Corstanje et al. [Land Degradation and Development] Table S1. Collated list of potential physical indicators of soil quality considered in the ranking exercise, with associated sub-categories and indicator numbers. Adapted from Rickson et al. (2012).

Physical SQI	Sub-category	Indicator
Direct measurements		
Bulk density (BD)	Kopecki ring	IND1
Bulk density	On-line sensor fusion	IND2
Bulk density	FDR and VIS-NIR spectroscopy	IND3
Packing density	Visual and BD + clay content	IND4
Total porosity	BD and particle density	IND5
Macroporosity	Tension table	IND6
Soil structure	Visual	IND7
Integrated air capacity to 1 m depth	Vol of pores that drain under gravity	IND8
Aggregate stability	Water droplet test	IND9
Dispersion ratio (DR), Water dispersible clay	No definitive method	IND10
Rate of erosion	t ha^{-1} y^{-1}; field, aerial surveys	IND11
Sealing (due to construction and urban development)	Remote sensing	IND12
Disruption/removal	Remote sensing	IND13
Moisture storage capacity, water holding capacity and soil water retention characteristics	Modified moisture release curve	IND14
Available water content	Moisture release curve	IND15
Readily available water content Water held between 0.05 and 2 bar pressure.	Moisture release curve	IND16
Water content	SAR	IND17
Water content	ER	IND18
Water content	EMI	IND19
Soil texture (particle size distribution)	Wet sieving and sedimentation	IND20
Soil texture	VNIRS	IND21
Infiltration/drainage capacity	Permeameter	IND22
Saturated hydraulic conductivity	Permeameter	IND23
Time to ponding	Rainfall intensity	IND24
Sorptivity	Model of infiltration	IND25
Soil temperature	Probe	IND26
Soil temperature	Remote sensing	IND27
Depth of soil	Visual	IND28
Penetration resistance	Penetrometer	IND29
Penetration resistance	Going stick	IND30
Shear strength	Shear box	IND31
Shear strength	Going stick	IND32
Top soil plastic limit to a depth of 1 m	Rolling and moulding	IND33
Number of locations with erosion features	Remote sensing	IND34
Erodibility / aggregate stability	Rainfall	IND35
Capping (due to rainfall impact and slaking)	% area affected	IND36
Rutting and poaching, topsoil surface conditions	Visual	IND37
Profile description/Visual soil evaluation –	Visual	IND38
Indirect measurements		
Catchment hydrograph	Hydrograph	IND39
Surface water turbidity, suspended sediment load, sediment fingerprinting	Fingerprinting	IND40
Biological status of rivers with and without sewage treatment works	WFD status	IND41
Number of eutrophication incidents per year	Phosphorous	IND42

Corstanje et al. [Land Degradation and Development] Table S2. Pertinence of physical soil quality indicators to the 'Soil Functions Category' of the logical sieve, with scoring system. Adapted from the Millennium Ecosystem Assessment (2005).

Soil function	Score
Provisioning (P) food(including seafood and game), crops, wild foods and spices fibre and fuel genetic resources volume and quality of water (domestic, industrial, agricultural use) pharmaceuticals, biochemicals, and industrial products energy (hydropower, biomass fuels) **Regulation (R)** **c**limate regulation water regulation water purification/detoxification air purification/detoxification of waste carbon sequestration waste decomposition, bioremediation and detoxification crop pollination pest and disease control **Cultural (C)** spiritual and religious value inspiration for art, folklore, architecture etc social relations aesthetic values cultural heritage cultural, intellectual and spiritual inspiration recreational experiences (including ecotourism) scientific discovery **Support (S)** soil formation and retention nutrient cycling primary production water cycling provision of habitat nutrient dispersal and cycling seed dispersal	0 = Not pertinent 1 = Poor 2 = Pertinent 3 = Highly pertinent

Corstanje et al. [Land Degradation and Development] Table S3. Pertinence of physical soil quality indicators to the 'Land Use Category' of the logical sieve, with scoring system. Adapted from CEH (2007).

