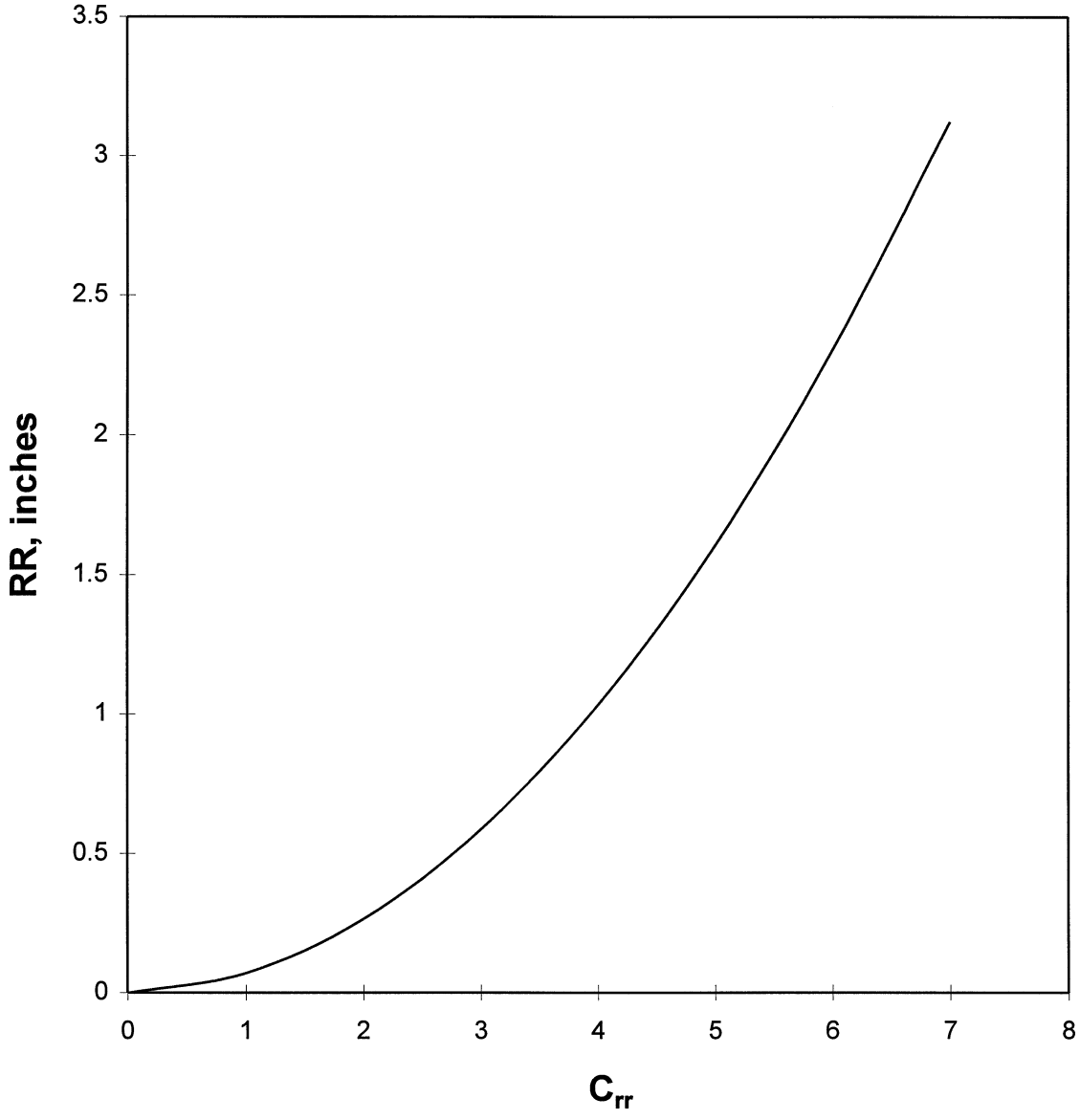
Chain Reading (C_{rr}) and Random Roughness Element

$$RR = 0.00734(C_{rr}) + 0.0627(C_{rr})^2$$

$$r^2 = 0.963$$



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

K′ as Function of Chain Random Roughness (C_{rr}) and Oriented Roughness (K_r)

