NEWSLETTER 2/2012

ESSC EUROPEAN SOCIETY for SOIL CONSERVATION

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Municipal solid waste buried under 'earthy material' on the slope of Vesuvius volcano, Italy. Today, the 'creation' of 'soil' with profiles like this is increasingly frequent (photo by Carmelo Dazzi, Palermo, Italy).

E.S.S.C. NEWSLETTER 2/2012

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Produced and composed by the Editor-in-Chief at The University of Wolverhampton (U.K.)
Printed by The Soil Science and Conservation Research Institute „Výskumný ústav pôdoznalectva a ochrany pôdy, Bratislava" (Slovakia).

CONTENTS

This issue of the ESSC Newsletter presents the 19th of our 'Guest Editorials.' This is an opportunity for leading authorities in the soil science community to offer their perspectives on issues relating to soil conservation. This contribution is from Carmelo Dazzi (Palermo, Italy and ESSC President).

Catena Verlag has kindly agreed to publish a book based on Guest Editorials. This will be entitled **'Global Perspectives on Soil Conservation.'** This will form part of the Catena 'Advances in GeoEcology' series. In principle, it is agreed that there will be future volumes, associated with the four year cycle of Congresses of the ESSC. Work on Volume 1 is progressing well.

Man and Soil: from Order to Chaos

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Introduction

Between 16 – 22 June 1955, a group of 70 researchers met at Princeton University in New Jersey (USA) to attend the international symposium on *'Man's Role in Changing the Face of the Earth.'* The Conference was made possible through the funding of the Wenner-Gren Foundation for Anthropological Research, and was the trigger for considerable efforts of planning and co-ordination that began in Spring 1952.

The main theme of the Symposium was the qualitative and quantitative effects of humans on different areas of the planet. Individual contributions were essays that summarized the state of knowledge about the topic under consideration. Furthermore, the authors were invited to highlight any lack of information, identifying areas to be explored. The lasting result of *"Man's Role in Changing the Face of the Earth"* was an immense volume with the same name, edited by William L. Thomas, Jr. (of the Wenner-Gren Foundation) and published by the University of Chicago Press.

In the book an interesting chapter on soil evolution entitled *'Slope and soil changes through Human Use'* was presented by three authors. Arthur N. Strahler oversaw the section *'The nature of induced erosion and aggradation,'* Luna B. Leopold the section *'Land use and sediment yield,'* while William A. Albrect presented the section *'Physical, chemical, and biochemical changes in the soil community.'* It is no coincidence that the need for a volume such as *'Man's Role'* was identified over 50 years ago. Enlightened minds have already had the perception of the dangerous effects of human activity on natural ecosystems and thus on soils.

In fact, since the appearance of man on earth, the soil has always consistently carried

out its natural ecosystem functions to produce goods and services destined for all humanity. However, as was the case for the other primary resources, the damage to soil ecosystems has become particularly evident since the second half of the 20th Century. Since then, there has been a global increase in human needs, driven by an increasingly technological society. In turn, this has influenced agricultural, industrial and urban developments, which have greatly affected the capability of soils to produce goods and services in quantity and quality.

In many cases, the human pressure on land was of such intensity as to transform the pedological order, which represents the norm for the soil, to total disorganization, pedological chaos and, consequently, the annihilation of soil diversity (Dazzi, 2002, 2005). The scientific debate that has developed in recent years on matters relating to the role of soil systems in the environmental balance, allowed us to attribute to soils properties and concepts that commonly are attributed to living beings, such as that of genetic erosion (Dazzi, 1995) and pedodiversity (Dazzi, 1995; Dazzi and Monteleone, 1999, 2002; Ibañez *et al.,* 1990, 1995). This coincided with the increased awareness that soil is no longer an almost exclusive domain of agriculture. Since soils fulfill both biotic and abiotic features, they have become a vital component of ecological processes and cycles, the useful filter of our increasingly polluted waters, the support base for our infrastructure, the repository of our waste, and the means by which archaeologists, with the help of soil scientists, read human history.

The current unfortunate situation is that *'Homo technologicus,'* descendant of *'Homo sapiens,'* forced to live in ever-bigger cities, to feed physiologically on fast food and intellectually on the web, to breathe air conditioning in hyper-technological offices and impersonal lofts, rarely stops and reflects on how much his well-being is fundamentally connected to the soil and to the other primary resources. Nor does man learn from the lessons history has taught. Man uses, but above all abuses, the soil, marking each corner of the earth with his footprint (Dazzi, 2008).

Dynamics and diversity of soil systems

Society generally considers the soil as one of the more stable and unchanging components of the environment. However, in reality it is a dynamic system and soil scientists consider it as such: an open system, constantly changing, sometimes faster, usually very slow, which receives and transfers matter and therefore energy, creating new dynamics and organizing themselves into new structures (Smeck *et al.,* 1983).

The best-known and used genetic soil model is a factorial model (Jenny, 1941), which considers its forming factors and indicates that soil (S) is a function of five factors: climate (cl), organisms (o), morphology (r), parent material (p) and time (t), which define its status and history. These factors are not causes, forces, or processes (Amundson and Jenny, 1991), but rather variables that control soil characteristics and are, therefore, considered as 'state factors.' The consideration of this model on a broader basis, allows us to limit it to just three factors: the initial state of the system (Lo), the external potential flows (Px) and the age of the system (t). So, for the soil, the general equation of state is:

$$S = f (Lo, Px, t)$$

The external flows are essentially determined by climate and consider, among others, solar radiation, heat transfer, water flows and biota. The initial state of the system is defined by the morphology and chemical, physical, mineralogical composition and characteristics of the parent material. The evolution of the soil and its perfect organization depends on a continuous circulation of energy flows within the system itself, where the phenomenon of internal self-regulation occurs and balance with the environment is governed by the immutable laws of Nature. We realize, therefore, that a single 'soil' does not exist, but rather 'many different types of soils,' depending on the multiple actions, reactions and energy transformations that occur in them by addition, loss, transformation and translocation of matter. The different soil types represent unique specimens (as unique are living beings), each characterized by a perfect organization, a well-defined order, the result of the almost infinite possibilities of combining pedogenic factors and processes.

Order in the soil system

Soil must, therefore, be regarded as an open system that, from a thermodynamic point of view, develops through the exchange of matter and energy with the environment. The slow, orderly transformation of parent material in a horizonated 'pedon' determined by the flow of energy and matter, conceptually leads to a decrease in entropy and hence to an increase in order in the soil system.

