Table 4.4.2 Estimated soil loss risk by soil type (non-slope equation)

Soil type	Total[1]			Fields[2]		
	Highest	Lowest	Median risk (rank)	Highest	Lowest	Median risk (rank)
RU1	16.5%	7.4%	16.4 (10)	36.4%	6.3%	17.3 (11)
RU2	21.8%	7.0%	14.1 (7)	27.6%	0.0%	16.0 (9)
RU3	1.6%	32.5%	10.2 (5)	3.0%	0.6%	12.9 (7)
VH	24.1%	6.7%	12.8 (7)	n/a	n/a	n/a
M	13.5%	14.7%	12.1 (6)	100.0%	0.0%	21.6 (14)
RL1	38.8%	7.8%	18.3 (12)	47.2%	0.0%	19.3 (12)
RL2	10.2%	6.6%	16.4 (10)	13.5%	0.0%	17.3 (11)
L1	18.5%	0.3%	17.7 (11)	21.8%	0.0%	18.1 (11)
L2	4.2%	0.0%	15.4 (11)	1.2%	0.5%	15.8 (9)
Alluvial	12.4%	67.6%	5.0 (2)	19.3%	56.0%	7.2 (3)
Valley	19.2%	33.8%	11.7 (6)	77.1%	0.0%	24.3 (14)

[1] Values are equal to the percentage of each soil type that is in the top/bottom 20% (highest/lowest soil loss risk).
[2] Values are equal the percentage of each soil type's fields that are in the top/bottom 20%.
* Median risk values are in units of 10^3 kg/ha/yr and parenthetical ranks range from 1 (lowest) to 15 (highest) calculated for the entire dataset.

As the presence of residues increases the amount of rainfall energy that is intercepted before reaching fields' soil (i.e., by increasing surface cover), soil loss estimates are consequently lower for fields that have residues present. These estimates for the highly cultivated soil types appear in Table 4.4.3.

Table 4.4.3 Estimated soil loss risk and canopy cover within field types (non-slope equation)

Region	Soil type	Residues		Bare	
		% Cover[1]	Soil loss (rank)[2]	% Cover[1]	Soil loss (rank)[2]
n/a	Alluvial	36.0	6.9 (3)	14.8	13.4 (7)
Northern	RU1	27.2	11.0 (5)	8.8	20.1 (13)
	RU2	26.9	12.9 (7)	8.8	19.5 (12)
Central	RL1	19.8	17.2 (11)	5.2	23.4 (14)
Southern	L1	16.5	17.9 (11)	7.3	19.7 (13)

[1] Cover percentages derived from median SLA-NDVI values using equation (3.17).
[2] Median risk values are in units of 10^3 kg/ha/yr and parenthetical ranks range from 1 (lowest) to 15 (highest) calculated for the entire dataset.

Table 4.4.4 shows soil loss estimates for soil types predominantly used for grazing. While soil loss is relatively low for most soil types without the inclusion of the slope factor, the typically steep slopes of soil types RU3 and V cause these lands to be at very high risk during rains. The low cover values for all soil types give an indication of the degree to which overgrazing has affected vegetation density in grasslands.

Table 4.4.4 Estimated soil loss risk and cover within grazing areas (i.e., spare bush/graze)

Region	Soil type	% Cover[1]	Soil loss (rank)[2]	Slope range[3]	Soil loss range[4]
n/a	Valley	25.0	12.0 (6)	6 – 25	12.5 – 142.0
Northern	RU3	32.7	8.3 (3)	10 – 25	19.5 – 98.2
n/a	Mbuga	19.8	12.4 (7)	1 – 2	1.8 – 3.4
Central	RL2	20.5	9.7 (4)	2 – 5	2.6 – 7.7
Southern	L2	16.4	15.0 (8)	4 – 6	9.0 – 15.6

[1] Cover percentages derived from median SLA-NDVI values using equation (3.17).
[2] Median risk values are in units of 10^3 kg/ha/yr and parenthetical ranks range from 1 (lowest) to 15 (highest) calculated for the entire dataset.
[3] Based on NSS soil type descriptions; units are in degrees.
[4] Calculated by multiplying the median amount of soil loss by the range of LS-factors that correspond to the range of slope values.

