

```

	A	B	C	D	E	F	G
81	*****	INDEX	*****				
82							
83		Alt I	INDEX				
84							
85		Alt E	ENTERPRISE BUDGET				
86							
87		Alt U	UNIVERSAL SOIL LOSS EQUATION				
88							
89		Alt C	CONSERVATION STRUCTURES				
90							
91		Alt F	FARM PROGRAM				
92							
93		Alt L	CALCULATORS FOR LAND COST, MACHINERY AMORTIZATION AND MACHINERY INSURANCE AND HOUSING				
94							
95							
96		Alt R	CONSERVATION RESERVE PROGRAM BID WORKSHEET				
97							
98							
99							(PAGE DOWN)
100	*****						
101	*****						
102			SAVE & PRINT MACROS				
103							
104			-ENTERPRISE BUDGET				Alt H
105			-FARM PROGRAM				Alt J
106			-CONSERVATION RESERVE PROGRAM				Alt K
107			-UNIVERSAL SOIL LOSS EQUATION				Alt Q
108			-CALCULATORS FOR LAND COST, MACHINERY AMORTIZATION, AND MACHINERY INSURANCE AND HOUSING				
109							
110			-CONSERVATION STRUCTURE ALTERNATIVE				Alt P
111			Terrace Cross Section				Alt X
112			Summary Terrace Section				Alt Y
113			Waterway, Diversion, W&S Basin				Alt Z
114			Terrace Outlet System				Alt V
115			Basin Outlet System				Alt W
116			-MACRO FOR SAVING				Alt S
117							
118							
119							(PAGE DOWN)
120	*****						

	CL	CM	CN	CO	CP
135	Operation and Maintenance (Alt C)				
136	13. CRP Maintenance		\$0	\$0	\$0
137	14. Set Aside Maintenance		\$0	\$0	\$0
138	15. Miscellaneous		\$0	\$0	\$0
139	16. Miscellaneous		\$0	\$0	\$0
140	17. Interest on Variable Costs		\$0	\$0	\$0
141	Interest Rate = 0.0%				
142	TOTAL VARIABLE COSTS		\$0	\$0	\$0
143	-----				
144	FIXED COSTS				
145	18. Real Estate Taxes		\$0	\$0	\$0
146	19. Interest on Owned Land (Alt L)		\$0	\$0	\$0
147	20. Rent - Cash and Share		\$0	\$0	\$0
148	21. Amortized Machinery Costs (Alt L)		\$0	\$0	\$0
149	22. Mach. Insurance, Housing (Alt L)		\$0	\$0	\$0
150	23. Annualized Conservation		\$0	\$0	\$0
151	Structure Cost (Alt C)				
152	24. Annualized CRP Est. Exp. (Alt F)		\$0	\$0	\$0
153	TOTAL FIXED COSTS		\$0	\$0	\$0
154	-----				
155	TOTAL COSTS		\$0	\$0	\$0
156	-----				
157	GROSS RETURNS (Alt F)				
158	25. Wheat		\$0	\$0	\$0
159	26. Corn		\$0	\$0	\$0
160	27. Milo		\$0	\$0	\$0
161	28. Soybeans		\$0	\$0	\$0
162	29.		\$0	\$0	\$0
163	30.		\$0	\$0	\$0
164	31. Total Non-Program Income		\$0	\$0	\$0
165	32. CRP Income		\$0	\$0	\$0
166	33. Total Commodity Program Payments		\$0	\$0	\$0
167	34. Hay or Graze Income		\$0	\$0	\$0
168	35.		\$0	\$0	\$0
169	36.		\$0	\$0	\$0
170	TOTAL RETURNS		\$0	\$0	\$0
171	-----				
172	NET RETURNS		\$0	\$0	\$0
173	-----				
174					

	H	I	J	K	L	M	N	O
41	15	Knox (Kp)		18-30		20		0.32
42	16	Marshall (Ma)		1-3		5		0.32
43	17	Marshall (Mb)		3-7		5		0.32
44	18	Martin (Mc)		3-7		5		0.37
45	19	Monona (Md)		3-19		5		0.32
46	20	Monona (Me)		3-10		5		0.32
47	21	Monona (Mf)		10-18		15		0.32
48	22	Monona (Mh)		18-30		20		0.32
49	23	Morrill (Mo)		2-7		5		0.28
50	24	Morrill (Mp)		7-12		5		0.28
51	25	Morrill (Ms)		12-18		5		0.28
52	26	Onawa (Od)		---		5		0.43
53	27	Onawa (On)		---		5		0.43
54	28	Pits (Pt)		---		5		
55	29	Reading (Re)		---		5		0.32
56	30	Sarpy (Sa)		---		5		0.17
57	31	Vinland (Vr)		20-40		5		0.32
58	32	Vinland (Vs)		4-15		5		0.32
59	33			other				

60
61 Source: Soil Survey of Doniphan County, Kansas

62 *****

63 SLOPE LENGTH AND GRADIANT FACTORS

64								
65	4.	Slope Length (L) in feet:				0		
66	5.	Slope Gradient (S) in ft/100 ft:				0		
67	6.	LS Factor:				0.00		

68
69 *****

70
71 COVER AND MANAGEMENT FACTOR

72
73 "C" values may be selected from the following table, or a weighted "C"
74 value may be calculated in the section starting at row 113.

75
76 Enter the "C" value in row 142

77
78 "C" Factor Values for Various Crops
79 Source: USDA-SCS TG Notice KS-140,9/86 Section I-C
80

	H	I	J	K		L		M		N		O
	Percent of Cround Cover After Planting											
	0	10	20	30	40	50	60	70	80	90		
81	Conservation											
82	Cropping Sequence											
83	-----											
84												
85	Corn or sorghum cont.	.32	.28	.24	.20	.16	.14	.11	.08	.06	.04	
86												
87	Small grain cont.	.25	.23	.20	.17	.14	.12	.08	.06	.04	.03	
88												
89	Small grain after	.22	.20	.18	.16	.14	.12	.08	.06	.04	.03	
90	row crop											
91												
92	Small grain after summer	.23	.21	.19	.17	.14	.12	.08	.06	.04	.03	
93	fallow of row crop or small											
94	grain residue (2 yr avg)											
95												
96	Corn or sorghum after	.30	.28	.26	.20	.16	.14	.11	.08	.06	.04	
97	small grain											
98												
99	Soybean cont.	.43	.37	.35	.30	.25	.22	.20	.15	.10	.08	
100												
101	Soybean or sunflower after	.33	.29	.26	.21	.17	.15	.12	.08	.06	.04	
102	small grain or row crop											
103												
104	Forage or sorghum drilled	.30	.28	.26	.20	.16	.14	.11	.08	.06	.04	
105	after row crops or small											
106	grain											
107												
108	Cotton, field beans, rape,	.33	.29	.26	.24	.20	.18	.16	.12	.08	.06	
109	sugar beets or vegetables											
110	after row crop or small											
111	grain											
112												
113	-----											
114												
115	CALCULATION OF WEICHTED "C" VALUE											
116												
117	Enter Crops, Acres, and "C" values in the appropriate columns											
118												
119	CROP				ACRES			"C" VALUE				
120	-----				-----			-----				

	H	I	J	K	L	M	N	O
121				0		0		
122				0		0		
123				0		0		
124				0		0		
125				0		0		
126				0		0		
127	-----			-----				
128	TOTAL			0				
129								
130	7. Weighted "G" value is:			0.000				

131
132 -----

133
134 Enter the "G" value in the appropriate column.
135 Enter Zeros in unused columns.

137	HIGH PRODUCTION					LOW PRODUCTION		
138	(100 bu/ac Corn or					(< 60 bu/ac Corn or		
139	Sorghum, 40 bu/ac					Sorghum, < 20 bu/ac		
140	Soybeans or Small Grain)		AVERAGE PRODUCTION			Soybeans or Small Grain)		
141	-----		-----			-----		
142		0		0			0	

143
144 8. The adjusted "G" value is: 0

145 -----
146 *****

147
148 SUPPORT PRACTICE FACTORS

149 Select a "P" factor from Tables A and B; enter them in row 197

150
151 Source: USDA-SGS TG Notice KS-93, 6/21/82, Section I-G

152
153
154 TABLE A TERRACE "P" FACTORS

155	-----							
156	Horizontal	Closed		Open Outlets with	Percent	Grade at 2/		
157	Interval (ft)	Outlets 1/		.1 - .3	.4 - .7	0.8		
158								
159	Less than 110	0.50		0.60	0.70	1.0		
160	110 - 140	.60		.70	.80	1.0		

	H	I	J	K	L	M	N	O
161 140 - 180			.70		.80	.90	1.0	
162 180 - 225			.80		.80	.90	1.0	
163 225 - 300			.90		.90	1.0	1.0	
164 300 and up			1.0		1.0	1.0	1.0	

165

166 1/ "P" factors for closed outlet terraces also apply to terraces with
167 underground outlets and to level terraces with open outlets.

168 2/ The channel grade is measured on the 300 feet of terrace length or

169 the one-third of total terrace length closest to the outlet,

170 whichever distance is less.

171

172

173 TABLE B SUPPORT PRACTICE FACTOR VALUE - "P"

174

176 Land Slope (%)	175 Up and Down		175 Strip Crop 3/		
	176 Hill	176 Contour	176 A	176 B	176 C
178 1 - 2	1.0	0.60	.30	0.45	0.60
179 3 - 8	1.0	.50	.25	.38	.50
180 9 - 12	1.0	.60	.30	.45	.60
181 13 - 16	1.0	.70	.35	.52	.70
182 17 - 20	1.0	.80	.40	.60	.80

183

184 3/ A - Four year rotation of row crop, small grain with meadow seeding
185 and two years of meadow. A second row crop can replace the small
186 grain if meadow is established in it.

187 B - Four-year rotation of two years row crop, winter grain with
188 meadow seeding, and one year meadow.

189 C - Alternate strips of row crop and winter grain.

190

191

192

193

Enter a "P" factor in each column.

194

195

Terrace "P" Factor

Support Factor

196

197

0

0

198

199

9. The "P" factor is: 0

200

	H	I	J	K	L	M	N	O
--	---	---	---	---	---	---	---	---

201 *****
202
203 SUMMARY OF THE USLE
204
205 R: 200
206 K: 0.28
207 LS: 0.00
208 C: 0
209 P: 0
210
211 10. Maximum allowable soil loss soil is: 5 tons/ac/yr.
212
213 11. Actual Soil Loss is: 0.0 tons/ac/yr.