In a speculative way it is helpful to consider the contribution of soil forming processes for each of the Soil Orders of the Soil Taxonomy (Soil Survey Staff, 2010), each with a characteristic and orderly configuration. Thus, for example, the process of leaching, which involves the translocation of some constituents (clays, organic matter, oxides and sesquioxides) from one horizon to another encouraging horizonation, results in an increase in the soil order and therefore in a negative value of soil entropy (Smeck *et al.,* 1983). Similarly processes that contribute to organizing order in the soil system include the processes of evolution of organic matter, through its diversification and distribution in the profile and the processes of soil structure development. In this sense, and considered as a whole, pedogenic processes produce for all Soil Orders of the Soil Taxonomy negative values of entropy and, thus, lead to well-organized soil systems.

Only Vertisol and Gelisol formation is interpreted as the result of a positive change of entropy: in fact, to argillo-pedoturbation and cryo-pedoturbation, respectively, that increase the randomness of the spatial components of the soil and are positive values of entropy (Smeck *et al.,* 1983). This is not surprising considering that these soils owe their characteristics to their very special natural processes of evolution. Therefore, as in the field of Soil Science the norm is represented by the Order, that is, the perfect organization that each soil shows and that determines a soil diversity that plays a major role in the natural balance. Thus, Anthrosols, by virtue of their considerable variability determined by man, have positive values of entropy.

Chaos in the soil

The order, which is the norm for soils and forms the basis of pedodiversity, can turn into disorder, into chaos, into a complete disorganization of soils, with total annihilation of pedodiversity by man; the negative element of pedogenesis (Palermo *et al.,* 2009). Many areas of the world are now involved in a process of 'anthrosolization' whose base is human activity and that leads to the formation of anthropogenic soils. The problem, of course, is not to be attributed to the mere population increase but, mainly, to the consumer pressures that lead nearly a billion people to enjoy super-affluent lifestyles that exert enormous pressures on

the global ecosystem. This consumerism is, in turn, linked to the expansion of technological knowledge and availability of energy that allows us to use and abuse increasing quantities of natural resources, bringing them to extinction.

Each year several areas of productive land are concreted or assigned to development. Our landscapes are scarred with progressively higher mountains of waste, some of which are toxic. Virgin areas are turned over with the plough, even though, at best, most of them have only marginal importance. From a pedogenic perspective, the destruction and/or creation of soil by man through the physical manipulation of 'earth materials' are catastrophic events that bring the soil to time 't0.' Almost always, the area of the newly created anthropogenic soils obtained by earth movements is roughly equal to the area of *destroyed* mature soils (Fanning and Fanning, 1989). These are the most striking events that occur during the construction of roads and highways, but there are less obvious yet equally dangerous examples for the protection of pedodiversity: the soils 'created' by burying waste of diverse origins and nature.

In several cases, however, agricultural activities threaten pedodiversity and lead to soil 'anthropization' (i.e. to homogenization of their characteristics that can be considered similar to the genetic erosion that narrows the range of variability and homogenizes living organisms). Vast areas of Mediterranean Europe, where vine cultivation is widespread, have been and are involved in this process (Dazzi *et al.,* 2004, 2006; Pla Sentis *et al.,* 2004). Several types of Alfisols, Inceptisols, Mollisols and Entisols have been so deeply and intensely reworked with powerful mechanical tools for cultivation that it is impossible to distinguish in them any fragment of the original horizons (Dazzi et al., 2006, 2009). It is clear that under these conditions soil resilience is absent, as in these 'soils' it is not possible to note any logical distribution of mineral or organic matter and any connection between them, as energy flows in the soil are destroyed (Plate 1).

Plate 1: In many anthropogenic soils any logical distribution of mineral and organic matter is completely lost. This example is from the Acate valley of south-east Sicily, Italy (photo by C. Dazzi).

In these cases, it would be more correct to consider such soils as 'earthy masses' that are, according to the still valid axiom of Glinka (quoted in Boulaine, 1989) parent materials that need a very long time to organize into new soils. A notable example of the consequences that the creation of anthropogenic soils can have on decreased pedodiversity and landscape quality comes from a survey carried out within the Municipality of Mazzarrone, a town in south-east Sicily (Italy) (Dazzi and Monteleone, 2007; Lo Papa *et al.,* 2011).

In the decade 1970 – 1980, the landscape of Mazzarrone (3,464 hectares) experienced rapid transformation, which led to significant increases in the *per capita* income of its inhabitants (Lo Verde, 1995). In particular, table grapes were widely grown, so that, currently, most land consists of vineyards. Wine growing spread rapidly during the 1970s, when cultivating 'Italia' vines started *en masse*. In this period vine cultivation started virtually everywhere. Vineyards grew up with a frequency not easily measurable and with consistent and evident transformation of the landscape. Such landscape transformation was achieved through excavation, land levelling and trenching. Arable lands, almond-yards, olive groves and natural grazing lands were replaced by vineyards. In many cases, to decrease slope gradients, vast amounts of soils were spread over the land by trucks, which is a very expensive operation. In a few years all surfaces that did not place limits to the use of mechanical tools for vine cultivation, and steeper areas, were affected by an intense process of anthropedogenesis, which resulted in the almost total annihilation of pedodiversity within the soilscape of Mazzarrone (Lo Papa *et al.,* 2011). Socio-economic benefits have been significant, but were obtained at the expense of intense changes to the soilscape. Different soil types on variable landscape morphologies and with very different characteristics (Calcic, Inceptic, Mollic and Typic Haploxeralfs; Calcic, Humic and Typic Haploxerepts; Entic Haploxerolls, Typic Xerorthents) were so deeply and intensely reworked in the preparation of vineyards, that we can no longer distinguish in them any fragment of the original horizons!

Plate 2: Deep gully erosion in anthropogenic soils under vineyards in the Canicattì area of central Sicily, Italy (photo by C. Dazzi).

The enormous pressure exerted on soil ecosystems leads to other disorders. The soil, raped so deeply, remains defenceless against erosion (Plate 2). Every year tonnes of soil are lost from these vineyards, either blown away by winds or are carried to plains, through large erosion rills and gullies, filled with soil material transported from other places where soils still present their specific configuration. In such conditions, it is clear that soil resilience, namely the soil's ability to counteract stress and alterations, is very low and often nill, because energy flux-

es, after human action, exceed critical thresholds. Problems also emanate from the use of plastic films and pesticides. Plastic films, used to cover vineyards, are often abandoned in the environment, even though there are legal obligations to recycle used plastic films. These plastic films are often burned and so release toxic compounds, such as dioxins. To maintain grapes on vines for prolonged periods, farmers use massive quantities of pesticides, which also persist in the environment.

