

Choosing Terrace Systems

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Terraces are one way to control soil erosion. Crop rotation and tillage practices also control erosion, but they do not provide control of runoff water after heavy rains. Terraces provide this control and should often be a part of your water management plan for continuous row crops on slopes of five percent or more.

Terraces do require high capital investments, however. Costs may range from \$100 to \$250 per acre, depending on the type of terrace system.

Terraces are intended to intercept and slow the flow of surface water from unprotected slopes. Contour farming by itself is not very effective in controlling water when large storms occur on moderately steep slopes. Terraces capture the water in a channel and control its removal from the field via an erosion-resistant, vegetative waterway or an underground pipe outlet. Design of grassed waterways is described in UMC Guide 1505.

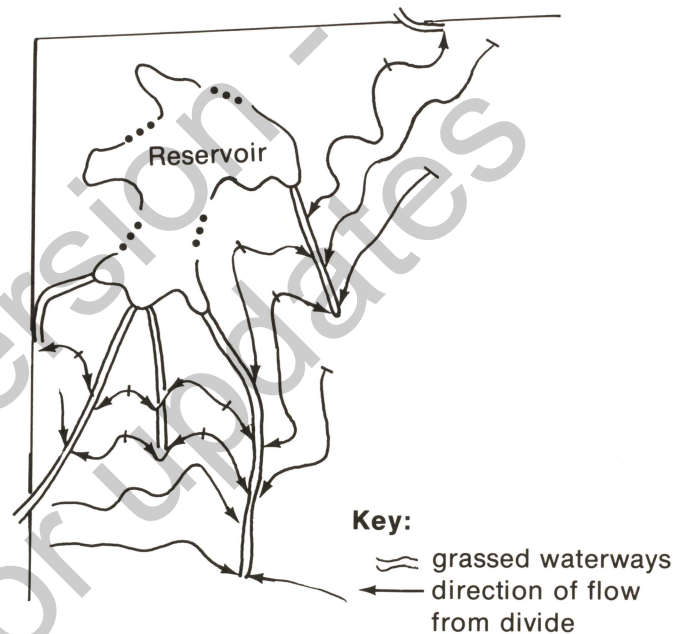
Your financial position will affect your choice of terracing systems. If you have a definite cash flow problem and little equity, you may consider only a minimal investment in the short term. If you have considerable equity in your land or other sources of capital, you can install a terrace system and still show a profit.

Unfortunately, no one has collected statistics showing significantly increased yields in the first five to ten years after terracing. Yield loss due to erosion is not easily measured but does definitely occur as the moisture holding characteristics of the eroded soil decline.

In deciding in which fields to spend money, remember that the best land is usually devoted to high return row crops and needs the maximum protection possible. Therefore, take two steps. First, prepare a plan for the entire farm. This is a must so that travel lanes, terraces, fences, and outlets all work together. Then, actually put the practices in place. Put in outlets first and then construct terraces on the best land near the tops of ridges. Careful scheduling will insure that terraces can be put in place as crop rotation permits.

Terraces are being built today under many of the same constraints that hindered their development forty years ago. However, advances in technology have provided a wider variety of technical alternatives. Review of terraces is helpful in identifying systems that are useful to Missouri landowners. These terrace methods are listed in order of both increasing cost and increasing design complexity. The simplest systems can be laid out directly in the field. Those developed later require more field measurements and considerable computation; thus, they usually require technical assistance. The overall objective of all the systems, of course, is to produce a cost-efficient and easy-to-farm system which meets the owner's preferences.

A case study of a farm in northeast Missouri illustrates the



1. Constant grade channels and grassed waterways are characterized by point rows and sharp curves.

various types of systems one might adopt. Each of the designs in Figures 1 through 4 includes features that may be important to different landowners.

Easiest and Cheapest

The early constant grade terrace, first constructed during the 1930s and early 1940s, was and continues today as an excellent erosion control device. See Figure 1. It is relatively easy to design and lay out in the field. It can be constructed using farm equipment. Grass turn rows or brush along the banks of a ditch or fence row often provide outlets. Two-row farm equipment on 40 inch rows could traverse the sharp turns and point rows which were often necessary to obtain a proper channel grade with no cutting or filling. Heavy earth moving equipment was not readily available when the constant grade terrace was first used; thus, farm equipment had to be used to build the terraces. Many farmers today ignore farming on the contour if they choose this type of terrace, since large equipment is difficult to use on these sharply turning channels. But the terrace ridges are damaged unless the land is farmed on the contour.

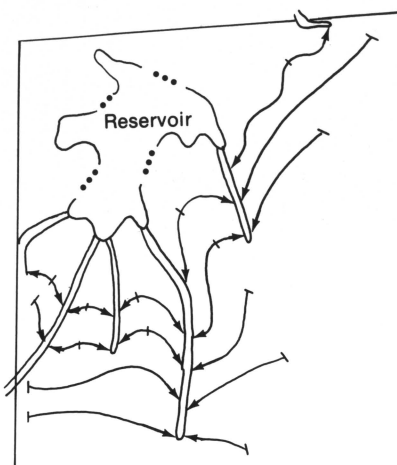
Dozers and 4-Row Equipment

As farm equipment began to increase in size, the larger four-row equipment no longer fit the terrace cross-section