214
215 THIS PLAN MEETS THE REQUIREMENTS OF THE FOOD SECURITY ACT
216 *****
217 Alt Q to Print USLE
218
219
220

	P	Q	R	S	T	U	V	W	
41									
42	1.	Terraced Area			(acres)			0	
43	2.	Land Slope			(percent)			10.00%	
44	3.	Earthwork Cost			(\$/cu.yd.)			\$0.50	
45	4.	Cost of Seeding Backslope			(\$/ac.)			\$60	
46	5.	Interest Rate			(%)			8.78%	
47	6.	Life of Structure			(yrs)			20	
48	7.	Length of Terraces Installed			(lin.ft.)			0	
49	8.	Misc. Costs			(\$)			\$0	
50	9.	If underground outlets are used on this field go							
51		to the Terrace Underground Outlet Worksheet (Alt T)							---
52									

OUTPUT SECTION

57								
58	1.	Amount of Earth Moved			(cu.yds./lin.ft.)			0.00
59	2.	Volume of Earth Moved			(cu.yds.)			0
60	3.	Total Earthwork Cost			(\$)			0
61	4.	Terrace Outlet System Cost			(\$)			0
62	5.	Cost of Seeding Backslope			(\$)			0
63	6.	Area Used by Backslope			(ac)			0.00

Terrace Type: NARROW BASE
 2:1 front slope
 2:1 back slope
 4 ft. top width

INPUT SECTION

41								
42	1.	Terraced Area			(acres)			0
43	2.	Land Slope			(percent)			10.00%
44	3.	Earthwork Cost			(\$/cu.yd.)			\$0.50
45	4.	Cost of Seeding Backslope			(\$/ac.)			\$60
46	5.	Interest Rate			(%)			8.78%
47	6.	Life of Structure			(yrs)			20
48	7.	Length of Terraces Installed			(lin.ft.)			0

	P	Q	R	S	T	U	V	W
49	8.	Misc. Costs			(\$)			\$0
50	9.	If underground outlets are used on this field go						---
51		to the Terrace Underground Outlet Worksheet (Alt T)						
52								

54 OUTPUT SECTION

57								
58	1.	Amount of Earth Moved			(cu.yds./lin.ft.)			0.00
59	2.	Volume of Earth Moved			(cu.yds.)			0
60	3.	Total Earthwork Cost			(\$)			0
61	4.	Terrace Outlet System Cost			(\$)			0
62	5.	Cost of Seeding Backslope			(\$)			0
63	6.	Area Used by Backslope			(ac)			0.00
64								
65								

30 Terrace Type: BROADBASE

41 INPUT SECTION

42								
43	1.	Terraced Area			(acres)			0
44	2.	Land Slope			(percent)			10.00%
45	3.	Earthwork Cost			(\$/lin.ft.)			\$0.78
46	4.	Interest Rate			(%)			8.78%
47	5.	Life of Structure			(yrs)			20
48	6.	Length of Terraces Installed			(lin.ft.)			0

	P	Q	R	S	T	U	V	W
49	7.	Misc. Costs			(\$)			\$0
50	8.	If underground outlets are used on this field go to						
51		Terrace Underground Outlet Worksheet (Alt T)						

56 OUTPUT SECTION

60	1.	Total Earthwork Cost		(\$)				0
61	2.	Terrace Outlet System Cost		(\$)				0

67 AFTER DATA IS ENTERED FOR A FIELD; INVOKE THE APPROPRIATE MACRO

68	Alt A	Field 1
69	Alt D	Field 2
70	Alt M	Field 3

72 Alt X to Print INPUT and OUTPUT Sections

74 SUMMARY OF TERRACE SYSTEM COSTS

76	1.	Installation Cost for this field						\$0
77					Field 1	Field 2	Field 3	
78					(Alt A)	(Alt D)	(Alt M)	
81	2.	Installation Costs			\$0	\$0	\$0	
83	3.	Total Installation Cost (F9)			\$0			
85	4.	Cost Sharing Rate			50%			
86	5.	Cost Sharing Annual Limit			\$3,500			

89 6. TERRACE COST SHARING

90 *****

91 a. Terrace Installation Cost \$0

93 Distribute the Installation Cost between the following years.

94 NOTE: ERR will appear if cells U91 and R110 are not equal.

96 Enter Current Year: 1988

97				Installation Cost
98	Year	Installation Cost	Cost Sharing	After Cost Sharing
99	(1)	(2)	(3)	(4)

	P	Q	R	S	T	U	V	W
101	1988		\$0		\$0		\$0	
102	1989		\$0		\$0		\$0	
103	1990		\$0		\$0		\$0	
104	1991		\$0		\$0		\$0	
105	1992		\$0		\$0		\$0	
106	1993		\$0		\$0		\$0	
107	1994		\$0		\$0		\$0	
108	1995		\$0		\$0		\$0	
109								
110	Totals		\$0		\$0			

111								
112			7. Present Value of Column 4				\$0	
113			8. Annualized Terrace Payment				\$0	
114			9. Annualized Terrace O&M Costs				\$0	

115
116 Alt Y to Print Terrace System Summary
117

118
119 WATERWAY
120

121 INPUT SECTION

122	1. Waterway Area		(acres)		0
123	2. Shaping Cost		(\$/ac.)		\$958
124	3. Seeding Cost		(\$/ac.)		\$80
125	4. Interest Rate		(%)		8.78%
126	5. Life of Structure		(yrs)		10
127	6. Misc. Costs		(\$)		\$0

128
129 OUTPUT SECTION

130	1. Total Shaping Cost		(\$)		0
131	2. Total Seeding Cost		(\$)		0
132	3. Total Installation Cost		(\$)		0

133
134
135 4. WATERWAY COST SHARING

136 *****

137 a. Waterway Installation Cost \$0

138

139 Distribute the Installation Cost between the following years.

140 NOTE: ERR will appear if cells T137 and R155 are not equal.

	P	Q	R	S	T	U	V	W
141								
142								
143	Year	Installation Cost			Cost Sharing		Installation Cost	
144	(1)	(2)			(3)		After Cost Sharing	
145							(4)	
146	1988	\$0			\$0		\$0	
147	1989	\$0			\$0		\$0	
148	1990	\$0			\$0		\$0	
149	1991	\$0			\$0		\$0	
150	1992	\$0			\$0		\$0	
151	1993	\$0			\$0		\$0	
152	1994	\$0			\$0		\$0	
153	1995	\$0			\$0		\$0	
154								
155	Totals	\$0			\$0			
156								
157		5. Present Value of Column 4					\$0	
158		6. Annualized Waterway Payment					\$0	
159		7. Annualized Waterway O&M Costs					\$0	
160								
161	<hr/>							
162	DIVERSION							
163	<hr/>							
164	INPUT SECTION							
165	1.	Amount of Earth Moved			(cu.yds.)		0	
166	2.	Earthwork Cost			(\$/cu.yd.)		\$0.50	
167	3.	Total Seeding Costs			(\$)		\$0	
168	4.	Interest Rate			(%)		8.78%	
169	5.	Life of Structure			(yrs)		10	
170	6.	Misc. Costs			(\$)		\$0	
171								
172	OUTPUT SECTION							
173	1.	Total Earthwork Cost			(\$)		0	
174	2.	Total Installation Cost			(\$)		0	
175								
176								
177	3. DIVERSION COST SHARING							
178	*****							
179	a.	Diversion Installation Cost			\$0			
180								

	P	Q	R	S	T	U	V	W
181	Distribute the Installation Cost between the following years.							
182	NOTE: ERR will appear if cells T179 and R197 are not equal.							
183								
184								
185	Year	Installation Cost		Cost Sharing		Installation Cost		After Cost Sharing
186	(1)	(2)		(3)		(4)		
187								
188	1988	\$0		\$0		\$0		
189	1989	\$0		\$0		\$0		
190	1990	\$0		\$0		\$0		
191	1991	\$0		\$0		\$0		
192	1992	\$0		\$0		\$0		
193	1993	\$0		\$0		\$0		
194	1994	\$0		\$0		\$0		
195	1995	\$0		\$0		\$0		
196								
197	Totals	\$0		\$0				
198								
199		4. Present Value of Column 4				\$0		
200		5. Annualized Diversion Payment				\$0		
201		6. Annualized Diversion O&M Costs				\$0		
202								
203	<hr/>							
204	WATER AND SEDIMENT BASIN							
205	<hr/>							
206	INPUT SECTION							
207	1. Amount of Earth Moved			(cu.yds.)		0		
208	2. Earthwork Cost			(\$/cu.yd.)		\$0.50		
209	3. Total Seeding Costs			(\$)		\$0		
210	4. Interest Rate			(%)		8.78%		
211	5. Life of Structure			(yrs)		10		
212	6. Misc. Costs			(\$)		\$0		
213	7. If underground outlets are used go to the							
214	Basin Underground Outlet Worksheet (Alt 0)					—		
215								
216	OUTPUT SECTION							
217	1. Total Earthwork Cost			(\$)		0		
218	2. Basin Outlet System Cost			(\$)		0		
219	3. Total Installation Cost			(\$)		0		
220								

	P	Q	R	S	T	U	V	W	
221									
222	4. W&S BASIN COST SHARING								
223	*****								
224	a.	W&S Basin Installation Cost						\$0	
225									
226	Distribute the Installation Cost between the following years.								
227	NOTE: ERR will appear if cells T224 and R242 are not equal.								
228									
229							Installation Cost		
230	Year	Installation Cost	Cost Sharing					After Cost Sharing	
231	(1)	(2)	(3)					(4)	
232									
233	1988	\$0	\$0					\$0	
234	1989	\$0	\$0					\$0	
235	1990	\$0	\$0					\$0	
236	1991	\$0	\$0					\$0	
237	1992	\$0	\$0					\$0	
238	1993	\$0	\$0					\$0	
239	1994	\$0	\$0					\$0	
240	1995	\$0	\$0					\$0	
241									
242	Totals	\$0	\$0						
243									
244		5. Present Value of Column 4						\$0	
245		6. Annualized W&S Basin Payment						\$0	
246		7. Annualized W&S Basin O&M Costs						\$0	
247									
248									
249	Alt Z to Print Waterway, Diversion, and Water and Sediment Basin Summary								
250									
251	*****								
252	A.	TOTAL ANNUAL CONSERVATION STRUCTURE COST						\$0	
253		Enter this value in the range of cells CN150..CQ150							
254		of the Enterprise Budget							
255									
256	B.	TOTAL ANNUAL OPERATION AND MAINTENANCE COSTS						\$0	
257		Enter this value in the range of cells CN134..CQ134							
258		of the Enterprise Budget							
259	*****								
260									

1 X Y Z AA AB AC AD AE
 2 *****WARNING*****
 3 DO NOT ALTER OR ERASE ANY OF THE MACROS IN THIS SECTION.
 4 DATA IN TABLES CAN BE CHANGED; REFER TO THE MANUAL.
 5 *****WARNING*****

6 TABLE II

7 This table is used in calculating annual Operation and Maintenance
 8 costs for conservation structures. Source: USDA-SCS Section V-A
 9 TG Notice KS-127, 7/85

11 Conservation Practice	Assumed Annual O&M Costs (%)
14 Terrace	2.00%
15 Waterway	3.00%
16 Diversion	3.00%
17 W&S Basin	5.00%

30
31 TABLE I

32 *****

33 The values in this table are used in the formulas in line 6 and 7 of the
 34 OUTPUT section for the Steepback slope and Narrowbase terraces.

36 GRASSED AREAS FOR GRASS BACK SLOPE AND NARROW BASE TERRACES		
37 Slope (%)	Grass Back Slope*	Narrow Base
38 8-10	0.3	0.4
39 11-14	0.4	0.5
40 15-18	0.5	0.6
41 19-21	0.7	0.7
42 22-23	0.8	0.7
43 24-25	0.9	0.8

44 * Seeded area (acres) per 1000 linear foot of terrace length.