Land use	**Score**
Arable & horticultural (A) Improved grassland (IG) Unimproved/rough grassland (UG) Woodland/forestry (W) Moorland (M) Bare ground (BG) Urban (U)	0 = Not pertinent 1 = Pertinent

Corstanje et al. [Land Degradation and Development] Table S4. Pertinence of physical soil quality indicators to the 'Soil Degradation' of the logical sieve, with scoring system. Adapted from European Commission (European Commission, 2006, Table 4).

Degradation process	**Score**
Erosion (E) Compaction (Co) Sealing of surface due to construction (S) Diffuse soil contamination (DC) Loss of organic matter (LOM) Loss of soil biodiversity (LOB)	0 = Not pertinent 1 = Low 2 = Pertinent 3 = Highly pertinent

Corstanje et al. [Land Degradation and Development] Table S5. Scoring values allocated to each of the challenge criteria used to evaluate physical soil quality indicators. Adapted from Merrington et al. (2006) and Huber et al. (2008).

Challenge criteria	Scores
Relevance/significance (Sig): 1. The indicator must be relevant to the function of environmental interaction (in addition to other functions listed in Table 2 above) and it must be interpretable in quantitative terms as an indicator of soil quality and the temporal changes in soil quality. 2. Allied to this is the issue of clarity. It must be clear what interpretation can or cannot be placed on an indicator. 3. It may be useful to consider indicators as direct or indirect indicators of a soil function. Thus, a catchment hydrograph is an indirect indicator of rainfall interception and storage by soils, but changes in soil water storage following rainfall is a direct indicator.	0 = not relevant 1 = relevant 2 = very relevant
Measurability, sensitivity, discrimination and signal-to-noise ratio (Mes): Practicability of indicators depends on efforts needed for monitoring, data gathering and for indicator calculation. For wide application of the indicators the complexity as well as the effort and costs of data gathering and calculation of the indicator values should be acceptable for decision makers. This criterion is linked strongly with data availability. In order to be operational, indicators should be easily measurable and quantifiable. 1. Soil properties are notoriously spatially variable: 50% is not unusual as the standard errors of the mean of many typical soil parameters. Against this, many soil parameters change only slowly with time. Thus long term monitoring must attempt to discriminate long term trends from “noisy” backgrounds. 2. In selecting indicators, we need to consider the probability of detecting significant changes over the sampling intervals, Thus, for example, if a parameter is likely to change by 5% between samplings, and the 95% confidence limits of the measured mean are equivalent to 50% of the mean, it will be many years before a significant change is detected. 3. This leads to the idea of the undetected change. Indicators should be evaluated against the time span over which significant changes will go undetected; and whether such changes, once detected, are already irreversible. Ideally the time over which a change is undetected is minimised. These aspects are easily determined using simple statistical procedures. 4. We should not adopt indicators which, because of significant variability (due either to actual spatial or temporal variability or to sampling and measurement errors), are unlikely to detect change over reasonable time intervals	1 = poor 2 = good 3 = very good
Practicability and analytical soundness (Sou): 1. How practicable is a potential indicator? Are there robust, proven methods for its measurement? Are such methods in the pipeline? Or will they need considerable development? In the latter case, there would need to very strong reasons to include an indicator which would require significant further development.. Where such reasons do exist, possibly because the indicator furnishes information unavailable in any other way, the project should suggest such further development. 3. The methodological approach to calculate the indicator has to be technically and scientifically sound, based on international standards and international consensus about its validity and its suitability for linkage to economic models, forecasting and information systems.	0 = not practical 1 = practicable
Efficiency and cost (EC): 1. We should seek to maximise the use of automatic methods including sensors, remote sensing and automatic data retrieval. Potential indicators should be examined against the need to minimise cost and maximise efficiency. 2. Allied to this is the general consideration of cost. Potential indicators must be assessed against the likely cost of populating them over 5, 10 and 20 years.	1 = high 2 = moderate 3 = low
Integrative indicators (II): 1. Wherever possible we should be looking for integrative indicators. These are indicators which effectively integrate the information from a number of subsidiary indicators. One example is the catchment hydrograph, which reflects the average hydrology of the soils in the catchment. 2. However, integrative indicators should only be adopted where they can be interpreted in terms of one of the key soil functions. In the case of catchment hydrographs, for example, it is still difficult to extract quantitative information on soil hydrology from what is a very smeared picture.	0 = no 1 = yes