Conclusions

Maintaining welfare and the development of humankind will depend largely on man's ability to ensure the sustainable use of the environment, a task very complicated because human activities have immense environmental impacts. The transformation of pedologic order into pedologic chaos allows us to highlight another particularly virulent aspect concerning the safeguarding of natural resources: i.e. society's low awareness of environmental issues.

We live in an era and in a cultural system particularly sensitive to human rights, but that is not as sensitive for its obligations and its responsibilities (Hillel, 1994). We are able to fight to defend our privileges, but we often shirk our duties. Our relationship with the environment is characterized by general indifference and widespread carelessness. Unfortunately, the awareness of the importance of the environmental resources and, in particular of the soil, is missing in our mind. Soil, being a 'crypto-resource' or hidden resource, is considered in its full importance only after catastrophic events and when disasters have occurred (Dazzi, 2008). In Europe we have shown skills in escaping troubles that wisdom would have advised us to avoid. It is now time to move from skill to wisdom, the same wisdom that pushed Franklin D. Roosevelt to argue that *"the history of every Nation is eventually written in the way in which it cares for its soil."*

Today, soil science has a crucial role to play in achieving sustainable systems of land use that meets the needs of an increasingly global and technological society. Research activities in soil science should embrace sectors considerably larger than the traditional ones and include, in addition to fundamental studies, research on ecosystems and global applications of pedo-techniques. Soils must now be considered in a new light, which is no longer limited to the field of agriculture and/or forestry, but extended to the entire territory (Singer and Warkentin, 1996; Tate, 1996). Now it is imperative a leap forward: we have to consider soils as goods for society and for all the activities of mankind.

It is clear that social and economic development cannot be stopped, but this development should respect the environment and its resources. In particular, procedures for assessing the impact of human activities on soilscapes should always consider soil conservation, which is a natural resource that cannot be renewed on a human time scale. Technicians and politicians must be involved in this task and the environmental choices should be made in the context of 'soil care' (Schjønning *et al.,* 2004). It must be clear to all that it is wise to devote more care toward the soil resource that gives us material well-being, considering that at the base of each process that increases the soil's vulnerability there is a stress factor that seriously affects its quality parameters and that affects the quality of human life: the lower the quality of the soils the lower is the quality of human life!

We must, therefore, do everything to bring back the ancient bond which links man to the soil and which led the former Secretary General of the United Nations Organization (UNO), Kofi Annan to say at the Johannesburg World Summit in September 2002: *"Prosperity obtained by plundering the natural environment is certainly not prosperity. It is only a temporary delay in future disaster."*

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Soil Erosion and Landcare in Iceland

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Introduction

Iceland is characterized with unusual variability in landscape and land conditions. Within only a short distance, the traveller can experience anything from lush vegetation, fertile agricultural areas, sparse vegetation and desert. The visitor will soon discover that the lack of trees and the extensive barren areas are some of the most striking features of Iceland. This may possibly seem quite natural in a country of volcanic origin with a chilling name. However, the reality is very different. Most of the deserts and areas with broken soil cover once were once covered with lush vegetation. The history of the soil and vegetation resources of Iceland is a tragic example of long-term consequences of the human battle for survival in a sensitive environment. At the same time, with one of the oldest soil conservation services in the world, Iceland is also an encouraging example of what can be done to halt these destructive forces.

Desertification in a humid environment

The history of vegetation and soils in Iceland since human settlement, about 1100 years ago, demonstrates clearly how the processes of desertification can render fertile ecosystems into barren wastelands (i.e. deserts) in a humid environment. The first settlers came to a fertile land. Vegetation may have covered ~60 % of the country, and woodlands, mainly birch (*Betula pubescens*), covered at least 25 % of Iceland´s area. Together with the herbaceous vegetation, the trees sheltered the fragile volcanic soils. However, the woods soon declined rapidly. The settlers needed land for grazing and cultivation. They cut the forests and burned scrublands to create fields and pastures. People's livelihood depended on their livestock, but grazing had a direct effect on the birch woods and prevented regeneration. Grazing was continuous all year long with the livestock feeding on whatever was available. Grass would have been the main feed in summer with an addition of twigs in winter when snow prohibited access to the ground.

The initial loss of tree cover and continued land use interacting with natural disturbances led to catastrophic soil erosion that has devastated large parts of Icelandic ecosystems. Land degradation started soon after settlement, but climatic deterioration in the 16 – 19th centuries and frequent volcanic eruptions accelerated the processes. Wind and water eroded the soil, leaving nothing but rocks and gravel. About 60 % of the original vegetation may have been lost from soil erosion. The remaining vegetation is extensively degenerated. As a result, the area of woodland reached a post-glacial minimum around 1950. It is estimated that 95 % of the tree cover has been lost. Poor land conditions and continued soil erosion are considered to be the most severe environmental problems in Iceland. Over 37,000 km^2 of Iceland (total area 103,000 km^2) are barren deserts and, in addition, large damaged areas have limited productivity.

A green island: how do we know?

The current extent and composition of vegetation in Iceland bears little resemblance to what it was historically. The ecosystem degeneration and desertification following settlement has been extensive and spectacular. Iceland is not as fertile and hospitable to its inhabitants as is could be. Arnalds (1987) summarized some of the various sources that can be used

Plate 1: Remnants of soil and vegetation bear silent witness to lost resources. This area is now under a re-vegetation project.

to reconstruct the vegetation of the past and trace some of the major changes in cover and composition through the centuries. To mention just a few, the settlement time Sagas, written ~200 years after the episodes, refer in many cases to the woodlands of the past. Pollen studies, linked to the use of ash layers for dating, reveal sharp changes in botanical composition after settlement, especially the disappearance of birch from many lowland areas.

Historical records are a good source for comparison of past and current land conditions. A description of all farms in Iceland from the early 18th Century indicates fertile land in many areas that are now severely degraded or barren deserts. Many old site or farm names, such as 'Skogar' (woods), indicate lush vegetation in now desertified areas, and the woodland word 'holt' now means a barren or infertile hill. Remnants of pits where charcoal was made out of birch, and other land use indicators, also tell a sad story of land degradation. Such information about changes in land health is important as one of the tools for setting goals for restoration of damaged land in Iceland. It is also a sharp reminder on the potential consequences of long-term unsustainable land use in a sensitive environment. In many areas remnants of former soil and vegetation bear silent witness to lost resources (Plate 1).