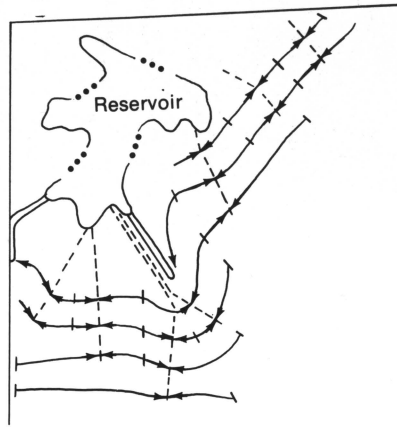
Key:

≡ grassed waterway
← direction of flow from divide

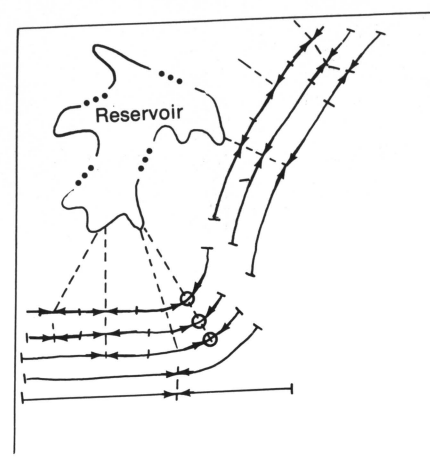
--- underground outlets
○ water and sediment control basin



2. Cuts and fills improve alignment. Note smoother curves.



3. Cuts and fills, a variable grade, plus some underground outlets improve alignment.



4. Cuts and fills, a variable grade, underground outlets, plus water and sediment control basins keep terraces parallel.

properly. Sharp turns and point rows caused more concern. The broad-base terrace was developed after World War II along with the practice of cutting a little more or less in the channel to reduce the sharpness of curves in the terrace. See Figure 2. Notice how terrace channels have straightened. After World War II, the crawler tractor with dozer blade came to be readily available for hire on the farm. This tractor was necessary for constructing the broad-base terrace. Bending the wire staffs of marking flags became a common way to mark where adjustments to improve terrace alignment were to be made. The bent staff signaled the dozer operator to cut a little deeper than normal at this point. The amount of extra cut was left to the dozer operator's judgment.

The dozer became a valuable tool in the development of agricultural lands. Gullies were cleared and shaped into crossable grassed waterways. Fence rows were cleared, and fences were eliminated to create larger fields and longer rows to accommodate even larger, more powerful farm machines. The 36-inch crop row width became more common. Cutting through high spots and filling across depressions in the terrace channel reduced curves and point rows. The idea of varying the terrace channel grades within certain limits gained general acceptance and extended the capacity for straightening the terrace without excessive cuts and fills. Operators continued to use dozers to transport cuts to areas of fill.

Terrace system designs became more demanding while layout possibilities became more varied. Cuts and fills required balancing and locating to make transporting fill easier. Guide stakes had to be marked with specific amounts to be cut and filled. Construction was more exacting. The builder had to supplement "seat of the pants" grading with more exact methods. A sequence of construction had to be planned to keep transportation of cuts and fill materials to a minimum.

Modern Technology and Narrow Rows

Modern times are bringing even larger machines and narrower rows. Row widths of 30 inches and 6- to 8-row equipment are becoming common. These rows must be traveled by huge, four-wheel drive tractors with like-sized tillage and planting equipment. Self-propelled combines with 6- or 8-row headers are commonplace.

Advanced technology has also given us herbicides, pes-

ticides, special planting machines, fertilizers, and tillage machines. The construction industry has developed the self-propelled and self-loading scraper, the chain and wheel type trencher, and corrugated polyethylene plastic tubing with a complete set of quick connect fittings. The self-loading scraper is fast becoming the primary machine for constructing terraces. Cuts and fills no longer have to be kept close together or even in the same terrace channel. This scraper is capable of cutting, transporting, filling, shaping, and smoothing earth efficiently. The trencher and corrugated plastic tubing have made the underground terrace outlet not only feasible but easier and faster to install than a grassed waterway.

As the self-loading scraper freed the terrace designer of many restrictions on location of cuts and fills, so has the underground outlet added new concepts of design that provide wide latitude in developing a parallel and accessible field terrace system and that satisfy the increased demand for easy-to-farm land. See Figure 3. In exchange, the modern day designer of terraces must consider storm runoff quantities, storage capacities of terrace channels, optimum removal rates, pipe flow rates and capacities for varying slopes, and proper outletting of underground conduits to minimize the possibilities of plugging by sediment or washouts. Terrace builders must be better able to follow construction plans and handle new installation techniques required to establish a satisfactory system and to reduce the possibilities of component failure. For a given area, the terrace system layout possibilities are many. Special training and field experience are valuable assets in reaching a solution which will give the most functional and economical plan.

The easiest-to-farm system proposed to date is shown in Figure 4. Farming operations do not always follow the contour in some sections of these terraces. But erosion control should still be effective as long as the affected slope lengths are kept within one terrace spacing. Other areas of the field are protected by water and sediment control basins, which trap the soil and do not let it leave the farm. The terraces in Figure 4 use all of the options and much of the technology listed above. A high priority has been given to ease of farming. Not all landowners would want to consider this system. Proper management of residues is critical if such a design is to succeed.

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