Policy Relevance (Rel): Policy relevance of indicators is expressed by their thematic coincidence with key topics within the current European soil policy agenda. In order to be of value for policy decision-making, key issues and indicators should be related to policy objectives for soil (in particular those in the EU Thematic Soil Strategy) and to environmental or other policy agendas where soil management is a central issue.	0 = not relevant 1 = relevant
Geographical coverage (Geo): Geographical coverage indicates the area where the indicator or the input parameters needed to calculate the indicator have already been monitored. For the selection of indicators special attention should be given to indicators already implemented, especially if the coverage across Europe is extensive. The advantage is a high applicability and most likely a high acceptance. But this should not hinder new developments, if another indicator is more suitable to illustrate the key issue.	1 = poor 2 = good 3 = very good
Availability of baseline and threshold data (Bas): This criterion indicates whether or not baseline and or threshold values have been established for the evaluated indicator. In order to have the possibility of relative comparison over time the availability of baseline and threshold data is important. Baselines and thresholds enable an assessment of a suitable use of soil and needs for effective measures to avoid a critical status of soil degradation. If no baseline or threshold values are available yet, their development should be possible with reasonable effort.	0 = not available 1 = available
Comprehensibility and clarity (Com): Comprehensibility describes the level of expert knowledge needed to understand the information on the situation of a soil threat provided by an indicator. The indicators should be generally understandable in order to facilitate communication of results provided by indicators to the public and political decision-makers. The final information should be clear and easy to interpret. Behind it, complex functions/models can be used, but those have to be combined in a logical and clear structure.	0 = incomprehensible 1 = weakly comprehensible 2 = comprehensible 3 = highly comprehensible

Corstanje et al. [Land Degradation and Development] Methods S6. Methodology for weighting factors, scoring and ranking indicators Adapted from Ritz et al. (2009) and Rickson et al. (2012).

Weighting Factors

Each score for each SQI was given a weighting factor to allow for the priorities of different stakeholders to be emphasised. For example, if food production is the main issue, the provisioning function of the soil may be the most important consideration whereas cost or practicality may be the more important issue when commissioning and implementing a national soil monitoring programme.

Scoring

Each physical SQI was given an individual numerical score for each factor in all 4 Categories. A factor was left un-scored only if its relevance was unknown. The scoring values and aggregated values were designed so that higher scores relate to greater potential for an indicator to be applicable i.e the higher the score the more likely the physical SQI is to be relevant in a national soil monitoring scheme. The expert group from Rickson et al. (2012) was asked to provide a score value within the range listed for each factor. The experts only provided scores for physical SQIs within their area of expertise. When more than one expert provided a score for an indicator/factor, an arithmetic mean value was calculated and used in the final framework for ranking indicators.

The resultant scores were then collated and used to formulate a list of candidate physical indicators of soil quality. Two broad approaches were used in identifying the most promising SQIs:

a) A simple ranking of cumulative (additive) scores (incorporating 0 scores, if any)
b) A filtering function (or sieve) which states that if a SQI fails at any point to meet the requirements of a meaningful SQI (i.e. scores 0), then this SQI will be disqualified or will 'drop out' of the selection process.

Methodology to rank indicators

The resultant scores for each physical SQI were then transformed according to the following formulae:

Category 1: Soil functions

$F_{EGS} = (XxP) + (XxR) + (XxC) + (XxS)$ (1)

Sieve = IF(PxRxCxS)>0 return 1 otherwise return 0 (2)

Sieved F_{EGS} = (1) x (2) (3)

Where F_{EGS} = cumulative score for factors relating to ecosystems goods and service; P = score for provisioning; R = score for Regulation; C = score for cultural; S = score for support; and X = weighting factor. Given the overall aim of the project is to identify physical SQIs that reflect all soil functions, the sieving process was set to remove all indicators that are unable to represent every soil function class. In other words, only those SQIs that reflect all soil functions are retained in equation (3). In reality, no indicators dropped out of the selection process at this stage.