 45 Source: Soil Conservation Service, Area 1

46

48

49

COST ESTIMATE WORKSHEET FOR BASIN UNDERGROUND OUTLETS

50

51

Go to BE130 to change outlet default prices

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ITEM	QUAN	UNIT	UNIT COST	TOTAL COST (\$)
MANUALLY TAMPED BACKFILL				
UNDER THE TERRACE RIDGE				
a. 4" dia.	0	Lin. Ft.	0.46	0
b. 5" dia	0	Lin. Ft.	0.52	0
c. 6" dia	0	Lin. Ft.	0.58	0
d. 8" dia	0	Lin. Ft.	0.69	0
e. 10" dia	0	Lin. Ft.	0.82	0
f. 12" dia	0	Lin. Ft.	0.94	0
g. 15" dia	0	Lin. Ft.	1.14	0
h. other	0	Lin. Ft.	0	0
PLASTIC PIPE				
RISER				
1. Corrugated				
2. Smooth				
3. Hickenbottom				
Enter Number of Choice: 1				
a. 4" dia	0	Each	66	0
b. 5" dia	0	Each	70	0
c. 6" dia	0	Each	73	0
d. 8" dia	0	Each	86	0
e. 10" dia	0	Each	113	0
f. other	0	Each	0	0
MAIN CONDUIT				
1. Corrugated				
2. Smooth				
3. other				

	AS	ATAU	AV	AW	AX	AY	AZ	EA	EB	EC
88										
89	Enter Number of Choice:	1								
90										
91	a. 3" dia		0	Lin. Ft.			0		0	
92	b. 4" dia		0	Lin. Ft.			1.08		0	
93	c. 5" dia		0	Lin. Ft.			1.22		0	
94	d. 6" dia		0	Lin. Ft.			1.8		0	
95	e. 8" dia		0	Lin. Ft.			2.53		0	
96	f. 10" dia		0	Lin. Ft.			3.71		0	
97	g. 12" dia		0	Lin. Ft.			4.39		0	
98	h. 15" dia		0	Lin. Ft.			6.28		0	
99	i. other		0	Lin. Ft.			0		0	
100										
101	CMP OUTLET									
102	1. Aluminum									
103	2. Plain Galvanized									
104										
105	Enter Number of Choice:	2								
106										
107	a. 6" dia		0	Lin. Ft.			5.88		0	
108	b. 8" dia		0	Lin. Ft.			7.4		0	
109	c. 10" dia		0	Lin. Ft.			8.98		0	
110	d. 12" dia		0	Lin. Ft.			11.47		0	
111	e. 15" dia		0	Lin. Ft.			13.35		0	
112	f. 18" dia		0	Lin. Ft.			15.48		0	
113	g. other		0	Lin. Ft.			0		0	
114										
115	RODENT GUARD									
116	a. 6" dia		0	Each			8.73		0	
117	b. 8" dia		0	Each			10.52		0	
118	c. 10" dia		0	Each			11.95		0	
119	d. 12" dia		0	Each			16.55		0	
120	e. 15" dia		0	Each			27.87		0	
121	f. 18" dia		0	Each			37.38		0	
122	g. other		0	Each			0		0	
123										
124	Alt W to Print Worksheet						TOTAL (\$)		0	
125	*RETURN TO CELL P203									
126										

130

131

COST ESTIMATE WORKSHEET FOR TERRACE UNDERGROUND OUTLETS

132

133

Go to BE130 to change outlet default prices

134

135

136

137

138

ITEM	QUAN	UNIT	UNIT COST	TOTAL COST (\$)
139 MANUALLY TAMPED BACKFILL				
140 UNDER THE TERRACE RIDGE				
141 a. 4" dia.	0	Lin. Ft.	0.46	0
142 b. 5" dia	0	Lin. Ft.	0.52	0
143 c. 6" dia	0	Lin. Ft.	0.58	0
144 d. 8" dia	0	Lin. Ft.	0.69	0
145 e. 10" dia	0	Lin. Ft.	0.82	0
146 f. 12" dia	0	Lin. Ft.	0.94	0
147 g. 15" dia	0	Lin. Ft.	1.14	0
148 h. other	0	Lin. Ft.	0	0
149				
150 PLASTIC PIPE				
151				
152 RISER				
153 1. Corrugated				
154 2. Smooth				
155 3. Hickenbottom				
156				
157 Enter Number of Choice: 3				
158				
159 a. 4" dia	0	Each	0	0
160 b. 5" dia	0	Each	0	0
161 c. 6" dia	0	Each	90	0
162 d. 8" dia	0	Each	123	0
163 e. 10" dia	0	Each	139	0
164 f. other	0	Each	0	0
165				
166 MAIN CONDUIT				
167 1. Corrugated				
168 2. Smooth				
169 3. other				

	AS	ATAU	AV	AW	AX	AY	AZ	BA	BB	BC
170										
171	Enter Number of Choice:									
172										
173	a. 3" dia		0	Lin. Ft.			0		0	
174	b. 4" dia		0	Lin. Ft.			2.5		0	
175	c. 5" dia		0	Lin. Ft.			3.05		0	
176	d. 6" dia		0	Lin. Ft.			4.34		0	
177	e. 8" dia		0	Lin. Ft.			6.4		0	
178	f. 10" dia		0	Lin. Ft.			9.22		0	
179	g. 12" dia		0	Lin. Ft.			12.37		0	
180	h. 15" dia		0	Lin. Ft.			0		0	
181	i. other		0	Lin. Ft.			0		0	
182										
183	CMP OUTLET									
184	1. Aluminum									
185	2. Plain Galvanized									
186										
187	Enter Number of Choice:									
188										
189	a. 6" dia		0	Lin. Ft.			5.88		0	
190	b. 8" dia		0	Lin. Ft.			7.4		0	
191	c. 10" dia		0	Lin. Ft.			8.98		0	
192	d. 12" dia		0	Lin. Ft.			11.47		0	
193	e. 15" dia		0	Lin. Ft.			13.35		0	
194	f. 18" dia		0	Lin. Ft.			15.48		0	
195	g. other		0	Lin. Ft.			0		0	
196										
197	RODENT GUARD									
198	a. 6" dia		0	Each			8.73		0	
199	b. 8" dia		0	Each			10.52		0	
200	c. 10" dia		0	Each			11.95		0	
201	d. 12" dia		0	Each			16.55		0	
202	e. 15" dia		0	Each			27.87		0	
203	f. 18" dia		0	Each			37.38		0	
204	g. other		0	Each			0		0	
205										
206	Alt V to Print Worksheet						TOTAL (\$)		0	
207	* RETURN TO CELL P38									
208										
209										

	BE	BF	BG	BH	BI	BJ	BK	BL
130	*****							
131	This section contains prices for the Terrace and Basin Underground							
132	Outlet Systems. Source: Attachment 1 to Kansas Bulletin No.KS300-7-25,							
133	8/21/87. Prices can be changed by inserting new values into the range							
134	to the right of the diameter column.							
135								
136								
137	Manually Tamped Backfill							
138	<hr/>							
139								
140	4" dia.	0.46						
141	5"	0.52						
142	6"	0.58						
143	8"	0.69						
144	10"	0.82						
145	12"	0.94						
146	15"	1.14						
147								
148	Riser Prices							
149	<hr/>							
150	1. Corrugated		2. Smooth				3. Hickenbottom	
151								
152	4" dia.	66	4" dia.	100	4" dia.		0	
153	5"	70	5"	126	5"		0	
154	6"	73	6"	128	6"		90	
155	8"	86	8"	186	8"		123	
156	10"	113	10"	254	10"		139	
157								
158	Main Conduit							
159	<hr/>							
160	1. Corrugated		2. Smooth				3. other	
161								
162	3" dia	0	3" dia	0	3" dia		0	
163	4"	1.08	4"	2.5	4"		0	
164	5"	1.22	5"	3.05	5"		0	
165	6"	1.8	6"	4.34	6"		0	
166	8"	2.53	8"	6.4	8"		0	
167	10"	3.71	10"	9.22	10"		0	
168	12"	4.39	12"	12.37	12"		0	
169	15"	6.28	15"	0	15"		0	

	X	Y	Z	AA	AB	AC	AD	AE
249	These tables are used in the cost sharing sections to subtract out							
250	costs that are not cost shared.							
251	*****							
252	Terraces							
253	Costs				Field 1	Field 2	Field 3	
254	<hr/>							
255	Misc.				\$0	\$0	\$0	
256	Backslope				0	0	0	
257								
258	Earthwork				0	0	0	
259	Outlet				0	0	0	
260								
261								
262	Ratio				0			
263								
264	*****							
265	Waterway							
266	Costs							
267	<hr/>							
268	Misc				0			
269	Seeding				0			
270								
271	Shaping				0			
272								
273	Ratio				0			
274								
275	*****							
276	Diversion Costs							
277	<hr/>							
278								
279	Seeding				0			
280	Misc.				0			
281								
282	Earthwork				0			
283								
284	Ratio				0			
285								
286	*****							
287	Water and Sediment Basin							
288	Costs							
289	<hr/>							
290								
291	Seeding				0			
292	Misc.				0			
293								
294	Earthwork				0			
295	Outlet				0			
296								
297	Ratio				0			
298	<hr/>							

BZ CA CB CC CD CE CF CG CH CI

94 ** 1988 GOVERNMENT FARM PROGRAMS **

95 -----COMBINED CROPS-----

96

97 CRP BASE ADJUSTMENT - Complete this section regardless of participation
98 in the Conservation Reserve Program. If land is entered in the CRP, the
99 correct base acreage for the Commodity Program will be calculated.

100

101 CRP INCOME & EXPENSES - This section is used to calculate annual income
102 and annualized expenses from participation in the CRP.

103

104 COMMODITY PROGRAM - Income from the Government Commodity Program can be
105 calculated in this section. Two types of farmer participation are pos-
106 sible: 1) Participation in the Acreage Reduction Program, or 2) 0/92
107 Participation. After completion go to BZ198 for a summary.

108

109 NON-PARTICIPATION - Income from non-participation in the Government
110 Commodity Program can be calculated by going to cell BZ 223.

111

112 Alt J to Print Farm Program (PAGE DOWN)

113 ** 1988 GOVERNMENT FARM PROGRAMS **

114 -----

115 CRP BASE ADJUSTMENT

116 -----

117 1. Total Acres of Cropland on Farm	0
118 2. Base Acres	0
119 3. Acres Entered in CRP	0
120 4. Base Acre Reduction	0
121 5. Adjusted Base	0
122 6. Available Acres of Non-Participation Crop	0

123 -----

124 CRP INCOME & EXPENSES

125 -----

126 1. CRP Payments (\$/ac)	\$0	Location in
127 2. Interest Rate	0.00%	Budget
128 3. Cost of Establishing CRP Acres	\$0	
129 4. Annual Income from CRP Acres	\$0	CN165..CQ165
130 5. Annual CRP Est. Expense	\$0	CN152..CQ152

131 -----

132 COMMODITY PROGRAM

	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
133										
134										
135							NON-			
136	INPUT						PARTICIPATE		0/92	
137	SECTION						CROP	CROP		
138							Wheat	Corn	Milo	
139	1. Base Acres						0			
140	Wheat		0.0				---	0.0		
141	Corn			0.0			---		0.0	
142	Milo				0.0		---			0.0
143	2. Proven Yield		0.0	0.0	0.0		---	0.0	0.0	0.0
144	3. Expected Yield		0.0	0.0	0.0		0	0.0	0.0	0.0
145										
146	4. % to Idle (ARP)		27.5%	20.0%	20.0%		---	27.5%	20.0%	20.0%
147	5. % Diversion (Opt)		0.0%	0.0%	0.0%		---	0.0%	0.0%	0.0%
148	6. Div. Pmt. per Bu.		\$0.00	\$1.85	\$1.45		---	\$0.00	\$1.85	\$1.45
149										
150	7. Permitted Pgm. Acres		0.0	0.0	0.0		---	0.0	0.0	0.0
151								to	to	to
152								0.0	0.0	0.0
153										
154										
155	8. Planted Acres						0			
156	Wheat		0.0				---	0.0		
157	Corn			0.0			---		0.0	
158	Milo				0.0		---			0.0
159	*****									
160	9. Need To Idle		0.0	0.0	0.0		---	0.0	0.0	0.0
161	*****									
162	10. Sell Price		\$2.92	\$2.58	\$2.80		\$6.22	\$2.92	\$2.58	\$2.80
163	11. 12-Mo. Price		\$2.92	\$2.51	\$2.80		---	\$2.92	\$2.51	\$2.80
164	12. Announced Loan Rate		\$2.28	\$1.74	\$1.74		---	\$2.28	\$1.74	\$1.74
165	13. Statute Loan Rate		\$2.85	\$2.17	\$2.17		---	\$2.85	\$2.17	\$2.17
166	14. Target Price		\$4.38	\$2.97	\$2.88		---	\$4.38	\$2.97	\$2.88
167										
168	15. Tot. Hay/Graze Inc.		\$0	\$0	\$0		\$0	\$0	\$0	\$0
169	*****									
170	----- NON PROGRAM CROP ACRES & INCOME if UNDERPLANTED									
171	16. Acres Available		0.0	0.0	0.0		---	0.0	0.0	0.0
172	a. CROP:						---			

	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
173 b. Yield				0.0	0.0	0.0	---	0.0	0.0	0.0
174 c. Price				\$0.00	\$0.00	\$0.00	---	\$0.00	\$0.00	\$0.00
175							---			
176 d. Gross Return				0	0	0	---	0	0	0
177	*****									
178	OUTPUT			PARTICIPATE						
179	SECTION			CROP			0/92			
180				Wheat	Corn	Milo	Wheat	Corn	Milo	
181	-----									
182	Income:			(if ERR's check to see that acres planted does not exceed acres available--lines 7 & 8)						
183										
184										
185	1. Production (Bu)			0	0	0	0	0	0	0
186	2. Sales									
187	Wheat			0			---	0		
188	Corn				0		---		0	
189	Milo					0	---			0
190	Soybeans							0		
191	3. Cash Def. Pmt.			0	0	0	---	0	0	0
192	4. Div. Payment			0	0	0	---	0	0	0
193	5. Tot. Comm. Payments			0	0	0	---	0	0	0
194	6. Hay or Graze Inc.			0	0	0	---	0	0	0
195	7. Non-Program Inc.			0	0	0	---	0	0	0
196				-----	-----	-----	-----	-----	-----	-----
197	8. TOTAL INCOME			0	0	0	0	0	0	0
198										
199	-----									

SUMMARY OF GOVERNMENT COMMODITY PROGRAM

203 Use only one option at a time. For example, if the conservation plan
 204 that is presently being evaluated includes Participation, transfer those
 205 values to the appropriate column in the Budget. If the next plan in-
 206 cludes 0/92 Participation, rework the Farm Program section, then trans-
 207 fer the 0/92 values to the appropriate column in the budget.

