

## References

- Agassi, M., Morin, J. & Shainberg, I., 1985. Effect of drop impact energy and water Salinity on infiltration rate of sodic soils. *Soil. Sci. Soc. Am. J.* 49, 186-190.
- Agassi, M. & Du Plessis, H.M., 1984. A rainfall simulator with a rotating disk. Description, uses and operating instructions. Unpublished SIRI report.
- Alperovitch, N., Shainberg, I., Keren, R. & Singer, M.J., 1985. Effect of clay mineralogy aluminium and iron oxides on the hydraulic conductivity of clay-sand mixtures. *Clays Clay Miner.* 33, 443-450.
- Arora, H.S. & Coleman, N.T., 1979. The influence of electrolyte concentration on flocculation of clay suspensions. *Soil Science.* 127, 134-139.
- Banin, A. & Amiel, A., 1969. A correlative study of the chemical and physical properties of a group of natural soils of Israel. *Geoderma* 3: 185-198.
- Baver, L.D., Gardner, W.H. & Gardner, W.R., 1972. Soil physics. New York: Wiley.
- Betrand, A.R., & Sor, K., 1962. The effects of rainfall intensity on soil structure and migration of colloidal materials in soils. *Soil Sci. Am. Proc.* 26, 297-300.
- Bisal, F., 1960. The effect of raindrop size and impact velocity on sand splash. *Can. J. Soil Sci.* 40, 242-245.
- Ben-Hur, M., Shainberg, I., Bakker, D. & Keren, R., 1985. Effect of soil texture and CaCO<sub>3</sub> content on water infiltration in crusted soil as related to water salinity. *Irrig. Sci.* 6, 281-294.
- Bloem, A.A., 1992. Criteria for adaption of the design and management of overhead irrigation systems to the infiltrability of soils. *M.Sc.Agric., Univ. Pretoria.*
- Bouyoucos, G.J., 1935. A method for making a mechanical analysis of the ultimate natural structure of soils.
- Bower, C.A., Reitemeyer, R.F. & Fireman, M., 1952. Exchangeable cation analysis of saline and alkaline soils. *Soil Sci.* 74: 251-61.
- Bresler, E. & Kemper, W.D., 1970. Soil water evaporation as affected by wetting methods and crust formation. *Soil Sci. Soc. Am. Proc.* 34, 3-8.
- Bryan, R.B., 1974. Water erosion by splash and wash and the erodibility of Alberta soils. *Geogra. Ann.*, 56A, 159-182.

- Bryan, R.B., 1990. Knickpoint evolution in rillwash. *Catena supplement* 17: 111-132.
- Bubenzer, G.D. & Jones, B.A., 1971. Drop size and impact velocity effects on the detachment of soils under simulated rainfall. *Trans. of the ASAE* 14: 625-628.
- Bühmann, C. & Schoeman, J.L., 1995. A mineralogical characterization of vertisols from the northern regions of the Republic of South Africa. *Geoderma* 66: 239-257.
- Buol, S.W., Hole, F.D. & McCracken, R.J., 1973. *Soil Genesis and Classification*. Iowa State University Press. Ames, Iowa.
- Cass, A. & Sumner, M.E., 1982. Soil pore structural stability and irrigation water quality: II Sodium stability data. *Soil Sci. Soc. Am. J.* 46, 507-512.
- Chaney, K. & Swift, R.S., 1984. The influence of organic matter on aggregate stability in some British soils. *J. Soil Sci.* 35, 223-230.
- Chen, Y., Tarchitzky, J.T., Brouwer, J., Morin, J. & Banin, A., 1980. Scanning electron microscope observation of soil crusts and their formation. *Soil Sci.* 130, 49-55.
- Chestworth, W., 1973. The parent rock effect in the genesis of soil. *Geoderma* 10, 215-225.
- Curtis, C.D. & Spears, D.A., 1971. Diagenetic development of kaolinite. *Clays and Clay Minerals* 19, 219-227.
- Day, P.R., 1965. Particle fractionation and particle size analysis. In C.A. Black et al. (Ed.) *Methods of Soil Analysis, part 1 Agronomy* 9, 545-567. *Am. Soc. of Agron.*, Madison, Wis.
- Deer, W.A., Howie, R.A. & Zussman, J., 1978. *Rockforming minerals*. John Wiley and sons, Newyork.
- D'Huyvetter, J.H.H., 1985. Determination of threshold slope percentage for the identification and delineation of arable land in Ciskei. *M.Sc.Agric., Univ. Fort Hare*.
- Duley, F.L., 1939. Surface factors affecting the rate of intake of water by soils. *Soil Sci. Soc. Am. Proc.* 4, 60-64.
- Duley, F.L. & Kelly, L.L., 1941. Surface condition of soil and time of application as related to intake of water. U.S.D.A. Circular No. 608.
- Du Plessis, H.M. & Shainberg, I., 1985. Effect of exchangeable sodium and phosphogypsum on the hydraulic properties of several South African soils. *S. Afr. J. Plant Soil Sci.* 2, 179-186.