Category 2: Land use

$F_{ALU} = (XxA)+(XxIG)+(XxUG)+(XxW)+(XxM)+(XxBG)+(XxU)$ (4)

Sieve = IF(AxIGxUGxWxMxBGxU)> 0 return 1 otherwise return 0 (5)

Sieved F_{ALU} = (4) x (5) (6)

Where F_{ALU} = cumulative score for applicability to land use; A = arable and horticultural; IG = improved grassland; UG = unimproved grassland; W = woodland and forestry; M = moorland; BG = bare ground; and U = urban. Equation 6 sieves all indicators and leaves only those in which all land use classes returned a >0 response.

Category 3: Soil degradation process

$F_{SD} = (XxE)+(XxCo)+(XxS)+(XxDC)+(XxLOM)+(XxLOB)$ (7)

Sieve = IF(ExCoxSxDCxLOMxLOB)> 0 return 1 otherwise return 0 (8)

Sieved F_{SD} = (7) x (8) (9)

Where F_{SD} = cumulative score for factors relating to soil degradation; E = erosion; Co = Compaction; S = sealing; DC = diffuse soil contamination; LOM = loss of organic matter; and LOB = loss of soil biodiversity. Equation 9 sieves all indicators and leaves only those in which every soil degradation process class returned a >0 response.

Category 4: Challenge criteria

F_{CC} = (XxSig) + (XxMes) + (XxSou) + (XxEC) + (XxII) + (XxRel) + (XxGeo) + (XxBas) + (XxCom) (10)

Sieve = IF(SigxMesxSouxECXxIIxRelxGeoxBasxCom)> 0 return 1 otherwise return 0 (11)

Sieved F_{CC} = (10) x (11) (12)

Where F_{CC} = cumulative score for challenge criteria; Sig = Relevance /significance; Mes = Measurability, sensitivity, discrimination and signal-to-noise ratio; Sou = Practicability and analytical soundness; EC = Efficiency and cost; II = Integrative indicators; Rel = Policy relevance and management strategy; Geo = Geographical coverage; Bas = Availability of baseline and threshold data; and Com = Comprehensibility and Clarity. Equation 12 sieves all indicators and leaves only those in which every challenge criteria class returned a >0 response.

The resultant scores from each of the 4 Categories were subsequently used to assess the performance of each physical SQI. The assessment can be made for any of the 4 Categories individually, by ranking the total scores resulting from F_{EGS}, F_{ALU}, F_{SD} and F_{CC} or from the sieved values of F_{EGS}, F_{ALU}, F_{SD} and F_{CC}. Applicability of SQIs (F_A) across all 4 Categories combined was assessed by ranking the resultant values i.e.:

$$F_A = F_{EGS} \times F_{ALU} \times F_{SD} \times F_{CC} \quad (13)$$

The assessment of SQI applicability across all 4 Categories combined, using the 'logical sieve' (Sieved F_A) was calculated as:

$$\text{Sieved } F_A = \text{Sieved } F_{EGS} \times \text{Sieved } F_{ALU} \times \text{Sieved } F_{SD} \times \text{Sieved } F_{CC} \quad (14)$$

Ranked results of equation 14 provide a form of 'integrated prioritisation' that accommodates all information on each indicator.

The way the logical sieve has been applied to physical SQIs in the first instance has an implicit hierarchy in the 4 Categories used, i.e. functions relating to ecosystems goods and services (Category 1) take top priority, followed by land use (Category 2), soil degradation (Category 3) and challenge criteria (Category 4). This order is based on the current emphasis on the importance of soil functions.

Corstanje et al. [Land Degradation and Development] Table S7. Example of logical sieve assessment (Physical SQI – Rate of erosion IND11)

Mean score values are based on the scoring values listed in SI 2-5. No weighting to the scores has been applied in this example (i.e. mean score is multiplied by 1).

