

APPENDIX A. CONVERSION TO SI METRIC SYSTEM

SI metric equivalents are not included in the procedures and tables presented in this handbook because direct conversion of each English unit is awkward in many instances and undesirable for a procedure used in the United States. Converting the RUSLE as a whole may be more appropriate. SI metric units can then be selected so that each of the interdependent factors will have a metric counterpart whose values will be expressed in numbers that are easy to visualize and to combine in computations.

A convenient unit for measuring cropland soil losses is metric tons per hectare (table A-1). **EI** values can be obtained by expressing rainfall energy in megajoule· millimeter per hectare· h· yr and expressing intensities in millimeters per hour. Factor **K** will then be in metric tons· hectare· hour per hectare· megajoule· millimeter or metric tons per hectare per unit **EI**. If 22.1 meters is taken as the basic slope length and 9 percent is retained as the basic slope gradient, the **LS** factor will not be affected. Using these units is recommended and is assumed in the following paragraphs.

The RUSLE factors will normally be derived directly in the English units by procedures outlined in Foster et al. (1981). However, the conversion factors in table A-2 will facilitate comparisons of the metric factor values with the English values published in this handbook. Details of the conversions are shown in Foster et al. (1981).

Appendix A.

Table A-1.
Dimensions of universal soil loss equation (USLE) factors

Factor	Symbol	Dimensions	Typical U.S. customary units
Rainfall intensity	i or I	$\frac{^1 \text{length}}{\text{time}}$	$\frac{\text{inch}}{\text{hour}}$
Rainfall energy per unit of rainfall	e	$\frac{\text{length} \cdot \text{force}}{\text{area} \cdot \text{length}}$	$\frac{^2 \text{foot} \cdot \text{tonf}}{\text{acre} \cdot \text{inch}}$
Storm erosivity	EI	$\frac{\text{length} \cdot \text{force} \cdot \text{length}}{\text{area} \cdot \text{time}}$	$\frac{^3 \text{hundreds of foot} \cdot \text{tonf} \cdot \text{inch}}{\text{acre} \cdot \text{hour}}$
Soil loss	A	$\frac{\text{mass}}{\text{area} \cdot \text{time}}$	$\frac{\text{ton}}{\text{acre} \cdot \text{year}}$
Annual erosivity	R	$\frac{\text{length} \cdot \text{force} \cdot \text{length}}{\text{area} \cdot \text{time} \cdot \text{time}}$	$\frac{\text{hundreds of foot} \cdot \text{tonf} \cdot \text{inch}}{\text{acre} \cdot \text{hour} \cdot \text{year}}$
Soil erodibility	K	$\frac{\text{mass} \cdot \text{area} \cdot \text{time}}{\text{area} \cdot \text{length} \cdot \text{force} \cdot \text{length}}$	$\frac{\text{ton} \cdot \text{acre} \cdot \text{hour}}{\text{hundreds of acre} \cdot \text{foot} \cdot \text{tonf} \cdot \text{inch}}$
Slope length	L	$\left(\frac{\text{length}}{\text{length}}\right)^m$	$\left(\frac{L}{L}\right)^m$
Slope steepness	S	Dimensionless	
Cover-management	C	Dimensionless	
Supporting practices	P	Dimensionless	

¹F=forces, L=length, M=mass, T=time, m=exponent that varies from 0.2 to 0.5

²Tonf indicates ton force. Ton without a subscript indicates ton.

³This notation, "hundreds of," means that the numerical value of the factor is 0.01 times its true value. That is, if R=125, its true value is 12,500 ft·tonf·in (acre·h·yr)⁻¹. The converse is true for "hundreds of" in the denominator of a fraction.

Source: Foster et al., 1981.

Table A-2.
Conversion factors for universal soil loss equation (USLE) factors.

