

Greetings to all of you from the ITC for the New Year. We wish you every happiness and success in all your endeavors in 2012. This academic year we have welcomed 26 new enthusiastic students coming from 15 different countries in the Physical Land Resources M.Sc. programme. We wish them all the best in their studies and hope that they will enjoy and benefit from their two-year stay in Belgium.

As already announced in the previous issue of our newsletter PEDON, VLIR-UOS is working on a new financing system for accredited International Course Programmes (ICPs). Probably at the beginning of 2012 a call for proposals will be launched whereupon all existing and new international master programmes will be able to submit their project. Emphasis is put on the uniqueness and development relevance of the master programme and the possibility of credit exchange between institutes in the North and in the South. Only master programmes which have obtained the VLIR-label will be considered for further financial support. This new policy will probably be effective from 2014 onwards.

As for our M.Sc. programme in Physical Land Resources (PLR), we are happy to inform you that a programme change has been implemented from the academic year 2010-2011 onwards. Responding to the students' request for more flexibility in the 2nd year programme, all main 2nd year courses have become elective and one course, 'Internship', has been added. The course 'Internship' allows students to carry out specialised scientific activities, which are not directly offered by the programme, in another institution for a period of maximum 6 weeks. Moreover, students from a country on the VLIR country list have the opportunity to apply for a 'Master Credits Allowance' offered by VLIR-UOS if they choose for an internship in a country in the South. In addition, this programme change also allows our students to choose courses from the other main subject, i.e. students with the option Soil Science can choose 1 or 2 courses from the option Land Resources Engineering lectured at VUB and vice versa. The alumni of the PLR programme working in universities and research institutions can play an active role in hosting and supervising a student in his or her institution during the 6-weeks internship. The student will then have the opportunity to participate in laboratory or field research during this period, and address a research topic of common interest. I encourage you to contact the ITC-secretariat if you would be willing to offer internship to a PLR student.

For the third year in a row, several alumni had the opportunity to take up a VLIR-UOS scholarship, called Ph.D.-Plus, to conduct intensive scientific research in one of the laboratories involved in the PLR programme for a period of three months in autumn 2011. This opportunity is very much appreciated as it opens up more avenues for networking and collaboration with the alumni's home country institutions. You will find the brief report of some alumni from D.R. Congo and China in this issue.

In this Editorial we also want to extend our thanks and appreciation to Ms. Anita Lostrie who has taken up her retirement in July 2011.

Besides the pictures of our present M.Sc. students, this issue also contains pictures taken at the ICP Get Together Day 2011 which was jointly organized by VLIR-UOS and Ghent University on the 10th of December in the Art Cube in Gent.

We always welcome your news and contributions. Please send any comments or suggestions to PLRprog.adm@ugent.be.

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Eric Van Ranst

LAUDATIO



Prof. Dr. Donald (Don) Gabriels was born in Ghent on May 30, 1946. After a short military career, he graduated in 1969 at Ghent University as Agricultural Engineer, specialized in hydraulic engineering. He then worked as research assistant at Iowa State University, USA and graduated in 1971 as M.Sc. in Agronomy (Soil

Physics). Back at Ghent University, he obtained his Ph.D. in Agricultural Engineering in 1974 and specialized in soil and water conservation and in soil physical processes related to soil erosion and soil degradation.

As a Fulbright postdoctoral fellow in Soil Conservation, he worked in 1976 at the Agronomy Department of Purdue University, USA at the time when Walt Wischmeier was presenting his Agricultural Handbook 537: "Predicting rainfall erosion losses: a guide to conservation planning", a first manual of the USLE model (Universal Soil Loss Equation). During that period the initial plans were discussed for the construction of the National Soil Erosion Laboratory (NSERL) at the campus of Purdue University.

Based at Ghent University, he started as a research fellow of the Fund for Scientific Research (FWO) from 1972 until 1992, when he became Associate Professor at Ghent University. During the first years of his academic career, he devoted his research to soil structure assessment and soil degradation processes, mainly from a soil amelioration and soil conditioning perspective for preventing soil structure breakdown and controlling water erosion (sub)processes. He built several laboratory and field rainulators, which have been copied by several laboratories in different countries all over the world, allowing them to do fundamental and applied research on factors affecting erosion processes. Numerous national and international M.Sc. and Ph.D. students, guided by Prof. Donald Gabriels made use of this equipment.

In the late 80s and beginning of the 90s, he coordinated the construction of a building for ICE (International Centre for Eremology) at Ghent University, including a unique combination of a large windtunnel with a rainulator facility. He received in 2008 the UNESCO Chair for Eremology (Studies on Deserts and Desertification) and is currently also co-chairman of the Belgian Expert group on Desertification (UN Convention to Combat Desertification, UNCCD), member of the advisory board of European DesertNet (EDN) and member of DesertNet International (DNI). This complements his teaching, research and services interests in soil structure, land degradation and desertification, soil physics, substrates, soil conditioning

and soil amelioration, soil erosion processes and control, wind erosion, inclined rainfall, and the construction of natural and synthetic grass (sport)fields.

He is also founder and since 1983 co-director of the College on Soil Physics at the Abdus Salam International Center for Theoretical Physics (ICTP), Trieste, Italy and co-organizer of COSWAND (Conservation of Soil and Water in Andes Countries), i.e. a workshop for local farmers and their family members, and of ELAFIS (Escuela Latino Americana de Física de Suelos), which are both organized at a regular basis. The latter two initiatives illustrate his specific interest in Latin America. And of course, Donald Gabriels would not be Donald Gabriels if he did not learn Spanish to better communicate with the local stakeholders. Besides Dutch, French, German and English, he thus speaks Spanish as well.

He was Head of Department of Soil Management at Ghent University and co-promoter of the International Cooperation Program M.Sc. Physical Land Resources from 2006 till 2011. He is author and co-author of numerous scientific and other (less academic) publications in journals, books, and proceedings of congresses, symposia and conferences and served as guest professor, guest lecturer and keynote speaker all over the world. He is past-editor and co-founder of the international journal *Soil Technology*, which later became part of the journal *Soil and Tillage Research*. He has further been vice-chairman of Subcommision *Land degradation* of the International Union of Soil Science (IUSS), vice-chairman of Subdivision: *Soil management and Soil conservation* of European Geophysical Union, and vice-chairman of Division: *Soil Physical Processes* of IUSS.

The last years of his official academic career were devoted to the UNESCO/MAB/UNU/Flanders Trust Fund project SUMAMAD (Sustainable Management of Marginal Drylands) and the UNESCO/IHP/Flanders Trust Fund project CAZALAC (Centro para el Agua en Zonas Aridas en America Latina y el Caribe), in which he acted as scientific expert.

Because of his experiences as a longtime (14 years!) treasurer of ISSS (now the IUSS: International Union of Soil Science), he was asked in 2004 to serve as co-treasurer of ESSC (European Society for Soil Conservation).

His contacts with the National Soil Erosion Laboratory at Purdue University, USA, facilitated him to spend there in 2009-2010 a sabbatical period to conduct research on the factors and subprocesses of the combined WEPP/WEPS model (Water Erosion Prediction Project/Wind Erosion Prediction System).

Besides and in part parallel with his academic career, Donald Gabriels built up a sports and coaching career. In his younger days, he was a member of the Belgian team for

athletics and handball, and served afterwards several years as a local, regional and national coach. Until now he is member or chairman of local and university sports commissions. He organized and was speaker at numerous national and international sport events and edited and wrote articles in sports magazines and books. He is still running an agency for the publication of scientific, art and sport related journals and books and for organizing events, tourist tours and expeditions. He coordinated, organized and participated as a driver in the Bruges-Paris-Dakar and Trans-Mauretania desert expeditions, as well as in the relay Madrid-Ghent (2000 km), held in 2000 on the occasion of the 500th year of birth in Ghent of Emperor Charles V.

And the latter brings us to another passion of Donald Gabriels. He has a keen interest in history (and entertaining people!), particularly of his native town, Ghent. He recently followed the Ghent Tourist Guide courses and also Ghent dialect courses, for which he received a certificate and now they call him a “*real Ghent Professor*”. For sure he will be more active as a guide in his native city of Ghent, which means that you can book him from now on if you want to know more about the big and little histories and stories of Ghent.

On October 1, 2011, Prof. Gabriels took up his retirement. We are sure that he is not “*tired*” and will be active in many of the scientific (and less scientific) activities he initiated. Sometimes you will find him in the ICE building as he is still supervising some national and international Ph.D. students. We wish him and his wife Jessie a good health and many pleasant years to come with lots of good food and drinks, and with more time for another of his passions, landscape painting ...

Wim Cornelis



Ms. Anita Lostrie has also taken up her retirement in July 2011. Since many years Ms. Anita Lostrie has been the guide for all new arriving students in Ghent and a continuous support to the programme. Many alumni will remember her efficiency and kind and helpful nature. Thank you Anita and we wish you all the best in the future!

THE SARTON-MEDAL 2011-2012 FOR HON. PROF. PAUL DE PAEPE

Since 1986, Ghent University awards yearly a Sarton Medal per faculty to scientists (whether member of the university or not) who contributed to the study of the history of science. This year the Medal from the Faculty of

Sciences was awarded to Hon. Prof. Dr. Paul De Paepe during an academic session on Friday December 2, 2011.

At this occasion he gave a lecture on: “Belgians and Belgian toponyms immortalised in geology”. He particularly focussed on minerals named after former professors or researchers of the geology department of Ghent University.



Hon. Prof. Dr. Paul De Paepe with his Sarton-medal surrounded by Prof. Dr. Peter Van den haute (Department of Geology and Soil Science, Ghent University) and Prof. Dr. Luc Moens, Vice Rector of Ghent University

Many ITC-alumni will remember Prof. De Paepe as the person who introduced them in the world of petrography, rock samples and rock thin sections, but few will have realised that he was also doing research on the history of mineralogy and industrial development in Belgium. Especially since he retired he could spend more time on this research.

More information on the Sarton-Medal can be found on following website: www.sartonchair.ugent.be/en/medals, and images of this ceremony on: www.beeldarchief.ugent.be/evenementen/PaulDePaepe

Georges Stoops

PRIZE DE BOODT-MASELIS FOR MOST OUTSTANDING GRADUATE STUDENT

During the official proclamation ceremony on 21 September 2011, the prize De Boodt-Maselis was awarded to two graduates of the Master Programme in Physical Land Resources, Yengwe Jones from Zambia and Obia Alfred from Uganda. Since 1998-1999, this prize is awarded to the most outstanding student(s) of the master programme, whose thesis contributed to the studies of Physical Land Resources. The prize, which consists of a certificate and a sum of 750 EUR for each student, was

NEWS FROM THE INSTITUTE

awarded by Mr. De Boodt, son of Em. Prof. Marcel De Boodt.



Graduation ceremony in the new auditorium of the UFO-building on September 21, 2011



↓ ↑ From left to right: Obia Alfred, Yengwe Jones and Mr. De Boodt



Obia Alfred graduated from the master programme in Physical Land Resources – major subject Soil Science with Great Distinction. He promoted with a master dissertation on "Use of soil amendments as adaptation strategy for global climate change". Prof. Dr. ir. Wim Cornelis was his promoter.

Yengwe Jones graduated from the master programme in Physical Land Resources – major subject Soil Science with Great Distinction. He promoted with a master dissertation on "The effects of *Faidherbia albida* leaf litter on N dynamics and the soil microbial community on two soil types in Zambia". Prof. Dr. ir. Stefaan De Neve was his promoter.



PLR student Peter Kasolota Kaluba (Zambia) gave a short speech in the name of all graduates

VLIR-UOS Get Together Day
Ghent, December 10, 2011



NEWS FROM THE INSTITUTE



Prof. Dr. Paul Van Cauwenberge, Rector of Ghent University, welcomes the many VLIR scholarship students of the different ICP programmes at the "Get Together Day" in the Art Cube in Gent

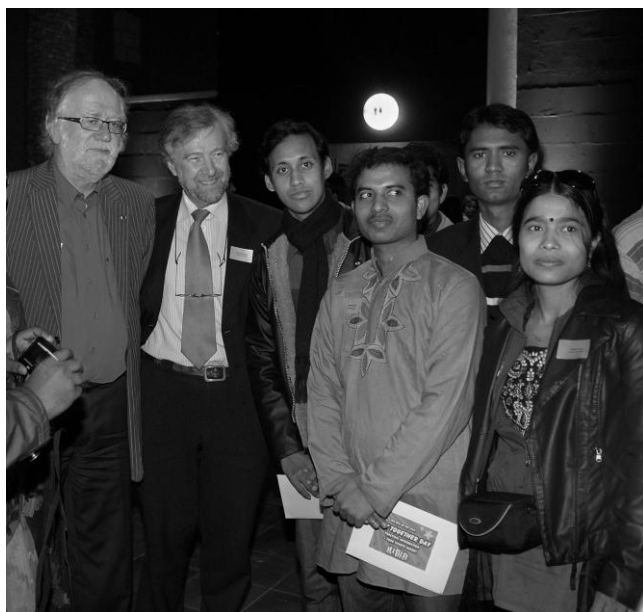


Photo Tine Desodt
Rector Ghent University Prof. Dr. P. Van Cauwenberge, Prof. P. Sorgeloos (Chairman VLIR-UOS bureau) (1st & 2nd from left) together with VLIR scholars



PLR students from Cameroon : Delphine Manka'abusi, Yannah Mero and Luc Onana Onana



Photo Tine Desodt
PLR student Doan Thanh Thuy (Vietnam) (1st from left)



Photo Tine Desodt
PLR students from Bangladesh: Fancy Rubeca and Akter Masuda (4th from left and 1st from right)



PLR students Yannah Mero (Cameroon) and Aulia Rahmawati (Indonesia) (1st and 2nd from right)



Photo Tine Desodt

Nancy Terryn - Development Cooperation UGent



Photo Tine Desodt

Liesbeth Vandepitte and Anneleen Van Laere - Development Cooperation UGent



PLR student Mechelle Rañises (Philippines)



Helke Baeyens - Development Cooperation UGent

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M.Sc. promoted 2011 Physical Land Resources

Option: Soil Science



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systems in West and Central Java*
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Abstract:

A comparative study of organic and conventional farming systems both in paddy and vegetable fields was conducted in West and Central Java, Indonesia, to determine the effect of management practices on soil quality. Parameters measured were SOC, total N, nutrient availability, enzyme activities, MBC and PLFA. A negative impact of inorganic fertilizer on soil pH was observed. Result showed all enzyme activities, MBC and PLFA correlated with SOC and total N in paddy fields, while correlations of β -glucosidase and β -glucosaminidase with MBC and PLFA were observed in vegetable fields. SOC and total N combining with β -glucosidase, MBC and PLFA appears to be particularly suited indicators to determine management practices impact on soil quality in paddy fields, while in vegetable fields, suitable indicators are SOC, total N, dehydrogenase, β -glucosaminidase and MBC. Higher SOM, soil pH, nutrient availability, enzyme activities, MBC and PLFA were also detected in organic farming compared to conventional farming both in paddy and vegetable fields. In conclusion, organic farming might have higher soil quality than conventional farming systems.



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*Assessment of rain erosivity and aridity in Central
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Abstract:

To understand the factors causing land degradation and desertification processes a precise study on rainfall characteristics is important. In this study therefore secondary meteorological data including daily rainfall and temperature for 10 successive years (2000-2009) were collected from 13 meteorological stations in 7 different administrative regions named: Mwanza, Shinyanga, Dodoma, Tabora, Arusha,

Singida and Northern part of Iringa region, all located in Central part of Tanzania. The meteorological data were used to assess aridity of drylands prone to desertification. Three different aridity indices methodologies including: Index of De Martonne (1926), Index of Thornthwaite (1948), UNEP (1997) and the Bagnouls-Gausson Index (BGI) were used in this study.

The results from this assessment have revealed three types of climate in Central Tanzania: humid climate, dry sub-humid climate and semi-arid climate. The humid climate includes three regions of Mwanza, Tabora and Shinyanga. The dry sub-humid climate includes Singida and Arusha regions while the semi-arid climate includes Dodoma and Iringa region.

In order to quantify the relative distribution of the rainfall patterns, a statistical derived index known as the Precipitation Concentration Index (PCI) was used. The results indicate that the rainfall distribution is affected by seasonal effects, strongly confined by a typical dry or wet period.

Further, the rainfall aggressiveness and erosivity were assessed according to the Modified Fournier Index (MFI) and CORINE (1995) methodology, respectively. A specific empirical erosion model as proposed by Morgan (1986) is also used for assessment of erosivity in addition to the CORINE (1995) methodology. The results revealed a variation in rainfall aggressiveness between high to very high and strong rainfall erosivity in all regions.

Finally, the correlation analysis was performed between MFI and the USLE erosivity factor $R=EI_{30}$. The result show a highly significant relationship between MFI and the USLE erosivity factor $R=EI_{30}$ in five regions out of seven. This leads to the conclusion that Central Tanzania is characterised by high aggressive and erosive types of rainfall which is the cause of serious experienced soil degradation and desertification.



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*Land evaluation for agricultural land use planning
in the Central Highlands of Vietnam*
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Abstract:

The main purpose of this study was developing a GIS based multi-criteria land use planning procedure to identify the suitable lands for Robusta coffee cultivation in the Dak Nong Province. This crop is one of most important crops in the province. Its actual cultivation extent is excessive and the planning is not sustainable. The province committee tries to reduce the cultivation area from 72,000 ha to 66,000 ha in 2020 as well as to increase the productivity of Robusta coffee.

In the first stage of the multi-criteria procedure, the suitability criteria have been selected based on literature research and local data. The criteria represented agro-ecological, environmental and socio-economical aspects and were standardized by membership functions (MF). In the second stage of the procedure, the agro-ecological criteria have been combined using the parametric method to identify the natural suitability of the study area. The impact of climate change was accessed by applying two sets of data: time-series (30 years) averages and data collected during a year of extremes (1998). The daily meteorological data of 8 stations have been calculated and extracted in this stage. The third stage is combining the agro-ecological criteria with other criteria by applying multi-criteria analysis. The pair-wise

comparison weighting and rating has been used to calculate the weight. The results of this stage are maps of actual and potential land suitability according to the average and extreme climate scenarios. The last stage comprises a comparison of third stage results to highlight the effects of climate change on land suitability within the study area.

The suitability maps for Robusta coffee provide the land suitability in study area as well as a suggestion for improving it.

The actual suitability evaluation shows that 40,000 ha of land have a marginal land suitability class. That means that if irrigation is not applied, the planning goal could not be reached. In case of the extreme year 1998, the suitability is much lower and consequently, even with rational land use planning, it is very difficult to reach the proposed goal.