Categories	Sub-categories	Mean score	Weighting (x)
1. Soil function	Provisioning (P)	3	1
	Regulation (R)	3	1
	Cultural (C)	3	1
	Support (S)	3	1
2. Land use	Arable & horticultural (A)	1	1
	Improved grassland (IG)	1	1
	Unimproved/rough grassland (UG)	1	1
	Woodland/forestry (W)	1	1
	Moorland (M)	1	1
	Bare ground (BG)	1	1
	Urban (U)	1	1
3. Soil Degradation	Erosion (E)	3	1
	Compaction (Co)	1.5	1
	Sealing of surface due to construction (S)	1.5	1
	Diffuse soil contamination (DC)	0	1
	Loss of organic matter (LOM)	2.5	1
	Loss of soil biodiversity (LOB)	2	1
4. Challenge criteria	Relevance/significance (Sig)	2	1
	Measurability, sensitivity, discrimination and signal-to-noise ratio (Mes)	2	1
	Practicability and analytical soundness (Sou)	1	1
	Efficiency and cost (EC)	2	1
	Integrative indicators (II)	1	1
	Policy Relevance (Rel)	1	1
	Geographical coverage (Geo)	2	1
	Availability of baseline and threshold data (Bas)	1	1
	Comprehensibility and clarity (Com)	3	1

Using information from S7, a cumulative value (F_A) and sieved cumulative value (Sieved F_A) were calculated for IND11, first for each Category and then for all Categories combined. A worked example of this calculation is shown below.

<u>Category 1: Soil functions</u>

F_{EGS} = (XxP) + (XxR) + (XxC) + (XxS) (1)
= (1 x 3) + (1 x 3) + (1 x 3) + (1 x 3)
= 12

Where F_{EGS} = cumulative score for factors relating to ecosystems goods and service; P = score for provisioning; R = score for Regulation; C = score for cultural; S = score for support; and X = weighting factor.

The sieving process removes all indicators that are unable to represent every soil function class. In other words, the SQI will only qualify if <u>all</u> soil functions are scored.

Sieve = IF(PxRxCxS)>0 return 1 otherwise return 0 (2)
= 1

Sieved F_{EGS} = (Eq. 1) x (Eq. 2) (3)
= 12 x 1
= 12

Category 2: Land use

F_{ALU} = (XxA)+(XxIG)+(XxUG)+(XxW)+(XxM)+(XxBG)+(XxU) (4)
= (1 x 1) + (1 x 1) + (1 x 1) + (1 x 1) + (1 x 1) + (1 x 1) + (1 x 1)
= 7

Where F_{ALU} = cumulative score for applicability to land use; A = arable and horticultural; IG = improved grassland; UG = unimproved grassland; W = woodland and forestry; M = moorland; BG = bare ground; and U = urban.

The sieving process removes all indicators that are unable to represent every land use class. In other words, the SQI will only qualify if all land uses are scored.

Sieve = IF(AxIGxUGxWxMxBGxU)> 0 return 1 otherwise return 0 (5)
= 1

Sieved F_{ALU} = (Eq. 4) x (Eq. 5) (6)
= 7 x 1
= 7

Category 3: Soil degradation process

F_{SD} = (XxE)+(XxCo)+(XxS)+(XxDC)+(XxLOM)+(XxLOB) (7)
= (1 x 3) + (1 x 1.5) + (1 x 1.5) + (1 x 0) + (1 x 2.5) + (1 x 2)
= 10.5

Where F_{SD} = cumulative score for factors relating to soil degradation; E = erosion; Co = Compaction; S = sealing; DC = diffuse soil contamination; LOM = loss of organic matter; and LOB = loss of soil biodiversity.

The sieving process removes all indicators that are unable to represent every soil degradation process. In other words, the SQI will only qualify if all soil degradation processes are scored.