Correlating soil loss estimates to vegetation density

Soil loss estimates exhibit significant, negative correlations with vegetation density (SLA-NDVI) in the pre-harvest (June) image (for the entire village: $r = 0.21$, $p < 0.0001$). This correlation, however, appears to be largely due to a stronger correlation between October and June SLA-NDVI ($r = 0.29$ for the entire village) than between soil loss and June SLA-NDVI (Figure 4.4.8), as October SLA-NDVI values are heavily weighed in the soil loss equation. This is especially true in areas with high densities of coniferous plant species (e.g., alluvial, valley, and RU3 soil types), as there is little seasonal change in vegetation density and so SLA-NDVI correlations should be consistently strong.

On the other hand, soil loss estimates had stronger correlations to June SLA-NDVI than did October SLA-NDVI for fields in all densely cultivated soil types (Figure 4.4.9), which suggests that this soil loss model may in the future become a useful predictor of crop productivity (assuming yield can be correlated to vegetation density). For grazing areas, however, June SLA-NDVI had slightly higher correlation coefficients than soil loss estimates to October SLA-NDVI (i.e., similar to Figure 4.4.8). Although significant correlations were also found between soil loss estimates and MSI, this appears spurious because the correlation coefficient between SLA-NDVI and MSI is -0.837, suggesting that the correlation with soil loss is mostly controlled by NIR reflectance, rather than NIR relative to MIR. A more detailed discussion of these results appears in section 5.4.

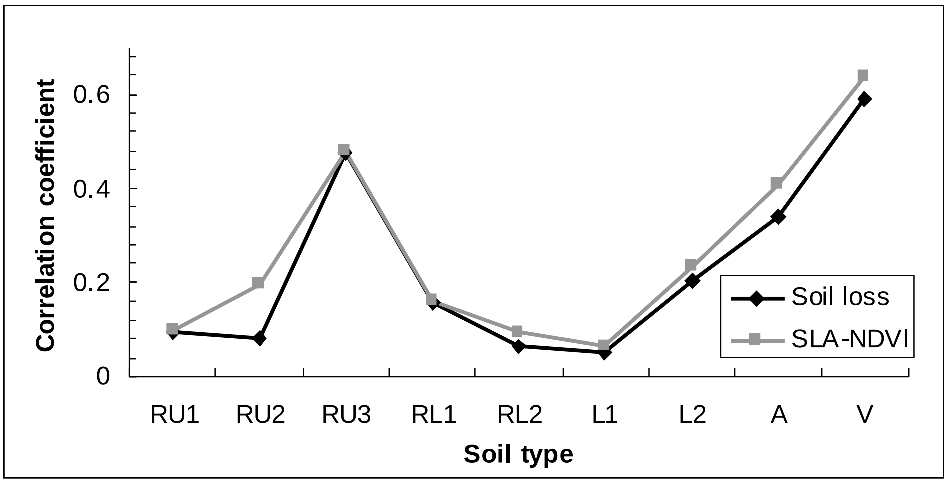

Figure 4.4.8 Strength of correlations between soil loss estimates and June SLA-NDVI by soil type