To convert from	U.S. customary units	Multiply by	To obtain:	SI Units
Rainfall intensity, i or I	$\frac{\text{inch}}{\text{hour}}$	25.4	$\frac{\text{millimeter}}{\text{hour}}$	$\frac{1}{h} \frac{\text{mm}}{\text{h}}$
Rainfall energy per unit of rainfall, e	$\frac{\text{foot} \cdot \text{tonf}}{\text{acre} \cdot \text{inch}}$	$2.638 \cdot 10^{-4}$	$\frac{\text{megajoule}}{\text{hectare} \cdot \text{millimeter}}$	$\frac{2}{\text{ha} \cdot \text{mm}} \text{MJ}$
Storm energy, E	$\frac{\text{foot} \cdot \text{tonf}}{\text{acre}}$	0.006701	$\frac{\text{megajoule}}{\text{hectare}}$	$\frac{3}{\text{ha}} \text{MJ}$
Storm erosivity, EI	$\frac{\text{foot} \cdot \text{tonf} \cdot \text{inch}}{\text{acre} \cdot \text{hour}}$	0.1702	$\frac{\text{megajoule} \cdot \text{millimeter}}{\text{hectare} \cdot \text{hour}}$	$\frac{\text{MJ} \cdot \text{mm}}{\text{ha} \cdot \text{h}}$
Storm erosivity, EI	$\frac{4}{\text{hundreds of foot} \cdot \text{tonf} \cdot \text{inch}} \frac{\text{foot} \cdot \text{tonf} \cdot \text{inch}}{\text{acre} \cdot \text{hour}}$	17.02	$\frac{\text{megajoule} \cdot \text{millimeter}}{\text{hectare} \cdot \text{hour}}$	$\frac{\text{MJ} \cdot \text{mm}}{\text{ha} \cdot \text{h}}$
Annual erosivity, R ⁵	$\frac{\text{hundreds of foot} \cdot \text{tonf} \cdot \text{inch}}{\text{acre} \cdot \text{hour} \cdot \text{year}}$	17.02	$\frac{\text{megajoule} \cdot \text{millimeter}}{\text{hectare} \cdot \text{hour} \cdot \text{year}}$	$\frac{\text{MJ} \cdot \text{mm}}{\text{ha} \cdot \text{h} \cdot \text{y}}$
Soil erodibility, K ⁶	$\frac{\text{ton} \cdot \text{acre} \cdot \text{hour}}{\text{hundreds of acre} \cdot \text{foot} \cdot \text{tonf} \cdot \text{inch}}$	0.1317	$\frac{\text{metric ton} \cdot \text{hectare} \cdot \text{hour}}{\text{hectare} \cdot \text{megajoule} \cdot \text{millimeter}}$	$\frac{\text{t} \cdot \text{ha} \cdot \text{h}}{\text{ha} \cdot \text{MJ} \cdot \text{mm}}$
Soil loss, A	$\frac{\text{ton}}{\text{acre}}$	2.242	$\frac{\text{metric ton}}{\text{hectare}}$	$\frac{\text{t}}{\text{ha}}$
Soil loss, A	$\frac{\text{ton}}{\text{acre}}$	0.2242	$\frac{\text{kilogram}}{\text{meter}^2}$	$\frac{\text{kg}}{\text{m}^2}$

¹Hour and year are written in U.S. customary units as h and yr and in SI units as h and y. The difference is helpful for distinguishing between U.S. customary and SI units.

²The prefix mega (M) has a multiplication factor of $1 \cdot 10^6$.

³To convert ft · tonf to megajoule, multiply by $2.712 \cdot 10^{-3}$. To convert acre to hectare, multiply by 0.4071.

⁴This notation, "hundreds of," means numerical values should be multiplied by 100 to obtain true numerical values in given units. For example, $R=125$ (hundreds of ft · ton · in (acre · h)⁻¹) = 12,500 ft · tonf h. The converse is true for "hundreds of" in the denominator of a fraction.

⁵Erosivity, EI or R, can be converted from a value in U.S. customary units to a value in units of Newton/hour (N/h) by multiplying by 1.702.

⁶Soil erodibility, K, can be converted from a value in U.S. customary units to a value in units of metric ton · ha (Newton · h)⁻¹ [t · h(ha · N)⁻¹] by multiplying by 1.317.

Source: Foster et al. 1981

