5.7 **HILLS**

Most agricultural fields are not perfectly flat. Within the field boundaries there may be knolls or hills. The question is basically "When and how do I input the knoll or hill effect on soil erosion?" Future models may be based on GIS data systems that will include soil properties, topographic effects, and variations in the surface residues or yields within the field. At this time a hill in RWEQ begins at the upwind boundary of the field. If there is a flat field upwind of the hill, the hill must be treated as a separate field.

The effect of a hill is to accelerate the wind speed on the upwind side and decelerate the wind speed on the downwind side. The measurement of wind speeds over hills has been described by Queney (1948). The assumption in RWEQ is that the variation in wind speeds reflects the potential for soil erosion. Erosion data are being collected in the Pacific Northwest and may provide additional insight into the true effect of hills on erosion.

5.7.1 **Hill data in RWEQ**

In RWEQ the hill options are input through the **`Field Geometry`** window. The slope length is input in feet; the slope gradient, in %. To be considered a knoll or hill there must be a 3% or greater change in the slope from the hill to the hill slope along the prevailing wind erosion direction. Slope length is the length of the windward face of the hill along the prevailing wind erosion direction.

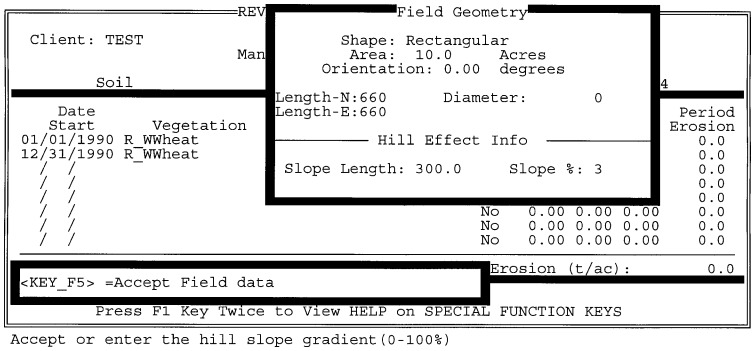
5.7.2 **Source of available hill data**

The source of slope length and gradient data are topographic maps or field surveys.

5.7.3 **Developing hill data**

In RWEQ the information on a hill can be assembled on the RWEQ INPUT FORM. This provides very limited input for fields with multiple hills or complex shapes. The current method is to enter the **`Field Geometry`** window and input the hill information. For example, the **`Field Geometry`** window for a 10-acre rectangular field with a slope length of 300 feet and a slope gradient of 3% is shown in Figure 5.7.3.1.

Figure 5.7.3.1



Fryrear, D.W., Ali Saleh, J.D. Bilbro, H.M. Schomberg, J.E. Stout, and T.M. Zobeck. 1998. Revised Wind Erosion Equation (RWEQ). Wind Erosion and Water Conservation Research Unit, USDA-ARS, Southern Plains Area Cropping Systems Research Laboratory. Technical Bulletin No. 1. Internet address: http://www.csrl.ars.usda.gov/wewc/rweq.htm

5.7.4 **Saving hill data**

In RWEQ the hill information is considered a part of the management file and is automatically saved in the management file.

5.7.5 **Examples of hill effects**

To demonstrate the effect of hills the management file TESTH.MAN is used with the modified Big Spring, Texas weather data file (MODPPPR.DAT). This management file has a sandy loam soil and a square, 10-acre field. This weather file has the wind directions set to 0°, the preponderance set to 10, and the positive parallel ratios set to 1 for each month. There are no barriers.

In the **`Field Geometry`** screen the slope length is set to 300 feet. The slope gradient is varied from 3% to 30% (Table 5.7.5.1).

Table 5.7.5.1. Estimated erosion using TESTH.MAN and MODPPPR.DAT. The soil is a sandy loam and the 10-acre field is square.

Slope gradient, *%*	0	3	5	10	15	30
Erosion estimate, *t/ac*	373.9	354.2	345.0	338.4	357.0	572.3

These values illustrate that hills can have a dramatic effect on soil erosion. The hill effect is amplified even more if soil erodibility is increased or residue levels decreased.

Erosion estimates are shown for two slope gradients as the slope length varies from 100 to 300 feet. For comparison, the erosion estimate for this system with no hill is 373.9 t/ac.

Table 5.7.5.2. Estimated erosion using TESTH.MAN and MODPPPR.DAT. The soil is a sandy loam and the 10-acre field is square.

Slope length, *feet*	100	200	300
Erosion estimate, *t/ac* with 5% slope	370.6	357.9	345.0
Erosion estimate, *t/ac* with 10% slope	369.9	353.5	338.4