On the other hand, upon improvement of the irrigation, a higher suitability is obtained and the land use planning goal is reached. There are about 200,000 ha of land in very suitable and moderately suitable classes. In case of 1998, there are only 38,000 ha available to cultivate Robusta coffee, having a marginal suitability. That means, the goal of land use planning could not be reached under extreme climatic conditions caused by climate change.

The combination of GIS and multi-criteria analysis provides visual results and is useful in agriculture land use planning. This combination also saves time and cost in land evaluation as the necessary data have been provided. Similar as many researches, the research accuracy is strongly dependent on the quality of input data as well as the strength and weaknesses of the methodology. A weakness found in this research is lack of data in chemical soil fertility. Although previous research suggests that chemical soil fertility is not an important factor that strongly affects land suitability for coffee, it is still a huge shortcoming of this study. In addition, the validation of result needs to be improved with field data as well as comparison with results of other research. Further research can be performed to fill these gaps.



Ms. Nkwain Yvonne FUNKUIN (Cameroon)
Greenhouse gas emission from biochar amended Flemish soils
Promoter: S. De Neve
Contact address: nkwainy@yahoo.com

Abstract:

The main objective of this master thesis was to examine the effect of biochar on CO₂ and N₂O emissions from a sandy loam Flemish agricultural soil. The biochars were produced from 3 feedstocks and at different pyrolysis temperatures and modes; digestate and willow wood (350° and 700°C by slow pyrolysis) and pine wood (500°C by fast pyrolysis). Biochar properties were significantly influenced by the feedstock and pyrolysis conditions. The biochar recovery yield (%) was higher at lower pyrolysis temperature. In general, the plant-based woody biochars had a high C content, low N content, low CEC, whereas the manure-based biochars had a low C content, N content and high CEC. The pH of these biochars ranged from neutral to alkaline.

To examine the effects of biochar on soil GHG production, two major incubation experiments were performed. In the first experiment, CO₂ emission from biochar amended soils at 50% WFPS was assessed. Biochar was added to the soil at an amendment level of 1.5% (w/w), corresponding to 10 tons ha⁻¹. The digestate and willow wood biochars produced at 350°C increased CO₂ emission from the soil by 47% and 45% respectively compared to the control treatment. The high temperature biochars substantially reduced these emissions by <10%. C mineralization was controlled more strongly by the pyrolysis temperature than by the feedstock type.

In addition, the effect of biochar on some soil biological and chemical properties was also determined after incubation. Biochar addition increased soil microbial biomass carbon. Dehydrogenase activity was higher in soils amended with low temperature biochars. Slow pyrolysis biochar addition lowered the soil B/F ratio assessed by phospholipid fatty acids extractions. Biochars with C/N ratios <20:1 led to higher mineral N availability (mineralization) while those with C/N ratios

>30:1 resulted in immobilization. Soil pH values also increased substantially after biochar addition.

The second incubation experiment assessed N₂O-N emissions from biochar-amended soils. Biochars added to the soil at 70% WFPS and an amendment level of 1.5% (w/w), suppressed N₂O-N emissions by >70%. The suppression resulted from the stimulation of N₂O reducing activity in soil because of some changes in soil chemical and as well as physical properties. N₂O-N emission from soil was strongly controlled by the feedstock type.



Mr. Peter Kasolota KALUBA (Zambia)
Drought assessment in Zambia in the face of climate change
Promoters: E. Van Ranst, W. Cornelis
Contact address: University of Zambia, School of Agricultural Sciences, Great East Road Campus, P.O. Box 32379, Zambia

Abstract:

Over the past three decades, the frequent drought and flood have characterized most countries in southern Africa and Zambia is not an exception. Normal weather rarely occurs countrywide due to these extreme weather events. Droughts have had the biggest shock to the country's food security since they are more frequent than floods. This has manifested in form of poor economic performance due to over reliance on rainfed agriculture reducing the chances of achieving the national development goal of strengthening agricultural and rural income. Thus drought assessment was carried out to find the magnitude and areal extent of droughts capable of affecting Zambia, since knowledge of their expected frequency for a variety of durations is imperative, if they are to be well managed. Based on monthly rainfall data from 34 widely distributed weather stations in Zambia, the Index Flood Regional Frequency Analysis based on L-moments (RFA-LM) was applied. Discordancy values as a first step were used in screening whether the site L-moments ratios were within range of the average L-moments of a group of similar stations forming a sub-region. Homogeneous sub-regions were formed by grouping stations within a similar range of mean annual precipitation (MAP) and was validated by the heterogeneity test. Based on the criteria of the goodness-of-fit test statistics ($Z^{DIST} = \pm 1.64$), the Generalized Extreme Value (GEV) distribution was the best regional distribution. To produce maps, regional predictor equations for L-moment ratios and MAP were developed for the study area. Finally the spatial mapping of at-site means and regional statistical parameters were inputted in L-map to produce spatial maps of drought recurrences. Droughts of magnitude 20, 30 and 40% deficit of normal rainfall were found to correlate to return periods of previous droughts reported for the country. The 20% and the other two deficits were synonymous to moderate and severe drought, respectively. The higher the magnitude of drought, the lower was the return period. The RFA-LM analysis showed the return period of droughts to increase from south to north of Zambia. The area with the most frequent return periods of drought is the extreme south of Zambia (Sesheke and Livingstone) in the agro-ecological zone I. The narrow range and generally widely spread pattern in return periods in the Southern Province confirmed earlier studies why the province is the most susceptible to drought. Despite showing susceptibility to drought, the Southern and Eastern Province contribute substantially to food production, giving reason that more attention is required to soil management measures such as conservation farming.



Mr. Randolph Musongo MAKIA (Cameroon)
Mineralogy and charge properties of soils with andic and ferralitic properties along a toposequence of Bambouto volcano (West Cameroon)
Promoter: E. Van Ranst
Contact address: ran52002@yahoo.com

Abstract:

The soils along the southern slopes of the Bambouto volcanic cone in

the West Cameroon highlands are developed in basaltic and trachytic weathering materials, and in the upper slopes (> 1800 m asl) they are probably covered by volcanic ash. The soils below 1800 m have typical Ferralic properties (Bt/Bo horizons with reddish colours), while those above 1800 m show Andic properties (Bw horizons with reddish brown colours) indicated in the field by a more fluffy structure and a low (< 0.9 Mg m⁻³) bulk density. In order to better understand the transition between Andic and Ferralic properties, we examined the mineralogical and chemical properties, more in particular the charge properties of selected B horizons along a toposequence (between 1450 and 2500 m). All studied soils contain kaolinite, Fe oxides and oxyhydroxides, gibbsite and traces of hydroxy-interlayered 2/1 minerals. The Bw horizons above 1800 m contain a high content of Al (Fe) humus complexes. The phosphate retention (PR) values are higher (60-70 %) in the soils above 1800 m altitude than in those below this altitude (PR = 30-60%). The pH (NaF) values after 24h are high in all B horizons (> 10), a little higher in the Bw horizons. The isoelectric point (pH_o) values ranged between 4.18-4.84 in the Bw horizons and between 5.02-6.11 in the Bt/Bo horizons. After the destruction of organic matter (OM) the pH_o values increased significantly, especially in the Bw horizons (5.80-7.04) above 1800 m indicating the influence of OM content on pH_o. The climatic conditions (high rainfall, cooler temperatures and lower evapotranspiration) at high altitude (>1800 m asl) result in greater accumulation of OM and precipitation of amorphous materials. Under these conditions Andic soil properties are much better expressed. At lower altitude (≤1800 m asl) the humid climate remains warm throughout the year, which promotes organic matter decomposition and weathering. This results in soils with a mineralogical composition (dominance of kaolinite and sesquioxides Fe and Al) representing the Ferralitic properties.



Mr. Habai Rafael MASUNGA (Tanzania)
Nitrogen mineralization from organic amendments
Promoter: S. De Neve
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Mwanza, Tanzania

Abstract:

To synchronize crop nitrogen demands with its supply from organic amendments used as nitrogen sources depends on the nitrogen mineralization potential of the materials. An incubation study was conducted to compare the nitrogen mineralization from several organic amendments. Four different organic amendments (fresh dairy cattle manure, clover green manure, and two different composts) were applied to the soil at a rate equivalent to 126 kg N ha⁻¹ and incubated for 97 days at 20°C and 55% water-filled pore space. Unamended soil was used as a check (control). The nitrogen mineralization potential of organic amendments was determined by measuring changes in total mineral nitrogen (NH₄⁺-N + NO₃⁻-N) periodically by destructive sampling at 7, 15, 21, 40, 68, and 97 days. Results showed that CLO-amended soil mineralized large amounts of N (54% of total N applied) and at a higher rate (1.056 µg N g⁻¹ soil day⁻¹) than the other amendments. Composts mineralized <5% of total N and at slower rates between 0.361 and 0.417 µg N g⁻¹ soil day⁻¹, while soil amended with MAN mineralized 9% of the total N applied.

Microbial biomass carbon (C_{mic}) was higher in the CLO-amended soil than in the control. Treatments COI, CLO and MAN did not differ in C_{mic}. These amendments stimulated several groups of microorganisms: COI had significantly higher Gram-positive bacteria and AMF; CLO had large content of Gram-negative bacteria, fungi, and protozoa. There was a weak positive correlation (R² = 0.473) between nitrogen mineralization and C_{mic}, which implies that variations in the size and composition of the microbial community could not explain all N dynamics. However, CLO resulted in the highest microbial communities as well as nitrogen mineralization.



Mr. Lawrence MUNJONJI (Zimbabwe)
Carbon and nitrogen dynamics in termite mounds of Katanga in D.R. Congo
Promoter: P. Boeckx
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Institute, CY 550 Causeway, Harare, Zimbabwe

Abstract:

The role of termites in modifying the physical, chemical and biochemical properties of soil cannot be overemphasized. The effect of *Cubitermes* and *Macrotermes* termite species on C and N dynamics in the Katanga Province of D.R. Congo were explored, particularly the concentrations of C and N inside termite mounds, and their ¹³C and ¹⁵N stable isotope signatures. The study also investigated the origin of carbonates in the *Macrotermes* mounds along with N mineralization rates in both *Cubitermes* and *Macrotermes* mounds. *Cubitermes* and *Macrotermes* mounds were generally enriched in C and N but *Cubitermes* had significantly higher concentrations compared to the *Macrotermes* due to the differences in materials used for mound construction, and the foraging habits. C and N, and their δ¹³C and δ¹⁵N values were distributed sigmoidally with the vertical position inside the *Macrotermes* mounds. Higher concentrations and values were obtained in the outer and central sections of the mound compared to the inner and mound foot. Values of δ¹³C and δ¹⁵N reflected the different OM decomposition states inside mounds as well as the preferred plant materials (C₃ or C₄) used by the termites. Values of δ¹⁵N appeared to be influenced by N mineralization and N losses. Negative correlations between δ¹⁵N and mineral N percentage of -0.99 and -0.22 were found for the conglomerate and Kasapa mound, respectively. N mineralization rate was twice as high in *Macrotermes* mounds (0.55 mg N kg⁻¹ soil day⁻¹) compared to the *Cubitermes* (0.22 mg N kg⁻¹ soil day⁻¹) due to existence of easily decomposable plant residues with low C/N ratios. In *Cubitermes* mounds NO₃⁻ formed increased with incubation time while NH₄⁺ decreased, suggesting the occurrence of nitrification in these mounds. Autotrophic nitrification might have occurred due to high CO₂ and NH₄⁺ in the mounds. Carbonates in the *Macrotermes* mounds were formed pedogenically, a conclusion based on the depleted ¹³C signatures of the carbonates found in the mounds (< -19.30‰) compared to those of the parent material (-8.61‰). This study gave an insight on the OM decomposition states in termite mounds; their enrichment in C and N, the occurrence of autotrophic nitrification in *Cubitermes*, and the pedogenic origin of carbonates in *Macrotermes* mounds thereby confirming the important role played by *Cubitermes* and *Macrotermes* in C and N cycles.



Mr. Pangsi NELSON AMBUEH (Cameroon)
Biological effects of soil amendments to immobilize heavy metal contamination
Promoters: F. Tack, E. Meers
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Abstract:

Heavy metal pollution is one of the effects of former or current anthropogenic activities such as, mining activities, industrial emissions, the application of agricultural amendments and lime product, smelting, electroplating, energy, fuel production, sludge dumping and military operations. From the mid-19th century to the mid seventies, the Campine region (northern region of Flanders) has been severely polluted by heavy metals as a result of past metal processing activities. Approximately an area of 700 km² in the Belgian and Dutch Campine region is now enriched with several toxic metals, including Zn, Cd and Pb through atmospheric deposition. Most remediation approaches (e.g. soil flushing, excavation etc.) are expensive and environmentally unfriendly. So phytomanagement, which is the use of plants having fast growth rate, high biomass production, deep rooting system and easily harvestable. In addition, such plants should also have high tolerance and accumulation capacity

for heavy metals especially in their harvestable and aerial parts. It is difficult to have a plant species with all these qualities at a time. Therefore, In situ immobilization i.e. the use of amendments to either enhance plant uptake and/ to stabilize metals in soils, have been proposed as alternative technologies available to clean up such a soil with slight to moderate contamination. For evaluation of the stabilization efficiency of the amendments, a greenhouse pot experiment with bean (*Phaseolus vulgaris* L.) was performed. In this experiments, various amendments were mixed with soil from this area in small planting pots and bean seeds were sown on it. The efficiency of each amendment was evaluated by measuring the growth rate, biomass and metal content in the plant material resulting from these amended soils.

The experiment demonstrated that digestate gave the best results in terms of growth and biomass production. This treatment increased soil pH, and slovakite and bioterra gave the best results in terms of reducing metal concentration in the plant material. These amendments exhibited the lowest concentration of Cd and Zn in their plant material and also had a high growth rate and biomass production. They also increased soil pH. The lowest performances were observed in phosphate sludge amended soil and blank soil with only fertilizer. They both showed the lowest growth rate and biomass production and contained higher levels of Cd and Zn in their plant material. As of the moment, the proposed amendments to solve the problem of Cd and Zn mobility and bioavailability in this area (sandy and low pH soil) are Bioterra and Slovakite. This is because they both increase soil pH to a neutral level and the level of Cd and Zn in their resulting plant material are very low (below the European threshold value). They also show a high growth and biomass production in the bean plants.



Mr. Van Qui NGUYEN (Vietnam)

Application of the crop water model AquaCrop in the Mekong Delta, Vietnam

Promoter: W. Cornelis

Contact address: Soil Science Department, College of Agriculture and Applied Biology, Cantho University, 3/2 Street, 10000 Ninh Kieu District, Cantho City, Vietnam

Abstract:

AquaCrop model is a program for simulating response of crop yield to water in a rainfed, supplemental, deficit and full irrigation environment. It was applied in Moc Hoa and Tinh Bien, which belong to Mekong Delta of Vietnam, in order to simulate rice yield under rainfed and irrigated conditions. In the research, an alternate wetting-drying (AWD) irrigation technique was applied for water-saving purposes.

Simulated potential yields are the same between two sites and increase gradually over years. The climatic factor which determines this increase might be CO₂, while a homogeneous climate condition does not cause the difference in potential yield between two sites. Simulated rainfed yield in Summer-Autumn was higher than that in Winter-Spring season because rainfall in the Summer-Autumn was much higher than that in the Winter-Spring. This indicates that water deficit is a critical factor which limits rice yield.

Imitated yields in the case with the presence of a plow pan in the soil profile were higher than the ones without the presence of the plow pan, since in the former case water is stored in the soil profile longer and water loss by drainage is almost eliminated. In this situation, water deficit ability is lower than that in the case without plow pan, and therefore the yield is higher. Simulation with the AWD technique indicated that the amount of water supply that could be saved was very high compared with the full irrigation regime, while the decrease in yield was not significant.

Long-term simulation showed a gradual increase in simulated yield over time. The climatic factor which drives this increase might be CO₂. Although temperature is also a limiting factor affecting rice yield at a given threshold, its increase over time was not remarkable compared with the increase of CO₂. Thus, reference CO₂ and simulated climate data need to be evaluated before application for specific areas.

Sensitivity analysis of the model showed a good response of rice yields to model inputs under water deficit conditions like in Winter-Spring

season although there were about 26% of model inputs which showed low sensitivity. Calibration and validation of the model were not performed due to lack of observed data. In order to apply the model for specific sites, the sensitivity of the model needs to be analyzed and then calibrated and validated for those sites.



Mr. Alfred OBIA (Uganda)

Use of soil amendments as adaptation strategy for global climate change

Promoter: W. Cornelis

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Abstract:

As climate change continues to unfold, the frequency of climatic extremes such as drought and flood will increase. Good soil quality is necessary to better resist the effects of climatic drought and flood in order to support sustainable agricultural production. The objective of the study was to test the capacity of soil amendments applied to a lateritic sandy clay ferralsol to improve soil properties and growth and yield of snap beans (*Phaseolus vulgaris* L.). The treatments were two rates of farmyard manure (FYM), M1 and M2 at 75 and 150 Mg/ha respectively, three levels of diammonium phosphate (DAP), P1, P2, and P3 at 25, 50 and 75 kg P₂O₅/ha respectively and control C. Bulk density and total porosity were significantly affected by M2 while the structure quality score was not significantly affected by the treatments ($P \leq 0.05$). Values of field and laboratory saturated hydraulic conductivity were significantly higher for only M2 amended plots ($P \leq 0.05$). Water retention was significantly increased by FYM at high pressure heads compared to DAP treatments ($P \leq 0.05$). Plant available water capacity and readily available water capacity were not significantly affected by the treatments ($P \leq 0.05$). Macro-porosity, matrix porosity, air capacity, relative water capacity and Dexter's index *S* were affected differently by the treatments ($P \leq 0.05$). The bulk density, structure quality scores, air capacity, and Dexter's index *S* showed consistency in evaluating soil physical quality. Laboratory saturated hydraulic conductivity and macro-porosity were also consistent but their critical limits need redefining for tropical soils. Plant available water capacity, readily available water capacity, relative water capacity and matrix porosity were not consistent in evaluating physical quality. FYM significantly increased organic carbon content, CEC, pH, total N, P (ammonium lactate and oxalate extracted), K⁺, Ca²⁺ and Mg²⁺ compared to the control ($P \leq 0.05$). Snap bean growth and yield significantly increased in the M2 treated plots ($P \leq 0.05$). A freely, locally available FYM showed more effect on soil properties and crop growth and yield than DAP and therefore its use is recommended.