- De Ploey, J., 1989. A model for headcut retreat in rills and gullies. *Catena Supplement* 14: 81-86.
- Du Preez, C.C. & Botha, F.J.P., 1980. Amatola Basin rural development project. Soils of the Amatola Basin. Agric. And rural development Res. Inst. Univ. Fort Hare. Report no 3/81.
- Ellison, W.D., 1945. Some effects of raindrops and surface flow on soil erosion and infiltration. *Trans. Am. Geophys. Union* 26, 415-429.
- Ellison, W.D., 1947. Soil erosion studies, part III. Some effects of erosion on infiltration and surface runoff. *Agr. Eng.* 28, 245-248.
- El-Swaify, S.A., 1973. Structural changes in tropical soils due to anions in irrigation water. *Soil Sci.* 115, 64-72.
- El-Swaify, S.A. & Swindale, L.D., 1969. Hydraulic conductivity of some tropical soils as A guide to irrigation water quality. *Ninth Int. Congr. Soil Sci. Trans.* 1, 381-389.
- Emerson, W.W., 1967. A classification of soil aggregates based on their coherence in water. *Aust. J. Soil Res.* 5, 47-57.
- Emmet, W.W., 1978. Overland flow. In hillslope hydrology, M.J. Kirkby (ed.). Chichester: Wiley.
- Evans, R., 1980. Mechanics of water erosion and their spatial and temporal controls. In: Soil erosion (Ed. Kirkby, M.J. & Morgan, R.P.C.), Chichester, Wiley.
- Epstein, E. & Grant, W.J., 1973. Soil crust formation as affected by raindrop impact. In A. hadas et al. (ed.) Ecological studies, 4, Physical aspects of soil water and salts in ecosystems, p. 195-201. Springer Verlag, Berlin-Heidelberg-New York.
- FAO., 1993. Guidelines for Land-use planning. Soil resources, management and conservation service under the guidance of the inter-Departmental Working group on Land use planning. Rome (FAO Development series 1).
- Farres, P., 1978. The role of time and aggregate size in the crusting process. *Earth Surface Processes* 3, 243-254.
- Foster, G.R., 1989. Modeling soil erosion and sediment yield. In R. Lal (Ed.) *Soil Erosion Research Methods*. P, 97-111.
- Foster, G.R. & Meyer, L.D. 1977. Soil erosion and sedimentation by water- an overview. in: Proc. Nat. Symp. Soil erosion and sedimentation by water. *ASAE, Pubil.* 4-77,