Stages of desertification

The ecosystem changes and consequent desertification of Icelandic landscapes are likely to have followed stepwise degradation and desertification pathways, as described by a conceptual model outlined by Aradottir *et al.* (1992) and further adapted by Archer and

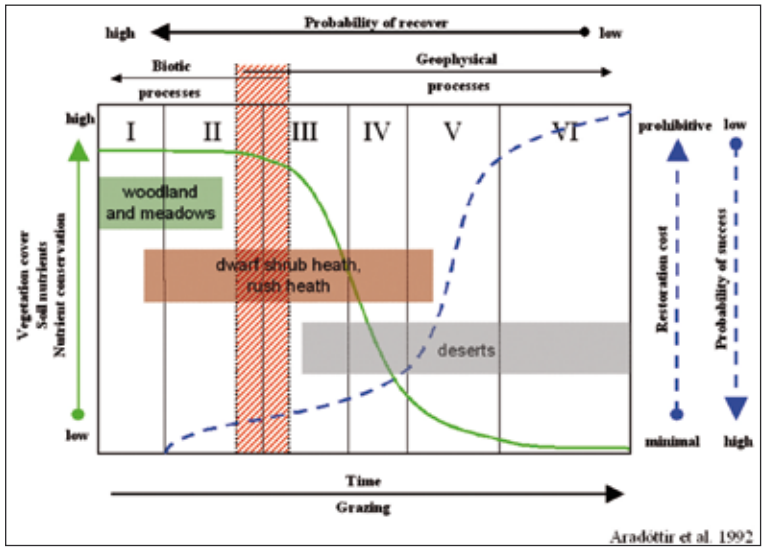

Figure 1: Continuous cover of birch, willow, grasses and forbs (State I) shifts to less productive heath land (State II). Spots of erosion begin to form with continued interaction of anthropogenic and human disturbances (State III) gradually increasing the area of exposed soil. Erosion fronts (rofabards) form (Arnalds, 2000) and soil and sand begins to encroach upon and weaken remaining vegetation (States III and IV). Remnants of vegetation and soils gradually disappear leaving glacial till or sandy surfaces behind (States V and VI).

Stokes (2000). The cost of restoration associated with degradation increases rapidly within stages III-V, and becomes almost prohibitive at stage VI (Figure 1), where resources such as nutrients and seed sources have been completely lost (Aradottir *et al.,* 1992). For further discussion, also see Tongway and Hindley (2000).

The nature and extent of soil erosion and desertification

Desertification continues to be a major threat to Iceland's natural resources. A national assessment of soil erosion and desertification at a scale 1:100,000 was conducted over the period 1991 – 1996 (Arnalds *et al.,* 2001). It is based on classification of erosion forms that can be identified on the landscape. The survey indicates that 40 % of Iceland is experiencing serious soil erosion (Table 1, Figure 2). Areas with high mountains, glaciers, rivers and lakes were excluded in the survey.

Table 1. Division of land in Iceland according to erosion classes (source: O. Arnalds *et al.,* 2001)

Erosion class	km²	% of whole
0 No erosion	4,148	4.0
1 Little erosion	7,466	7.3
2 Slight erosion	26,698	26.0
3 Considerable erosion	23,106	22.5
4 Severe erosion	11,322	11.0
5 Extremely severe erosion	6,375	6.2
Mountains	9,794	9.5
Glaciers	11,361	11.1
Rivers and lakes	1,436	1.4
Unmapped	1,010	1.0
TOTAL	**102,716**	**100**

Soil erosion in Iceland is characterized by two overall mechanisms. The first is sand encroachment, where sand buries vegetated areas resulting in bare sandy deserts. The second involves mainly water and wind, which results in the removal of rich Andosol soils.

Sandy deserts with active aeolian processes characterize nearly 22,000 km², or ~21 % of the total area of Iceland (Arnalds *et al.,* 2001). In large parts of the Icelandic highlands (~13,000 km²) sand has drifted over the old gravel surface left by Pleistocene glaciation. A large part of these areas were previously covered with 50 – 200 cm thick Andosols.

Erosion spots (i.e. openings in the vegetation with active erosion) are common on 27 % of Iceland (Plate 2). This erosion form is mostly found in areas with low intensity erosion, but commonly leads to more severe erosion, such as the formation of erosion fronts (the 'rofabard'). Their appearance indicates a shift in the domain of processes where land degradation processes are being taken over by soil erosion processes.

The 'rofabard' is one of the most striking erosion features in Iceland. These are erosion

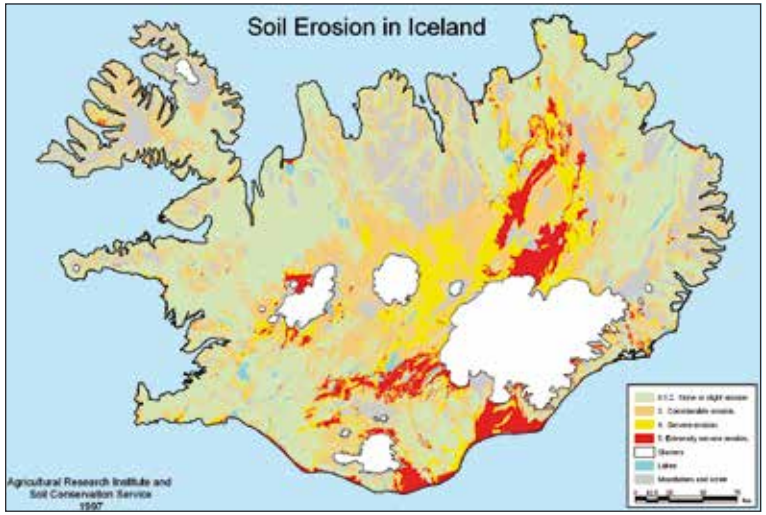

Figure 2: Serious soil erosion characterizes 40 % of Iceland, indicated here by the yellow (considerable erosion), brown (severe erosion) and red (extremely severe erosion) colours (source: Arnalds et al., 2001).