Mr. Raymond Ngu TICHA (Cameroon)

Physico-chemical stabilization of cadmium and zinc in a sandy soil

Promoters: F. Tack, E. Meers

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Abstract:

Anthropogenic contamination of soil environment by Cd and Zn over a vast area of the Campine region in Belgium has occurred in the past century. Conventional methods used in cleaning up contaminated soils are very expensive hence low cost attractive remediation by in situ stabilization using various chemical amendments is a preferred alternative through the formation of insoluble precipitates or complexation. Sandy soil from the vicinity of a smelter was treated with various inorganic (bioterra, slovakite, calcium carbonate and phosphate sludge) and organic (biochar, compost, digestate) amendments to determine the extent of stabilization by changes in physico-chemical properties. The soil pH increased by a factor 0.1 to 1.5 units in the treated soil as compared to the control sample. Several single chemical extraction methods were used as proxies to determine

the pseudo-total metal content (*aqua regia*, HCl, EDTA, TCLP) and the available fraction (0.1 M Ca(NO₃)₂, 0.01M CaCl₂, and rhizon sampler) in the soil solution. The pseudo-total (*aqua regia*) extracted Cd content was (12±1 mg kg⁻¹) and Zn (727 ± 80 mg kg⁻¹) indicating a moderately polluted soil. A strong inverse correlation ($r = -0.904$ to -0.912) of Ca (NO₃)₂ and ($r = -0.434$ to -0.900) CaCl₂ extractable Cd and Zn was found with soil pH, indicating that pH was the main controlling factor for the metal stabilization in bioterra (92-98%), slovakite (75-87%) and calcium carbonate (50-56 %) amended soil through the formation of metal-precipitates. With regard to the organic amendments, soils treated with digestate stabilized Cd and Zn by 67-75% through complexation process. Phosphate sludge, biochar and compost were weakly effective in the physico-chemical stabilization of Cd and Zn in the sandy soil. The observed stabilization effectiveness showed that the used amendments possess a considerable potential in pot experiments. Hence aspects of economic viability and long term environmental impacts on large-scale projects should be properly investigated.



Mr. Dereje Tirfessa WOLDETENSAY (Ethiopia)
Use of structural soil properties for predicting water retention properties of some Ethiopian soils
Promoter: W. Cornelis
Contact address: Hawassa University, Wondo Genet College of Forestry and Natural Resources, P.O. Box 128, Shashemene, Ethiopia

Abstract:

The soil moisture characteristics curve (SMCC) is a very important attribute of soil water. But direct measurement of SMCC is time consuming, laborious and expensive. Hence pedotransfer functions (PTFs) were introduced to develop SMCC from easily measurable soil properties such as sand, silt, clay, pH, bulk density and organic matter. In recent years it came to the attention of researchers in this area that introducing soil structure in PTFs will improve the prediction capacity of PTFs. In this context a study was carried out (1) to test whether grouping based on soil structure can improve the prediction capacity of PTFs compared to not grouping them, or grouping them based on soil texture and soil type, or not and (2) evaluate existing pedotransfer functions using soil samples from Ethiopia. A total of fifty four samples was taken from top soil and subsoil of thirteen profiles that comprises of seven textural classes (clay, clay loam, loam, sandy clay loam, sandy loam, silt clay and silt loam) and four soil types (Andosols, Cambisols, Ferralsols and Vertisols). Parameterization of structure type, size, grade and vertical biological pores was done by scoring for each pedological attribute. This score was used to divide soils into weak, moderate and strong structures. Then point PTFs were developed using multiple linear regression (backward regression approach) at -1 kPa, -3 kPa, -6 kPa, -10 kPa, -33 kPa, -100 kPa and -1500 kPa before and after grouping based on texture, structure and soil type. Eight point PTFs reported were also evaluated at -33 kPa and -1500 kPa. Evaluation was done using the accuracy indices of root mean squared error (RMSE), mean squared variation (MSV) and mean squared deviation (MSD). The study showed that grouping improved the accuracy of point estimates for water content. This may be attributed to reduced variation in soil characteristics. Comparison between groupings showed that the accuracy increased with the following order: soil type, structure and texture. Evaluation of point PTFs showed that the PTF by Reichert et al. (2009) developed from soil samples from Brazil was found to be the best at -33 kPa and -1500 kPa among compared point PTFs. This may be explained by the similarities in texture between the data set used to develop the PTF and the one used by this study. However, there is a need for further research to substantiate the findings at a large scale and with a considerable dataset.



Mr. Nicky WYFFELS (Belgium)
Characterisation of soil hydraulic parameters in the unsaturated zone at different scales: laboratory, pedon and hillslope
Promoter: W. Cornelis
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Abstract:

Soil hydraulic properties are known to be scale dependent. In this study, water retention and hydraulic conductivity curves were determined at three different scales of a multilayered silty loam soil located at the Nil-Saint-Martin catchment in Belgium. They were measured in the lab using soil cores, at the pedon scale using TDR sensors, tensiometers and tension infiltrometry, and at the hillslope scale (100 m) by inverse modeling with the HYDRUS code. It is shown that the procedures at the lab scale and the pedon scale based on disc infiltrometers resulted in a different hysteretic paths of the water retention curve. The HYDRUS code succeeded to reliably predict soil hydraulic behavior in one and two dimension. At the laboratory scale, the soil specimens were susceptible to swelling when fully saturated, deforming the soil matrix and reducing the hydraulic conductivity. The saturated hydraulic conductivity deduced from the disc infiltrometry was about one order of magnitude higher compared to the other scales, but a small increase in pressure head resulted in a near-instantaneous decrease of the hydraulic conductivity, evidence for abundant macropores. The results show a high variability in the heterogeneous unsaturated flow among plots and layers and can be improved by extended input of spatial variability.



Ms. Sabina YEASMIN (Bangladesh)
Soil nitrogen fractions and nitrogen mineralization in paddy soils
Promoter: S. Sleutel
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Abstract:

Nitrogen (N) mineralization is the key process for N nutrition of wetland paddy soils and still there is no reliable method to estimate N mineralization of paddy soils. Thus, accurate and easily measurable parameters to predict N mineralization in paddy soils could be very helpful for developing appropriate fertilizer strategies. This study was conducted to identify possible predictors for N mineralization in paddy soils of two distinct long-term field experiments of Bangladesh and also to investigate the influence of management and soil organic matter (SOM) quality on N mineralization. One study site was on weathered terrace soil with rice-wheat crop rotation at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) experimental farm having five OM treatments combined with two mineral N fertilizer levels. Another experimental site was on young floodplain soil with rice-rice crop rotation at Bangladesh Agricultural University (BAU) having five mineral fertilizer treatments. Soils from all treatments of both study sites were analyzed for total N and OC content and also the N and OC content of different physiochemical fractions, indicative for organic matter (OM) quality. First, soils were physically fractionated into sand sized and silt+clay sized OM. The silt+clay sized OM was further chemically fractionated by oxidation with 6% NaOCl to isolate oxidizable and oxidation resistant fractions, followed by extraction with 10% HF to isolate HF-extracted and residue fractions. Soils were further investigated for β -glucosaminidase, β -glucosidase and L-glutaminase enzyme activities, alternative electron acceptors (reducible Fe and Mn) and for the non-exchangeable NH₄⁺. N mineralization rate of all soils were determined previously from both aerobic and anaerobic incubations at a temperature of 20°C over fourteen weeks.

At BSMRAU, total N and total OC were significantly related to both the aerobic and the anaerobic N mineralization rates. Significant positive correlation was also found between physically fractionated coarse particulate OM+sand sized N and aerobic N mineralization

rate, and silt+clay sized N with both of the N mineralization rates. The aerobic N mineralization was also related to the chemically fractionated NaOCl-oxidizable N; and HF-resistant N was positively correlated to both N mineralization rates. In case of biological parameters, only L-glutaminase activity showed a significant positive correlation to both N mineralization conditions. Thus, total N content, physically fractionated SOM and L-glutaminase activity were found to be useful predictors for the N mineralization rate and OM and fertilizer applications influenced the N mineralization rate in this site.

At the other experimental site, surprisingly no correlation was found between N mineralization rate and any of the quantified SOM fractions and biological parameters except for L-glutaminase activity in anaerobic condition. Thus, OM quality was not influencing the N mineralization of this site and instead inorganic factors such as alternative electron acceptors might be the controlling factors for N mineralization.

Finally, it has been revealed that OM quality is not the only dominating factor for N mineralization in paddy soils. Soil type and crop rotation also have a great importance, as clearly demonstrated by the large differences in outcome of the correlation analysis for BSMRAU and BAU. For example, differences in inundation period in the studied intensive rice cropped soils can induce differences in accumulation of polyphenolic compounds which possibly immobilize organic N. Furthermore, the studied soils at BAU could be deficient in alternative electron acceptors (Fe, Mn) which are crucial for anaerobic mineralization. Therefore, the study findings have brought an expectation that further investigation on polyphenol accumulation and alternative electron acceptors can be a step forward to identify a realistic predictor for N mineralization in paddy soils.



Mr. Jones YENGWE (Zambia)

*The effects of *Faidherbia albida* leaf litter on N dynamics and the soil microbial community on two soil types in Zambia*

Promoter: S. De Neve

Contact address: The University of Zambia, P.O. Box 32379, Great East Road, 1010 Lusaka, Zambia

Abstract:

Nitrogen is considered as one of the most limiting plant nutrient in Zambian agriculture. Despite the availability of artificial fertilizers, the problem still persists due to the expensive nature of the commodity. To try and overcome nutrient deficits, nitrogen-fixing trees (NFTs) are used to restore nutrient cycling and soil fertility. One of such trees (NFTs) being promoted and used by farmers in Zambia to provide part of the required N on their fields is *Faidherbia albida* (locally called the Musangu tree). This study was carried out to see whether the positive influence of *F. albida* on crop yield is due to litter fall addition to the soil or also due to more long-term modifications of the soil biochemical properties under the canopy or influence zone of the trees. Soil and litter samples were collected from two sites with different soils (Chongwe and Monze). At each site, two fields with *F. albida* trees were randomly selected and soils were collected from four trees within each field. Soils were sampled randomly inside the canopy and also outside the canopy. An 8 week incubation experiment was conducted to determine N mineralization, C_{mic} and microbial community size and composition. Soils from under the canopy had significantly higher C_{org} , total N, base cations and initial mineral N. They also had lower C/N ratios but were not significantly different from soils outside the canopies. Addition of litter increased amount of N mineralized in all soils. Litter addition improved N mineralization rates, C_{mic} and microbial communities in soils especially in soils outside the canopy. Total PLFAs also showed an increasing trend when litter was added to the soils. The positive influence of *F. albida* could be attributed to both long-term modifications of the soil biochemical properties under the canopy and litter addition. The effect of canopy was also significant as observed by higher microbial activity and community in soils under the canopy compared to those outside it. Both effects of canopy and litter were more prominent on soils from Monze compared to Chongwe soils. Therefore, *F. albida* leaf litter could improve short-term SOM and microbial activity. However, establishing permanent *F. albida* trees within the fields is much more

advantageous to the farmers and would greatly improve SOM content and nutrient availability, thereby reversing soil fertility depletion in the long-term. Further studies on soils from more sites to have a general overview of *F. albida*'s effect on bio-chemical properties and on various soils types need to be conducted.

Option:

Land Resources Engineering



Mr. Alemu Yenehun BEYENE (Ethiopia)

Spatial and Temporal Simulation of Groundwater Recharge for Geba Catchment, Northern Ethiopia Using WetSpa

Promoter: O. Batelaan

Contact address: Mekelle University, P.O. Box 3074, Mekelle, Ethiopia

Abstract:

A spatially distributed physical model WetSpa is applied to the Geba catchment (Northern Ethiopia) to simulate the spatial and temporal variation of groundwater recharge. It was simulated on a daily basis for about nearly four years (January 1, 2000 to December 18, 2003). It resulted in fair agreement of measured and simulated stream flow hydrographs when observed visually and from model performance indicators (bias = -2.54%, NS = 69.83%, NSL = 74.78% and NSH = 83.26%). It was also validated and a close performance value observed.

According to the water balance calculation, about 3.76% of the total precipitation is intercepted by the plant canopy; 87.51% infiltrates to the soil (out of which 13.02% percolates 2.74% laterally flow and 84.24% evapotranspired from the root zone), and 7.22% losses as surface runoff.

The mean annual recharge value varies from about 45 mm (in 2003) to 207.5 mm (in 2001) which on average accounts for 98.6 mm per year for the whole study area. On a monthly basis, August is maximum (72.52 mm) and December is the minimum (with 0.08 mm). The mean annual groundwater recharge spatially varies from 0 to 371 mm. About 21% of Geba has a recharge amount of >120mm and 1% less than 5 mm. Soil type is the determining factor for the spatial variation of recharge. And rainfall is for its temporal variation and soil moisture content in lesser extent.



Mr. Mohammed EL-SHENAWY (Egypt)

Historical Evolution of Palaeoclimate and Environment in Belgium Based on Stable Isotope Analyses of a Stalagmite from the Han-sur-Lesse Cave

Promoters: E. Keppens, S. Verheyden

Contact address: Geology Department, Faculty of Science, Beni-Suef University, Salah Salem Street, 62511 Beni-Suef, Egypt

Abstract:

"For paleoclimate, the past two decades have been the age of the ice core. The next two may be the age of the speleothem".

In this statement, Gideon Henderson (Science, 2006) summarized the importance of speleothems in providing a regional climate record in continental setting. Since speleothems precipitated from seepage waters derived from the overlying surface, they are capable of providing high resolution paleoclimate information, by interpreting their properties like oxygen and carbon isotope ratios, trace element concentrations, annual band thickness and others of environmental changes.

As Belgium is located at the western maritime end of Europe and contains a large number of caves in its Southern part, it is therefore a key-site to investigate regional climate variability along the west - east transect. Moreover, it shows a gap in paleoclimatic picture of Europe

since it is located between well-studied areas of the UK, Germany, France and Scandinavia. This thesis contributes to a better understanding of stable isotopic behaviour of the cave environment in order to find the key to the interpretation of $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ of speleothems in terms of past climate and environment.

In this study, the Proserpine stalagmite (a part of 23 cm length) from Han-Sur-Lesse cave, Southern Belgium, provides a continuous stable isotope record from 1600 to 1800 AD (LIA). The $\delta^{18}\text{O}$ is interpreted as a proxy for the rainfall amount while $\delta^{13}\text{C}$ for vegetation intensity. The stalagmite records clearly show variability in rainfall amount which consequently affected the vegetation community. Three distinct dry periods are observed: before 1610 AD, around 1710 AD and around 1780 AD. By contrast, a remarked wet period is recorded between 1725 and 1770 AD. Moreover, the years of crop failures before the French Revolution are recorded in our high resolution analysis. In addition, our high resolution profile inversely correlates with NAO indices that indicate the dependence of the Proserpine stalagmite on regional climate patterns rather than the local ones.



Mr. Ahmed ELWAN (Egypt)
Groundwater Modelling of the Paddenpoel Catchment, Belgium
Promoter: O. Batelaan
Contact address: Geology Department, Faculty of Science, Assiut University, El Gamea Street, 71516 Assiut, Egypt

Abstract:

The first groundwater model for the Paddenpoel catchment, Belgium, was developed using MODFLOW-NWT. The steady-state groundwater model was calibrated successfully and the simulated heads were in good agreement with the observed head. The calibrated model gave a Mean Error (ME) of -0.017 m and a Root Mean Square Error (RMSE) of 0.816 m. The simulated discharge by the groundwater model (22.89 m³/d) shows a good comparison with the measured discharge (23.45 m³/d) in the Paddenpoel catchment. MODPATH was used to map the recharge areas of the drain in the Paddenpoel catchment by using backward particle tracking. The results of MODPATH were found to coincide with the lower simulated groundwater head at one of the piezometers near this drain.



Mr. Danish Mehmood MALIK (Pakistan)
Water Balance Analysis of Congo Basin Using GRACE and GLDAS
Promoter: O. Batelaan
Contact address: Place St. Lazare 1, K. 10, 1210 Sint-Joost-Ten-Node, Belgium

Abstract:

Water storage change has implications not only for the hydrological cycle, but also for sustainable water resource management in especially large river basins. Satellite/remote sensing techniques have gained increasing application in monitoring basin and regional hydrological processes in recent decades. In this study, the latest version of GRACE (Gravity Recovery and Climate Experiment) is used to estimate total water storage (surface plus ground) and its changes in the Congo River Basin (CRB) in central Africa for the period January 2003 to November 2009. Additionally, we used GLDAS land surface state variables to infer how TWS is partitioned into canopy water and soil moisture components. By computing storage changes in GRACE TWS, GLDAS land surface state variables and using terrestrial-based water balance approach, we calculated groundwater storage changes for the basin. Time-series comparisons show a good agreement between the GRACE satellite data, GLDAS model data and computed groundwater data. The good agreement suggests that GRACE detects storage depletion in the 3,690,750 km² CRB study area. Change in soil moisture storage is less than that in saturated storage, suggesting that storage depletion in the basin is mainly in the saturated zone. Both the GRACE and calculated groundwater storage changes indicate storage loss in the range of 6.16

to 8.4 mm/yr (in terms of equivalent water thickness). However, by comparing the results with the previous studies on the Congo River Basin, we have noticed that the basin overall storage has increased because of increase in precipitation in the last three years. GRACE hydrology data could therefore be handy in monitoring storage dynamics and water availability in the study area. As GRACE data are available for virtually every region of the world, their application in conjunction with hydrological models could improve hydrological studies. This may lead not only to water balance closures, but also to sustainable water resource management at basin to regional scale.



Mr. Samson Omondi OIRO (Kenya)
The Hydrogeology and Groundwater Quality Assessment of Kisumu Town Area in Kenya
Promoter: K. Walraevens
Contact address: c/o Mr. Ronald Ngala, P.O. Box 7551, Nairobi, Kenya

Abstract:

Groundwater is multidimensional concept and is characterized by location, occurrence over time, size, aquifer properties and accessibility. The groundwater composition is determined by composition and mixing ratio of end members, hydrodynamics/mass transport processes and chemical reactions. Infiltration of precipitation influences groundwater quality. The quality of water in the region is also determined by the geological composition of the aquifers and human activities in the area. Well log data, chemical properties of the groundwater measured at sampling time, chemical analysis reports of wells at well sinking time and laboratory analysis of the water samples collected for the thesis work were put together in a discussion shedding light in understanding and interpretation of the analysis, in relation with the past relevant works. The study area has a complex geology with two main aquifers. Due to a great need in assessing and monitoring of groundwater quality and quantity, well lithological data and chemical analysis of samples were used to understand the hydrogeology and hydrochemistry of the study area. Grapher, GIS, PHREEQC and AQUACHEM programs were used in the analysis and interpretation. Qualitative assessment of groundwater was done in this study area to understand the suitability of the groundwater for domestic use. The majority of groundwater was found to be very soft, water type to be NaHCO₃ and NaMix. The main problem in the study area was found to be that of NO₃⁻ and F-concentration. Anthropogenic pollution in the area is mainly through poorly managed waste disposal and sinking of pit latrines all over the slums in the study area.