Sieve = IF(ExCoxSxDCxLOMxLOB)> 0 return 1 otherwise return 0 (8)
= 0

Sieved F_{SD} = (7) x (8) (9)
= 10.5 x 0
= 0

Category 4: Challenge criteria

F_{CC} = (XxSig) + (XxMes) + (XxSou) + (XxEC) + (XxII) + (XxRel) + (XxGeo) +
(XxBas) + (XxCom) (10)
= (1 x 2) + (1 x 2) + (1 x 1) + (1 x 2) + (1 x 1) + (1 x 1) + (1 x 2) + (1 x 1) + (1 x 3)
= 15

Where F_{CC} = cumulative score for challenge criteria; Sig = Relevance /significance; Mes = Measurability, sensitivity, discrimination and signal-to-noise ratio; Sou = Practicability and analytical soundness; EC = Efficiency and cost; II = Integrative indicators; Rel = Policy relevance and management strategy; Geo = Geographical coverage; Bas = Availability of baseline and threshold data; and Com = Comprehensibility and Clarity.

The sieving process removes all indicators that do not meet every challenge criteria class. In other words, the SQI will only qualify if all challenge criteria are given a >0 response.

Sieve = IF(SigxMesxSouxECXxIIxRelxGeoxBasxCom)> 0 return 1 otherwise return 0 (11)
= 1

Sieved F_{CC} = (10) x (11) (12)

$= 15 \times 1$
$= 15$

Applicability of the SQI (F_A; here rate of erosion) across all 4 Categories combined was assessed by multiplying the resultant values i.e.:

$$\text{SQI } F_A = F_{EGS} \times F_{ALU} \times F_{SD} \times F_{CC} \quad (13)$$
$$= 12 \times 7 \times 10.5 \times 15$$
$$= 13230$$

The (Sieved F_A for the SQI) was calculated as:

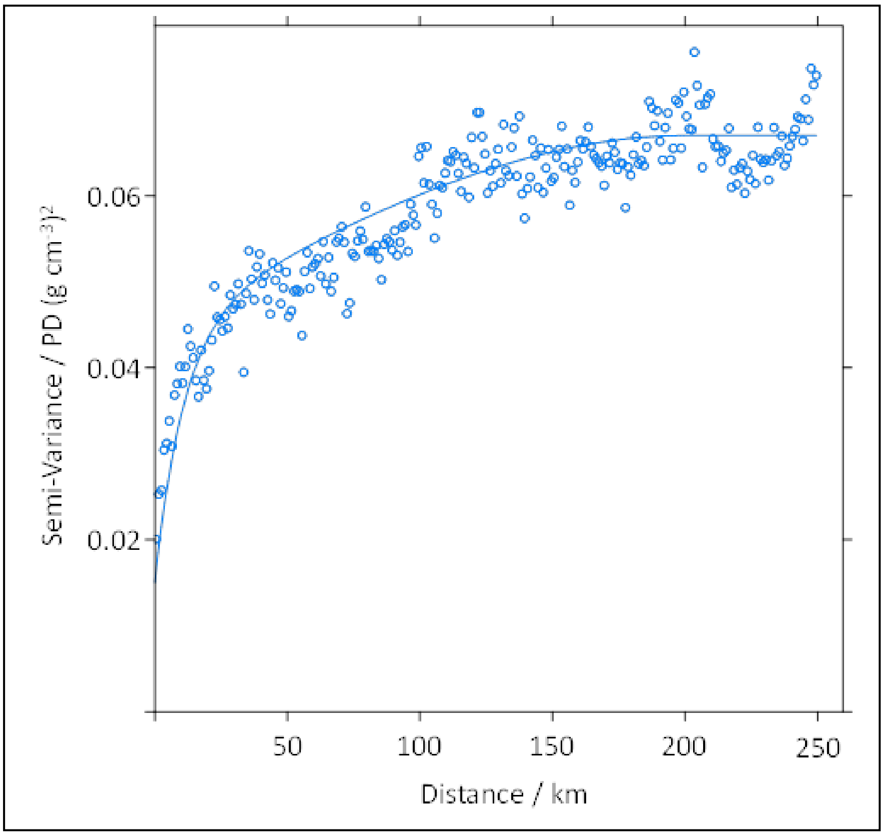
$$\text{Sieved } F_A = \text{Sieved } F_{EGS} \times \text{Sieved } F_{ALU} \times \text{Sieved } F_{SD} \times \text{Sieved } F_{CC} \quad (14)$$
$$= 12 \times 7 \times 0 \times 15$$
$$= 0$$

The cumulative score of 13230 ranks this indicator as one of the top cumulative scoring indicators (rank = 1). However, because the rate of erosion SQI scored 0 against diffuse soil contamination, this indicator is sieved out in Category 3 and the final sieved score (F_A) is 0.

