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Chapter 6. CONTOUR FARMING AFFECTS RUNOFF PATTERNS AND SOIL MOVEMENT

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Contouring or contour farming is an erosion-control supporting practice where cropping operations follow a route nearly parallel to contour (equal-elevation) lines rather than up-and-down slope or parallel to the field boundaries. Idealistically, contoured rows each carry all runoff from that row and cause it to flow across the slope at a slight gradient into a grassed waterway or other controlled-erosion channel. Realistically, however, contoured rows often fail to slope continuously toward a waterway or they do not have the capacity to carry all the runoff. Therefore, contouring is usually a quite different erosion-control practice when actually applied on cropland than it is conceptually.

Characteristics that affect the effectiveness of contouring include:

1. Flow cross section--Depends on row width, row microrelief (height and shape of cross section as left by tillage), land slope (perpendicular to the row), irregularity of the row ridges (locations where breakovers might occur), and cross sections of waterways and breakover channels (if they occur).

2. Flow velocity--Depends on flow cross section, surface roughness, row gradient (including the influence of irregularities that may reverse the gradient), row length, and land slope (for waterways and breakover channels).

3. Excess rainfall (runoff) rate--Depends on rainstorm characteristics, infiltration characteristics of the soil, and moisture conditions.

Certain factors, such as soil type and land slope, are characteristics of the field. Others factors may vary from year to year, such as row gradient, row width, and row length. Factors that depend on the farming system include the tillage system, frequency of cultivation, height of row ridges, and roughness of the soil surface. Factors that vary stochastically include rainfall patterns, soil moisture conditions at rainfall, certain surface irregularities, the runoff pattern as determined by whether breakovers previously had occurred, and the size and shape of breakover channels as they enlarge from progressive erosion.

Since contouring is a widely used practice that varies greatly depending upon the individual situation, probably a single evaluation of its effectiveness is inadequate. Instead, various typical contour conditions should be

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analyzed. The effectiveness of each condition should be indicated as a guide. Variations to be evaluated should include types of tillage that affect row microrelief differently, land slopes, row slopes and their irregularities, row lengths, row widths, cropping systems, and rainstorm patterns.

A limited number of conditions should be tested at first, using techniques incorporated in the model for concentrated flow. Concentrated flow would occur in the rows and waterways until row breakovers developed; thereafter, it would follow the shorter rows and breakover channels. Once breakover occurred, the new flow pattern would be appropriate until new rows with significant microrelief are established by further tillage. Thus, runoff that occurred for a given tillage system, row length, and storm size either would flow down the row to an established waterway or would follow the rows until it reached a breakover channel. This would determine the flow pattern thereafter until a significant change due to subsequent tillage occurred. In both situations, sediment from along the rows plus that from the waterways and breakovers, where present, should be included as appropriate. Figures 1 and 2 illustrate this approach.