	Participation	0/92 Participation	Location in Enterprise Budget
208			
209			
210			
211	Income		
212	-----	-----	-----

	ER	ES	ET	EU	EV	EW	EX	BY
193								
194								
195								
196								
197								
198								
199								
200								
201								
202								
203								
204								
205						\$1.46	\$0.46	\$0.08
206						\$1.46	\$0.46	\$0.08
207						\$1.46	\$0.46	\$0.08
208								
209								
210								
211								
212								

Percent diversion for
feed grains = 15.00%

96 CZ DA DB DC DD DE
 97 *****

98 LAND COST CALCULATOR - This section is used calculate interest costs on
 99 land owned by the farmer.

100 AMORTIZED MACHINERY COSTS (current situation) - In this section, costs
 101 of owning machinery are amortized over the life of the machine. Enter
 102 the purchase price, life, and salvage value of each piece of machinery
 103 in the current equipment complement.

104
 105 ADJUSTMENTS TO AMORTIZATION COSTS FOR MACHINERY BOUGHT OR SOLD -
 106 Conservation plans may require a different machinery complement than
 107 the one that is currently being used. In this section enter the
 108 purchase price, life, and salvage value of each piece of machinery that
 109 is bought or sold as a result of changing conservation plans.

110
 111 MACHINERY INSURANCE AND HOUSING CALCULATOR - This section calculates
 112 insurance and housing values for the original machinery complement and
 113 makes adjustments for new machinery complements.

114
 115 (PAGE DOWN)

116 _____

117 LAND COST CALCULATOR

118 -----

119	1. Land Value per Acre	\$0.00
120	2. Interest Rate	0.00%
121	3. Total Acres Owned	0

122 _____

123	4. Interest on Land	\$0
124	Enter value in line 4 into cells CN146..CQ146	

125

126

127 AMORTIZED MACHINERY COSTS (current situation)

128 -----

129 A. Interest Rate: 8.78%

130

131		Purchase Price	Life	Salvage	Annual
132	TRACTORS	of Machine	(yrs)	Value	Amort. Costs
133	(1)	(2)	(3)	(4)	(5)

134 -----

135	1.	\$0	0	\$0	\$0
-----	----	-----	---	-----	-----

CZ	DA	DB	DC	DD	DE
136 2.		\$0	0	\$0	\$0
137 3.		\$0	0	\$0	\$0
138 4.		\$0	0	\$0	\$0
139 5.		\$0	0	\$0	\$0
140					
141					
142					
143	OTHER IMPLEMENTS				
144	-----				
145 1.		\$0	0	\$0	\$0
146 2.		\$0	0	\$0	\$0
147 3.		\$0	0	\$0	\$0
148 4.		\$0	0	\$0	\$0
149 5.		\$0	0	\$0	\$0
150 6.		\$0	0	\$0	\$0
151 7.		\$0	0	\$0	\$0
152 8.		\$0	0	\$0	\$0
153 9.		\$0	0	\$0	\$0
154 10.		\$0	0	\$0	\$0
155	-----				
156	11. TOTAL MACH. VALUE	\$0			\$0
157	Enter the total from column 4 into cell CN148				
158					
159	ADJUSTMENTS TO AMORTIZATION COSTS FOR MACHINERY BOUGHT OR SOLD				
160	-----				
161	Machinery Bought				
162	-----				
163		Purchase Price	Life	Salvage	Annual
164	TRACTORS	of Machine	(yrs)	Value	Amort. Costs
165	-----				
166	(1)	(2)	(3)	(4)	(5)
167	-----				
168 1.		\$0	0	\$0	\$0
169 2.		\$0	0	\$0	\$0
170					
171	OTHER IMPLEMENTS				
172	-----				
173 1.		\$0	0	\$0	\$0
174 2.		\$0	0	\$0	\$0
175 3.		\$0	0	\$0	\$0

	CZ	OA	OB	DC	DD	DE
176	4.		\$0	0	\$0	\$0
177	5.		\$0	0	\$0	\$0
178	<hr/>					
179	6. TOTAL PURCHASED		\$0			\$0
180						
181						
182	Machinery Sold					
183	<hr/>					
184			Purchase Price	Life	Salvage	Annual
185	TRACTORS		of Machine	(yrs)	Value	Amort. Costs
186	<hr/>					
187	(1)		(2)	(3)	(4)	(5)
188	<hr/>					
189	1.		\$0	0	\$0	\$0
190	2.		\$0	0	\$0	\$0
191						
192	OTHER IMPLEMENTS					
193	<hr/>					
194	1.		\$0	0	\$0	\$0
195	2.		\$0	0	\$0	\$0
196	3.		\$0	0	\$0	\$0
197	4.		\$0	0	\$0	\$0
198	5.		\$0	0	\$0	\$0
199	<hr/>					
200	6. TOTAL SOLD		\$0			\$0
201	7. NEW MACHINERY VALUE		\$0			
202	8. ADJUSTED AMORTIZATION	----->				\$0
203	Enter Adjusted Amortization value from column 4 into cells C0148..CQ148					
204						
205	MACHINERY INSURANCE AND HOUSING CALCULATOR					
206	<hr/>					
207				Current		Adj. values
208	<hr/>					
209				(1)		(2)
210	Insurance and Housing Percentage			1.00%		
211						
212	1. Insurance and Housing			\$0		\$0
213	<hr/>					
214	Enter the value from column 1 into cell CN149					
215	Enter the value from column 2 into cells C0149..CQ149					

	DF	DG	DH	DI	DJ	DK	DL	DM
116								
117								
118								
119								
120								
121								
122								
123								
124								
125								
126								
127								
128	-----							
129								
130		Purchase Price						
131		minus						
132		Salvage Value						
133		(6)						
134	-----							
135		\$0						
136		\$0						
137		\$0						
138		\$0						
139		\$0						
140								
141								
142								
143								
144								
145		\$0						
146		\$0						
147		\$0						
148		\$0						
149		\$0						
150		\$0						
151		\$0						
152		\$0						
153		\$0						
154		\$0						
155	=====							

	DF	DG	DH	DI	DJ	DK	DL	DM
156								
157								
158								
159								
160	-----							
161								
162		Purchase Price						
163		minus						
164		Salvage Value						
165	-----							
166		(6)						
167								
168		\$0						
169		\$0						
170								
171								
172								
173		\$0						
174		\$0						
175		\$0						
176		\$0						
177		\$0						
178	-----							
179								
180								
181								
182								
183		Purchase Price						
184		minus						
185		Salvage Value						
186	-----							
187		(6)						
188								
189		\$0						
190		\$0						
191								
192								
193								
194		\$0						
195		\$0						

	DF	DG	DH	DI	DJ	DK	DL	DM
196		\$0						
197		\$0						
198		\$0						
199	<hr/>							
200								
201								
202								
203								
204								
205								
206	-----							
207								
208	-----							
209								
210								
211								
212								
213	-----							
214								
215								

	DJ	DK	DL	DM	DN	DO	DP	DQ	
11	*****								
12	CONSERVATION RESERVE PROGRAM								
13	BID WORKSHEET								
14	-----								
15									
16	This worksheet is used to estimate a bid which can be used to enter								
17	highly erodible land into the CRP. IF the going rate for acceptance								
18	into the CRP is already known, disregard this section.								
19									
20	Go to DR18 for an example								
21									
22	Alt K to Print CRP Section								
23	*****								
24									
25	Acres to Enter in CRP							0	
26									
27	*****								
28									
29	1. Estimated Average Annual Returns to Farm Without CRP Participation								
30									
31	a. Receipts From Sale of Farm Products							\$0	
32	b. (+) Deficiency and Diversion Payments							\$0	
33	c. (-) Total Variable Costs							\$0	
34	d. (-) Total Fixed Costs							\$0	
35								-----	
36	e. (=) Returns to Farm Without Participation							\$0	
37									
38	*****								
39									
40	2. Estimated Average Annual Returns to Farm With CRP Participation								
41									
42	a. Receipts From Sale of Farm Products on Reduced Acres							\$0	
43	b. (+) Deficiency and Diversion Payments on Reduced Acres							\$0	
44	c. (+) Receipts From Hunting, etc. on CRP Land							\$0	
45	d. (-) Misc. Costs for Hunting, etc.							\$0	
46	e. (-) Maintenance Costs for CRP Acres							\$0	
47	f. (-) Total Variable Costs on Reduced Acres							\$0	
48	g. (-) Total Fixed Costs on Reduced Acres, Including								
49	Changes in Machinery Costs and Taxes							\$0	
50								-----	

	DJ	DK	DL	DM	DN	DO	DP	DQ
51	h. (-) Returns to Farm With Participation							\$0
52								
53	*****							
54								
55	3. Cost of Establishing Conservation Practices on CRP Acreage							
56								
57	a. Expected Costs for Establishing Perennial Grass,							
58	Wildlife Planting, Windbreaks, Trees, etc.							\$0
59	b. (-) Gov't Share of Establishment Cost							\$0
60								-----
61	c. Net Landowner Cost of Establishing CRP							\$0
62								
63	*****							
64								
65	4. Cost to Re-Establish Cropland in Year 10							
66								
67	--NOTE: Enter Current Costs and Returns--							
68								
69	a. Costs of Re-Establishing Cropland Including							
70	Seedbed Preparation, Fertilizer, Chemicals, etc.							\$D
71	b. (+) Other Re-Establishment Costs							\$0
72	c. (-) Salvage Value of Products Harvested							
73	From CRP Acres							\$0
74								-----
75								
76	d. (=) Cost to Re-Establish in Year 10							\$0
77								
78	*****							
79								
80	5. Change in Off-Farm Income Due to CRP Participation							
81								
82								
83	a. Off-Farm Income With CRP Participation (\$)							\$0
84	b. (-) Off-Farm Income w/o CRP Participation (\$)							\$0
85								
86	c. (-) Change in Off-Farm Income Due to CRP							-----
87	Participation							\$0
88	*****							
89								
90	6. Calculation of Breakeven Bid							

	DJ	DK	DL	DM	DN	DO	DP	DQ
91								
92								\$0
93								\$0
94								\$0
95								\$0
96								\$0
97							0	
98							6.00%	
99								
100								\$0.00
101								
102	*****							
103								
104								
105								
106								
107								
108								
109								
110								

EB

Appendix D.