- pp 1-13, ASAE, St. Joseph, MI, 49085.
- Foster, G.R., Meyer, L.D. & Onstad, C.A., 1976. An erosion equation derived from basic erosion principles. *Trans. ASAE* 19, 678-682.
- Foster, G.R., Meyer, L.D. & Onstad, C.A., 1977. A runoff erosivity factor and variable slope length exponents for soil loss estimates. *Trans. Am. Soc. Agric. Eng.* 20, 683-687.
- Frenkel, H., 1970. The effect of climatic changes on weathering processes and soil formation from lime rocks in the eastern Jodea mountains. (In Hebrew). M.Sc. thesis, Hebrew Univ. of Jerusalem.
- Frenkel, H., Goertzen, J.O. and Rhoades, J.D., 1978. Effect of clay type and content, exchangeable sodium percentage and electrolyte concentration on clay dispersion and soil hydraulic conductivity. *Soil Sci. Am. J.* 42: 32-39.
- Gal, M., Arcan, L., Shainberg, I. & Keren, R., 1984. The effect of exchangeable Sodium and phosphogypsum on the structure of soil crusts. *Soil Sci. Soc. Am. J.* 48, 872-878.
- Garland, G., 1982. An appraisal of South Africa research into runoff erosion. *S.A. Geogr. J.* 64 (2), 138-143.
- Gee, G.W. & Bauder, J.W., 1986. Particle size analysis in C.A. Black et al. (Ed.) *Methods of Analysis, part 1 Agronomy* 9, 383-411. *Am. Soc. of Agron.* Madison Wis.
- Gerrard, A.J., 1981. *Soils and Landforms*. London: Allen.
- Goldberg, S. & Glaubic, R.A., 1987. Effect of saturating cation, pH, aluminium and iron oxide on the flocculation of kaolinite and montmorillonite. *Clays and Clay Minerals*. 35, 220-227.
- Govers, G., 1990. Empirical relationships for the transport capacity of overland flow. Erosion, Transport and Deposition processes. Proc. of the Jerusalem Workshop, March-April 1987. IAHS Publ. No. 189.
- Guidelines for land-use planning. FAO: Development Series 1., 1993. Rome, FAO.
- Hahne, H.C.H. & Fitzpatrick, R.W. 1985. Soil mineralogy. In: Land types of the maps 2628 East rand, 2639 Mbabane (ed. C.N. MacVicar). *Mem. Nat. resour. S. Afr.* No. 5.
- Hensley, M. & Laker, M.C., 1975. Land resources of the Ciskei. In; The agricultural

- potential of the Ciskei – a preliminary report (Ed. M.C. Laker). Alice: University of Fort Hare.
- Hesley, M. & Laker, M.C. 1978. Land resources of the consolidated Cikei. In: The Agricultural potential of the Ciskei (Ed. M.C. Laker). Alice: University of Fort Hare.
- Hillel, D., 1980. Applications of soil physics. Academic Press, New York.
- Hjulstrom, R., 1935. Studies of the morphological activity of rivers as illustrated by the river Fyries. *Bull. Geol. Inst. Univ. Uppsala* 25, 221-527.
- Jackson, M.L., Tyler, S.A., Willis, A.L., Bourbeau, G.A. & Pennington, R.P., 1968. weathering sequence of clay size minerals in soils and sediments, 1. Fundamental generalizations. *J. Phys. Coll. Chem.* 52, 1237-1260.
- Jenny, H., 1941. Factors of soil formation. A system of quantitative pedology. McGraw-Hill, New York.
- Kazman, Z., Shaiberg, I. & Gal, M., 1983. Effect of low levels of exchangeable Na (phosphogypsum) on the infiltration rate of various soils. *Soil Sci.* 135, 184-192.
- Kemper, W.D. & Koch, E.J., 1966. Aggregate stability of soils from Western United States and Canada. U.S.D.A. Tech. Bulletin, No. 1355.
- Kemper, W.D. & Noonan, L., 1970. Runoff as affected by salt treatments and soil texture. *Soil Sci. Soc. Am. Proc.* 34, 126-130.
- Kemper, W.D. & Rosenau, R.C., 1984. Soil cohesion as affected by time and water content. *Soil Sci. Soc. Am. J.* 48: 1001-1006.
- Kemper, W.D. & Rosenau, R.C., 1986. Aggregate stability and size distribution. In *Methods of Soil Analysis, part 1. Agronomy no. 9* (2<sup>nd</sup> edition), 425-442.
- Laker, M.C., 1990. The conservation status of agricultural resources in the developing areas of South Africa. Proc. 1990 National Veld Trust Conference, Pretoria. (Pages of Proc. not numbered in sequence). National Veld Trust, Pretoria.
- Laker, M.C., 2000. Soil Resources: Distribution, Utilization, and Degradation. Chapter 14 In: *The geography of South Africa in a Changing World.* (Eds Fox, R. & Rowntree) Cape Town: Oxford University Press.
- Laker, M.C., 2001. Personal communication. Univ. Pretoria, Pretoria, RSA.
- Laker, M.C. & D'Huyvetter, J.H.H., 1988. Slope-erodibility relationships for different soils in semi-arid region of Ciskei. Proc. 5<sup>th</sup> ISCO Conf., Bangkok, Vol. 1, 641-