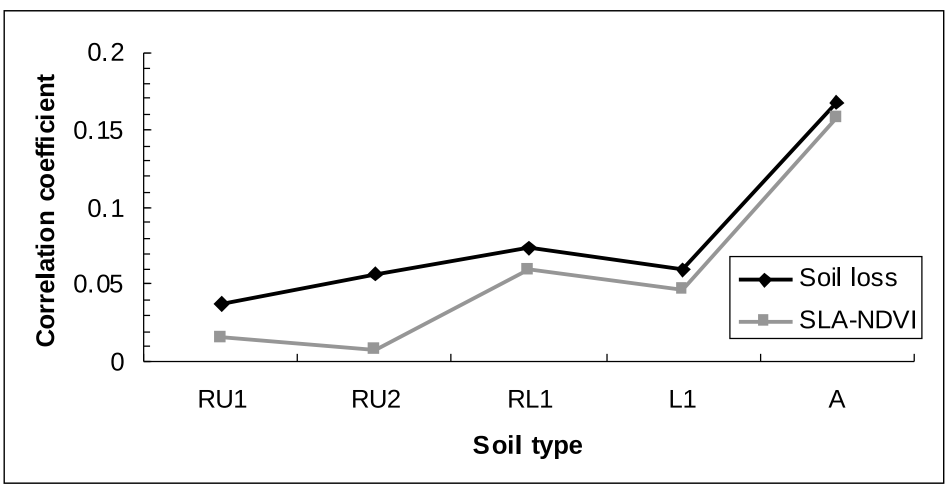

Figure 4.4.9 Strength of correlations between soil loss estimates and June SLA-NDVI for <u>fields</u> in the most heavily cultivated soil types

Correlating soil loss estimates to other trends among soil types

Figure 4.4.10 shows that there are strong trends among fields in heavily cultivated soil types for all potential indicators of soil fertility (with the exception of the alluvial soil type, where trends are not as consistent for reasons discussed in the next chapter). For instance, (not including alluvial fields) RU1 has the lowest estimated soil loss risk, the highest maize productivity, the greatest seasonal difference in SLA-NDVI values, and the highest contents of both N and K. While there are small fluctuations between RU2 and RL1, these soil types are consistently below average for all indicators, while L1 is consistently above average. At a qualitative level, the persistence of these trends among soil types bolsters the validity of the methodology used to generate soil loss estimates.

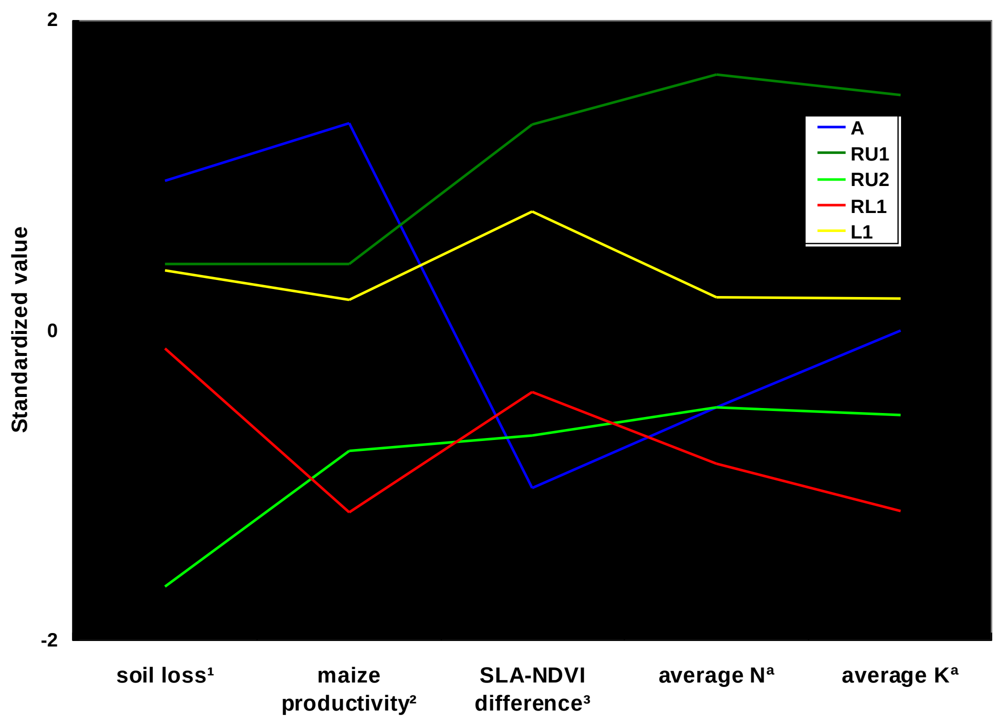

Figure 4.4.10 Standardized distribution of important trends in fields for heavily cultivated soil types
[1] Calculated as average soil loss including slope from values in Figure 4.4.7.
[2] Values are from Table 4.1.1.
[3] Values are from Table 4.2.5.
[a] Values are from Table 4.3.2.