L_2 †		40	39.6	39.2	38.8	38.4	38.0	37.6	37.2	36.8	36.4	36.0	35.6	35.2	34.8	34.4	34.0	33.6	33.2	32.8
C_{rr}*		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
K_r**		K′																		
inch	cm																			
0	0	1.00	0.88	0.78	0.69	0.61	0.54	0.48	0.42	0.37	0.33	**0.29**	0.26	0.23	0.20	0.18	0.16	0.14	0.12	0.11
1	2.5	0.36	0.31	0.28	0.25	0.22	0.19	0.17	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04
2	5.1	0.21	0.19	0.17	0.15	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.02
3	7.6	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02
4	10.2	**0.12**	0.11	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	**0.03**	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01
5	12.7	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01
6	15.2	0.10	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
7	17.8	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
8	20.3	0.09	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01
9	22.9	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01
10	25.4	0.11	0.10	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01
11	27.9	0.12	0.11	0.10	0.08	0.07	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01
12	30.5	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02

* Chain random roughness value (C_{rr}) computed as $C_{rr} = \left(1 - \frac{L_2}{L_1}\right) \times 100$ where L_1 = any chain length and L_2 = horizontal length over the rough surface (Saleh, 1993).

** $K_r = 4 \times \frac{(\text{ridge height})^2}{\text{ridge spacing}}$ (See table in Appendix H-3.)

† L_2 measurement in inches when L_1 (chain length) is 40 inches.

‡ **EXAMPLES**: If L_2 (using the 40" chain laid *parallel* to the ridges and furrows) is 36" and K_r = 0, then K′ = 0.29.
If ridges are 4" high with 16" spacing, then the K_r (left hand column) is 4. With no *random* roughness (L_2 = 40 or C_{rr} = 0) the K′ = 0.12.
With the combination of random roughness (L_2 = 36") and ridge roughness (K_r = 4) the K′ = 0.03. (See the bolded values.)

Table to determine soil ridge roughness (K_r) when ridge height and ridge spacing are known.

Ridge Spacing, inches	Ridge Height, inches									
	1	2	3	4	5	6	7	8	9	10
	K_r									
2	2	8	-	-	-	-	-	-	-	-
4	1	4	9	-	-	-	-	-	-	-
6	1.5	2.7	6	10.7	-	-	-	-	-	-
8	0.5	2	4.5	8.0	-	-	-	-	-	-
10	0.4	1.6	3.6	6.4	10.0	-	-	-	-	-
12	0.3	1.3	3.0	5.3	8.2	11.9	-	-	-	-
14	0.3	1.1	2.6	4.6	7.1	10.3	-	-	-	-
16	0.2	1.0	2.2	4.0	6.2	9.0	-	-	-	-
18	0.2	1.0	2.0	3.6	5.6	8.0	10.9	-	-	-
20	0.2	0.8	1.8	3.2	5.0	7.2	9.8	-	-	-
24	0.2	0.6	1.5	2.7	4.2	6.0	8.2	10.7	-	-
28	0.1	0.6	1.3	2.3	3.6	5.1	7.0	9.1	-	-
32	0.1	0.5	1.1	2.0	3.1	4.5	6.1	8.0	10.1	-
36	0.1	0.4	1.0	1.8	2.8	4.0	5.4	7.1	9.0	-
40	0.1	0.4	0.9	1.6	2.5	3.6	4.9	6.4	8.1	10.0
45	0.1	0.4	0.8	1.4	2.2	3.2	4.4	5.7	7.2	8.8
50	0.1	0.3	0.7	1.3	2.0	2.9	3.9	5.1	6.5	8.0
55	0.1	0.3	0.7	1.2	1.8	2.6	3.6	4.7	5.9	7.2
60	0.1	0.3	0.6	1.1	1.7	2.4	3.3	4.3	5.4	6.6
70	0.1	0.2	0.5	0.9	1.4	2.1	2.8	3.7	4.6	5.7
80	0.1	0.2	0.5	0.8	1.2	1.8	2.4	3.2	4.0	5.0
90	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.8	3.6	4.4
100	0.0	0.2	0.4	0.6	1.0	1.4	2.0	2.6	3.2	4.0
110	0.0	0.1	0.3	0.6	0.9	1.3	1.8	2.3	2.9	3.6
120	0.0	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.7	3.3

For example: If ridge height is 8" and spacing is 36" the K_r is 7.1; however, if the wind is at an angle such that the 8" ridges are spaced 90" along the path of the wind, the K_r is 2.8".