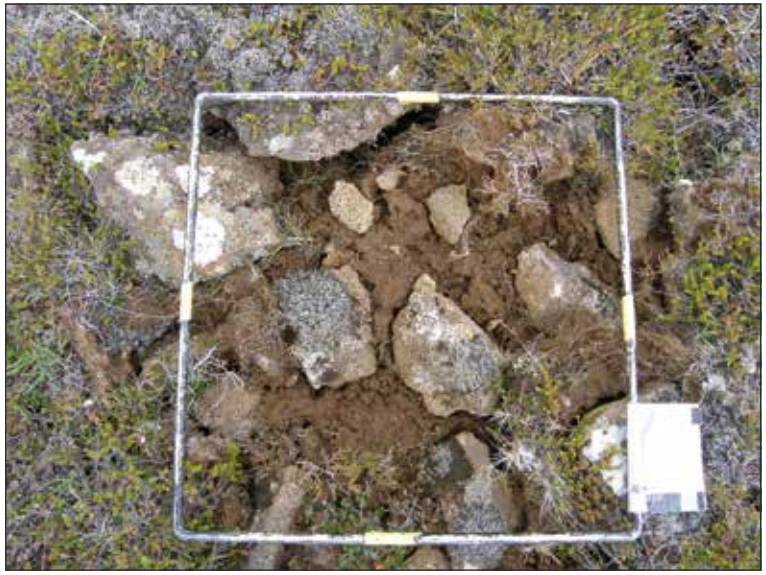

Plate 2: Soil erosion spots are openings in the vegetation surface where the mineral soil is exposed. They are indicators of land degradation, formed through the combined interaction of grazing and climate. Once they form they are able to persist and expand due to active frost-heave.

escarpments where vegetated Andosols are being truncated from the surface and barren desert is left behind (Plate 3). This form of erosion is prominent on ~20% of the area of Iceland, and is a major environmental problem. Other forms of soil erosion are also active in destroying Icelandic ecosystems (Arnalds *et al.,* 2001). Other common erosion forms are solifluction, landslides, gullies, soil movement on gravel flats (eroded land) and screes.

Plate 3: 'Rofabard', a striking Andosol soil feature. It is formed as the entire soil profile erodes, leaving nothing but the Pleistocene surfaces behind. The white horizons are tephra (volcanic ejecta).

Erosion: The battle begins

The peak of the ecosystem destruction in Iceland may have been reached in the 19th century, when new export markets for wool and wethers led to an increase in sheep numbers without regard for the carrying capacity of the land. Repeated disastrous events occurred in the last decades of the 19th century and numerous farms were destroyed by sandstorms and soil erosion (Olgeirsson, 2007). Vast areas became denuded with a total loss of vegetation and soils. These catastrophic events triggered preventative measures. However, ignorance of the role of grazing in this destruction and lack of means for erosion control prevented successful action.

The severity of land degradation in Iceland prompted the establishment of northern Europe's only designated, and possibly the world's oldest, Soil Conservation Service (SCS) in 1907 (Runólfsson, 1987; Crofts, 2011). The Forestry Service, originally established by the same law as the SCS, had the role of combating the destruction of woodlands in Iceland and overseeing the task of reforestation. A direct translation of the Icelandic name of the SCS, *Landgræðsla ríkisins,* is the *State Healing-the-Land Institute,* which reflects much better the actual nature of the Institute than the conventional 'soil conservation' version. This political

effort, however, was flawed by a lack of overall policy support. There were many initial conservation barriers that had to be overcome, such as scarce resources and lack of knowledge. Even worse were long lasting lack of land user responsibility, lack of belief in the work, and the common fatalistic land-user attitude that severe soil erosion was the 'will of God,' and that it was not within human means to halt the destructive forces.

Many areas with rapidly advancing soil erosion, especially encroaching sand dunes, were fenced off for protection from grazing, and seeded with stabilizer plants, such as *Leymus arenarius,* the only plant capable of immobilizing drifting sand in Iceland (Plate 4). Stone or timber walls were also erected for the same purpose and the *Leymus* seeded in its shelter.

Plate 4: The native Leymus arenarius is the only plant capable of halting sand encroachment in Iceland.

Iceland´s more than 100 years of national effort on halting soil erosion and restoring land quality are characterized by numerous success stories, despite limited financial and human resources for most of this time (Olgeirsson, 2007; Arnalds and Runolfsson, 2009; Crofts, 2011).

Reflections on the journey

The successes of the first 70 years of soil conservation in Iceland are beyond the comprehension of the current generation, especially considering the limited financial and human resources. However, on a national scale, not enough was being achieved. Only a small proportion of the affected areas have been treated and serious soil erosion still characterizes ~40 % of the land area of the country (Arnalds *et al.,* 2001).

In retrospect, the reasons include:

1. **Localized soil conservation,** as only the spots of most severe erosion and desertification were being treated.
2. **Single-issue conservation,** as the focus was on halting erosion, not preventive measures on a landscape basis.
3. **Lack of land user and public involvement, leading to low conservation awareness,** as the Government conducted most of the work with its own personnel and machinery.
4. **Insufficient inventories on the state of the natural resources and cause and effect relationships,** leading to futile debates between land users and conservationists on the seriousness of soil erosion problems and the role of land use in land degradation processes.
5. **Governmental subsidies for sheep production, without environmental links,** as a high level of support led to an all-time peak in sheep numbers in 1978. Poor grazing management led to severe overgrazing in many areas. The Government was paying at both ends: indirectly for the cause of the land damage, and directly for its repair.
6. **Weak law on soil conservation,** as the SCS in reality had no actual means to enforce proper protection of sensitive soils and vegetation. Theoretically, maximum numbers of livestock could be decided where needed, but the legal procedure was so complex, and remains so, that this option for preventive measures has been useless.

There are more reasons for the mixed success of the early soil conservation work. In effect, this period was characterized by various sociological barriers to improved conservation, a lack of incentives to care for the land, and disincentives to reduce unsustainable use of land resources. These lessons from the initiation of the soil conservation work in 1907 up to ~1980 are, in many ways, similar to experiences from many other countries for this period (Arnalds, 2005).

Landcare: Turning the tide

Restoration of degraded land and the quest for sustainability are unattainable without a commitment to good management by the agricultural community. As a step in reaching the long-term goal of making the land users the true custodians of the land, a new participatory programme for re-vegetation was launched in 1990, termed the *Farmers heal the land.* It was based on work already being done by many farmers, and met an increasing desire by farmers to improve the health of their land. The programme is supervised by the Soil Conservation Service, and the basic prerequisites for participation are land in need of re-vegetation and a commitment to using areas under reclamation in a sustainable manner.

Realizing the limited financial resources available to farmers for land improvement, it was decided that their machinery, time and skill, plus a small proportion of the cost of materials would be their main contribution to the project. The direct cost-share, although limited, was considered important in stimulating the feeling of 'ownership' of the project. The project was built on the psychological concept of mutual trust. Bureaucracy was minimized and communication improved with emphasis on a handshake and simple paper-work.