Formulas Used in Spreadsheet

UNIVERSAL SOIL LOSS EQUATION

N10: PR [W9] 200
 M21: PR @VLOOKUP(M19,H27..I59,1)
 O21: PR @VLOOKUP(M19,H27..O59,7)
 M67: (F2) PR (M65/72.6)^(@IF(M66>=5,0.5,@IF(M66>=3.5#AND#M66<5,0.4,
 @IF(M66>=1#AND#M66<3.5,0.3,0.2)))*((65.41*(@SIN((@ATAN(M66/
 100)*180/@PI)*@PI/180)^2))+4.56*(@SIN((@ATAN(M66/100)*180/@PI)*
 @PI/180))+0.065)
 K128: PR @SUM(K121..K126)
 K130: (F3) PR @IF(K128=0,0,((K121*M121)+(K122*M122)+(K123*M123)+(K124
 *M124)+(K125*M125)+(K126*M126))/K128)
 L144: PR @IF(I142+K142+N142=0,0,@IF(I142>0,I142*0.8,@IF(K142>0,K142,
 @IF(N142>0,N142*1.2,1/0)))) K199: PR (J197*M197)
 J205: PR [W9] (N10)
 J206: PR [W9] (O21)
 J207: (F2) PR [W9] (M67)
 J208: PR [W9] (L144)
 J209: PR [W9] (K199)
 M211: PR @VLOOKUP(M19,H27..M59,5)
 K213: (F1) PR (J205*J206*J207*J208*J209)
 H215: PR [W9] @IF(K213<M211,"THIS PLAN MEETS THE REQUIREMENTS OF THE
 FOOD SECURITY ACT","THIS PLAN DOES NOT MEET THE REQUIREMENTS OF
 THE FOOD SECURITY ACT")

CONSERVATION STRUCTURES

Steep Backslope Terraces

W58: (F2) PR [W9] @IF(W48=0,0,0.89+(7.41*W43/(1-2*W43)))
 W59: (FO) PR [W9] (W58*W48)
 W60: (FO) PR [W9] (W44*W59)
 W61: (FO) PR [W9] @IF(W48>0,BB206,0)
 W62: (FO) PR [W9] @IF(W43<=0.1,AA38/1000*W48*W45,@IF(W43>0.1#AND#W43<=
 0.14,AA39/1000*W48*W45,@IF(W43>0.14#AND#W43<=0.18,AA40/1000*W48*
 W45,@IF(W43>0.18#AND#W43<=0.21,AA41/1000*W48*W45,@IF(W43>0.21
 #AND#W43<=0.23,AA42/1000*W48*W45,(AA43/1000*W48*W45))))))
 W63: (F2) PR [W9] @IF(W43<=0.1,AA38/1000*W48,@IF(W43>0.1#AND#W43<=0.14,
 AA39/1000*W48,@IF(W43>0.14#AND#W43<=0.18,AA40/1000*W48,@IF(W43>
 0.18#AND#W43<=0.21,AA41/1000*W48,@IF(W43>0.21#AND#W43<=0.23,AA42
 /1000*W48,(AA43/1000*W48))))))
 W76: (CO) PR [W9] (W49+W60+W61+W62)

Broadbase Terraces

W60: (FO) PR [W9] (W45*W48)
W61: (FO) PR [W9] @IF(W48>0, BB206, 0)
W76: (CO) PR [W9] (W49+W60+W61)
W60: (FO) PR [W9] (W45*W48)
W61: (FO) PR [W9] @IF(W48>0, BB206, 0)
W76: (CO) PR [W9] (W49+W60+W61)

Narrow Base Terraces

W59: (FO) PR [W9] (W58*W48)
W60: (FO) PR [W9] (W44*W59)
W61: (FO) PR [W9] @IF(W48>0, BB206, 0)
W62: (FO) PR [W9] @IF(W43<=0.1, AC38/1000*W48*W45, @IF(W43>0.1#AND#W43<=0.14, AC39/1000*W48*W45, @IF(W43>0.14#AND#W43<=0.18, AC40/1000*W48*W45, @IF(W43>0.18#AND#W43<=0.21, AC41/1000*W48*W45, @IF(W43>0.21#AND#W43<=0.23, AC42/1000*W48*W45, AC43/1000*W48*W45))))))
W63: (F2) PR [W9] @IF(W43<=0.1, AC38/1000*W48, @IF(W43>0.1#AND#W43<=0.14, AC39/1000*W48, @IF(W43>0.14#AND#W43<=0.18, AC40/1000*W48, @IF(W43>0.18#AND#W43<=0.21, AC41/1000*W48, @IF(W43>0.21#AND#W43<=0.23, AC42/1000*W48, AC43/1000*W48))))))
W76: (CO) PR [W9] (W49+W60+W61+W62)

Summary of Terrace System Costs

U83: (CO) PR [W9] @ROUND(U81+V81+W81, 0)
U91: (CO) PR [W9] (U83)
P101: PR (S96)
T101: (CO) PR [W9] @IF(R101*(1-(\$ABS\$262))*\$US\$85<\$US\$86, R101*(1-(\$ABS\$262))*\$US\$85, \$US\$86)
V101: (CO) PR [W9] (R101-T101)
P102: PR (1+P101)
T102: (CO) PR [W9] @IF(R102*(1-(\$ABS\$262))*\$US\$85<\$US\$86, R102*(1-(\$ABS\$262))*\$US\$85, \$US\$86)
V102: (CO) PR [W9] (R102-T102)
P103: PR (1+P102)
T103: (CO) PR [W9] @IF(R103*(1-(\$ABS\$262))*\$US\$85<\$US\$86, R103*(1-(\$ABS\$262))*\$US\$85, \$US\$86)
V103: (CO) PR [W9] (R103-T103)
P104: PR (1+P103)
T104: (CO) PR [W9] @IF(R104*(1-(\$ABS\$262))*\$US\$85<\$US\$86, R104*(1-(\$ABS\$262))*\$US\$85, \$US\$86)
V104: (CO) PR [W9] (R104-T104)
P105: PR (1+P104)
T105: (CO) PR [W9] @IF(R105*(1-(\$ABS\$262))*\$US\$85<\$US\$86, R105*(1-(\$ABS\$262))*\$US\$85, \$US\$86)

V105: (CO) PR [W9] (R105-T105)
 P106: PR (1+P105)
 T106: (CO) PR [W9] @IF(R106*(1-(\$ABS\$262))*\$US\$85<\$US\$86,R106*(1-(\$ABS\$262))*\$US\$85,\$US\$86)
 V106: (CO) PR [W9] (R106-T106)
 P107: PR (1+P106)
 T107: (CO) PR [W9] @IF(R107*(1-(\$ABS\$262))*\$US\$85<\$US\$86,R107*(1-(\$ABS\$262))*\$US\$85,\$US\$86)
 V107: (CO) PR [W9] (R107-T107)
 P108: PR (1+P107)
 T108: (CO) PR [W9] @IF(R108*(1-(\$ABS\$262))*\$US\$85<\$US\$86,R108*(1-(\$ABS\$262))*\$US\$85,\$US\$86)
 V108: (CO) PR [W9] (R108-T108)
 R110: (CO) PR @IF(@SUM(R101..R108)<U91,1/0,@SUM(R101..R108))
 T110: (CO) PR [W9] @SUM(T101..T108)
 V112: (CO) PR [W9] @NPV(W46,V101..V108)
 V113: (CO) PR [W9] @PMT(V112,W46,W47)
 V114: (CO) PR [W9] @NPV(W46,R101..R108)*AA14

Waterway

V130: PR [W9] (V122*V123)
 V131: PR [W9] (V122*V124)
 V132: PR [W9] (V127+V130+V131)
 T137: (CO) PR [W9] @ROUND(V132,0)
 P146: PR (S96)
 T146: (CO) PR [W9] @IF(T101=\$US\$86,0,@IF(R146*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T101,\$US\$86-T101,R146*(1-(\$ABS\$273))*\$US\$85))
 V146: (CO) PR [W9] (R146-T146)
 P147: PR (1+P146)
 T147: (CO) PR [W9] @IF(T102=\$US\$86,0,@IF(R147*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T102,\$US\$86-T102,R147*(1-(\$ABS\$273))*\$US\$85))
 V147: (CO) PR [W9] (R147-T147)
 P148: PR (1+P147)
 T148: (CO) PR [W9] @IF(T103=\$US\$86,0,@IF(R148*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T103,\$US\$86-T103,R148*(1-(\$ABS\$273))*\$US\$85))
 V148: (CO) PR [W9] (R148-T148)
 P149: PR (1+P148)
 T149: (CO) PR [W9] @IF(T104=\$US\$86,0,@IF(R149*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T104,\$US\$86-T104,R149*(1-(\$ABS\$273))*\$US\$85))
 V149: (CO) PR [W9] (R149-T149)
 P150: PR (1+P149)
 T150: (CO) PR [W9] @IF(T105=\$US\$86,0,@IF(R150*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T105,\$US\$86-T105,R150*(1-(\$ABS\$273))*\$US\$85))
 V150: (CO) PR [W9] (R150-T150)
 P151: PR (1+P150)
 T151: (CO) PR [W9] @IF(T106=\$US\$86,0,@IF(R151*(1-(\$ABS\$273))*\$US\$85>\$US\$86-T106,\$US\$86-T106,R151*(1-(\$ABS\$273))*\$US\$85))
 V151: (CO) PR [W9] (R151-T151)
 P152: PR (1+P151)

T152: (CO) PR [W9] @IF(T107=\$US\$86,0,@IF(R152*(1-(\$ABS\$273))*\$US\$85>\$US\$86-
 T107,\$US\$86-T107,R152*(1-(\$ABS\$273))*\$US\$85))
 V152: (CO) PR [W9] (R152-T152)
 P153: PR (1+P152)
 T153: (CO) PR [W9] @IF(T108=\$US\$86,0,@IF(R153*(1-(\$ABS\$273))*\$US\$85>\$US\$86-
 T108,\$US\$86-T108,R153*(1-(\$ABS\$273))*\$US\$85))
 V153: (CO) PR [W9] (R153-T153)
 R155: (CO) PR @IF(@SUM(R146..R153)<T137,1/0,@SUM(R146..R153))
 T155: (CO) PR [W9] @SUM(T146..T153)
 V157: (CO) PR [W9] @NFV(V125,V146..V153)
 V158: (CO) PR [W9] @PMT(V157,V125,V126)
 V159: (CO) PR [W9] @NFV(V125,R146..R153)*AA15

Diversion

V173: PR [W9] (V166*V165)
 V174: PR [W9] (V167+V170+V173)
 T179: (CO) PR [W9] @ROUND(V174,0)
 P188: PR (S96)
 T188: (CO) PR [W9] @IF(T101+T146=\$US\$86,0,@IF(R188*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T101-T146,\$US\$86-T101-T146,R188*(1-(\$ABS\$284))*\$US\$85))
 V188: (CO) PR [W9] (R188-T188)
 P189: PR (1+P188)
 T189: (CO) PR [W9] @IF(T102+T147=\$US\$86,0,@IF(R189*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T102-T147,\$US\$86-T102-T147,R189*(1-(\$ABS\$284))*\$US\$85))
 V189: (CO) PR [W9] (R189-T189)
 P190: PR (1+P189)
 T190: (CO) PR [W9] @IF(T103+T148=\$US\$86,0,@IF(R190*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T103-T148,\$US\$86-T103-T148,R190*(1-(\$ABS\$284))*\$US\$85))
 V190: (CO) PR [W9] (R190-T190)
 P191: PR (1+P190)
 T191: (CO) PR [W9] @IF(T104+T149=\$US\$86,0,@IF(R191*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T104-T149,\$US\$86-T104-T149,R191*(1-(\$ABS\$284))*\$US\$85))
 V191: (CO) PR [W9] (R191-T191)
 P192: PR (1+P191)
 T192: (CO) PR [W9] @IF(T105+T150=\$US\$86,0,@IF(R192*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T105-T150,\$US\$86-T105-T150,R192*(1-(\$ABS\$284))*\$US\$85))
 V192: (CO) PR [W9] (R192-T192)
 P193: PR (1+P192)
 T193: (CO) PR [W9] @IF(T106+T151=\$US\$86,0,@IF(R193*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T106-T151,\$US\$86-T106-T151,R193*(1-(\$ABS\$284))*\$US\$85))