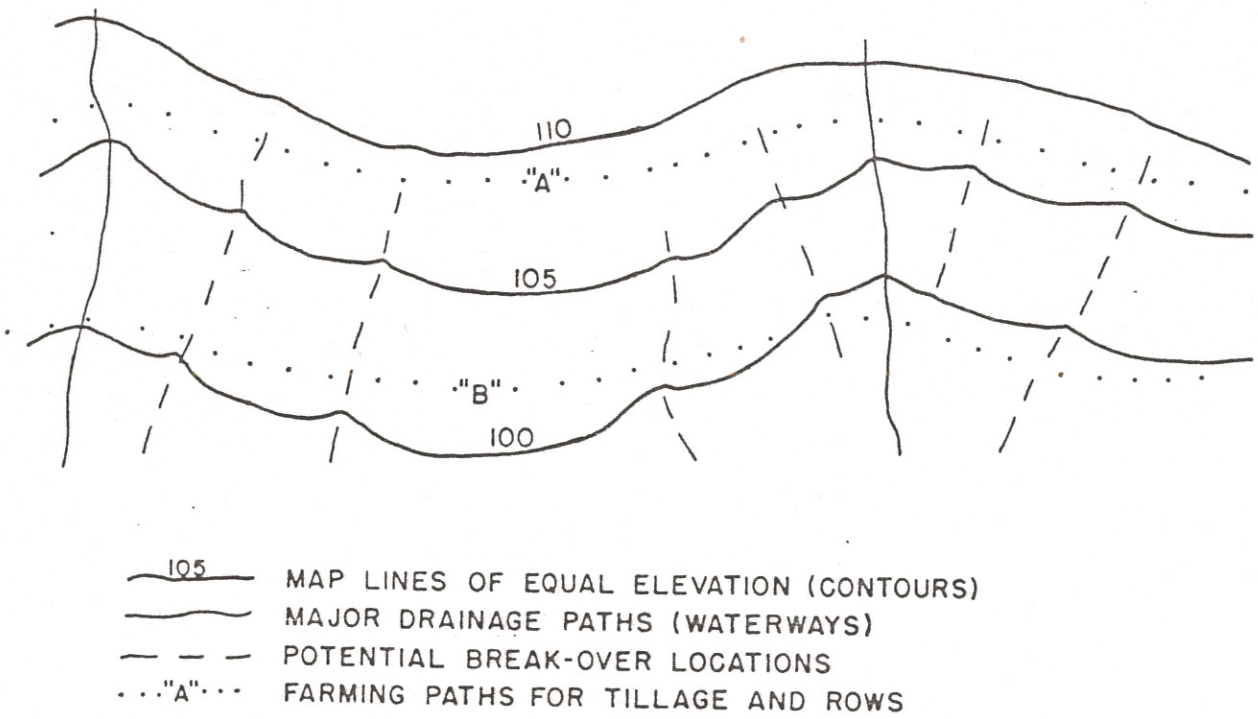

Figure 1.--Typical field topography showing true contour lines and probable tillage paths in fields that are contour farmed.

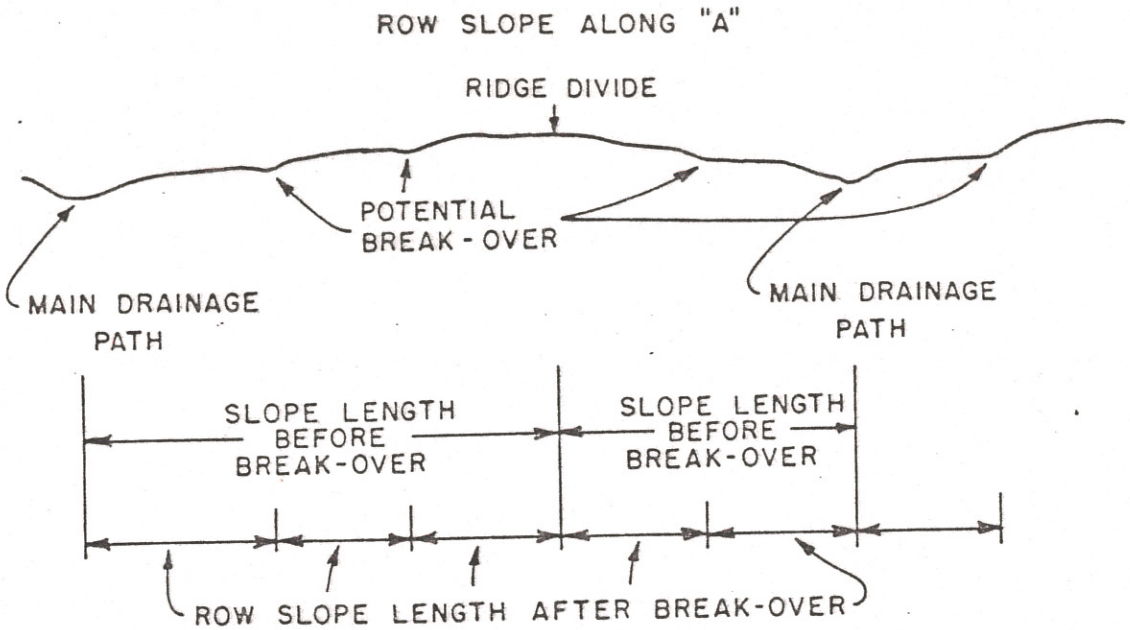

Figure 2.--Changes in runoff pattern and slope length along row "A" when runoff breaks across crop rows of field in Figure 1.

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