The 'bottom-up' nature of the Project has made it easy to interact with land users on their own terms. The farmers take pride in their achievements and enjoy being participants in reaching a solution to degradation problems. This, in turn, opens up positive channels for discussing and resolving other resource issues; topics that were traditionally difficult to broach prior to this co-operation. Participants commonly do more than they are asked to do. They are innovative and are urged to experiment with reclamation guidelines and to custom-

ize solutions for their own situations. This co-operation between farmers and scientists/soil conservationists has greatly advanced the development of successful restoration techniques and illustrates the power of the grass-root approach. Over 30% of the sheep producers in Iceland are now actively participating, along with many other farmers.

Another programme was also established for larger projects and for wider participation, the Land Improvement Fund. Together these two projects have achieved much, not least in fostering community and farmer engagement in caring for the land. Public participation is a main characteristic of the land restoration work in Iceland (Plate 5).

Plate 5: Landcare in Iceland. Involving young people is a key to a sustainable future. These school children are using mulch to revegetate active erosion fronts.

Mitigating climate change: a new financial incentive for land restoration

With its extensive problems of land degradation and desertification, and experiences from a century of practical soil conservation, afforestation and re-vegetation, Iceland provides an interesting venue for a dynamic dialogue on the role of carbon sequestration in reaching a multitude of national and global goals, including mitigating climate change.

While the molecule carbon (C), in the form of carbon dioxide (CO_2), is the main culprit in climate change, this same molecule in the form of organic matter is a foundation for our existence. CO_2 can, in fact, be regarded as a misplaced resource that should to be returned back to Earth in an organic form.

As a result of the massive land degradation, vast amounts of carbon have been lost from Icelandic ecosystems. In an assessment of barren lands in Iceland Oskarsson *et al.* (2004) estimated that between 120 – 500 million tonnes of organic matter has been lost from Icelandic soils during 11 centuries of human settlement, about half of which have been oxidized and lost to the atmosphere. Accounting for the degradation of soil and vegetation outside the assessed areas, the total carbon losses are much higher.

Record keeping of soil conservation and re-vegetation efforts until 1960 were limited, but the main focus was on saving vegetation, even towns and districts, from advancing sand dunes, some of which were encroaching several hundred metres annually. From 1958 – 1990, most activities involved spreading seeds and/or fertilizer by airplane and direct seeding of lyme-grass (*Leymus arenarius* L.) and other graminoids. With more efficient ground machinery, aerial distribution has ceased and now most of the work is done by farmers and other local people interested in land reclamation work. Methods for recording activities have improved at the same time, most notably by using aerial photographs and GPS-positioning systems. Since 2002, GPS tracking has increasingly been used to record activities as they occur (e.g. the spreading of seeds and/or fertilizers). The SCS has maintained a national inventory on re-vegetation areas since 1990. The objectives of this inventory are to monitor the changes in C-stocks, maintain and improve existing land restoration mapping and gather data to improve current methodologies. Activities which started prior to 1990 are not currently included in this inventory. This National Inventory on Revegetation Area (NIRA) is based on systematic sampling on predefined grid points. The basic unit of this grid is a square 1.0 × 1.0 km in size. Approximately 1000 potential data points have been surveyed. Half of those are selected for sampling and will be used for permanent C-stock monitoring in the future, such as the site indicated in Plate 6.

Plate 6: Land being surveyed for carbon sequestration assessment.

Carbon sequestration is a significant tool in the Icelandic Climate Change Action Program in meeting commitments to the Kyoto Protocol. This is a perfect example of a 'win-win' situation and has resulted in increased funds for soil conservation and land restoration. Due to the volcanic nature of Icelandic soils, carbon sequestration rates are high. There is an urgent need for land restoration, and combined with reducing emissions from human activities, Iceland could become a carbon neutral country (Ágústsdóttir *et al.,* 2007).

Land use

Most of contemporary Iceland can be classified as rangelands and pastures. Agriculture is by far the largest land user, and sheep and cattle for meat and milk accounts for 69 % of the total value of agricultural produce. Production of sheep, cattle and horses are primarily based on grazing native pastures and rangelands, and making hay to feed the livestock through the long winters. Crop production is small scale, although rapidly increasing with new cultivars, especially barley with the more favourable temperatures. The lowlands are divided into farms in private ownership (Plate 7), while the highlands are mostly divided into commons used for sheep grazing by the respective communities.

Plate 7: Land condition spans a broad scale in Iceland, and agriculture is very important to the nation.

Land conditions vary and in areas of severe land degradation grazing can have a dramatic effect. The result has been a large-scale desertification in a humid environment, reaffirming the need for a broader perspective for defining the term desertification (Arnalds, 2000). In degraded or denuded areas, livestock production can significantly slow vegetation recovery. Improvements in grazing management and revegetation efforts are needed in order to reach goals of sustainable land use in many areas of Iceland.

Icelandic agriculture is characterized by high levels of governmental support; direct and indirect import barriers; an image of almost veterinary drug-free high quality produce, and a growing realization of the need to maintain prosperous agriculture for food security. However the immense societal change of the last decades, combined with debates over the role of governmental support in the immense land degradation experienced in Iceland, has had major impacts on public goodwill towards agriculture. Maintaining a social licence to farm, that is the credibility and trust that is required for prosperity, will be an increasingly complex task for Icelandic agriculture in the future (Arnalds, 2011).

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Zero Version of the Terms of Reference of the Global Soil Partnership

For further information, please visit:
http://www.fao.org/nr/water/landandwater_gsp.html

After six months of intense preparatory activities, a major meeting to launch a Global Soil Partnership was conducted by FAO at its headquarters in Rome, Italy, from 7 – 9 September 2011. The meeting was organized in collaboration with the Joint Research Centre (JRC) of the European Commission (EC). The main purpose of the meeting was to present to FAO Member Countries and key stakeholders the proposal of a Global Soil Partnership (GSP) by FAO and to obtain reactions and recommendations on the way forward towards the establishment of such a partnership.

The meeting fully approved the necessity for such a partnership, and conclusions and agreement were that a Technical Working Group (TWG) will be established for preparing the Zero draft version of the Terms of Reference (ToR) for the establishment and implementation of the Global Soil Partnership. The Technical Working Group was established on 17 October 2011. The present document constitutes the Zero Version of the Terms of Reference resulting from the deliberations of the TWG facilitated by FAO. It includes all TWG contributions in a single consolidated working document to be further submitted to the Open Ended Working Group of the FAO Member Countries tasked to prepare the final version for endorsement by FAO Governing bodies.

Background of the Global Soil Partnership (GSP)

Soil is a finite natural resource. On a human time-scale it is non-renewable. However, despite the essential role that soil plays in the life of people, there is increasing degradation of soil resources due to inappropriate practises, burgeoning population pressures and inadequate governance over this essential resource.