 V193: (CO) PR [W9] (R193-T193)
 P194: PR (1+P193)
 T194: (CO) PR [W9] @IF(T107+T152=\$US\$86,0,@IF(R194*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T107-T152,\$US\$86-T107-T152,R194*(1-(\$ABS\$284))*\$US\$85))
 V194: (CO) PR [W9] (R194-T194)
 P195: PR (1+P194)
 T195: (CO) PR [W9] @IF(T108+T153=\$US\$86,0,@IF(R195*(1-(\$ABS\$284))*\$US\$85>
 \$US\$86-T108-T153,\$US\$86-T108-T153,R195*(1-(\$ABS\$284))*\$US\$85))
 V195: (CO) PR [W9] (R195-T195)

R197: (CO) PR @IF(@SUM(R188..R195)<>T179,1/0,@SUM(R188..R195))
T197: (CO) PR [W9] @SUM(T188..T195)
V199: (CO) PR [W9] @NFV(V168,V188..V195)
V200: (CO) PR [W9] @PMF(V199,V168,V169)
V201: (CO) PR [W9] @NFV(V168,R188..R195)*AA16

Water and Sediment Basins

V217: PR [W9] (V207*V208)
V218: (FO) PR [W9] @IF(V207>0,\$BB\$124,0)
V219: (FO) PR [W9] (V209+V212+V217+V218)
T224: (CO) PR [W9] @ROUND(V219,0)
T233: (CO) PR [W9] @IF(T101+T146+T188=\$US\$86,0,@IF(R233*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T101-T146-T188,\$US\$86-T101-T146-T188,R233*(1-(\$AB\$297)
))*\$US\$85))
V233: (CO) PR [W9] (R233-T233)
P234: PR (1+P233)
T234: (CO) PR [W9] @IF(T102+T147+T189=\$US\$86,0,@IF(R234*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T102-T147-T189,\$US\$86-T102-T147-T189,R234*(1-(\$AB\$297)
))*\$US\$85))
V234: (CO) PR [W9] (R234-T234)
P235: PR (1+P234)
T235: (CO) PR [W9] @IF(T103+T148+T190=\$US\$86,0,@IF(R235*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T103-T148-T190,\$US\$86-T103-T148-T190,R235*(1-(\$AB\$297)
))*\$US\$85))
V235: (CO) PR [W9] (R235-T235)
P236: PR (1+P235)
T236: (CO) PR [W9] @IF(T104+T149+T191=\$US\$86,0,@IF(R236*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T104-T149-T191,\$US\$86-T104-T149-T191,R236*(1-(\$AB\$297)
))*\$US\$85))
V236: (CO) PR [W9] (R236-T236)
P237: PR (1+P236)
T237: (CO) PR [W9] @IF(T105+T150+T192=\$US\$86,0,@IF(R237*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T105-T150-T192,\$US\$86-T105-T150-T192,R237*(1-(\$AB\$297)
))*\$US\$85))
V237: (CO) PR [W9] (R237-T237)
P238: PR (1+P237)
T238: (CO) PR [W9] @IF(T106+T151+T193=\$US\$86,0,@IF(R238*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T106-T151-T193,\$US\$86-T106-T151-T193,R238*(1-(\$AB\$297)
))*\$US\$85))
V238: (CO) PR [W9] (R238-T238)
P239: PR (1+P238)
T239: (CO) PR [W9] @IF(T107+T152+T194=\$US\$86,0,@IF(R239*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T107-T152-T194,\$US\$86-T107-T152-T194,R239*(1-(\$AB\$297)
))*\$US\$85))
V239: (CO) PR [W9] (R239-T239)
P240: PR (1+P239)
T240: (CO) PR [W9] @IF(T108+T153+T195=\$US\$86,0,@IF(R240*(1-(\$AB\$297))*
\$US\$85>\$US\$86-T108-T153-T195,\$US\$86-T108-T153-T195,R240*(1-(\$AB\$297)
))*\$US\$85))

V240: (CO) PR [W9] (R240-T240)
 R242: (CO) PR @IF(@SUM(R233..R240)<>T224,1/0,@SUM(R233..R240))
 T242: (CO) PR [W9] @SUM(T233..T240)
 V244: (CO) PR [W9] @NPV(V210,V233..V240)
 V245: (CO) PR [W9] @FMT(V244,V210,V211)
 V246: (CO) PR [W9] @NPV(V210,R233..R240)*AA17
 V252: (CO) PR [W9] (V113+V158+V200+V245)
 V256: (CO) PR [W9] (V114+V159+V201+V246)
 AB262: PR [W9] @IF(@SUM(AB258..AD259)=0,0,((@SUM(AB255..AD256)/@SUM(AB258..AD259))))
 AB268: PR [W9] (V127)
 AB269: PR [W9] (V131)
 AB262: PR [W9] @IF(@SUM(AB258..AD259)=0,0,((@SUM(AB255..AD256)/@SUM(AB258..AD259))))
 AB268: PR [W9] (V127)
 AB269: PR [W9] (V131)

Terrace and Basin Outlet System

AZ59: PR [W9] (BF140)
 BB59: PR [W9] (AV59*AZ59)
 AZ60: PR [W9] (BF141)
 BB60: PR [W9] (AV60*AZ60)
 AZ61: PR [W9] (BF142)
 BB61: PR [W9] (AV61*AZ61)
 AZ62: PR [W9] (BF143)
 BB62: PR [W9] (AV62*AZ62)
 AZ63: PR [W9] (BF144)
 BB63: PR [W9] (AV63*AZ63)
 AZ64: PR [W9] (BF145)
 BB64: PR [W9] (AV64*AZ64)
 AZ65: PR [W9] (BF146)
 BB65: PR [W9] (AV65*AZ65)
 BB66: PR [W9] (AV66*AZ66)
 AZ77: PR [W9] @IF(\$AT\$75=1,BF152,@IF(\$AT\$75=2,BI152,@IF(\$AT\$75=3,BL152,1/0)))
 BB77: PR [W9] (AV77*AZ77)
 AZ78: PR [W9] @IF(\$AT\$75=1,BF153,@IF(\$AT\$75=2,BI153,@IF(\$AT\$75=3,BL153,1/0)))
 BB78: PR [W9] (AV78*AZ78)
 AZ79: PR [W9] @IF(\$AT\$75=1,BF154,@IF(\$AT\$75=2,BI154,@IF(\$AT\$75=3,BL154,1/0)))
 BB79: PR [W9] (AV79*AZ79)
 AZ80: PR [W9] @IF(\$AT\$75=1,BF155,@IF(\$AT\$75=2,BI155,@IF(\$AT\$75=3,BL155,1/0)))
 BB80: PR [W9] (AV80*AZ80)
 AZ81: PR [W9] @IF(\$AT\$75=1,BF156,@IF(\$AT\$75=2,BI156,@IF(\$AT\$75=3,BL156,1/0)))
 BB81: PR [W9] (AV81*AZ81)
 BB82: PR [W9] (AV82*AZ82)

AZ91: PR [W9] @IF(\$AT\$89=1,BF162,@IF(\$AT\$89=2,BI162,BL162))
 BB91: PR [W9] (AV91*AZ91)
 AZ92: PR [W9] @IF(\$AT\$89=1,BF163,@IF(\$AT\$89=2,BI163,BL163))
 BB92: PR [W9] (AV92*AZ92)
 AZ93: PR [W9] @IF(\$AT\$89=1,BF164,@IF(\$AT\$89=2,BI164,BL164))
 BB93: PR [W9] (AV93*AZ93)
 AZ94: PR [W9] @IF(\$AT\$89=1,BF165,@IF(\$AT\$89=2,BI165,BL165))
 BB94: PR [W9] (AV94*AZ94)
 AZ95: PR [W9] @IF(\$AT\$89=1,BF166,@IF(\$AT\$89=2,BI166,BL166))
 BB95: PR [W9] (AV95*AZ95)
 AZ96: PR [W9] @IF(\$AT\$89=1,BF167,@IF(\$AT\$89=2,BI167,BL167))
 BB96: PR [W9] (AV96*AZ96)
 AZ97: PR [W9] @IF(\$AT\$89=1,BF168,@IF(\$AT\$89=2,BI168,BL168))
 BB97: PR [W9] (AV97*AZ97)
 AZ98: PR [W9] @IF(\$AT\$89=1,BF169,@IF(\$AT\$89=2,BI169,BL169))
 BB98: PR [W9] (AV98*AZ98)
 BB99: PR [W9] (AV99*AZ99)
 AZ107: PR [W9] @IF(\$AT\$105=1,BF175,@IF(\$AT\$105=2,BI175,1/0))
 BB107: PR [W9] (AV107*AZ107)
 AZ108: PR [W9] @IF(\$AT\$105=1,BF176,@IF(\$AT\$105=2,BI176,1/0))
 BB108: PR [W9] (AV108*AZ108)
 AZ109: PR [W9] @IF(\$AT\$105=1,BF177,@IF(\$AT\$105=2,BI177,1/0))
 BB109: PR [W9] (AV109*AZ109)
 AZ110: PR [W9] @IF(\$AT\$105=1,BF178,@IF(\$AT\$105=2,BI178,1/0))
 BB110: PR [W9] (AV110*AZ110)
 AZ111: PR [W9] @IF(\$AT\$105=1,BF179,@IF(\$AT\$105=2,BI179,1/0))
 BB111: PR [W9] (AV111*AZ111)
 AZ112: PR [W9] @IF(\$AT\$105=1,BF180,@IF(\$AT\$105=2,BI180,1/0))
 BB112: PR [W9] (AV112*AZ112)
 BB113: PR [W9] (AV113*AZ113)
 AZ116: PR [W9] (BF185)
 BB116: PR [W9] (AV116*AZ116)
 AZ117: PR [W9] (BF186)
 BB117: PR [W9] (AV117*AZ117)
 AZ118: PR [W9] (BF187)
 BB118: PR [W9] (AV118*AZ118)
 AZ119: PR [W9] (BF188)
 BB119: PR [W9] (AV119*AZ119)
 AZ120: PR [W9] (BF189)
 BB120: PR [W9] (AV120*AZ120)
 AZ121: PR [W9] (BF190)
 BB121: PR [W9] (AV121*AZ121)
 BB122: PR [W9] (AV122*AZ122)
 BB124: PR [W9] @SUM(BB59..BB66)+@SUM(BB77..BB82)+@SUM(BB91..BB99)+@SUM
 (BB107..BB113)+@SUM(BB116..BB122)
 AZ141: PR [W9] (BF140)
 BB141: PR [W9] (AV141*AZ141)
 AZ142: PR [W9] (BF141)
 BB142: PR [W9] (AV142*AZ142)
 AZ143: PR [W9] (BF142)
 BB143: PR [W9] (AV143*AZ143)
 AZ144: PR [W9] (BF143)

BB144: PR [W9] (AV144*AZ144)
 AZ145: PR [W9] (BF144)
 BB145: PR [W9] (AV145*AZ145)
 AZ146: PR [W9] (BF145)
 BB146: PR [W9] (AV146*AZ146)
 AZ147: PR [W9] (BF146)
 BB147: PR [W9] (AV147*AZ147)
 BB148: PR [W9] (AV148*AZ148)
 AZ159: PR [W9] @IF(\$AT\$157=1,BF152,@IF(\$AT\$157=2,BI152,@IF(\$AT\$157=3,BL152,1/0)))
 BB159: PR [W9] (AV159*AZ159)
 AZ160: PR [W9] @IF(\$AT\$157=1,BF153,@IF(\$AT\$157=2,BI153,@IF(\$AT\$157=3,BL153,1/0)))
 BB160: PR [W9] (AV160*AZ160)
 AZ161: PR [W9] @IF(\$AT\$157=1,BF154,@IF(\$AT\$157=2,BI154,@IF(\$AT\$157=3,BL154,1/0)))
 BB161: PR [W9] (AV161*AZ161)
 AZ162: PR [W9] @IF(\$AT\$157=1,BF155,@IF(\$AT\$157=2,BI155,@IF(\$AT\$157=3,BL155,1/0)))
 BB162: PR [W9] (AV162*AZ162)
 AZ163: PR [W9] @IF(\$AT\$157=1,BF156,@IF(\$AT\$157=2,BI156,@IF(\$AT\$157=3,BL156,1/0)))
 BB163: PR [W9] (AV163*AZ163)
 BB164: PR [W9] (AV164*AZ164)
 AZ173: PR [W9] @IF(\$AT\$171=1,BF162,@IF(\$AT\$171=2,BI162,BL162))
 BB173: PR [W9] (AV173*AZ173)
 AZ174: PR [W9] @IF(\$AT\$171=1,BF163,@IF(\$AT\$171=2,BI163,BL163))
 BB174: PR [W9] (AV174*AZ174)
 AZ175: PR [W9] @IF(\$AT\$171=1,BF164,@IF(\$AT\$171=2,BI164,BL164))
 BB175: PR [W9] (AV175*AZ175)
 AZ176: PR [W9] @IF(\$AT\$171=1,BF165,@IF(\$AT\$171=2,BI165,BL165))