653. Dept. Land Dev., Bangkok.
- Lamb, J., 1950. Effect of past management and erosion of soil on fertilizer efficiency. *Soil Sci.* 70, 385-392.
- Laws, J.O., 1940. Recent studies in raindrops and erosion. *Agr. Eng.* 21, 431-433.
- Laws, J.O. & Parsons, D.A. 1943. The relationship of raindrop size to intensity. *Trans. Am. Geophys. Un.* 24, 452-460.
- Levy, G.J., 1988. The effects of clay mineralogy and exchangeable cations on some hydraulic properties of soils. *Ph.D., Univ. Pretoria.*
- Levy, G.J., Shainberg, I. & Morin, J., 1986. Factors affecting the stability of soil crusts in subsequent storms. *Soil Sci. Soc. Am. J. Am. J.* 50: 196-201.
- Levy, G.J. & Van Der watt, H.v.H., 1988. Effects of clay mineralogy and soil sodicity on soil infiltration rate. *S. Afr.J. Plant Soil* 5, 92-96.
- Loughnan, F.C., 1969. Chemical weathering of the silicate minerals. Elsevier Publishing Company, New York.
- Lynch, J.M. & Bragg, E., 1985. Microorganisms and soil aggregate stability. *Adv. Soil Sci.* 2, 133-171.
- Marais, J.N., 1978. The climate of the Ciskei. In: The Agricultural potential of the Ciskei. (Ed. ; M.C. Laker). Alice: University of Fort Hare.
- Meyer, L.D. & Harmon, W.C., 1984. Susceptibility of agricultural soils to interrill erosion. *Soil Sci. Soc. Am. J.* 48: 1152-1157.
- McIntyre, D.S., 1958. Permeability measurements of soil crusts formed by raindrop impact. *Soil. Sci.* 85, 185-189.
- McLean, E.O., 1982. Soil pH and lime requirements. In: Page, A.L. et al. (ed.). Methods of Soil Analysis. Part 2. Monograph no. 9, ASA-SSSA, Wis., pp: 199-224.
- McNeal, B.L. & Coleman, N.T., 1966. Effect of solution composition on soil hydraulic conductivity. *Soil Sci. Soc. Am. Proc.* 20, 308-312.
- McNeal, B.L., Norvell, W.A. & Coleman, N.T., 1966. Effect of solution composition on Soil hydraulic conductivity. *Soil Sci. Soc. Am. Proc.* 20, 308-312.
- McNeal, B.L., Layfield, D.A., Norvel, W.A. & Rhoades, J.D., 1968. Factors influencing hydraulic conductivity of soils in the presence of mixed –salt solutions. *Soil. Sci. Soc. Am. Proc.* 32, 187-190.