Mr. Gebreslassie Mebrahtu SUYUM (Ethiopia)
Landslide Susceptibility Assessment Using GIS Techniques in Dessie Area, Northern Ethiopia
Promoters: M. Kervyn, J. Moeyersons, P. Trefois
Contact address: Mekelle University, P.O. Box 3074, Mekelle, Ethiopia

Abstract:

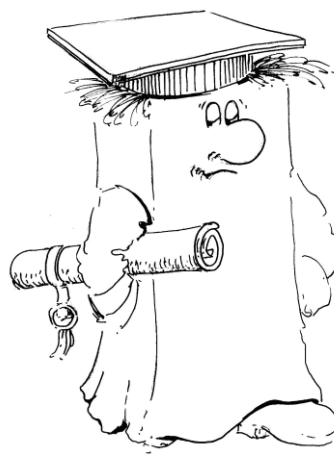
The Dessie depression is one of the numerous "hanging" tectonic basins located along the western Afar margin, Ethiopia, which is frequently affected by landslides in the past few years. Indirect bivariate statistical analysis of susceptibility mapping is conducted using the parameter factors that are pertained to landsliding and to estimate potential landslide hazard zones. The area under investigation covers 63km² and the inventory of landslides was performed from aerial photographs, ASTER image and Google Earth. A total of 41 landslides were identified. Nine causative factors were believed to be potentially triggered slope failure of the area, namely: elevation, land cover, aspect, slope, lithology, distance to stream, stream density, distance to road and distance to fault.

A landslide susceptibility map was obtained using all causative factors (SI and CF scenario 1); both statistical methods agreed for 78.44% of total area being classified in the same susceptibility zones which attained 78.09% of the landslide area occurring along with the

classification agreement of susceptibility zones of the two methods. When three factors (elevation, distance to roads and lithology) are eliminated from the data sets (scenario 2), the area with classification agreement between the two methods decreased from 78.44% to 76.61%.

“A posteriori” landslide probabilities of four different susceptibility map scenarios were compared. Accordingly, SI scenario 1 was selected as the best model in predicting landslide hazard of the study area. Compared to others scenarios, SI scenario 1 showed the highest posterior landslide probability in high and very high susceptibility zones (0.1591) and the smallest posterior landslide probability in low susceptibility zone (0.0057). Based on the final model, the area under low, moderate, high and very high susceptibility classes represent 45.15%, 16.77%, 17.29% and 20.49% respectively.

M-D envelope developed for Coos Bay assumes the homogeneity nature of lithology, soil and climate. Nevertheless, it seems to be applicable in Dessie with a significant influence of seismic activity and variable lithology, soil and climate. Topographic threshold analysis of Dessie landslides separated two classes of landslides. 37 of them are located above M-D which could be triggered hydrologically. Whereas, four of them are plotted below the M-D line of envelope possibly be seismic in origin. Yet, this discrimination of landslides triggering mechanism remains in question as long as the local M-D envelope is not developed in an area of free seismic activity.



F. Vandendriessche

Ph.D. PROGRAMME PHYSICAL LAND RESOURCES

Ph.D. promoted 2010-2011



Dr. Dongmei XUE

Title of Ph.D. thesis: **Nitrate source classification in surface water via isotopic fingerprinting**

Date of promotion: May 13, 2011

Promoters: P. Boeckx, B. De Baets

Curriculum vitae:

Dongmei Xue obtained her bachelor's degree in Environmental Engineering at Shenyang Agricultural University in China in 2004. Afterwards, she worked as a chemical analyst at Institute of Applied Ecology, Chinese Academy of Sciences, in China. In 2005, she became a student at the “Vrije Universiteit Brussel”, and obtained her master's degree in Environmental Science and Technology with the grade of distinction. In 2006, she started her Ph.D. research as a scientific collaborator at ISOFYS and KERMIT at Ghent

University. During her Ph.D. study, she has published 5 papers in international journals with peer-review, 2 of which have been evaluated as top 10 papers by BioMedLib. Additionally, one has been submitted and 2 papers are in preparation. In addition, she got the Chinese government award for outstanding self-financed students abroad for 2010.

Abstract:

In natural systems, the main nitrogen (N) sources are bacteria that fix N_2 from the air. In non-natural systems, on the other hand, anthropogenic activities have severely changed the N cycle and increased the N load of ecosystems, often leading to high NO_3^- concentrations in surface- and ground water. The objective of this thesis was to identify and to compare the classification of NO_3^- sources in surface water in Flanders (Belgium) by expert knowledge and by isotopic fingerprinting and physico-chemical properties. The study sites were located in Flanders, the northern part of Belgium. Forty-seven sampling points were selected from the MAP (Manure Action Plan) monitoring network and classified by experts into five different NO_3^- source classes on the basis of a different land use: agriculture class, agriculture with groundwater compensation class, a combination of agriculture with horticulture class, greenhouses in an agricultural area class and household class. To achieve the overall objective, an integrated approach has been set-up by (1) selecting representative sampling points based on a decision tree model performance, (2) selecting an analytical technique for determination of the isotopic signal of nitrogen and oxygen ($\delta^{15}N$ - and $\delta^{18}O$ - NO_3^-), and (3) retrieving the expert classification of 30

sampling points using outputs of a Bayesian isotope mixing model in a k-means clustering approach and performance of the decision tree model as built up in step 1. The results after conducting the 3 steps indicate that isotopes can help to develop a NO_3^- source classification in the absence of expert knowledge.



**Dr. Ahmed Youssef Sayed
ABDELKHALEK**

Present function and address: Research Assistant in Water Resources Research Institute (WRRI), Egypt

Title of Ph.D. thesis: **Development of an Early Warning System for Flash Floods in Wadi Watier – Sinai Desert**

Date of promotion: June 6, 2011

Promoter: W. Bauwens

Curriculum vitae:

Ahmed Youssef Sayed Abdelkhalek was born in Giza, Egypt in 1976. He received a Bachelor of Science degree in Civil Engineering from Ain Shams University in 1999. In 2004, he obtained his Master of Water Resources Engineering from the “Vrije Universiteit Brussel” (VUB) and the “Katholieke Universiteit Leuven” (KULeuven). He has been working for the Ministry of Water resources and irrigation of Egypt as a research assistant in Water Resources Research Institute (WRRI) since 2001. He carried out his Ph.D. research on “Development of an Early Warning System for Flash Floods in Wadi Watier-Sinai Desert” at the “Vrije Universiteit Brussel”, Belgium, from March 2007 to April 2011.

Abstract:

Flash floods can cause important economic damages in arid areas and even the loss of lives. The Ph.D. research contributed to the development and implementation of an innovative early warning system for flash floods in Wadi Watier in the South Sinai desert (Egypt): the Flash Flood Manager (FlaFloM). FlaFloM aims to protect the city of Nuweiba from the flash-flood hazards and contributes to the wise use of floodwaters. Intensive hydrological analyses have been carried out using hydrometeorological ground station data and satellite data for the study area, followed by the development of a custom-built rainfall-runoff hydrologic model. The rainfall-runoff model transforms the rainfall data into flows at the outlet of the canyon of Wadi Watier near Nuweiba City. The hydrologic model is therefore custom-built - to reflect the arid conditions of the region and the limited observation data - using MATLAB® and SIMULINK®. The research also includes a sensitivity and uncertainty analysis for the developed tools, and the data used. Variance-based sensitivity and uncertainty

analysis on the FlaFloM results were conducted applying quasi-Monte Carlo sequences (Latin Hypercube sampling). The Ph.D. provides a review of this method to assess sensitivity and uncertainty analysis in arid regions where rainfall observations and hydrologic stream flow data are scarce. The research work contributed to the better understanding of the behaviour of flash floods in arid and semi-arid regions. The FlaFloM system has been in operation since December 2009. It is used by the Crisis and Disaster Management Centre of the South Sinai governorate. The system resulted in additional time to spread warnings and take action for the competent authorities. As such, the system succeeded in providing a flood warning two days in advance in January 2010 and protected the city of Nuweiba.



Dr. Wiesam A.A. ESSA

Present function and address: Staff Member of the Geography Department of AL-AQSA University, Khan Younis City, Palestine (Gaza)

Title of Ph.D. thesis: **Thermal Subpixel Estimation in Urban Areas with Spaceborne Sensing**

Date of promotion: June 10, 2011

Promoters: O. Batelaan, J. van der Kwast

Curriculum vitae:

Wiesam A.A. Essa was born in Raffah, Gaza Strip – Palestine, on February 20, 1975. He received the degree of B.Sc. Environment and Earth Science in February 1997 from Islamic University of Gaza – Palestine, the degree of Professional Master in Land Degradation and Conservation Using the Application of Remote Sensing and GIS in September 2004 from International Institute for Geo-Information Science and Earth Observation, ITC – Netherlands. Wiesam is a Staff Member of the Geography Department of AL-AQSA University (Khan Younis City – Gaza) since February 2005. Wiesam worked as Ph.D. student at the Hydrology and Hydraulic Engineering Department, Vrije Universiteit Brussel, since July 2008. His main research interests are in the field of thermal remote sensing imagery applications, especially thermal downscaling.

Abstract:

Downscaling land surface temperature from thermal spaceborne imagery is considered as a rather new and challenging research problem for urban areas while this research problem has been well investigated for vegetated areas using different approaches. Consequently, no methodology is presently available for bio-physical surface characterization such that downscaling land surface temperature in heterogeneous urban areas is feasible. This work therefore contributes to a better understanding of the thermal physical

processes acting in urban areas.

Adaptation and improvement of the DisTrad method, commonly used in vegetated areas, was applied to downscale land surface temperature over urban areas. In this study, the urban zone of Dublin city (Ireland) was selected because it shows a sufficient range of spectral and thermal remote sensing information.

The first part of this thesis considers the role of 16 different spectral indices: BASVI, R, B, NDWI, NDBal, SVI, SAVI, NDBI, NDSI, I, UI, FC, VC, V, IBI and NDVI as possible input in DisTrad. The relationship of each index with observed remotely sensed land surface temperature was used to investigate the most suitable input parameter for DisTrad in an urban environment. The impervious percentage (I) shows the best downscaling results for the urban land surface temperature patterns to higher resolutions compared to the originally used NDVI in vegetated areas.

The second part investigates the feasibility of downscaling potential sources of thermal data imagery such as Moderate Resolution Imaging Spectroradiometer (MODIS). Simulation of MODIS land surface temperature images was necessary, since no coincident high resolution images were available for evaluation of the downscaling results. The adapted DisTrad method using the relation between land surface temperature and impervious percentage shows improved downscaling results compared to the original implementation of DisTrad for all evaluated resolutions. Since this study was carried out using simulated data, it is likely that larger errors can be expected when applying the procedure to real MODIS data, because of additional noise added to the temperature data particularly from sensor registration. Future studies should address this issue.

The third part discusses the utility of three types of MODIS/Terra land surface temperature image products (MOD11_L2, MOD11A1 and MOD11A2) that are obtained in two different ways V4 and V5 for downscaling to different target resolutions of 60, 90, 120, 240 and 480 m. An improved version of DisTrad was proposed in which a better parameterization of the original DisTrad temperature residuals in urban areas is obtained. The improved DisTrad proves to have a stronger capability to downscale land surface temperatures in urban areas than the original DisTrad.

Validation of the downscaled products using original DisTrad, the improved DisTrad and the uniformly disaggregated land surface temperature images (UniTrad) are performed by comparative analysis with a time-coincident Landsat 7 ETM+ thermal image. Statistical results indicate that the improved DisTrad method is more robust than the original DisTrad or the UniTrad.



Dr. ir. Koen VERBIST

Present function and address: Researcher,
Ghent University, Belgium

Title of Ph.D. thesis: **Climatic and soil physical constraints for efficient rain water harvesting in degraded lands of Chile**

Date of promotion: June 14, 2011

Promoters: D. Gabriels, W. Cornelis

Curriculum vitae:

Koen Verbist (°Antwerp, April 8, 1978) received his diploma of Bio-Engineer in Land and Forest Management in the year 2001. From 2002 to 2005 he worked at the Research Group Soil Erosion, Department of Soil Management on projects dealing with measurement and modeling of soil losses in the Flemish Ardennes, as policy supporting research. The focus was put on the proposal of erosion control measures and the formulation of strategies for reducing the sediment transport to rivers. Afterwards, he stayed three years (2005-2008) at the UNESCO Water Centre for Latin America and the Caribbean (CAZALAC), where he was in charge of regional projects on drought management and prediction, and reported at international fora, such as the UN Convention for Combating Desertification (UNCCD) in 2008 and 2011. During this period he also laid the foundation of his Ph.D. research in semi-arid zones of Central Chile, where he tutored 16 Flemish and local M.Sc. students with their thesis. In the last 3 years (2008-2011) he was active as assistant (AAP-member) at the Research Group for Soil Physics at the Soil Management. He is (co-)auteur of 12 scientific articles published in international journals with peer-review, as well as of policy support documents and the Aridity Atlas of Latin America. His research results were presented on international conferences, venues and UNESCO meetings. In December 2010 he (co-)organized the International Conference "Arid and Semi Arid Development through Water Augmentation" in Valparaiso (Chile), with the support of VLIR-UOS.

Abstract:

The semi-arids of Chile are characterized by acute drought risks that reduce the production potential of these areas, as well as their sustainable development. On the other hand, water harvesting techniques (WHT) have been proposed as a measure to help reduce the climate risk. Although these techniques are frequently applied in Chile under a range of soil physical and climatic conditions, the efficiency in view of maximizing the available moisture content has not yet been evaluated.

Departing from this point of view, the dissertation was split in three parts. In Part I the climatic variability of the

STUDENTS, RESEARCH FELLOWS & TRAINEES

arid part of central Chile is investigated and linked to the El Nino Southern Oscillation (ENSO). This variability is used here in the assessment of WHT when modeled under different climatic conditions, but it also supports short term early prediction of drought events in the region.

In the second part, the focus shifts to the heterogeneity of soil physical properties that are characterized by high stoniness in these regions. First, a reference technique was sought to determine infiltration and water retention parameters in these soils, which are essential to modeling WHT. Secondly, a relation was found between the spatial variation of these parameters and the stoniness, which can explain the soil physical heterogeneity of these soils.

Finally, in the third part of the dissertation, a new method was developed to evaluate the efficiency of WHT using a three-dimensional soil hydrological model, in which surface and subsurface processes are simulated simultaneously. The water balance is solved for different field setups and an improved design is proposed based on the transpiration efficiency, which is a clear improvement over existing frameworks.

The techniques developed in this Ph.D. thus allow to assess and predict the climatic risk in the region, to measure the soil physical parameters in these stony soils adequately and to dimension the water harvesting more efficiently.

New Ph.D. students 2011-2012



Ms. Nguyen Minh Phuong (Vietnam)
Master in Physical Land Resources
Subject: HYDROPED: Bridging pedology and hydrology through pedotransfer functions for sustainable soil-water management in the Mekong Delta, Vietnam
Promoter: W. Cornelis
Period: March 1, 2010 till February 28, 2014
Scholarship: Ministry of Education and Training, Vietnam



Mr. Tran Ba Linh (Vietnam)
Master in Physical Land Resources
Subject: Effect of land use and soil management on soil quality in the Mekong Delta, Vietnam
Promoter: W. Cornelis
Period: March 1, 2010 till February 28, 2014
Scholarship: Ministry of Education and Training, Vietnam



Ms. Medrina Kamwendo (Malawi)
Master in Physical Land Resources
Subject: Assessment of soil quality under conservation agriculture in dryland zones of Malawi
Promoter: W. Cornelis
Period: October 1, 2010 till September 30, 2014
Scholarship: VLIR



Ms. Jasmien Wildemeersch (Belgium)
Master in Bioscience Engineering, Environmental Technology
Subject: Integrated small-scale water harvesting for food security in Niger
Promoter: W. Cornelis
Period: October 15, 2010 till October 14, 2014
Scholarship: VLIR

Ms. Kearsley Elizabeth (Belgium)
Master in Bioscience Engineering, Environmental Technology
Subject: Carbon balance and processes in tropical rainforest, Democratic Republic of Congo
Promoters: P. Boeckx, K. Steppe
Period: July 15, 2011 till July 15, 2015
Scholarship: Project Funding

Mr. Bashar Al-Barri (Syria)
Master in Bioscience Engineering, Environmental Technology
Subject: Using nuclear techniques for modeling and monitoring vadose zone processes
Promoter: W. Cornelis
Period: September 15, 2011 till September 14, 2015
Scholarship: VLIR



Mr. Mathijs Dumon (Belgium)
M.Sc. Geology
Subject: Quantification of mineral components in soils and assessment of their impact on soil processes and properties
Promoter: E. Van Ranst

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Dictionnaire encyclopédique de science du sol (5th edition)

by Cl. Mathieu and J. Lozet. *Tec & Doc, Lavoisier*, London, Paris, New York, 2011. Hardbound, 733 pp. ISBN: 2-7430-1319-6. 149 €.

In *Pedon* 14, 2003, I reported on the fourth edition of this dictionary published less than ten years ago. This short time span proves both the quality and the usefulness of this document. The content of the fifth edition has been extended and updated, the number of terms increasing to 5000 in the present edition. The entries do not cover only the complete field of soil science, but also related fields, such as geology, mineralogy, geomorphology and in some cases agronomic aspects. In addition to this increase in number of entries, the new edition includes an updating of definitions and concepts, especially those derived from WRB (2006 instead of 1999) and its French analogue, the “Référentiel Pédologique” (2008 instead of 1995).

Each entry starts with the French term, followed by the English translation. Some entries are very short, only a few lines, other cover half a page, practically always with several cross-references to other entries. In a few cases this results in a circular research, eventually going back to the same initial entry. Terms and concepts of soil chemistry, classification, morphology and physics are clearly

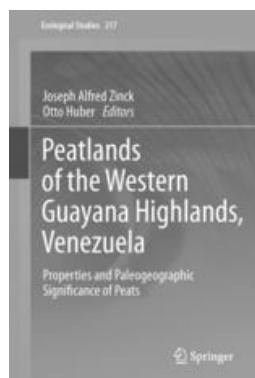
explained and mostly well illustrated. Also important geological, geomorphologic, mineralogical and petrographic terms used in soil science are discussed as well as some agronomic concepts. A number of soil micromorphological terms and concepts are explained and illustrated, but it is not always clear to which descriptive system they belong, leading to confusion. Many regional European, African and Asian concepts are explained, raising this dictionary to a more international level than some of the Anglo-Saxon encyclopaedias do. Especially when reading regional or older literature it is an indispensable tool.