 BB176: PR [W9] (AV176*AZ176)
 AZ177: PR [W9] @IF(\$AT\$171=1,BF166,@IF(\$AT\$171=2,BI166,BL166))
 BB177: PR [W9] (AV177*AZ177)
 AZ178: PR [W9] @IF(\$AT\$171=1,BF167,@IF(\$AT\$171=2,BI167,BL167))
 BB178: PR [W9] (AV178*AZ178)
 AZ179: PR [W9] @IF(\$AT\$171=1,BF168,@IF(\$AT\$171=2,BI168,BL168))
 BB179: PR [W9] (AV179*AZ179)
 AZ180: PR [W9] @IF(\$AT\$171=1,BF169,@IF(\$AT\$171=2,BI169,BL169))
 BB180: PR [W9] (AV180*AZ180)
 BB181: PR [W9] (AV181*AZ181)
 AZ189: PR [W9] @IF(\$AT\$187=1,BF175,@IF(\$AT\$187=2,BI175,1/0))
 BB189: PR [W9] (AV189*AZ189)
 AZ190: PR [W9] @IF(\$AT\$187=1,BF176,@IF(\$AT\$187=2,BI176,1/0))
 BB190: PR [W9] (AV190*AZ190)
 AZ191: PR [W9] @IF(\$AT\$187=1,BF177,@IF(\$AT\$187=2,BI177,1/0))
 BB191: PR [W9] (AV191*AZ191)
 AZ192: PR [W9] @IF(\$AT\$187=1,BF178,@IF(\$AT\$187=2,BI178,1/0))
 BB192: PR [W9] (AV192*AZ192)
 AZ193: PR [W9] @IF(\$AT\$187=1,BF179,@IF(\$AT\$187=2,BI179,1/0))
 BB193: PR [W9] (AV193*AZ193)
 AZ194: PR [W9] @IF(\$AT\$187=1,BF180,@IF(\$AT\$187=2,BI180,1/0))

BB194: PR [W9] (AV194*AZ194)
 BB195: PR [W9] (AV195*AZ195)
 AZ198: PR [W9] (BF185)
 BB198: PR [W9] (AV198*AZ198)
 AZ199: PR [W9] (BF186)
 BB199: PR [W9] (AV199*AZ199)
 AZ200: PR [W9] (BF187)
 BB200: PR [W9] (AV200*AZ200)
 AZ201: PR [W9] (BF188)
 BB201: PR [W9] (AV201*AZ201)
 AZ202: PR [W9] (BF189)
 BB202: PR [W9] (AV202*AZ202)
 AZ203: PR [W9] (BF190)
 BB203: PR [W9] (AV203*AZ203)
 BB204: PR [W9] (AV204*AZ204)
 BB206: PR [W9] @SUM(BB141..BB148)+@SUM(BB159..BB164)+@SUM(BB173..BB181)
 +@SUM(BB189..BB195)+@SUM(BB198..BB204)

ENTERPRISE BUDGETS

CN140: (CO) PR [W11] @SUM(CN123..CN139)*0.5*\$CM\$141
 CO140: (CO) PR [W11] @SUM(CO123..CO139)*0.5*\$CM\$141
 CP140: (CO) PR [W11] @SUM(CP123..CP139)*0.5*\$CM\$141
 CQ140: (CO) PR [W11] @SUM(CQ123..CQ139)*0.5*\$CM\$141
 CN142: (CO) PR [W11] @SUM(CN123..CN140)
 CO142: (CO) PR [W11] @SUM(CO123..CO140)
 CP142: (CO) PR [W11] @SUM(CP123..CP140)
 CQ142: (CO) PR [W11] @SUM(CQ123..CQ140)
 CN153: (CO) PR [W11] @SUM(CN145..CN152)
 CO153: (CO) PR [W11] @SUM(CO145..CO152)
 CP153: (CO) PR [W11] @SUM(CP145..CP152)
 CQ153: (CO) PR [W11] @SUM(CQ145..CQ152)
 CN155: (CO) PR [W11] +CN142+CN153
 CO155: (CO) PR [W11] +CO142+CO153
 CP155: (CO) PR [W11] +CP142+CP153
 CQ155: (CO) PR [W11] +CQ142+CQ153
 CN170: (CO) PR [W11] @SUM(CN158..CN169)
 CO170: (CO) PR [W11] @SUM(CO158..CO169)
 CP170: (CO) PR [W11] @SUM(CP158..CP169)
 CQ170: (CO) PR [W11] @SUM(CQ158..CQ169)
 CN172: (CO) PR [W11] (CN170-CN155)
 CO172: (CO) PR [W11] (CO170-CO155)
 CP172: (CO) PR [W11] (CP170-CP155)
 CQ172: (CO) PR [W11] (CQ170-CQ155)

1988 GOVERNMENT FARM PROGRAMS

BW205: (C2) PR +\$BWS206
 BX205: (C2) PR +\$BXS206
 BY205: (C2) PR +\$BYS206
 BW206: (C2) PR @IF(BW207<0,0,BW207)
 BX206: (C2) PR @IF(BX207<0,0,BX207)
 BY206: (C2) PR @IF(BY207<0,0,BY207)
 BW207: (C2) PR @IF(CCI164-CCI163<0,CCI166-CCI163,CCI166-CCI164)
 BX207: (C2) PR @IF(CDI164-CDI163<0,CDI166-CDI163,CDI166-CDI164)
 BY207: (C2) PR @IF(CEI164-CEI163<0,CEI166-CEI163,CEI166-CEI164)
 CF120: (F0) PR [W7] @IF(CF118=0,0,@ROUND((CF118*(CF119/CF117)),0))
 CF121: (F0) PR [W7] @IF(CF118=0,0,(CF118-CF120))
 CF122: PR [W7] @IF(CF118=0,0,(CF117-(CF119+CF121)))
 CF129: (C0) PR [W7] (CF119*CF126)
 CCI150: (F1) PR [W7] @ROUND((1-(CCI146+CCI147))*CCI140,1)
 CDI150: (F1) PR [W7] @ROUND((1-(CDI146+CDI147))*CDI141,1)
 CEI150: (F1) PR [W7] @ROUND((1-(CEI146+CEI147))*CEI142,1)
 CB151: PR [W7] @IF(CDI147>BX202#OR#CEI147>BX202#OR#CCI147>BX202,"** %
 DIVERSION IS TO LARGE **","")
 C B 1 5 2 : PR [W7] @ I F (C C 1 4 0 + C D 1 4 1 + C E 1 4 2 = 0 , "
 ",@IF(CCI140+CDI141+CEI142=CF121,"",@IF(CCI140+CDI141+CEI142<CF121,"**
 BASE IS UNDERPLANTED **","** BASE IS OVERPLANTED **"))
 OG152: (F1) PR [W7] @ROUND((OG140*(1-(OG146+OG147))*0.92),1)
 CH152: (F1) PR [W7] @ROUND((CH141*(1-(CH146+CH147))*0.92),1)
 CI152: (F1) PR [W7] @ROUND((CI142*(1-(CI146+CI147))*0.92),1)
 C F 1 5 3 : PR [W7] @ I F (C G 1 4 0 + C H 1 4 1 + C I 1 4 2 = 0 , "
 ",@IF(OG140+CH141+CI142=CF121,"",@IF(OG140+CH141+CI142>CF121,"*0/92
 BASE IS OVERPLANTED*","*0/92 BASE IS UNDERPLANTED*"))
 CF155: PR [W7] (CF139)
 OG155: PR [W7] @IF(CG147>BX202#OR#CH147>BX202#OR#CI147>BX202,"** %
 CCI160: (F1) PR [W7] (((\$CC\$146+\$CC\$147)/(1-(\$CC\$146+\$CC\$147)))*\$CC\$156
 CDI160: (F1) PR [W7] (((\$CD\$146+\$CD\$147)/(1-(\$CD\$146+\$CD\$147)))*\$CD\$157
 CEI160: (F1) PR [W7] (((\$CE\$146+\$CE\$147)/(1-(\$CE\$146+\$CE\$147)))*\$CE\$158
 CG160: (F1) PR [W7] (((\$CG\$146+\$CG\$147)/(1-(\$CG\$146+\$CG\$147)))*\$CG\$156*0.92
 CH160: (F1) PR [W7] (((\$CH\$146+\$CH\$147)/(1-(\$CH\$146+\$CH\$147)))*\$CH\$157*0.92
 CI160: (F1) PR [W7] (((\$CI\$146+\$CI\$147)/(1-(\$CI\$146+\$CI\$147)))*\$CI\$158*0.92
 CCI171: (F1) PR [W7] @IF(\$CC\$140-CCI156-CCI160<0,0,CCI140-CCI156-CCI160)
 CDI171: (F1) PR [W7] @IF(CDI141-CDI157-CDI160<0,0,CDI141-CDI157-CDI160)
 CEI171: (F1) PR [W7] @IF(CEI142-CEI158-CEI160<0,0,CEI142-CEI158-CEI160)
 CG171: (F1) PR [W7] @IF(\$CG\$140-OG156-OG160<0,0,OG140-OG156-OG160)
 CH171: (F1) PR [W7] @IF(CH141-CH157-CH160<0,0,CH141-CH157-CH160)
 CI171: (F1) PR [W7] @IF(CI142-CI158-CI160<0,0,CI142-CI158-CI160)
 CCI176: (F0) PR [W7] (CCI171*CCI173*CCI174)
 CDI176: (F0) PR [W7] (CDI171*CDI173*CDI174)
 CEI176: (F0) PR [W7] (CEI171*CEI173*CEI174)
 CG176: (F0) PR [W7] (CG171*CG173*CG174)
 CH176: (F0) PR [W7] (CH171*CH173*CH174)
 CI176: (F0) PR [W7] (CI171*CI173*CI174)
 CCI185: (F0) PR [W7] @IF(CCI140=0,0,@IF(CCI156>CCI150,1/0,CCI156*CCI144))
 CDI185: (F0) PR [W7] @IF(CDI141=0,0,@IF(CDI157>CDI150,1/0,CDI157*CDI144))

CE185: (FO) PR [W7] @IF(CE142=0,0,@IF(CE158>CE150,1/0,CE158*CE144))
 CF185: (FO) PR [W7] (CF144*CF155)
 OG185: (FO) PR [W7] @IF(OG140=0,0,@IF(OG156>OG152,1/0,OG156*OG144))
 CH185: (FO) PR [W7] @IF(CH141=0,0,@IF(CH157>CH152,1/0,CH157*CH144))
 CI185: (FO) PR [W7] @IF(CI142=0,0,@IF(CI158>CI152,1/0,CI158*CI144))
 CC187: (FO) PR [W7] @IF(CC162>CC164,CC185*CC162,CC185*CC164)
 OG187: (FO) PR [W7] @IF(OG162>OG164,OG185*OG162,OG185*OG164)
 CD188: (FO) PR [W7] @IF(CD162>CD164,CD185*CD162,CD185*CD164)
 CH188: (FO) PR [W7] @IF(CH162>CH164,CH185*CH162,CH185*CH164)
 CE189: (FO) PR [W7] @IF(CE162>CE164,CE185*CE162,CE185*CE164)
 CI189: (FO) PR [W7] @IF(CI162>CI164,CI185*CI162,CI185*CI164)
 CF190: (FO) PR [W7] (CF185*CF162)
 CC191: (FO) PR [W7] @IF(CC140=0,0,BW206*CC143*CC156)
 CD191: (FO) PR [W7] @IF(CD141=0,0,BX206*CD143*CD157)
 CE191: (FO) PR [W7] @IF(CE142=0,0,BY206*CE143*CE158)
 OG191: (FO) PR [W7] +CG152*OG143*BW206
 CH191: (FO) PR [W7] +CH152*CH143*BX206
 CI191: (FO) PR [W7] +CI152*CI143*BY206
 CC192: (FO) PR [W7] +CC147*CC148*CC140*CC143
 CD192: (FO) PR [W7] +CD147*CD148*CD141*CD143
 CE192: (FO) PR [W7] +CE147*CE148*CE142*CE143
 OG192: (FO) PR [W7] +OG140*OG143*OG147*OG148
 CH192: (FO) PR [W7] +CH141*CH143*CH147*CH148
 CI192: (FO) PR [W7] +CI142*CI143*CI147*CI148
 CC193: (FO) PR [W7] +CC192+CC191
 CD193: (FO) PR [W7] +CD192+CD191
 CE193: (FO) PR [W7] +CE192+CE191
 OG193: (FO) PR [W7] +OG192+OG191
 CH193: (FO) PR [W7] +CH192+CH191
 CI193: (FO) PR [W7] +CI192+CI191
 CC194: (FO) PR [W7] +CC168
 CD194: (FO) PR [W7] +CD168
 CE194: (FO) PR [W7] +CE168
 OG194: (FO) PR [W7] +OG168
 CH194: (FO) PR [W7] +CH168
 CI194: (FO) PR [W7] +CI168
 CC195: (FO) PR [W7] (CC176)
 CD195: (FO) PR [W7] (CD176)
 CE195: (FO) PR [W7] (CE176)
 OG195: (FO) PR [W7] (OG176)
 CH195: (FO) PR [W7] (CH176)
 CI195: (FO) PR [W7] (CI176)
 CC197: (FO) PR [W7] +CC187+CC193+CC194+CC195
 CD197: (FO) PR [W7] +CD188+CD193+CD194+CD195
 CE197: (FO) PR [W7] +CE189+CE193+CE194+CE195
 CF197: (FO) PR [W7] (CF190)
 OG197: (FO) PR [W7] +OG187+OG193+OG194+OG195