Corstanje et al. [Land Degradation and Development] Methods S8. Geostatistical modelling technique. Adapted from Rickson et al. (2012).

A model-based approach was used to obtain an estimate of the SQI spatial variability. The geostatistical modelling was executed in R software and the variogram procedure was executed in the R library Gstat. Power analyses was used to determine the sample size needed to detect meaningful change in the priority SQIs. Statistical power is the probability that a specific difference will be detected at a specified level of confidence.

The influence of spatial scales on sample size was calculated using a model-based approach where the variation of different regions (size of spatial unit) was obtained from the variogram below.



Variogram of packing density (PD) obtained from data from NSI of England and Wales and ADAS (Newell Price *et al.*, 2012)

Corstanje et al. [Land Degradation and Development] Methods S9. Methodology for determining pedotransfer functions. Adapted from Rickson et al. (2012).

Pedotransfer function 1:

Multilinear regression model:

$$Y = a + b_1X_1 + b_2X_2 + \ldots + b_xX_x + E \qquad \text{(Eq 1)}$$

where Y is the dependent variable; a is a constant; b_i are coefficients; X_i are predictor variables; and E is an error term. To assess the predictive power of the model, a 10-fold cross validation was implemented using the DAAG package (Maindonald & Braun, 2011). The significant variables were chosen by a stepwise selection procedure using the stepAIC function of the MASS package in R (Venables & Ripley, 2002).

Pedotransfer function 2:

Multiple Additive Regression Splines:

A set spline basis functions are constructed (nonlinear functions) that are entirely determined from the regression data, and determines where they are applicable by automatically selecting appropriate knot values for different variables (in essence a multiple piecewise linear regression, where each breakpoint (or knot value) defines the "region of application" for a particular linear regression equation).

Variable importance in MARS fitting. Numbers refer to rankings of importance

	S_v	S_g	Drainable Porosity	Plant Available Water	Relative Field Capacity
BULKD	2	2	2	2	2
CLAY	3	2	2	2	1
SILT	0	1	0	2	2
SAND	1	2	2	2	2
ORGANIC_CARBON	1	2	1	3	1
LU_GROUP	0	0	0	0	0
SUBGROUP	1	1	4	1	3
SERIES	4	4	2	3	2

Corstanje et al. [Land Degradation and Development] Methods S10. Methodology for determining soil water retention characteristics (index S, AC, PAWC and RFD) from the LandIS data base. Adapted from Rickson et al. (2012).

For each soil, the water retention function represented by the Van Genuchten equation (eq 1) was fitted to the data where *θ* is the moisture content, *h* is the pressure head, θ_{sat} is the saturated moisture content, θ_{res} (residual moisture content) α and n are fitting parameters and m = 1 – 1/n.

$$\theta = (\theta_{sat} - \theta_{res})\left[1 + \left(\frac{1}{\propto h}\right)^{n}\right]^{-m} + \theta_{res}$$ (Eq 1)

The Dexter's S index was calculated with Eq 2, using the fitted parameters and converted into S_g using Eq. 3.

$$S = \left| n(\theta_{sat} - \theta_{res}) \left[1 + \frac{1}{m}\right]^{-(1+m)} \right|$$ (Eq 2)

$$S_v = \rho_b S_g$$ (Eq 3)

AC, PAWC and RFC indicators were calculated using:
θ_{sat} (saturated moisture content at 0m pressure head), estimated from the porosity
θ_{fc} (volumetric moisture content at field capacity), occurring at 0.5 or 1m pressure head
θ_{PWP} (moisture content at permanent wilting point), measured at 150m pressure head

It was not possible to calculate macroporosity (M) because measurements of the moisture content, θ_m (occurring at 0.1m pressure head) were not given.

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