Extremely useful, even for persons with a limited knowledge of French, are the numerous tables and graphs comparing different systems of units, limits of size classes and textural classes, rock names and so on. A large set of tables in annex compile soil names used by the different systems: WRB (2006; groups, qualifiers and suffixes), Soil Taxonomy (2006; orders, suborders and great groups), the French soil classification CPCS (1967; classes and subclasses), the “Référentiel pédologique français” (2008), the legend of the World Soil Map of FAO, the German soil classification (1985; classes and subclasses), and the legend of the Russian soil map (2000; division, type and subtype). Other useful annexes are a set of tables comparing horizon symbols and names used in different description systems and a table correlating WRB and Soil Taxonomy terms.

Short biographies of 120 late soil scientists (including several former staff members of ITC and invited lecturers) introduce the reader in the history of soil science and those who created and developed this discipline.

This encyclopaedic dictionary is written in a clear and compact style, allowing checking a term or concept in a couple of seconds. The numerous cross references allow digging deeper in the subject. Layout, format, the beautiful illustrations, partly in colour, and the plasticized hardcover invite the owner to use the book frequently. This dictionary will show to be a time saving item, not only for native French speaking soil scientists, geologists and environmentalists, but also for others with a passive knowledge of this Latin language. Also for persons involved in teaching at college or undergraduate level it is an excellent help. The English-French index at the end makes the book a highly estimated help for translation of scientific texts on soil science and related fields.

Georges Stoops

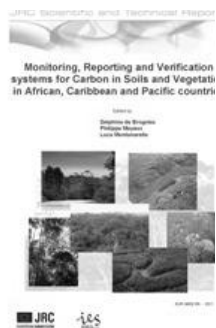


Peatlands of the Western Guayana Highlands, Venezuela (1st edition)

by Zinck, Joseph Alfred and Huber, Otto., 2011, XVII, 295 p. 92 illustrations (44 in color). ISBN 978-3-642-20137-0. 99,95 €.

The Guayana Highlands in northeastern tropical America, rising from lowland rain forests and savannas up to 3000 m elevation, are characterized by ancient tablelands called *tepui*s. The peatlands that developed on the tepuis constitute unique and fascinating ecosystems and are the focus of this volume, which starts with an overview of tropical and subtropical peats, followed by an introduction to the geo-ecological features of the Guayana region as a whole, with special emphasis on the diversity of the vegetation cover from lowlands to uplands to highlands. The core subject centers on the properties and dating of the peat deposits and the interpretation of the chronological record in terms of past environmental changes. The well illustrated book will appeal to a broad range of scientists interested in tropical highland peats, including quaternarists, soil scientists, geomorphologists, geographers, geologists, ecologists, botanists, hydrologists, conservationists and land use planners.

Eric Van Ranst



Monitoring, Reporting and Verification systems for Carbon in Soils and Vegetation in African, Caribbean and Pacific countries

by Delphine de Brogniez, Philippe Mayaux and Luca Montanarella. Luxembourg: Publications Office of the European Union, 2011. ISBN: 978-92-79-21136-2 (print), 978-92-79-21137-9 (pdf).

Improved terrestrial carbon management offers tremendous potential for climate change mitigation and, in many cases, there are associated cobenefits such as increased productivity, resilience and biodiversity. In January 2011, the Institute for Environment and Sustainability of the Joint Research Centre organized an inter-service meeting on "Monitoring, Reporting and Verification systems for carbon in soils and vegetation in African, Caribbean and Pacific countries" with the objective of refining its long-term research agenda in that domain. This was achieved in the light of the needs of the Directorates-General involved in the development and environment policies namely DEVCO, ENV, CLIMA, ENTR, RTD and AGRI as well as of the recent evolution of the UNFCCC negotiations. This report encompasses the proceedings of the meeting together with the conclusions and recommendations to JRC

work program stated by the invited experts and policy-makers from the different relevant DGs.

Eric Van Ranst



Tropicultura

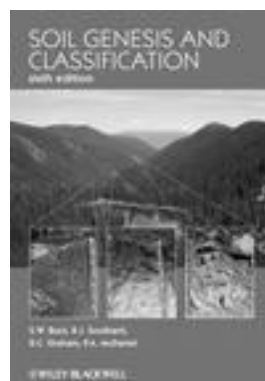
Open Access ISSN 0771-3312

Tropicultura publishes original articles, research and synthesis notes, book and thesis summaries as well as reviews of films and videos relative to all aspects of rural development including Soil Science and Environmental Sciences.

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Eric Van Ranst



Soil Genesis and Classification (6th edition)

by Stanley W. Buol, R.J. Southard, R.C. Graham, P.A. McDaniel. Wiley-Blackwell 2011. Hardcover, 560 pages. ISBN: 978-0-8138-0769-0. 72 €.

Soil Genesis and Classification, Sixth Edition, builds on the success of the previous editions to present an unparalleled resource on soil formation and classification. Featuring a color plate section containing multiple soil profiles, this text also includes information on new classification systems and emerging technologies and databases with updated references throughout. Covering the diverse needs of both the academic and professional communities, this classic text will be a must have reference for all those in soil science and related fields.

Eric Van Ranst



New Soil Science Journal

It is my pleasure to announce you the birth of a new soil science journal: the Spanish

Journal of Soil Science. The SJSS is an international journal launched by the Spanish Soil Science Society, published every four months that welcomes scientific research in Soil Science from all countries and geographic regions, dealing with the different areas of Soil Science: soil research - including soil micromorphology-, study, education, and management. It will be an open-access, free-of-charge for authors, peer-reviewed journal that, from the very beginning will comply with all the requirements for indexing and cataloguing of the main citation databases.

The SJSS will be mainly in English, but accepts contributions in Spanish and Portuguese. It is accessible through the Universia portal: <http://sjss.universia.net>. Here you can find full papers, instructions for authors, etc. The first issue was published in autumn 2011.

Rosa Poch



Grands paysages pédologiques de France

by Marcel Jamagne. Quae éditions, Versailles, France, October 2011. 624 pages and CD-Rom, ISBN: 978-2-7592-1036-7. 48 €.

Première synthèse nationale sur le sol, composante essentielle de notre environnement, cet ouvrage présente l'ensemble des connaissances sur les principales

ressources en sols de France métropolitaine. Les données reprennent l'essentiel des travaux d'inventaire, de cartographie et de recherches associées sur les sols, notamment ceux réalisés dans le cadre du levé de la "Carte pédologique de France", coordonnée scientifiquement par l'Institut national de la recherche agronomique. Abondamment illustré par des schémas, des extraits de cartes explicatifs de la distribution des sols et de nombreuses photographies intégrées dans le cédérom associé, ce livre comporte par ailleurs la corrélation entre la taxonomie française utilisée (Référentiel pédologique) et le référentiel international World Reference Base for soil resources (WRB).

Eric Van Ranst

Multilingual translation of micromorphological terminology.

In Pedon n° 22 (January 2011) we reported already on the multilingual translation of the micromorphological

terminology proposed by Bullock et al. (1985) and more recently by Stoops (2003).

Meanwhile two languages, namely **Russian** and **Arab**, have been added to the original 14: **Castellano** (Spanish), **Català** (Catalan), **Česky** (Czech), **Deutsch** (German), **Français** (French), **Galego** (Galician), **Italiano** (Italian), **Magyar** (Hungarian), **Nederlands** (Dutch), **Norwegian**, **Polski** (Polish), **Português** (Portuguese), **Română** (Romanian) and **Slovenčina** (Slovak).

The new version 1.3 is now available on our website: http://www.plr.ugent.be/micromorphology_news.html.

Georges Stoops

INTERESTING LINKS

SEM micrographs showing humic acid nanotube membranes supporting the "Humic Acid Nanotube concept" of Em. Prof. Kim Howerd Tan and others of his papers are posted on the following web site: <http://www.drkhtan.net16.net/>.

The Soil Science Society of America has published three most interesting videos on Soil: "The Story of Soil", <https://www.soils.org/story>. Take a look at these videos and share them with your colleagues and students.

The IUSS Commission Soil Classification has its own website: <http://clic.cses.vt.edu/IUSSI.4/> and has published its first newsletter: http://clic.cses.vt.edu/IUSSI.4/IUSS_SoilClassification_Newsletters.htm.

The report from the Launching of the UN Decade of Deserts and the Fight against Desertification (2010-2020) by UNCCD that was held in London in December 2010 can be found in this link: <http://unddd.unccd.int/europe-launch.htm>.



Francis Vandendriessche

A NOVEL TOOL TO PREDICT HYDROPHYSICAL PROPERTIES OF SOILS IN LOWER CONGO

2008-2012

Funded by: BOF-UGent

Project collaborators: W. Cornelis, E. Van Ranst

Doctorandus: Yves-Dady Botula Manyala

The existing soil database of Lower Congo will be digitised and transformed to a web based application. The database will be extended with data on hydrophysical soil properties. The database is then used to develop pedotransfer functions (PTFs) to predict hydrophysical properties of Lower Congo soils using novel data mining techniques. Scenario studies will demonstrate how PTFs can improve land management planning.

Wim Cornelis

PROSPECTS AND IMPROVEMENT OF CROP PRODUCTIVITY IN VERTISOLS THROUGH CONSERVATION AGRICULTURE IN TIGRAY IN NORTHERN ETHIOPIA

2008-2012

Funded by: VLIR-UOS

Project collaborators: W. Cornelis, J. Nyssen

Doctorandus: Tesfay Araya

In Tigray, conservation agriculture (CA) has been introduced since 2004 for in situ water conservation. It aims at mitigating agricultural drought by improving soil quality through improved rainwater infiltration and thus reducing loss of water by runoff on one hand, and through reducing deep percolation and soil evaporation on the other hand. Together with an improved nutrient balance, this should lead to higher crop yields. The objective of the project is to evaluate the impact of four management practices on various soil quality indices, on the efficient use of rainwater and on several crop parameters from on-farm experimental plots. Rather than developing yet another CA tool, we investigate whether CA-based resource-conserving technologies might be achieved successfully with simple changes to the use of the indigenous marasha ard plough.

Wim Cornelis

SUSPENDED SOLIDS AND SEDIMENTS IN THE SCHELDT ESTUARY – ENVIRONMENTAL IMPACT OF THE SIGMAPLAN

2009-2012

Funded by: Waterwegen en Zeekanaal, Afdeling Zeeschelde

Project collaborators: M. Chen, J. Gonzalez, S. Wartel, F. De Smedt

This project is under the framework of “Onderzoek naar de gevolgen van het Sigmaplan, baggeractiviteiten en havenuitbreiding in de Zeeschelde op het milieu” (OMES). OMES entails a multidisciplinary study of the environmental consequences of human interference in the Scheldt Estuary (Belgium). More specifically attention is given to effects of the Sigmaplan, dredging activities and harbor extension in the Zeeschelde, on habitats and pollutions. The complete research project consists of nine (9) major aspects relating to a monthly monitoring of the physical, chemical and biological parameters of the pelagic, intertidal and subtidal areas as well as of the lateral load of the Zeeschelde and its tributaries. The obtained database aims to develop an ecological model and to put the model into practice. This multidisciplinary research project is carried out by partners from Universiteit Antwerpen, Vrije Universiteit Brussel, Universiteit Gent, and Université Paul Sabatier Toulouse. Our research tasks mainly deal with the physical and sedimentological study of the Scheldt Estuary including flow characteristics, light climate of water column, suspended solid concentration and loads, the physical properties of the suspended solid, as well as morphological evolution and sediment accumulation rates on tidal marshes.

Margaret Chen

NOVEL PEDOTRANSFER FUNCTIONS FOR PREDICTING PHYSICAL AND HYDRAULIC PROPERTIES OF TANZANIAN SOILS

2009-2013

Funded by: BTC

Project collaborators: W. Cornelis, E. Van Ranst

Doctorandus: Thadeo Mpulila

Water relations are among the most important physical phenomena that affect the use of soils for agricultural, ecological, environmental, and engineering purposes. To formulate soil-water relationships, soil physical and hydraulic properties are required as essential inputs. Such data are, however, often not available. This project aims at establishing a new physical and hydraulic properties dataset for soils in Tanzania. Novel data mining techniques that allow to predict those properties from basic soil properties using pedotransfer functions (PTFs) will be

developed. Scenario studies will demonstrate how PTFs can improve land management planning.

Wim Cornelis

HYDROPEDE: BRIDGING PEDOLOGY AND HYDROLOGY THROUGH PEDOTRANSFER FUNCTIONS FOR SUSTAINABLE SOIL-WATER MANAGEMENT IN THE MEKONG DELTA, VIETNAM

2010-2014

Funded by: Ministry of Education and Training, Vietnam

Project collaborator: W. Cornelis

Doctorandus: Nguyen Minh Phuong

The emerging interdisciplinary research domain of hydropedology, which bridges pedology and hydrology, is gaining substantial attention. The project aims at understanding how pedological attributes affect soil water retention and soil water flow in the Mekong Delta, Vietnam, through the development of innovative “hydraulic” pedotransfer functions. Distinct pedogenetic (structure, morphology, horizonation, ...), landscape or vegetation features typically observed in the Mekong Delta, as well as novel data mining and pattern recognition tools will be considered in the PTF construction. The PTFs will be used for running models for applications ranging from field-scale water flow studies to global climate change.

Wim Cornelis

EFFECT OF LAND USE AND SOIL MANAGEMENT ON SOIL QUALITY IN THE MEKONG DELTA, VIETNAM

2010-2014

Funded by: Ministry of Education and Training, Vietnam

Project collaborator: W. Cornelis

Doctorandus: Tran Ba Linh

Some areas of the Mekong Delta have been exploited and used intensively by many farmer generations. Land management practices applied include manual soil preparation, machinery ploughing, acid sulphate soil leaching, fertilized or unfertilized cultivation in order to obtain high yields and production. These practices, combined with natural soil processes, finally bring soils to complete degradation. This in turn leads to unsustainable agricultural development over the area. Nowadays, the paddy fields are alternatively changed and intercropped with cash crops or industrial crops. The aim of this project is to evaluate the impact of land use and soil management practices on soil quality in the Mekong Delta, and to

present recommendations for sustainable land management in the future.

Wim Cornelis

ASSESSMENT OF SOIL QUALITY UNDER CONSERVATION AGRICULTURE IN DRYLAND ZONES OF MALAWI

2010-2014

Funded by: VLIR-UOS

Project collaborator: W. Cornelis

Doctorandus: Medrina Linda Kamwendo Mloza-Banda

In Southern Africa, especially in semi-arid areas, conservation agriculture (CA) has been introduced since a few years and is highly promoted. Although it may be self-evident to many that CA will improve soil quality and hence increase the resilience of the soils against drought and thus increase yields, this assumption generally goes without rigorous evaluation or detailed testing. Agronomic properties, soil characteristics and economic benefits have not been widely studied among smallholder rainfed farmers. Moreover, the Tropical Soil Biology and Fertility Institute of the International Centre for Tropical Agriculture has recently raised very critical concerns about adoption of CA in smallholder farming systems in Africa. This project aims at critically assess CA for maize production in Central Malawi and Southern Malawi, two districts located in low rainfall zones and prone to drought. Suggestions for improvement of the current CA practices will be made.

Wim Cornelis

INTEGRATED SMALL-SCALE WATER HARVESTING FOR FOOD SECURITY IN NIGER

2010-2014

Funded by: VLIR-UOS

Project collaborator: W. Cornelis

Doctorandus: Jasmien Wildemeersch

This study evaluates small-holder rainwater harvesting techniques as strategies for ensuring food security in semi-arid Niger. They will be compared in terms of efficiency in combating the low available water in the rootzone, caused by erratic rainfall and imbalanced rainfall partitioning, through the study of the rootzone water balance, adoption constraints, yield increase and hydrological impact.

Wim Cornelis

IMPACT OF TERMITES ON THE MINERAL, TEXTURAL AND MOLECULAR ORGANIC COMPOSITION OF TROPICAL SOILS

2010-2014

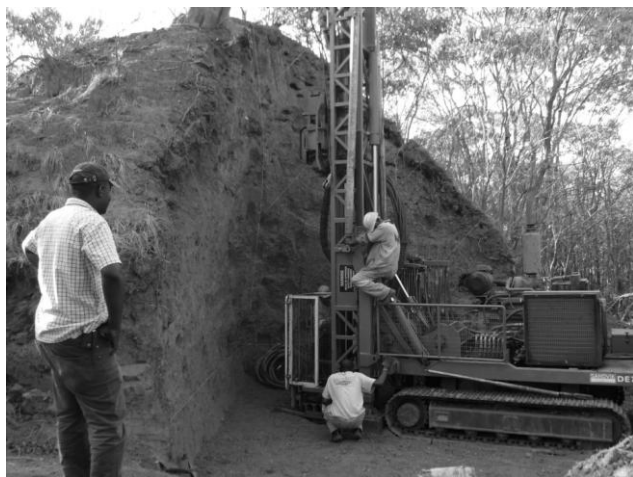
Funded by: FWO (Research Foundation Flanders)

Promoters: E. Van Ranst, P. Boeckx, F. Vanhaecke, G. Baert, F. Mees

Doctorandi: B.B. Mujinya, H. Erens

Deep core sampling under large termite mounds of Katanga, DRC

The Miombo woodlands of South Katanga (DRC) are characterized by 3 to 5 of these large conic mounds ha⁻¹ built by *Macrotermes falciger*. With an average height and diameter exceeding 5 and 18 m respectively, these are some of the largest biogenic structures in the world. Mound soil properties differ considerably from those of the surrounding Ferralsols. Most notably, mound soil exhibits a finer texture, higher CEC and exchangeable basic cation content, lower SOM content, and the build-up of carbonates. However, these soil properties were found to be far from uniform in the 250 m³ that constitute an average mound. Unlike many other mound-building termite species, the mounds of *Macrotermes falciger* are largely fossil, the result of continuous erosion and recolonization of existing mounds. The termites' nesting and foraging activity, combined with other pedological processes generates a wide range of physical, chemical, and biological conditions in different parts of the mound. Besides mapping the resulting variability of soil properties within large termite mounds, the Ph.D. studies of my colleague Basile Mujinya (M.Sc. PLR, 2006) and myself also contemplate the origin and possible applications of this variability.