- McVicar, C.N., de Villiers, J.M., Loxton, R.F., Verster, E., Lambrecht, J.J.N., Merryweather, F.R., Le Roux, J., Van Rooyen, T.H., Harmse, H.J. & Von, M. 1977. Soil Classification: A binomial system for South Africa. *Science Bull.*, 390. Dept. of Agric. Tech.
- Miller, W.P., 1987. Infiltration and soil loss of three gypsum-amended ultisols under simulated rainfall. *Soil Sci. Soc. Am. J.* 51, 1314-1320.
- Miller, W.P. & Bahuruddin, M.K., 1986. Effect of dispersive clay on infiltration and soil loss of southeastern soils. *Soil Sci.* 142, 235-240.
- Moldenhauer, W.C. & Koswara, J., 1968. Effect of initial clod size on characteristics of splash and water erosion. *Soil Sci. Soc. Am. Proc.* 32, 297-301.
- Moldenhauer, W.C. & Kemper, W.D., 1969. Interdependence of water drop energy and clod size on infiltration and clod stability. *Soil Sci. Soc. Am. Proc.* 33, 297-301.
- Moore, I.D. & Larson, C.L., 1979. Effects of drainage projects on surface runoff from Small depressional watersheds in the North Central region. WRRRC University of Minnesota, *Grd. School Bull.* 99.
- Morgan, R.P.C., 1977. Soil erosion in the United Kingdom; Field studies in the Silsoe area, 1973. 1975, *Nat. Coll. Agric. Eng.* Silsoe, Occasional papers.
- Morgan, R.P.C., 1979. Topics in applied geography- soil erosion. London: Longman
- Morin, J. & Benyamini, Y., 1977. Rainfall infiltration into bare soils. *Water Resources Res.* 13, 813-817.
- Morin, J., Goldberg, S. & Seginer, I., 1967. A rainfall simulator with a rotating disk. *Trans. Am. Soc. Agric. Engrs.* 10, 74-79.
- Mosley, M.P., 1974. Experimental study of rill erosion. *Trans. of the ASAE* 17: 909-916.
- Moss, A.J., Green, P. & Hutka, J., 1982. Small channels: their experimental formation, nature and significance. *Earth Surf. Proc.* 1, 401-415.
- Nel, D.J., 1989. Die relatiewe invloed van Ca en Mg op fisiese eienskappe van grond. D. Sc. Thesis, Potchefstroom Univ.
- Nelson, D.W. & Sommers, L.E., 1982. Total carbon, organic carbon and organic matter. In: Page, A.L. et al (ed.). *Methods of Soil Analysis. Part 2. Monograph no. 9, ASASSSA, Madison, Wis.* Pp: 539-579.
- North, P.F., 1979. Assessment of the ultrasonic method of determining soil structural

- stability in relation to soil management properties. *Soil Sci.* 30, 463-472.
- Oster, J.D. & Schroer, F.W., 1979. Infiltration as influenced by irrigation water quality. *Soil Sci. Soc. Am. J.* 43, 444-447.
- Patterson, S.H., 1967. Bauxite reserves and potential aluminium resources of the world. *U.S. Geol. Survey Bull.* 1228.
- Poesen, J., 1987. The role of slope angle in surface seal formation. In V. Gardiner (Ed.) Intern.
- Pupisky, H. & Shainberg, I., 1979. Salt effects on the hydraulic conductivity of a sandy soil. *Soil Sci. Soc. Am. J.* 43, 429-433.
- Quirk, J.P. & Schofield, R.K., 1955. The effect of electrolyte concentration on soil permeability. *J. Soil Sci.* 6, 163-178.
- Rapp, I., 1998. The effects of soil properties and experimental conditions on the rill erodibilities of selected soils. *Ph.D., Univ. Pretoria.*
- Richards, L.A. (ed.), US Salinity Laboratory Staff., 1954. Diagnosis and improvement of saline and alkali soils. USDA Agric. Handbook No. 60. US Salinity Laboratory, Riverside, Calif.
- Rhodes, J.D. & Ingavalsen R.D., 1969. Macroscopic swelling and hydraulic conductivity Properties of four vermiculite soils. *Soil Sci. Soc. Am. Proc.* 33, 364-369.
- Rooseboom, A. & Harmse, H.J., 1979. Changes in the sediment load of the Orange River during the period 1929-1969. Proc. Symp. on hydrology of areas of low precipitation, Canberra.
- Rooseboom, A. & Mulke, F.J., 1982. "Erosion initiation" in D.E. walling (Ed.). IAHS Publication. Paris.
- Rose, C.W., 1962. Some aspects of rainfall, radiant drying, and soil factors on infiltration under rainfall into soils. *J. Soil Sci.* 13, 286-298.
- Rose, C.W., 1985. Developments in erosion and deposition models. *Adv. In soil Sci.* 2: 1-63.
- Schroeder, D., 1984. Soils: Facts and Concepts. Int. Potash institute, Bern, Switzerland.
- Schofield, R.Q. & Samson., 1954. Flocculation of kaolinite due to the attraction of opposite charge crystal faces. *Disc. Faraday Soc.* 18: 138-145.
- Shainberg, I., Singer, M.J. & Janitzky, P., 1987. Effect of aluminium and iron oxides on