 CH197: (FO) PR [W7] +CH188+CH193+CH194+CH195
 CI197: (FO) PR [W7] +CI189+CI193+CI194+CI195
 CD213: (FO) PR [W7] (CC187)
 CF213: (FO) PR [W7] (OG187)
 CD214: (FO) PR [W7] (CD188)

CF214: (FO) PR [W7] (CH188)
 CD215: (FO) PR [W7] (CE189)
 CF215: (FO) PR [W7] (CI189)
 CH215: PR [W7] 'CN160..CQ160
 CD216: (FO) PR [W7] @IF(CC140+CD141+CE142=0,0,(CF197))
 CF216: (FO) PR [W7] @IF(OG140+CH141+CI142=0,0,(CF197))
 CD217: (FO) PR [W7] (CC195+CD195+CE195)
 CF217: (FO) PR [W7] (CG195+CH195+CI195)
 CD218: (FO) PR [W7] (CC193+CD193+CE193)
 CF218: (FO) PR [W7] (CG193+CH193+CI193)
 CD219: (FO) PR [W7] (CC194+CD194+CE194)
 CF219: (FO) PR [W7] (CG194+CH194+CI194)
 CD221: (FO) PR [W7] (50000)+((CC165-CC164)*CC143*CC156)+((CD165-CD164)
 *CD143*CD157)+((CE165-CE164)*CE143*CE158)
 CF221: (FO) PR [W7] (50000)+((CG165-CG164)*CG143*CG156)+((CH165-CH164)
 *CH143*CH157)+((CI165-CI164)*CI143*CI158)
 CG235: (FO) PR [W7] (CB235*CC235*CE235)
 CG236: (FO) PR [W7] (CB236*CC236*CE236)
 CG237: (FO) PR [W7] (CB237*CC237*CE237)
 CG238: (FO) PR [W7] (CB238*CC238*CE238)
 CG239: (FO) PR [W7] (CB239*CC239*CE239)
 CG240: (FO) PR [W7] (CB240*CC240*CE240)
 CB242: PR [W7] @SUM(CB235..CB240)

CALCULATORS FOR LAND COST, MACHINERY AMORTIZATION
 AND MACHINERY INSURANCE AND HOUSING

DC123: (CO) PR [W10] (DC119*DC120*DC121)
 DE135: (CO) PR [W13] @IF(DC135=0,0,@PMT(DG135,\$DC\$129,DC135))
 DG135: (CO) PR @IF(DC135=0,0,DB135-DD135)
 DE136: (CO) PR [W13] @IF(DC136=0,0,@PMT(DG136,\$DC\$129,DC136))
 DG136: (CO) PR @IF(DC136=0,0,DB136-DD136)
 DE137: (CO) PR [W13] @IF(DC137=0,0,@PMT(DG137,\$DC\$129,DC137))
 DG137: (CO) PR @IF(DC137=0,0,DB137-DD137)
 DE138: (CO) PR [W13] @IF(DC138=0,0,@PMT(DG138,\$DC\$129,DC138))
 DG138: (CO) PR @IF(DC138=0,0,DB138-DD138)
 DE139: (CO) PR [W13] @IF(DC139=0,0,@PMT(DG139,\$DC\$129,DC139))
 DG139: (CO) PR @IF(DC139=0,0,DB139-DD139)
 DE145: (CO) PR [W13] @IF(DC145=0,0,@PMT(DG145,\$DC\$129,DC145))
 DG145: (CO) PR @IF(DC145=0,0,DB145-DD145)
 DE146: (CO) PR [W13] @IF(DC146=0,0,@PMT(DG146,\$DC\$129,DC146))
 DG146: (CO) PR @IF(DC146=0,0,DB146-DD146)
 DE147: (CO) PR [W13] @IF(DC147=0,0,@PMT(DG147,\$DC\$129,DC147))
 DG147: (CO) PR @IF(DC147=0,0,DB147-DD147)
 DE148: (CO) PR [W13] @IF(DC148=0,0,@PMT(DG148,\$DC\$129,DC148))
 DG148: (CO) PR @IF(DC148=0,0,DB148-DD148)
 DE149: (CO) PR [W13] @IF(DC149=0,0,@PMT(DG149,\$DC\$129,DC149))
 DG149: (CO) PR @IF(DC149=0,0,DB149-DD149)
 DE150: (CO) PR [W13] @IF(DC150=0,0,@PMT(DG150,\$DC\$129,DC150))

DG150: (CO) PR @IF(DC150=0,0,DB150-DD150)
 DE151: (CO) PR [W13] @IF(DC151=0,0,@PMT(DG151,\$DC\$129,DC151))
 DG151: (CO) PR @IF(DC151=0,0,DB151-DD151)
 DE152: (CO) PR [W13] @IF(DC152=0,0,@PMT(DG152,\$DC\$129,DC152))
 DG152: (CO) PR @IF(DC152=0,0,DB152-DD152)
 DE153: (CO) PR [W13] @IF(DC153=0,0,@PMT(DG153,\$DC\$129,DC153))
 DG153: (CO) PR @IF(DC153=0,0,DB153-DD153)
 DE154: (CO) PR [W13] @IF(DC154=0,0,@PMT(DG154,\$DC\$129,DC154))
 DG154: (CO) PR @IF(DC154=0,0,DB154-DD154)
 DB156: (CO) PR [W14] @SUM(DB135..DB139)+@SUM(DB145..DB154)
 DE156: (CO) PR [W13] (@SUM(DE135..DE139)+@SUM(DE145..DE154))
 DE168: (CO) PR [W13] @IF(DC168=0,0,@PMT(DG168,\$DC\$129,DC168))
 DG168: (CO) PR @IF(DC168=0,0,DB168-DD168)
 DE169: (CO) PR [W13] @IF(DC169=0,0,@PMT(DG169,\$DC\$129,DC169))
 DG169: (CO) PR @IF(DC169=0,0,DB169-DD169)
 DE173: (CO) PR [W13] @IF(DC173=0,0,@PMT(DG173,\$DC\$129,DC173))
 DG173: (CO) PR @IF(DC173=0,0,DB173-DD173)
 DE174: (CO) PR [W13] @IF(DC174=0,0,@PMT(DG174,\$DC\$129,DC174))
 DG174: (CO) PR @IF(DC174=0,0,DB174-DD174)
 DE175: (CO) PR [W13] @IF(DC175=0,0,@PMT(DG175,\$DC\$129,DC175))
 DG175: (CO) PR @IF(DC175=0,0,DB175-DD175)
 DE176: (CO) PR [W13] @IF(DC176=0,0,@PMT(DG176,\$DC\$129,DC176))
 DG176: (CO) PR @IF(DC176=0,0,DB176-DD176)
 DE177: (CO) PR [W13] @IF(DC177=0,0,@PMT(DG177,\$DC\$129,DC177))
 DG177: (CO) PR @IF(DC177=0,0,DB177-DD177)
 DB179: (CO) PR [W14] @SUM(DB168..DB169)+@SUM(DB173..DB177)
 DE179: (CO) PR [W13] @SUM(DE168..DE169)+@SUM(DE173..DE177)
 DE189: (CO) PR [W13] @IF(DC189=0,0,@PMT(DG189,\$DC\$129,DC189))
 DG189: (CO) PR @IF(DC189=0,0,DB189-DD189)
 DE190: (CO) PR [W13] @IF(DC190=0,0,@PMT(DG190,\$DC\$129,DC190))
 DG190: (CO) PR @IF(DC190=0,0,DB190-DD190)
 DE194: (CO) PR [W13] @IF(DC194=0,0,@PMT(DG194,\$DC\$129,DC194))
 DG194: (CO) PR @IF(DC194=0,0,DB194-DD194)
 DE195: (CO) PR [W13] @IF(DC195=0,0,@PMT(DG195,\$DC\$129,DC195))
 DG195: (CO) PR @IF(DC195=0,0,DB195-DD195)
 DE196: (CO) PR [W13] @IF(DC196=0,0,@PMT(DG196,\$DC\$129,DC196))
 DG196: (CO) PR @IF(DC196=0,0,DB196-DD196)
 DE197: (CO) PR [W13] @IF(DC197=0,0,@PMT(DG197,\$DC\$129,DC197))
 DG197: (CO) PR @IF(DC197=0,0,DB197-DD197)
 DE198: (CO) PR [W13] @IF(DC198=0,0,@PMT(DG198,\$DC\$129,DC198))
 DG198: (CO) PR @IF(DC198=0,0,DB198-DD198)
 DB200: (CO) PR [W14] @SUM(DB189..DB190)+@SUM(DB194..DB198)
 DE200: (CO) PR [W13] @SUM(DE189..DE190)+@SUM(DE194..DE198)
 DB201: (CO) PR [W14] (DB156+(DB179-DB200))
 DE202: (CO) PR [W13] +DE156+(DE179-DE200)
 DC212: (CO) PR [W10] (DB156*DC210)
 DE212: (CO) PR [W13] (DB201*DC210)

CONSERVATION RESERVE PROGRAM WORKSHEET

DQ36: (C0) PR (DQ31+DQ32-DQ33-DQ34)
DQ51: (C0) PR (DQ42+DQ43+DQ44-DQ45-DQ46-DQ47-DQ49)
DQ61: (C0) PR (DP58-DP59)
DQ76: (C0) PR (DQ70+DQ71-DQ73)
DQ87: (C0) PR +DQ83-DQ84
DQ92: (C0) PR (DQ36)
DQ93: (C0) PR (DQ51)
DQ94: (C0) PR @FMT(DQ61,DP98,10)
DQ95: (C0) PR (DQ76)
DQ96: (C0) PR +DQ87
DP97: (F0) PR (DP25)
DQ100: (C2) PR @IF(DP97=0,0,((DQ92-DQ93)+DQ94+DQ95-DQ96)/DP97)

ELECTRONIC SPREADSHEET MODEL FOR COMPARING
CONSERVATION PLANS FOR DONIPHAN COUNTY, KANSAS

by

Jerold Dean Neufeld

B.S., Kansas State University, 1986

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Engineering

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1988

ABSTRACT

The Food Security Act of 1985 contains major conservation provisions aimed at reducing crop surpluses, while at the same time reducing soil erosion on highly erodible land. Highly erodible land is land which has the potential to erode at eight times its tolerable erosion rate.

Conservation Compliance and the Conservation Reserve Program are two of the main features of the Food Security Act. The purpose of these programs is to discourage cultivation of annual crops on all highly erodible land. In order to continue farming this land, farmers must develop and implement conservation plans which reduce soil losses to rates which are technically and economically achievable.

The objective of this study was to develop an electronic spreadsheet model which can be used to help farmers in Doniphan County, Kansas, compare conservation plans which meet the compliance provisions of the Food Security Act.

The model contains six major sections:

1. Universal Soil Loss Equation
2. Conservation Structures
3. Government Farm Programs
4. Calculators for Land Costs, Machinery Amortization, and Machinery Insurance and Housing
5. Conservation Reserve Program Bid Worksheet
6. Enterprise Budgets

The model enables farmers and Soil Conservation Service personnel to estimate costs and returns associated with the various components of each possible conservation plan. It can then be used to determine

whether the proposed plans meet the compliance provisions of the Food Security Act. When conservation planning with this model is complete, the farm manager can select the conservation plan which best fits his or her particular farming situation.

As the deadline approaches for implementation of conservation plans, this model will become a valuable tool which can be used to simplify and facilitate the conservation planning process.