The renewed recognition of the central role of soil resources as a basis for food security and the provision of key ecosystem services, including climate change adaptation and mitigation, has triggered numerous regional and international projects, initiatives and actions. Despite these numerous emergent activities, soil resources are still seen as a second-tier priority and no international governance body exists that advocates for and co-ordinates initiatives to ensure that the knowledge and recognition of soils are appropriately represented in global change dialogues and decision making processes[1]. At the same time, there is need for co-ordination and partnership to create a unified and recognized voice for soils and to avoid fragmentation of efforts and wastage of resources.

On the basis of the recommendation of FAO's High-Level External Committee (HLEC) on the Millennium Development Goals to the Director-General (13 – 14 October 2009) and the discussions and conclusions from the 22nd Committee on Agriculture (COAG) (Rome, 16 – 19 June 2010), preparatory activities have been initiated by FAO in order to explore the possibility of establishing a global soil partnership, according to the recommendations by COAG (CL 140/3).

Soils, the foundation of agricultural development, provide the basis for food, feed, fuel and fibre production, water availability, nutrient cycling, organic carbon stocks, one-quarter of global biodiversity, and as a platform for construction and construction material. However, soil quality varies with site conditions and management practises. The area of fertile soils is limited and is increasingly under pressure by competing land uses including cropping, forestry and pasture/rangeland as well as for energy production, settlement, infrastructure and raw materials extraction. The increasing degree and extent of soil degradation processes due to mismanagement and land use changes are threatening this resource and urgent action is needed to reverse this trend if we are to assure the necessary food production for future generations, mitigation of climate change, provision of clean groundwater, and contribute to halting biodiversity loss. Maintaining healthy soils required for feeding the growing population of the world and meeting their needs for biomass (energy), fibre, fodder and other products can only be ensured through a strong partnership. This should then be one of the guiding principles of the GSP; that is to maintain soil uses that allow us to also sustain other ecosystem services on which our livelihoods and societies depend, including water regulation and supply, climate regulation, biodiversity conservation and other cultural services. The conservation and, where possible, enhancement and restoration of the soil resources of the world through sustainable and productive use should, therefore, be the ultimate twinned goal of the GSP.

Soil is important for mitigating climate change and its proper management can also support human adaptation efforts. Soil is both a source and a sink of greenhouse gases; there is a delicate balance between sink and source functions. Soils worldwide contain up to five times as much carbon as the atmosphere. The annual flux of carbon dioxide between soil and the atmosphere is also large and estimated at seven times that of carbon dioxide from fossil fuels. Waterlogged and permafrost soils hold major stocks of carbon but (due to lowering of the water table and thawing of permafrost) may become important emitters of two potent greenhouse gases, methane and nitrous oxide, as a result of climate change and land use change.

Soils are home to over one-quarter of all living species on earth, and one teaspoon of garden soil may contain thousands of species, millions of individuals, and a hundred metres of fungal networks. Many of the functions performed by soil organisms can provide essential services to human society. These include nutrient cycling, soil formation and primary produc-

[1] The United Nations Convention to Combat Desertification (UNCCD) has a geographical scope limited to drylands.

tion. In addition, soil biodiversity influences the regulation of atmospheric composition and climate, water quantity and quality, pest and disease incidence in agricultural and natural ecosystems, and human diseases. Soil organisms may also control, or reduce, environmental pollution. Finally, soil organisms also contribute to provisioning services that directly benefit people, for example the genetic resources of soil micro-organisms can be used for developing novel pharmaceuticals.

Vision and Mission

The vision of the Global Soil Partnership is the improvement of the global governance of the limited soil resources of the planet in order to guarantee healthy and productive soils for a food secure world, as well as sustain other ecosystem services on which our livelihoods and societies depend. These include water regulation and supply, climate regulation, biodiversity conservation and other cultural services.

The mission of the GSP is to develop capacities, build on best available science, and facilitate/contribute to the exchange of knowledge and technologies between stakeholders, existing multilateral environmental agreements, and technical and scientific bodies of a similar nature, for sustainable management of soil resources at all levels with a view to enhancing food security, protecting ecosystem services, and contributing to poverty alleviation in an era of global demographic growth.

Disclaimer

The Global Soil Partnership is a voluntary initiative and does not create any legally binding rights or obligations between or among its members or any other entities under domestic or international law.

The GSP reinforces that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction (Principle 2, Rio Declaration on Environment and Development).

Strategic Objectives

Through enhanced and applied knowledge about soil resources as well as a harmonization process, the Global Soil Partnership will:

- Create and promote awareness among all type of stakeholders (e.g. scientists, decision/ policy makers, land managers, civil society) that healthy soils and sustainable soil management are preconditions for human well-being and economic welfare and therefore play key roles for sustainable development.
- Address critical soil issues that are globally and regionally relevant for sustaining the provisioning services through soils, in particular towards increasing food security, enhancing climate change adaptation and mitigation and sustaining the provision of ecosystem services in a context of global demographic growth.
- Guide soil knowledge and targeted research in accordance with national conditions and needs to address concrete challenges on the ground through a common communication platform, including an Intergovernmental Technical Panel on Soils to provide an authoritative voice on technical and scientific issues.
- Establish an active and effective network for addressing soil cross-cutting issues, including national and international soil health (biodiversity) best practises, and ensuring synergies among relevant agricultural, forestry, environmental and human development processes.
- Develop sustainable management strategies for the different soils considering their potential and limitations for different types of uses and taking into account the wider socio-economic context as well as national needs and policies.
- Promote access to soil information and advocate the need for new soil surveys and data collection, especially in those countries where soil information is obsolete and coarse and does not respond to user demands.
- Promote investment and technical co-operation in all related soil issues to address fundamental issues in the field in the different regions, aiming at the sustainable management of soil resources.
- Promote institutional strengthening and capacity development of national soil institutions.
- Promote necessary public and governmental awareness on the World Soil Day (5 December) as established by the International Union of Soil Sciences, with a view to its adoption as the World Soil Day by the United Nations General Assembly.

Composition and Governance of the Global Soil Partnership

The Governance of the GSP is proposed to be composed of the following elements:

Figure 1: Governance of the Global Soil Partnership.