The drilling equipment was positioned as close to the centre as possible



Detailed sampling in the heart of an active colony



A continuous core sample was obtained, from the centre of the mounds into the parent rock

To elucidate these processes and their implications, many large termite mounds were cut open and sampled in detail. Part of the explanation, however, is to be found in the origin of the building material the termites use for their construction. The greatest challenge remained to obtain undisturbed soil samples from the subsoil, the saprolite and the parent rock. Luckily, during the fieldwork campaigns, we established good contacts with the geology department of a local mining company. As such, our friends there agreed to do three deep core drillings for us underneath the termite mounds we were investigating. This way, we obtained three continuous soil cores up to 40 m deep, each time well into the parent rock. As such, we are now the first to have a complete and undisturbed vertical sequence of soil from the top of a termite mound into the underlying rock. Micromorphological, mineralogical and physico-chemical analyses will be carried out on these samples the coming months to trace the impact of the termites in this continuum, and to confirm standing hypotheses on carbonate formation in mounds, stoneline formation, and clay and nutrient cycling by termite activity.

Hans Erens

QUANTIFICATION OF MINERAL COMPONENTS IN SOILS AND ASSESSMENT OF THEIR IMPACT ON SOIL PROCESSES AND PROPERTIES

*Funded by: Laboratory of Soil Science
In collaboration with: Laboratoire HydrASA (Hydrogéologie, Argiles, Sols et Altérations), Université de Poitiers
Promotor: E. Van Ranst
Doctorandus: M. Dumon (assistant)*

Quantification of mineral components in soils is a key step when studying pedogenetic processes and the resulting soil properties. More specifically the importance of clay mineralogy cannot be ignored, since many soil functions and processes are attributed to their presence.

Software able to calculate X-ray diffraction patterns has proven to be a reliable method for determining mineralogy. The SIROQUANTTM software allows to calculate diffraction patterns of mixtures containing up to 50 different minerals. It uses the well-known whole-pattern fitting methodology of Rietveld and comes with a database containing 1050 mineral phases. Software to add more minerals, either based on crystal structure information or using experimentally obtained X-ray diffraction patterns, is also provided. The power of this software package lies in the automatic refinement of a selection of parameters by comparing the calculated pattern with the experimental pattern, using a non-linear least-squares algorithm. As such the software does not only allow to estimate weight fractions of different phases contributing to the X-ray diffraction pattern, but also to refine their crystal structures.

However, the determination and quantification of clay mineralogy is a more complicated process, due to compositional and structural variations occurring within phyllosilicates such as isomorphic substitutions, (partial) hydroxy-interlayering and random inter-stratification of different layer types.

As such SIROQUANTTM does not provide an easy way to quantify these types of minerals or their layer composition. The Sybilla[®] software, on the other hand, was designed by Chevron specifically for analyzing clay samples, and is as such able to calculate patterns for mixed layer minerals. It contains a predefined set of clay minerals and allows other phases to be added using input files. Just like SIROQUANTTM it can also be used to refine the parameters involved in the calculation, either automatically (using genetic algorithms) or manually (trial-and-error approach).

Normative calculations using total elemental analysis (sometimes combined with selective dissolution techniques) is another, less frequently used method used in

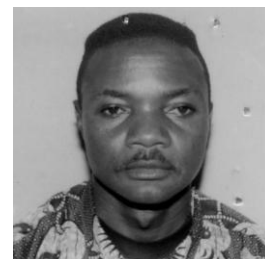
estimating the mineral composition. Abundances of a series of ideal minerals are computed from chemical analysis. These calculations are usually derived or based on the well-known CIPW norm, and require a qualitative knowledge of the minerals present in the sample. Additional information from selective dissolution techniques (e.g. dithionite-citrate-bicarbonate (DCB), dark oxalate and alkaline digestion) may allow to refine the calculations involved.

A comparison of the results from samples with a known composition allows to identify possible sources of error, and refine the strategies and calculations involved in the procedures. Moreover, the results can be used as input for other research topics including a.o. soil degradation, nutrient availability, erodibility, etc.

Mathijs Dumon

VLIR Ph.D.-PLUS SCHOLARSHIPS 2011

Dr. Ruben Koy Kasongo
(University of Kinshasa, DR Congo)



It was a privilege and an honor that I obtained such a prestigious South-North Specialization scholarship from VLIR-UOS to stay at the Laboratory of Soil Science of Ghent University from September to December 2011. I obtained my M.Sc. degree from the International Training Centre for Physical Land Resources at Ghent University in 2005 with a BTC scholarship, and my Ph.D. research was about improving the quality of sandy soils of the Batéké plateau (DR Congo) by using local geological materials and industrial organic waste products, under the supervision of Prof. Dr. E. Van Ranst of Ghent University. Since I obtained my Ph.D. (December 2009), I am working as an associate professor in the Department of Earth Science at Kinshasa University. I am in charge of teaching the following courses: General Pedology, Soil Biology, Clay Mineralogy and Soil, Vegetation and Mineralization. I am also obliged to supervise the thesis work and practical exercises of students, to do research and extension work to the community in fields related to Soil Science and Geochemistry.

There are many benefits that I got during my stay at Ghent University such as: (i) working on three manuscripts submitted to the international journals "Soil Use and Management" and "Canadian Journal of Soil Science", using the unpublished data from my Ph.D. research combined with additional data on Italian ryegrass growth in greenhouse pot experiments, (ii) searching and saving some digital scientific papers from the major e-journals,

(iii) conducting chemical total analyses of sandy soil and clay samples at the Laboratory of Soil Science of Ghent University, and (iv) preparing teaching materials (lecture notes of general pedology and clay mineralogy). The work was under the intensive supervision of Prof. Dr. E. Van Ranst (Ghent University), with collaborative discussions with Prof. Dr. G. Baert (Hogeschool Ghent) and Prof Dr. Ann Verdoodt.

Overall, this Ph.D. Plus Program gave me the opportunity to further improve my scientific writing skills, upgrading my teaching with new findings on several aspects related to soil improvement by using local agrominerals and organic waste products. I got further training in new analytical techniques and methods to analyze soils with the aims to improve soil fertility. Therefore, I wish to sincerely thank Prof. Dr. E. Van Ranst, Ms. Hilde Luyckx, Ms. Anne-Marie Tanghe, Ms. Nicole Vindevogel and all VLIR staff.

Ruben Koy Kasongo



Dr. ir. Emery Kasongo Lenge Mukonzo (University of Lubumbashi, DR Congo)

Within the framework of the VLIR own initiative project: *"Valorisation des données disponibles des ressources naturelles physiques de la République Démocratique du*

Congo pour une gestion rationnelle et durable des terres" implemented jointly between Ghent University and the Congolese universities of Kinshasa and Lubumbashi, I was given a Ph.D. scholarship and obtained my Ph.D. degree at Ghent University in 2008 under the supervision of Prof. E. Van Ranst, Prof. Dr. A. Verdoodt and Prof. Ngongo Luhembwe from the University of Lubumbashi.

After completion of my Ph.D. studies, I went back to DR Congo where, since then, I teach courses such as Tropical Pedology, Soil Biology, Soil Management and Agricultural Extension at the Faculty of Agriculture of the University of Lubumbashi. I also carry out research for development with farmers in the DR Congo through NGOs.

With the generous support of Ph.D. Plus 2011 Scholarship, it was once again possible for me to undertake scientific work at Ghent University. During my stay at Ghent University from 20th September to 15th december 2011, I could prepare the following scientific papers:

- (1) "Une méthodologie pour intégrer la gestion des cultures dans la simulation des rendements", Kasongo Lenge M.E., Ann Verdoodt, Ngongo Luhembwe M., Geert Baert, Eric Van Ranst
- (2) "Insécurité foncière et sécurité alimentaire: perspectives dans la province minière du Katanga

(RD Congo)", Kasongo Lenge M.E., Ann Verdoodt, Ngongo Luhembwe M., Geert Baert, Eric Van Ranst

Emery Kasongo Lenge Mukonzo



From left to right: Dr. Ruben Koy Kasongo (UNIKIN, D.R. Congo), ir. Rachid Moussadek (INRA, Morocco), Prof. Dr. E. Van Ranst, Dr. ir. Emery Kasongo Lenge (UNILU, D.R. Congo)

Dr. Liming Ye (Chinese Academy of Agricultural Sciences (CAAS), Institute of Agricultural Resources and Regional Planning)



It was a great honour to be granted the South-North Specialization Scholarship by VLIR for the period between August and October 2011 at Ghent University. Ghent is almost my second home.

I obtained my M.Sc. in *Physical Land Resources* in 1999 with a scholarship from ABOS (i.e. DGD now) and my Ph.D. in Earth Sciences in 2008 supported by the Special Research Fund (BOF) of UGent, both under the guidance of Prof. Dr. E. Van Ranst of the Department of Geology and Soil Science at UGent. My Ph.D. was specialized in modeling soil degradation's impact on long-term food security in China, the first of its kind, using large-scale grid datasets and production scenarios. Since then, I have continued my research on food security at my home institute in China. I am now acting as a project leader under the National Basic Research Program on climate change and food security at the Chinese Academy of Agricultural Sciences in Beijing.

It has been more than a joy for me to return to Gent for a specialization period of nearly three months and it has been a productive stay as well. Food security in China is still subject to debate among researchers and policy makers, although China has largely succeeded to use 9% of world cropland to feed 22% of the world population. Climate change brings additional uncertainty to this issue. As one of the mitigation options worldwide, biofuel crops may help control the GHG emissions but compete with food crops for land and water. It is a sensible – perhaps

inevitable – choice to meet the national biofuels targets by using marginal lands. Based on my research done in Ghent, two papers have been submitted and the third is under production:

Papers produced:

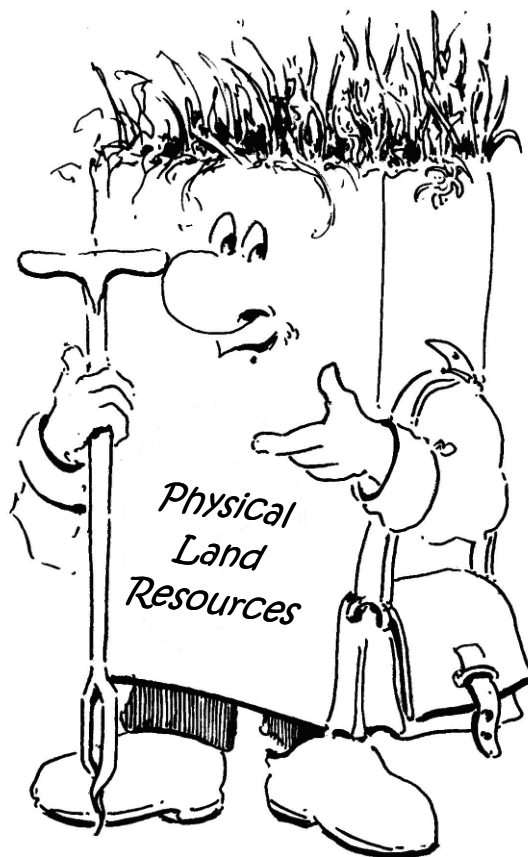
- L.Ye, W.Xiong, Z. Li, P. Yang, W.Wu, G. Yang, Y. Fu, J. Zou, Z. Chen, E. Van Ranst, H. Tang. 2011. China's food security under climate change toward 2050. *Agronomy for Sustainable Development*. (under review).
- L.Ye, G. Yang, E. Van Ranst, H. Tang. 2011. Time-series modeling and prediction of global monthly absolute temperature for environmental decision making. *Advances in Atmospheric Sciences*. (under review).
- L.Ye, E. Van Ranst, H. Tang. 2011. Potential production of biofuels on marginal lands in China. (under production).

I also took advantage of my stay to meet colleagues in Ghent and other parts of Europe. During the *Global Science Conference on Climate-Smart Agriculture* held in Ede-Wageningen, the Netherlands, from 24 to 26 October 2011, for example, one of the research priorities that I had identified in Gent – namely the need of research on patterns and effects of pests and diseases on crop yield under climate change – was adopted by the conference declaration on climate-smart agriculture. This declaration was recently published as an official document on the Agricultural Day during the UN-COP17 climate talks in Durban, South Africa in December 2011.

Conferences attended:

- L.Ye, G.Yang, A.Verdoort, H.Tang, R.Moussadek, Y.Fu, E.Van Ranst. 2011. A theoretical framework for assessing food security and food policy effectiveness in China. *Wageningen Conference on Applied Soil Science, Soil Science in a Changing World*, (18-22 September, 2011), Wageningen, the Netherlands.
- Wageningen Declaration on Climate-Smart Agriculture. *Global Science Conference on Climate-Smart Agriculture*, (24-26 October, 2011), Ede-Wageningen, the Netherlands.
- L.Ye, W.Xiong, Z. Li, P. Yang, W.Wu, G. Yang, Y. Fu, J. Zou, Z. Chen, E. Van Ranst, H. Tang. 2011. Simulated effects of climate change on food security in China toward 2050 *International Conference on Climate Change and Food Security*, (6-8 November, 2011), Beijing, China.

Liming Ye



Francis Vandendriessche

CAREER MOVES



Dr. ir. Ann Verdoodt (Ph.D. 2003, promoter Prof. Dr. Eric Van Ranst) has been appointed Professor in Land Degradation at the Faculty of Bioscience Engineering, Ghent University. She graduated as a Master in Bioscience Engineering in Land and Water Management in 1999 and then started her Ph.D.

research within the discipline of land evaluation under the guidance of Prof. Van Ranst. Since then, she has been actively involved in the Physical Land Resources Program, first assisting the practical exercises of the courses on Land Evaluation, and Soil Prospection and Classification; and later on as a lecturer and co-lecturer of the courses Seminars in Physical Land Resources and Land Evaluation. In her new position, she replaces Prof. Donald Gabriels (lecturer of Soil Erosion Processes and Control, Soil Degradation), who retired since this academic year. Her research will focus on the assessment, prevention and remediation of soil degradation through rational land use planning and optimized soil management.

in Thailand until 1986. He was then transferred as Project Manager to a similar project based in Dar Es Salaam, Tanzania until 1988. He ended his field career in 1988-1989 as Project manager of a large Soil Survey project in Botswana and then transferred to FAO Headquarters in Rome, first as Technical Officer Soil Resources, later as Senior Officer Land Resources and as Coordinator of the Land Degradation Assessment Project (LADA) until the end of 2010. His work covered a number of soil based areas, notably the chemical and physical characterization of benchmark soil series in Sudan and the Philippines, land evaluation techniques based on agro-ecological zoning and crop modeling both nationally and globally. Dr. Nachtergaele was one of the early developers and promoters of the World Reference Base (WRB) for Soil Resources (he has been Vice-Chair of the IUSS-Working Group WRB) and contributed significantly to the update of the FAO/UNESCO Soil Map of the World under the Global Soil and Terrain Database (SOTER) program culminating in the publication in 2008 of the Harmonized World Soil Database. During the last years of his career he coordinated an international effort to combat land degradation under the LADA project, resulting in innovative assessment methods at local, national and global scale. Dr. Nachtergaele is the author of numerous scientific articles on Agro-Ecological Zoning, Soil classification and Land Degradation Assessment. He has been an active member of the European Soil Bureau.

Eric Van Ranst

LAUDATIO



Dr. ir. Freddy Nachtergaele, ITC-Ghent alumnus, promotion 1973

Dr. ir. Freddy Nachtergaele went on early retirement after a long career with the Food and Agriculture Organization of the United Nations (FAO). He started working with FAO as an associate expert in Soil

Chemistry, first in a Soil Survey project in Sudan (1974-1976), later in the Philippines (1976-1977). In 1978 he was employed by the General Administration for Development Cooperation (GADC-Belgium)/the Flemish Interuniversity Council (VLIR) under Professor R. Tavernier to lecture Soil Science and Land Evaluation at the "Institut National d'Agriculture" in El Harrach, Algeria, a post which he held for 6 years until 1983. He then returned to Belgium to finalize a Ph.D. in Agronomy under Professor C. Sys on "Land evaluation approaches applied to northern Algeria" which he defended cum laude in 1985. That same year he rejoined FAO as a Technical Officer Land Resources for a regional project, concerned with Land Use Planning, based

IN MEMORIAM



Em. Prof. Armand Van Wambeke (1926-2011), former ITC staff member

After a full and most diversified professional career in soil science, Em. Prof. Armand Van Wambeke passed away on Tuesday, May 3rd, at Kendal, Ithaca, USA at the age of 84. He was born on May 16, 1926 in Gent, Belgium. Armand's education was based in Gent. After his graduation from the Royal High School of Ghent in 1944, he enrolled at the State Agricultural University in Gent, where he obtained the degree of agricultural engineer of the tropical regions in 1949. He was an accomplished basketball player and represented Belgium at the 1948 Olympics in London.

After military service in the Ordinance Corps, Armand worked as a field soil surveyor at INEAC (*Institut pour l'Etude Agronomique au Congo Belge*) in the former Belgian Congo, and Ruanda-Urundi (now Rwanda and Burundi) from 1951 to 1960 where he also contributed to the 5th ISSS World Congress in Léopoldville (now Kinshasa) in 1954. The data he collected in Central Africa

formed the basis for his Doctoral dissertation at the State Agricultural University in Gent in 1958 on the properties and classification of soils in the Kivu area, Eastern Congo. From 1960 to 1961, he was lecturer in Soil Science and Tropical Soils at the Faculty of Agriculture of the University of the Belgian Congo and Ruanda-Urundi in Usumbura (now Bujumbura).

From 1961 to 1964 Armand joined the Land and Water Division of the United Nations Food and Agriculture Organization (FAO) as soil surveyor in Colombia where he mapped the Llanos Orientales. From 1965 to 1966 he was active as Project Leader at the Belgian Center for Soil Survey in Gent. In 1965 he did some fieldwork in the Terai of Nepal. From 1966 to 1969 he served as FAO Regional Soils Expert for South America, settled in Santiago in Chili. During his residence in Chili, he had the opportunity to become acquainted with soil science activities in all Latin American countries and he was Visiting Professor at the University of Puerto Rico.

His great expertise in soils of the humid tropics has led to some major reference publications on this subject matter such as:

- FAO Soils Bulletin N° 23 on “Management and Properties of Ferralsols”, FAO, 1974;
- Van Wambeke and Dudal, 1978 in Diversity of Soils in the Tropics: “Macro-variability of soils in the tropics”;
- Van Wambeke, 1989 in Advances in Soil Science: “Tropical Soils and Soil Classification Updates”;
- Towards the end of his career in 1992 he wrote his famous textbook: “Soils of the Tropics. Their Properties and Appraisal”, which was translated into French in 1995 by Jean Lozet and Jean Chapelle: “Sols des Tropiques, Propriétés et Appréciation”;
- A WRB-version of this book was later published under the “Land and Water Digital Media Series N° 24” as a CD-ROM. In this edition the tropical environment and its influence on the formation of soils, their properties and their management is presented in an interactive form with numerous slides of the major soil types and tropical landscapes. The CD-ROM has been used as a popular learning tool on tropical soils for students and agronomists alike.