- hydraulic conductivity of sandy loamy soil. *S. Sci. Soc. Am. J.* 51, 1283-1287.
- Singer, M.J., Janitzky, P. & Blackar, Y., 1982. The influence of exchangeable sodium percentage on soil erodibility. *Soil Sci. Soc. Am. J.* 46, 117-121.
- Smith, H.J.C., 1990. The crusting of red soils as affected by parent material, rainfall, cultivation and sodicity. *M.Sc.Agric., Univ. Pretoria.*
- Soil classification working group., 1991. Soil classification: A taxonomic system for South Africa. Dept. Agriculture Development, Pretoria, South Africa.
- Soil Survey Staff., 1975. Soil Taxonomy. A basic system of soil classification for making and interpreting soil surveys. USDA Agric. Handb. No. 436. Washington DC.
- Stern, R., 1990. Effects of soil properties and chemical ameliorants on seal formation, runoff and erosion. *Ph.D., Univ. Pretoria.*
- Stern, R., Ben-Hur, M. & Shainberg, I., 1991. Clay mineralogy effect on rain infiltration, seal formation and soil losses. *Soil Sci.* 152: 455-462.
- Sumner, M.E., 1957. The physical and chemical properties of tall grass veld soils of Natal in relation to their erodibility. *M.Sc.Agric., Univ. Natal. (Section 3.5).*
- Tisdall, J.M. & Oades, J.M., 1982. Organic matter and water stable aggregate in soils. *J. Soil Sci.* 33, 141-163.
- Turekian, K.K. & Wedepohl, K.H., 1961. Distribution of the elements in same major units of the earth's crust. *Geol. Soc. Am. bull.* 72, 175-191.
- Turner, D., 2001. Personal communication. Agricultural Research Council, Pretoria, RSA.
- United States Department of Agriculture. 1972. Soil survey laboratory methods and procedures for collecting soil samples. Soil Survey Report No. 1 US. Govern. Printing Office. Washington DC.
- U.S. Salinity Laboratory Staff., 1954. Diagnosis and improvement of saline and alkaline soils. U.S. Dept. Agric. Handbook No. 60. Washington, D.C.
- Van Beekom, C.W.C., Van den Berg, C., De Boer, T.A., 1953. Van der Malen, W.H., Verhoeven, B., Westerhof, J.J. & Zuur, A.J., 1953. Reclaiming land flooded with salt water. *Neth. J. Agric. Sci.* 1, 225-244.
- Van der Merwe, A.J., 1973. Physical and chemical relationships of selected OFS soils. A statistical approach based on taxonomic criteria. DSc (Agric) thesis, Univ. Oran-

ge Free State.

- Van der Merwe, A.J. & Burger, R., 1969. The influence of exchangeable cations on certain physical properties of a saline-alkali soil. *Agrochemophysica* 1, 63-66.
- Van Liew, M.W. & Saxton, K.E. 1983. Slope steepness and incorporated residue effects on rill erosion. *Trans. ASAE* 26: 1738-1743.
- Velasco-Molina, H.A., Swoboda, A.R. & Godfrey, C.I., 1971. Dispersion of soils of different mineralogy in relation to sodium adsorption ratio and electrolyte concentration. *Soil Sci.* 111, 282-287.
- Wischmeier, W.H. & Smith, D.D., 1958. Rainfall energy and its relation to soil loss. *Trans. Am. Geophys. Un.* 39, 285-308.
- Wischmeier, W.H. & Smith, D.D., 1965. Erosion losses from cropland east of the rocky mountains, USDA, Agr. Res. Serv. Arg. Handboek 282
- Wischmeier, W.H. & Smith, D.D., 1978. Predicting rainfall erosion losses. Handbk. U.S. Dept. Agr. No. 537.
- Yaron, B. & Thomas, G.W., 1968. Soil hydraulic conductivity as affected by sodic water. *Water Resour. Res.* 4, 545-552.
- Young, R.A. & Onstad, C.A., 1978. Characterization of rill and interrill eroded soils. *Trans. ASAE* 21, 1126-1130.
- Zingg, A.W., 1940. Degree and length of slope as it affects soil loss in runoff. *Agric. Eng.* 21, 59-64.