Armand became acquainted with Cornell University during an interim position as International Professor in 1966, after which he returned to Latin America as the Regional Soil Survey Officer for FAO, and in 1970 to the State University of Ghent, Faculty of Science, as Senior Researcher at the Laboratory of Physical Geography and Regional Pedology under the direction of Professor René Tavernier. During his stay at Ghent University, he guided students of the International Training Center for Post-graduate Soil Scientists (ITC-Ghent) and started his research on soil moisture and temperature regimes (the Newhall Simulation Model) worldwide. In that period he

did also some field studies in the Philippines, Malaysia and Thailand. He was an enthusiastic early adopter of computer technology.

His arrival at Cornell University in 1976 initiated an academically very productive phase as Professor of Tropical Soil Science, teaching undergraduate and graduate students until his retirement in 1995. Armand Van Wambeke's research interests were focused on the development of methodologies that make soil resource inventories more accessible to land use planners. Next to his important work on soils of the tropics, Armand also made substantial contributions to the field of “Land Evaluation”. He gained international recognition for his research in land evaluation by developing a computer-based expert system with his Ph.D. student David Rossiter (ALES, Automated Land Evaluation System, 1987), which has been used, all over the world. Armand's group at Cornell supported the international outreach of the US Soil Survey with a series of practical publications on cartography and on evaluating the quality of soil surveys. At Cornell, he regularly travelled around the world in support of soil survey and educational efforts and did two sabbaticals at the ITC-Ghent and the Laboratory of Soil Science of the Ghent University.

Armand was known for his great analytical mind and ability to bring structure to the evaluation of complex soil systems. He took pride in challenging his students to think both broadly and in depth. His reputation was that of a critical and demanding scholar and a fair and inspiring teacher. Since 1986 Armand Van Wambeke was corresponding member of the Section of Natural and Medical Sciences of the Royal Academy of Overseas Sciences in Belgium.

Armand and Francine had six children (4 boys and 2 girls); one of his boys died in a plane crash in South America a few years ago. Armand leaves behind a beautiful family including his wife, five of his six children, and twelve grandchildren.

His scientific findings will continue to serve as important references, fuelling the discussions in many papers to come. Those who had the privilege to know Armand more closely will always remember his favourite one-liners such as:

“To make progress in soil science one must go outside of it”;

“We don't want to be Dutch, we don't want to be French, we definitely don't want to be German, so we are Belgian”;

and referring to his Olympic experience where Belgium was eliminated in the group stage despite winning three of five games:

“The important thing is not to win, it is to compete”.

References: This "In Memoriam" is drawn from following sources: Curriculum Vitae of Armand Van Wambeke available at Ghent University and at the Royal Academy of Overseas Sciences; and with the permission of Prof. H. van Es, Chair of the Department of Crop and Soil Sciences, Cornell university, Ithaca, NY http://www.iuss.org/images/stories/IUSS%20Bulletin%201%20-%20117/IUSS_bulletin_118_hires.pdf;

<http://www.legacy.com/obituaries/theithacajournal/obituary.aspx?n=armand-van-wambeke&pid=150792938>

Eric Van Ranst



Prof. Dr. Mohammed Mahmoud El-Badawi (1945-2011), ITC-Ghent alumnus, promotion 1986

On Wednesday July 27, 2011, Prof. Dr. Mohammed Mahmoud El-Badawi passed away. He was born on December 27, 1945 in the Daqahlia Governorate in the Nile

Delta in Egypt. He obtained his first university degree (B.Sc.) from Alexandria University in 1966, in Soil Science. In March 1967, he joined the National Research Centre (NRC) in Cairo as a young scientist. Unfortunately, the war between Israel and Egypt started in June 1967. This interrupted his scientific career, and Mohammed El-Badawi went into military service for several years, at the front at the Suez Canal.

This period has deeply marked his life. After the conflict, he picked up his studies again and he obtained his M.Sc. in Soil Science in 1978 from the Ain Shams University in Cairo. In 1981, he came to the Ghent University to prepare his Ph.D. under the supervision of Prof. Dr. Luc Daels. He defended his thesis entitled "Study of some land properties in the Nile Delta (Egypt) based on remote sensing" in 1986. After his stay in Belgium he returned to Egypt to pick up his career at the Soils & Water Use Department, NRC in Cairo where he became a professor in 2001. Prof. Dr. Mohammed Mahmoud El-Badawi always kept close contact with Ghent University. He cooperated in many projects of Ghent University - Geography Department, e.g. the study of soil salinity in the Nile Delta and the desert fringes by remote sensing, urbanization mapping in the Nile Delta; and recently the detection with the aid of remote sensing of paleochannels of the Nile River.

In 2004 he lectured the geography students during a two weeks field course in Egypt. Last January-February he participated actively every day in the "Egyptian Revolution" in order to obtain more democracy in his country. He came back to Belgium several times to work on projects or to attend a workshop at his "home"-university. It was always a pleasure working with Prof. Dr. Mohammed Mahmoud El-Badawi during field missions in Egypt. Our next mission to Egypt will never be the same, we will miss him dearly.

Rudi Goossens & Tharwat Ghabour



Dr. ir. André Louis (1923-2011), ITC-Ghent alumnus, 1st promotion 1964, and ITC staff member

After a committed career as a Project Leader and Senior Scientific Collaborator at the Laboratory for Physical Geography and Regional Pedology at Ghent University under the leadership of Professor Dr. R. Tavernier, Dr. ir. André Louis passed away on August 9, 2011 at Zottegem, Belgium, at the age of 89.



↑ Dr. ir. André Louis (back row, 4th from left) in the field with ITC-students end of 1970s. Also in this picture Eric Van Ranst (back row, 2nd from left), Dominique Langouche (front row, 2nd from right) and Mr. Theo De Cock (back row, 3rd from left)

↓ (4th from left): Dr. ir. André Louis who organized an excursion to "Henegouws Heuvelland" for the staff of the Laboratory of Soil Science in 2007



André Louis was born on July 17, 1923 in Gent, Belgium. After his graduation from the St. Barbara College and St. Amandus College at Gent he enrolled at the State Agricultural University in Gent where he obtained the Degree of Agricultural Engineer in 1948. Later on in 1964 André Louis obtained a "Licentiate in Soil Survey" at the "International Training Centre for Post-graduate Soil Scientist - ITC" (first promotion) in the Faculty of Science. In 1969 he obtained his Ph.D. with a dissertation on "Contribution to the knowledge of soil properties of the region between the rivers Dender and Zenne".

From 1948 to 1959 Dr. André Louis worked as a Project Leader at the Belgian Centre for Soil Survey under the leadership of Professor René Tavernier. During these years he mainly realized fieldwork in the loess area of Belgium. From 1959 to 1983 he lectured the course “Soil Survey” in which he mainly did field work with the students of the ITC-Ghent. André Louis was a field soil scientist, a soil surveyor, to the backbone. He loved to be in the field, not in the office. Dr. Louis realized also several soil survey projects in Greece by order of the Greek Government. The last 5 years of his professional career Dr. André Louis worked on the “Soil Map of the European Communities; 1:1,000,000” under the authority of the “Directorate-General for Agriculture of the Commission of the European Communities”. Besides several publications in scientific journals, the soil maps of Dr. André Louis are still used nowadays in environmental studies and in the concept of Regional and European strategies for the protection of soils.

Eric Van Ranst

NOTE FROM ALUMNI

Have you ever congratulated yourself ?

What a title ? It sounds so strange ? Doesn't it ? But I did it!! Two days ago, after a long time of having missed it, I found the number 22 (January 2011) of PEDON. Right at the beginning, on pages 2 and 3, I see two very familiar faces: Prof. Dr. Georges Stoops and Prof. Dr. Luc Daels. They have received respectively the Philippe Duchaufour medal for the internationally recognized achievements, and the Sarton medal, for efforts to protect the landscape in Flanders and Belgium.

Prof. Luc Daels supervised my work leading to an M.Sc. degree with the qualification “great distinction”. Furthermore, and something that I will never forget, he was the one who encouraged me, not to forget the advices I received from Dr. Mark Antrop (now: Prof. Dr. Antrop), in publishing my very first scientific article in the “Pedologie” journal. As someone who was supervised by Prof. Daels and his staff, I enjoyed from a fantastic atmosphere in the “Seminarie voor Regionale Geografie” located in a very cosy sphere of the nice building in the Krijgslaan. Prof. Daels replaced Prof. Snacken, head of the “Seminarie” for several years, until he got retired. Prof. Luc Daels is not only a scientist, but also a great artist in the real sense of the word, meaning that he does not only create very fantastic paintings, but he is also kind, and has a great sense of solidarity.

From the above remark about how happy I was to see my first article published, one can already guess how interested I was in doing research, though not a coincidence!! Soil Science, and in particular Geopedology,

is such an attractive science and art that can absorb anyone who has once stepped in.

After having experienced mapping (poly-)pedons using Remote Sensing, it was now the time to get into the pedon, that is, Soil Micromorphology. I remember that many people were surprised when they heard that I was going to do a research promoted by a Soil Micromorphologist. Very often people were saying: what a distance, from satellite to microscope?! The reality was that I was very much caught by the way that the subject was taught by Prof. G. Stoops, then (1973-75) not professor yet.

Thanks to my employer, ITC in Enschede, The Netherlands, I was given the chance to do my Ph.D. Not difficult to decide on the topic and the promoter. Prof. Stoops accepted to promote the research, and my boss (at the ITC in Enschede), Professor Alfred Zinck, who has continuously encouraged me in my scientific life, was my daily supervisor.

I remember that whenever I had the chance to be in Ghent, with Prof. Stoops, who patiently sat with me at the microscope setting to look into my thin sections, I admired him for his knowledge. I always wonder how one can get into the landscape genesis by studying a few thin sections ? It is really true! He could tell me things that I had found out during fieldwork, in applying a geopedologic approach in the study of landscape. He is really great, and I feel very proud to have been his student. I have learnt many things from him, scientific and social-oriented.

Now that you have read this short note about these two gentlemen, do you agree with me why I titled my notes as: “have you ever congratulated yourself ?”

Abbas Farshad

VISITORS



From left to right: Hon. Prof. Dr. P. De Paepe, Prof. Dr. Christianto Lopulisa and Dr. Hernusye H. L.

May 9, 2011: Prof. Dr. Christianto Lopulisa (M.Sc. ITC-Ghent, 1982, Ph.D. ITC-Ghent, 1986) and Dr. Hernusye H. L. (M.Sc. ITC-Ghent, 1983, Ph.D. ITC-Ghent, 1989) from Hasanudin University, Makassar, Indonesia visited the Department of Geology and Soil Science.

December 18-19, 2011 : Prof. Dr. Huajun Tang (M.Sc. ITC-Ghent 1987 and Ph.D. ITC-Ghent 1993), Vice President of CAAS, Beijing, China paid a visit to the Laboratory of Soil Science.

Eric Van Ranst

WHERE ARE THEY NOW ?

**Former winners of the Prize
Foundation De Boodt-Maselis
for the Promotion of Studies in Eremology
(now within the Physical Land Resources Programme)**

Dr. Mohamed Ouessar (Tunisia) (1st winner 1991)



Born in southern Tunisia, Dr. Mohamed Ouessar completed his undergraduate Studies at Institut National Agronomique de Tunis (National Agronomic Institute of Tunisia) (INAT) in 1989 and received his M.Sc. and Ph.D. degrees in Agricultural Sciences (Soil and water management) from the Faculty of Bioscience Engineering (International Centre for Eremology), Ghent University (Belgium) in 1991 and 2007 respectively. He was the first winner of Prize of “*Foundation De Boodt-Maselis for the promotion of studies in Eremology*”, Ghent (Belgium) in September 1991.

He is currently a senior researcher at the Arid Zone Research Institute (*Institut des Régions Arides*) (IRA) (Médenine, Tunisia) and the coordinator of the Remote Sensing and Geographic Informations System Unit of his institute.

Since his appointment as researcher at IRA in 1994, he has contributed actively, as coordinator or team member, to the realization of numerous joint research projects funded by national and international agencies (WB, ABOS, EU, CSFD, UNU, USDA, UNESCO). His research programs focused mainly on water harvesting, GIS based Hydrological Modeling and Decision Support Systems, Impact Assessment, Watershed Management, Climate Change Impacts and Adaptation, Combating Desertification and Drylands Management.

He contributed also to the training and capacity building through supervision of trainees and students of all levels from national and international centers and organizations and universities, part time teaching at the universities on drylands and natural resources management related issues, and organization of specialized local and international training sessions.

He has been solicited to provide expertise for studies and/or projects conducted by national (Ministries of Agriculture, Environment, Planning) and international organizations (FAO, GTZ, OSS, UNU) in addition to the assistance of the local development agencies (Agriculture, Environment, Development).

He visited several research departments and centers in the world: International Centre for Agricultural Research in the Dry Areas (ICARDA, Aleppo, Syria), Office of Arid Land Studies (University of Arizona), National Soil Erosion Research Laboratory (West Lafayette, Indiana) Southwest Watershed Research Centre (Tucson, Arizona), Maison de la Télédétection (Montpellier, France), International Centre for Theoretical Physics (ICTP) (Trieste, Italy), Gobabeb Desert Research Centre (Namibia), Central Arid Zone Research Institute (CAZRI) (Jodhpur, India), Soil and Water Conservation Centre (Xian, China), Keio University (Japan), etc.

He is affiliated to several international professional associations: IUSS, Réseau Erosion (IRD), Réseau Télédétection (AUF, France), BPD (UK), IGU (Commission on Land Degradation and Desertification). He is also volunteering in many NGOs operating in his region (ASNAPED, UTAIM, AAMTT).

He published several scientific papers in national and international journals in addition to his contribution to the edition of books and book chapters. He is also reviewer for several international journals

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Mohamed Ouessar with colleagues of the promotion 1990-1991 of M.Sc. in Eremology together with Em. Prof. Dr. Marcel De Boodt, when putting the "first stone" of the International Centre for Eremology on the grounds of the Faculty of Bioscience Engineering of Ghent University

Some of his recent publications:

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Schiettecatte W., Ouessar M., Gabriels D., Tanghe S., Heirman S. & Abdelli F. 2005. Impact of water harvesting techniques on soil and water conservation: a case study on a micro catchment in southeastern Tunisia. *Journal of Arid Environment* 61:297-313.

Books:

- Ben Mechlia N., Oweis Th., Masmoudi M., Mekki I., Ouessar M., Zante P. & Zekri S. 2008. Conjunctive use of rain and irrigation water from hill reservoirs for agriculture in Tunisia. Research report n°6, ICARDA/INAT, Aleppo, 28 pp.
- Ben Mechlia N., Oweis, T., Masmoudi, M., Khatteli, H., Ouessar, M., Sghaier, N., Anene, M. & Sghaier, M. 2009. Assessment of supplemental irrigation and water harvesting potential: Methodologies and case studies from Tunisia. ICARDA/IWMI, 35pp.
- Bruggeman, A., Ouessar, M. & Mohtar, R. (eds) 2008. Watershed management in dry areas: challenges and opportunities. ICARDA, Aleppo, 173 pp.
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Donald Gabriels

PROMOTIONS-AWARDS



Dr. Vincent de Paul Obade (M.Sc. PLR, 2003), successfully defended his Ph.D. entitled "crop residue assessment using remotely sensed data" at South Dakota State University, USA.

Obade Vincent

Prof. Dr. Mitiku Haile (M.Sc. ITC-Ghent, 1985, Ph.D. ITC-Ghent, 1987) is now Deputy Permanent Delegate of Ethiopia at UNESCO in Paris.

Dr. Mitiku Haile from Ethiopia graduated in 1985 at the International Training Centre for Post-graduate Soil

PERSONALIA

Scientists (ITC-Ghent) and obtained his Ph.D. degree under the supervision of Prof. Dr. ir. C. Sys at Ghent University in December 1987. After his Ph.D. promotion Mitiku Haile went back to Ethiopia and joined the then Alemaya University as Assistant Professor of Soil Science.

Prof. Dr. Mitiku Haile took several academic positions like Chairperson of the Faculty of Agriculture, Associate Dean of Graduate School and Academic Vice-President. In 1993 he moved to Mekelle to establish the College of Dryland Agriculture and Natural Resources which formed the basis for Mekelle University. He led the new institution as a Dean and President for 18 years. Links were established with several national and international universities. Through support from VLIR-Own Initiative projects and a VLIR-IUC programme several Mekelle University staff members were trained for their master and Ph.D. degrees at Flemish universities. Tremendous publications were also produced in collaboration with Belgian Professors. Spin-offs and value additions were registered for different research projects undertaken jointly and important conferences were conducted on thematic issues.



From left to right: Prof. Dr. E. Van Ranst, Prof. Dr. Mitiku Haile (Mekelle University), Prof. Dr. S. Deckers (Catholic University of Leuven) on the Vertisols in Tigray, Ethiopia

Since July 2011, Prof. Dr. Mitiku Haile is posted at UNESCO in Paris in the capacity of Deputy Permanent Delegate of Ethiopia. He is still attached to Mekelle University and is periodically advising and promoting M.Sc. and Ph.D. students.

Eric Van Ranst

Nguyen Thanh Tuan (M.Sc. PLR 2009) from Vietnam or actually working at Geoscience Department of the Vietnam National Museum of Nature, Vietnamese Academy of Science and Technology in Vietnam became the proud father of a newborn baby son “Nguyen Tran Manh” on November 26, 2011. Congratulations!



F. Vandendriessche

ATTENDED MEETINGS

Intensive Training Course on Soil Micromorphology

March 28-April 8, 2011, Tübingen, Germany

The course was organized by Dr. Daniela Sauer (Institute of Soil Science, Hohenheim University) and Dr. Peter Kühn (Soil Science and Geomorphology Group, University of Tübingen), with support of Prof. Dr. Rosa Poch (M.Sc. ITC-Ghent, 1989) and Prof. Em. Dr. Georges Stoops (ITC-Ghent), who had organized the course in previous years. Dr. Daniela Sauer and Peter Kühn are former ITC-trainees and followed the course “Micromorphology” at ITC-Ghent.



Em. Prof. G. Stoops with the participants



Em. Prof. G. Stoops supervising the microscopic work of the participants

The Petrology Group of the Department of Geosciences, University of Tübingen, hosted the course in their well-equipped microscopy room. The course was attended by 22 Ph.D. students and researchers from 11 different

countries (Colombia, Croatia, Germany, Israel, Italy, Netherlands, Poland, Russia, Serbia, Switzerland, United Kingdom). About half of the time was devoted to microscopical exercises. During the practical exercises participants had the occasion to discuss also their own thin sections with the teaching staff.

Rosa Poch

Launch of a Global Soil Partnership at the FAO headquarters

September 7-9, 2011, Rome, Italy

During the launch of the Global Soil Partnership (GSP) for Food Security and Climate Change Mitigation and Adaptation at the FAO headquarters, Rome on 7-9th September 2011, the FAO Director-General Jacques Diouf warned that pressure on the world's soil resources and land degradation are threatening global food security. He called for a renewed international effort to assure sufficient fertile and healthy soils today and for future generations. The soil science community needs an effective single voice to ensure that soil issues are taken seriously at the international policy negotiating table when different agendas are being addressed.

The background of this GSP is the renewed recognition of the central role of soil resources for assuring food security and the increased awareness that soils play a fundamental role in climate change adaptation and mitigation has triggered numerous projects, initiatives and actions that need an increased effort of coordination and partnership in order to avoid unnecessary duplication of efforts and waste of resources, especially in times of substantial budget restrictions.

The GSP will aim towards collaboration and sharing of responsibilities so as to provide a coherent framework for joint strategies and actions of the various existing initiatives. The GSP should aim at facilitating the dialogue and interaction among the various users and stakeholders currently competing for the use of soil resources at global scale. The GSP will facilitate the establishment of synergies by addressing cross-cutting issues related to soils for food security, climate change, biodiversity and desertification. It will therefore aim towards a strong collaboration and support to the relevant UN agencies dealing with those issues: FAO (Food Security), UNFCCC (Climate Change), CBD (Biodiversity and UNCCD (Desertification). The sustainable and productive use of the soil resources of the world should therefore be the ultimate twinned goal of the GSP.

Strategic objectives:

- The GSP's **vision** is for a sustainable and productive use of the soil resources of the world and sustainable agricultural production.

- The GSP's **mission** is to support and facilitate joint efforts towards sustainable management of soil resources for food security and climate change adaptation and mitigation.

Through enhanced and applied knowledge of soil resources as well as improved global governance and standardization, the partnership will:

- create and promote awareness among decision makers and stakeholders on the key role of soil resources for sustainable land management and sustainable development;
- address critical soil issues in relation to food security and climate change adaptation and mitigation;
- guide soil knowledge and research through a common global communication platform incorporating real local challenges;
- establish an active and effective network for addressing soil crosscutting issues, and;
- develop global governance guidelines aiming to improved soil protection and sustainable soil productivity.

Further information available on the FAO website (<http://www.fao.org/>).

Eric Van Ranst

Wageningen Conference on Applied Soil Science

September 18-22, 2011, Wageningen, The Netherlands

With the first Wageningen Conference on Applied Soil Science, from 18 to 22 September 2011, a new series of tri-annual conferences on Soil Science, organized by the Soil Science Centre of Wageningen University, was launched.

This first edition, entitled "Soil Science in a Changing World", addressed the importance of soil science for combating and mitigating the challenges of our time: food security, water resources, climate change, ensuring biodiversity and how to govern these issues and create policy for taking measures. Instead of the disciplinary organization of most conferences, a thematic approach thus had been adopted and each day of the conference handled 2 of these thematic issues.

In response to the generally low profile of many soil scientists in these matters, the conference aimed to offer a platform for sharing knowledge of soils across the world and across science, for engaging in interdisciplinary exchanges of ideas, thoughts, and opinions, and to promote thinking out of the box, being innovative and creative. This international conference attracted over 250 experts in the various fields and the congress program targeted this sharing of knowledge with keynote speakers followed by debates. Participants could furthermore choose between attending oral presentations or

participating in workshops, whereas the poster presenters received 1 minute time (strictly checked by a ticking clock projected on the screen) to introduce their research and invite the public to their poster. Several session chairs furthermore mobilized their session contributors to develop draft opinion papers for publication.

For more details on the conference program and topics addressed, I would like to recommend to have a look to the book of abstracts and presentations of the keynote speakers. Both can be accessed through the conference website on <http://www.wageningensoilmeeting.wur.nl/UK/>.

The meeting also resulted in the launch of the Global Soil Biodiversity Initiative (GSBI). The GSBI, composed of 5 leading representatives of different universities in US, the Netherlands, UK and the Joint Research Centre, will be responsible for the development of an active platform promoting the translation of expert knowledge on soil biodiversity into environmental policy, in order to assure management and enhancement of ecosystem services. It mainly aims at exploiting the already available knowledge in the field to maximum potential. The GSBI will contribute biodiversity knowledge to the Global Soil Partnership that brings together 3 international agreements interested in sustaining soils: the Convention on Biological Diversity, the UN Convention on Desertification, the UN Framework Convention on Climate Change and will be operated by the Food and Agriculture Organization. For more information on the GSBI and how to join it, you can have a look to the website <http://www.globalsoilbiodiversity.org/>.

Ann Verdoodt

International Conference on Climate Change and Food Security (ICCCFS): "How Can Agriculture Respond to Climate Change to Ensure Food Security"

November 6-8, 2011, Beijing, China

The International Conference on Climate Change and Food Security (ICCCFS), held in the Friendship Hotel in Beijing, November 6-8, was organized by the Chinese Academy of Agricultural Sciences (CAAS) and the International Food Policy Research Institute (IFPRI), and sponsored by the National Science Foundation of China, the CGIAR Research Program on Climate Change, Agriculture and Food Security, and the Project Adapting to Climate Change in China. The event included technical sessions, poster sessions, and social events. Prof. Dr. Huajun Tang, Vice-president of CAAS and ITC-Ghent alumnus (M.Sc. ITC-Ghent, 1987 and Ph.D. ITC-Ghent, 1993) chaired the entire conference and Dr. Liming Ye, project leader at the Institute of Agricultural Resources and Regional Planning of CAAS and PLR-UGent alumnus (M.Sc. PLR, 1999 and Ph.D. in Geology, 2008), orally presented his research findings on food security and climate change in China; output of his Ph.D. and Postdoc research he did at the Laboratory of Soil Science of the

Ghent University under the supervision of Prof. Dr. Eric Van Ranst. Besides the UGent-alumni, the conference was attended by 150 scientists from Indonesia, the United States, Japan, the European Union, Switzerland, etc. and climate change experts from an influential bloc of developing countries known as BRICS (Brazil, Russia, India, China and South Africa) – expected to play a key role in global climate change negotiations in Durban, South Africa.



Prof. Dr. Huajun Tang (M.Sc. ITC-Ghent, 1987; Ph.D. ITC-Ghent, 1993), Vice President of the Chinese Academy of Agricultural Sciences (CAAS) welcoming the participants of the ICCCFs in Beijing

The conference provided a forum for leading international scientists and young researchers to present their latest research findings, exchange their research ideas, and share their experiences in the field of climate change and food security. Scientists of the BRICS countries plus Indonesia and the United States reported results on the food security and climate change challenges facing their countries and some of them presented simulations about potential future weather and crop production changes based on sophisticated climate models. Based on their research, they identified two sets of priority actions to address the challenges from climate change (a) strengthening public sector agricultural research, and (b) increasing the amount, appropriateness, and accessibility of spatial data. Some of the 12 priority research areas selected by the participants for funding in the future are directly related to soil science: (1) *soil ecosystems* – healthy soils are complex ecosystems that contribute to crop productivity; (2) *irrigation structure and efficiency*; and (3) *land use change*. A major contributor to GHG emissions is land use change (the conversion of forest and savannah areas that store large amounts of carbon in the soil to agricultural soils that store less carbon).

During the conference, Dr. Liming Ye also participated in the expert panel discussion on climate change in an effort to identify research priorities to fight hunger under climate change. Prior to the conference, Dr. Liming Ye visited Prof. Dr. Eric Van Ranst in Gent with a VLIR Ph.D.-Plus Scholarship during August-October 2011.



Prof. Dr. Huajun Tang (M.Sc. ITC-Ghent, 1987; Ph.D. ITC-Ghent, 1993) and Dr. Liming Ye (M.Sc PLR, 1999; Ph.D. UGent 2008) toasting on the success of the ICCCFs at the closing reception

Some of the policy options that Dr. Liming Ye had put forward during the panel discussion at the ICCCFs-2011 were originally formulated during his stay at Ghent University. These policy options and research priorities (e.g., breeding of higher yielding food and biofuel crops; changing patterns and effects of pests and diseases on yield; farmer-centric climate financing; need of new schemes of intellectual property rights (IPRs) that facilitates the North-South transfer of climate change-related knowledge) were formally adopted and included in the policy paper endorsed by the conference and co-authored by Prof. Dr. Huajun Tang and Dr. Liming Ye. This policy paper has been officially released on the *Climate Change and Agriculture Side Event* on December 1, 2011 as recommendations to the delegates of the UNFCCC COP17 global climate talks in Durban, South Africa.

Liming Ye

FUTURE MEETINGS

January 11-March 28, 2012: Online Seminar: "Fundamentals in Soil Science" on Wednesday evenings.
Information: <http://www.soils.org/education/fundamentals-soils>.

February 7-8, 2012: International Conference on Environmental, Socio-economic and Health Impacts of Artisanal and Small Scale Mining, Malang, **Indonesia**.
Information: <http://www.eshi-asm.fp.ub.ac.id/>.

March 1, 2012: BELQUA workshop, Louvain-la-Neuve, **Belgium**. Information: <http://www.belqua.be>.

March 30, 2012 : Global Soil Biodiversity Initiative, London, **Great Britain**. Information : <http://globalsoilbiodiversity.org>.

MEETINGS

April 10-13, 2012: 5th Global Workshop on Digital Soil Mapping 2012, Sydney, **Australia**. Information: http://www.pedometrics.org/dsm_oz/abstract.html.

April 16-20, 2012: XIX Latin American Soil Science and XXIII Argentinean Soil Science Congress, Mar del Plata, **Argentina**. Information: <http://www.congresodesuelos.org.ar/site/>.

April 22-26, 2012: Ascochyta 2012: 3rd International Ascochyta Workshop, Cordoba, **Spain**. Information: <http://www.ascochyta.org>.

April 22-27, 2012: European Geosciences Union General Assembly 2012 on “Soil Science Through History”, Vienna, **Austria**. Information: <http://meetings.copernicus.org/egu2012/home.html>.

May 15-17, 2012: 8th International Soil Science Congress, Izmir, **Turkey**. Information: <http://www.soilcongress.ege.edu.tr>.

May 17-20, 2012: International Conference on Environmental Pollution and Public Health, Shanghai, **China**. Information: <http://www.icbbe.org/epph2012/>.

May 20-24, 2012: Bouyoucos Conference on the Advances in Research on Soil Biological, Chemical, and Physical Properties for Sustainable Constructed Rootzones, Philadelphia, PA, **USA**. Information: <http://www.constructedrootzones.org/>.

May 28-June 2, 2012: 5th International Scientific Conference BALWOIS 2012, Ohrid, **Republic of Macedonia**. Information : <http://ocs.balwois.com/index.php?conference=BALWOIS&schedConf=BW2012>.

June 3-8, 2012: 9th INTECOL International Wetlands Conference, Orlando, Florida, **USA**. Information: <http://conference.ifas.ufl.edu/intecol/agenda.html>

June 11-14, 2012: 4th International Conference on Soil Classification, sponsored by the International Union of Soil Scientists (IUSS), Lincoln, Nebraska, **USA**. This meeting is organized by the IUSS Commission Soil Classification and continues the sequence of meetings held in Velence (Hungary, 2001), Petrozavodsk (Russia, 2004) and Santiago (Chile, 2008). Information: http://clic.cses.vt.edu/IUSS1.4/Conf_Soil_Classification_2012/IUSS_Conf_Soil_Classification_2012_A1.html.

June 12-15, 2012: 7th European Congress on Regional GEOscientific Cartography and Information Systems, Bologna, **Italy**. Information: http://www.regione.emilia-romagna.it/wcm/geologia_en/Sections/EUREGEO.htm.

June 12-15, 2012: ORBIT 2012 International Conference: Global Assessment for Organic Resources

and waste Management, Rennes, **France**. Information: <http://www.orbit2012.fr/>.

June 17-23, 2012: 12th International Multidisciplinary Scientific GeoConference & Expo SGEM 2012, Albena, **Bulgaria**. Information: <http://www.sgem.org/>.

June 18-22, 2012: 4th International Conference on Cartography and GIS, Albena, **Bulgaria**. Information: <http://www.cartography-gis.com/4thConference/Index.html>

June 24-27, 2012: 46th US Rock Mechanics/ Geomechanics Symposium, Chicago, IL, **USA**. Information: <http://www.armasymposium.org>.

June 24-29 June, 2012: Goldschmidt 2012 conference, Montreal, **Canada**. Information: <http://www.goldschmidt2012.org>.

June 26-29, 2012: 17th International Nitrogen Workshop: New Horizon, Wexford, **Ireland**. Information: <http://www.nitrogenworkshop.com/>.

July 2-6, 2012: 4th International Congress on Eurosoil 2012, Fiera del Levante, Bari, **Italy**. The EUROSOIL meeting is held every 4 years and is open to contributions from all over the world. Information: <http://www.eurosoil2012.eu>.

July 8-14, 2012: 14th International Working Meeting on Soil Micromorphology including a mid-meeting excursion. *July 14:* post-meeting excursion “Vineyard soils of Priorat area on schists and loess”; *July 15-17:* post-meeting excursion “Soils of the Pyrenees”, *July 9-10:* Parallel workshops in the microscope rooms of the Faculty of Geology of the Universitat de Barcelona: “Archaeological Soil Micromorphology Working Group Meeting” & “Micromorphology of Glacigenic Sediments”, Lleida, **Spain**. Information: <http://www.lleida2012.udl.cat/>.

July 15-20, 2012: Biogeomon 2012: The 7th International Symposium on Ecosystem Behavior, Point Lookout, Maine, **USA**. Information: <http://www3.villanova.edu/conferences/biogeomon/index.html>.

July 15-22, 2012: 9th ISEG – International Symposium on Environmental Geochemistry, University of Aveiro, Aveiro, **Portugal**. Information: <http://9iseg.web.ua.pt/web/index.php>

July 22-27, 2012: 2nd International Conference on Hydropedology, Leipzig, **Germany**. Information: <http://www.ufz.de/hydropedology2012>.

July 23-26, 2012: International Symposium on Managing Soils for Food Security and Climate Change Adaptation

and Mitigation, Vienna, **Austria**. Information:
<http://www-pub.iaea.org/mtcd/meetings/Announcements.asp?ConfID=41176>.

August 13-17, 2012: VI Congress of the Dokuchaev Soil Science Society, Petrozavodsk, **Russia**. Information:
lubimova@agro.geonet.ru

August 15-18, 2012: 11th Symposium of Mesozoic Terrestrial Ecosystems, Gwangju City, **Korea**. Information:
<http://www.2012mte.org/innerA.html>.

August 20-24, 2012: ESA12: 12th Congress of the European Society for Agronomy, Helsinki, **Finland**. Information:
<http://www.esa12.fi/index.htm>.

August 26-30, 2012: 7th International Acid Sulfate Soil Conference. Post-conference excursions on August 31 and September 1, 2012, Vaasa, **Finland**. Information:
<http://www.7iassc.fi>.

August 27-31, 2012: International Conference on Geomorphic Processes and Geoarchaeology: From Landscape Archaeology to Archaeotourism, Moscow-Smolensk, **Russia**. Information:
<http://Geoarch2012.narod2.ru>.

August 29-31, 2012 : ISC 2012, University of Basel, **Switzerland**. The central theme of the conference is "Strategies for Sustainability: Institutional and Organisational Challenges". Information:
<http://www.sustainabilityconference.ch>

September 2-7, 2012: Jesium 2012, Leipzig, **Germany**. Information: http://www.jesium2012.eu/JESIUM_2012/Welcome.html

September 22-24, 2012: 2nd International Disaster Prevention Technology and Management DPTM 2012 conference, Chengdu, **China**. Information:
http://www.disasterjournal.net/d_inst/index.htm.

September 30-October 4, 2012: 1st Divisional Conference, Ulm, **Germany**. Information :
<http://www.uni-hohenheim.de/bodenkunde>.

October 7-10, 2012: 5th International Symposium on Environmental Geochemistry in the Tropical Countries, Búzios, **Brazil**. Information:
<http://www.uff.br/remadsuff/isegteng/5isegt.htm>.

October 21-25, 2012: ASA-CSSA-Soil Science Soc. Am. Int. Meeting, Cincinnati, **Ohio, USA**. Information:
<http://www.soils.org/calendar>.

2013

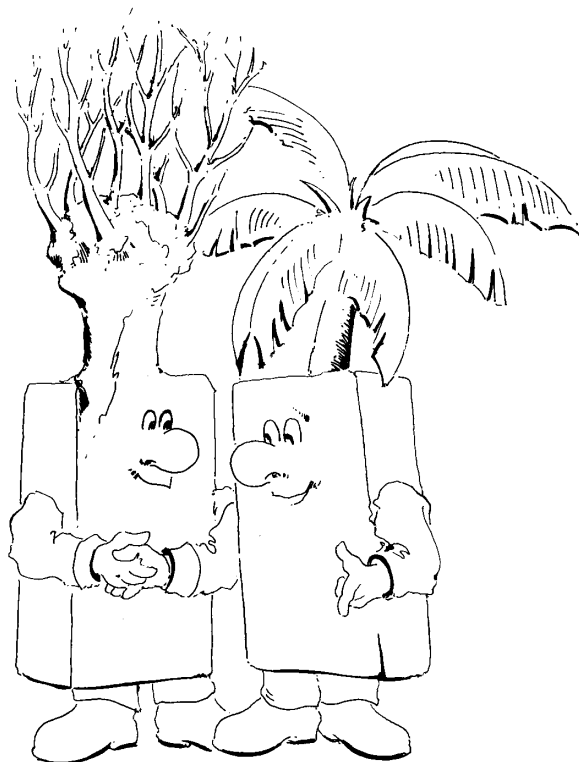
May 21-24, 2013: Biohydrology 2013 Conference, Landau, **Germany**. Information:
<http://www.biohydrology2013.de>.

July 6-8, 2013: 6th International Congress of Chemistry and Environment ICCE 2013, Antwerp, **Belgium**;

September 30-October 4, 2013: Soils in Space in Time - First Divisional 1 Conference of IUSS, Danube, **Germany**. Information: karl.stahr@uni-hohenheim.de

2014

June 8-13, 2014: 20th World Congress of Soil Science, Seoul, **South Korea**. Information:
<http://www.20wcsc.org/>.



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