Partners

The GSP should become an interactive, responsive and voluntary partnership, open to governments, institutions and other stakeholders at various levels (Figure 1). The different kinds of partners that will be needed include financial/funding partners, technical/scientific partners, advisory partners and general partners. These partners could come from any kind of regional and national institutions/organizations working on soils (e.g. governmental organizations, universities, civil institutions, research centres, soil science societies, UN agencies, NGOs, private companies, farmer associations, donors). Partners by default to the GSP are the FAO member countries who determine FAOs priorities as laid out in the Strategic Framework

and Programme of Work and Budget of the Organization and according to the needs and priorities identified in their countries.

The representatives of the different GSP partners will meet annually at a GSP Plenary Assembly to review the actions of the GSP (see Section 5.5). A specific registration form for joining the GSP is available in Appendix 1 (at the end of this article).

Intergovernmental Technical Panel on Soils (ITPS)

It is proposed to establish an Intergovernmental Technical Panel on Soils (ITPS) to provide scientific and technical advice on global soil issues. The ITPS is a core component of this Partnership and should be formally established by the FAO Council according to FAO's rules and procedures. Its members shall be nominated by the GSP Plenary Assembly for an initial term of two years, renewable for one additional term (with agreement of the GSP Plenary Assembly) and supported by specific Terms of Reference (ToR) to be prepared by the Technical Working Group and Open-Ended Working Group. These experts should act in their personal capacity, not receive instructions from any government or other institution, and provide the best possible scientific and technical knowledge available.

It is proposed that initially the ITPS shall be composed of 27 recognized experts ensuring a proper regional cover, appropriate scientific expertise (covering the range of scientific and practical expertise encompassed by the GSP) and gender balance. Following there is a proposal about the regional distribution of experts for composing the Panel: five from Africa, five from Europe, five from Asia, five from Latin America and the Caribbean, three from the Near East, two from North America and two from the South West Pacific

The ITPS will advise the GSP and FAO itself as well as provide an authoritative technical voice on global soil issues, including other relevant conventions, such as the UNFCCC, CBD and UNCCD. Close links should be developed between the ITPS and the newly established Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), in order to ensure that soil related issues are adequately taken into account, eventually acting as a subpanel of IPBES for soil issues.

Global Soil Partnership (GSP) Secretariat

The GSP Secretariat is the co-ordination and facilitation body of the GSP that will be in charge of facilitating the implementation of the GSP actions through its regional partnerships and networks. The GSP will be hosted by FAO in view of its global mandate. The GSP Assembly will nominate the GSP Executive Secretary at their first plenary meeting (expected to take place in the second semester 2012). Under the guidance of the GSP Plenary Assembly and seeking the technical and scientific advice of the ITPS, the Executive Secretary will be responsible for supporting the implementation of the GSP activities according to the pillars and strategic objectives to be prioritized and established, initially on a biennial basis, but with a five year and a longer term planning perspective. The GSP Plenary Assembly will conduct an annual review of the activities of the Secretariat.

The Secretariat will also work on governance, finance, communications, planning and operational management of GSP programmes and administration. Direct links will be established with the Regional Soil Partnerships (RSP) in each region (according to FAO classification: Africa, Asia, Europe and the Caucasus, Latin America and the Caribbean, Near and Middle East, North America and South West Pacific) to facilitate implementation of the GSP plan of action in the regions through close interaction and consultation with national members and soils networks. The GSP Secretariat will promote the establishment of the necessary partnership and networking and communicating activities in those regions where well established soil networks and collaborative processes are lacking. The Secretariat will endeavour to co-ordinate the GSP work with the other Rio Conventions, notably the UNCCD.

Regional Soil Partnerships (RSPs)

Regional Soil Partnerships (RSPs) should be formed among interested and active stakeholders. These regional partnerships will work in close co-ordination with FAO Regional Offices and will establish an interactive consultative process with national soils entities (e.g. soil survey institutions, soil management institutions, soil science societies), regional soil science societies and other relevant regional mechanisms under the various related conventions. Preferably, they will build on existing regional networks or collaborative processes (e.g. African Network for Soil Biology and Fertility-AfNET), linking National and local networks, partners, projects and activities to ensure that the partnership process is country-driven. They should provide guidance on regional goals/priorities and the required implementation mechanisms and should regularly review progress in reaching agreed objectives and targets. In particular, RSPs should facilitate links with national and local soil management programmes and activities with a view to strengthening work on soils and to developing synergies with other relevant initiatives and activities. Some of the activities of the RSP could be *inter alia:*

a) Analysis of soil research and international soil-related co-operation in the region (in support of the GSP project/intervention database).
b) Compilation of existing, available data sets (supporting GSP meta-data catalogue).
c) Associate experts from member countries/organizations of the regional network (support the expert list).
d) Participation and mediation for harmonization and database building (e.g. towards a new global soil data set).
e) Organization of capacity building activities in the frame of international/technical co-operation programmes.
f) Advise on regional positions and prepare regional statements to the GSP (e.g. identification of issues and hot spots).
g) Strategic networking and fund raising in the regions.

The Global Soil Partnership Plenary Assembly

The GSP plenary assembly will be the main yearly meeting of Panel members, GSP Secretariat, representatives of the different partners and national members of FAO, including regional organizations, such as the European Union. This assembly will be in charge of reviewing and prioritizing GSP actions and facilitating a balanced regional decision-making process.

Links of the Global Soil Partnership with the Rio Conventions

The sustainable management of soil resources contributes directly and indirectly to all three Rio Conventions (UNFCCC, CBD and UNCCD) in terms of sustainable soil management, soil fertility and productivity, soil carbon fluxes and climate change and soil biodiversity.

The GSP is expected to contribute to all related global policy processes in an independent and authoritative way. At the core of its global authority will be the Intergovernmental Technical Panel on Soils that will be the independent scientific advisory body for providing

the necessary high-level scientific advice to policy-makers and institutions dealing with soil related issues. Co-ordination and collaboration mechanisms should be established with relevant mechanisms established under the multilateral environmental agreements and other relevant international commitments on food security and poverty alleviation, in accordance with the Millennium Development Goals.

The GSP support the process leading to the adoption of sustainable development goals on soils in 2015, should the Rio+20 Conference agree on such a process. The GSP will lead a process in order to place soils at the higher level of the political agenda in RIO+20. This advocacy will require the active participation of partner institutions and other like-minded organizations, such as the UNCCD.

Pillars of Actions

In particular, the GSP should support the process leading to the adoption of sustainable development goals on soils. The GSP will contribute to environmental wellbeing, through, for example, preventing soil erosion and degradation, reducing greenhouse gas emissions, promoting carbon sequestration and promoting sustainable use of agricultural inputs for soil health and ecosystem management. It will equally contribute to human wellbeing and social equity through improved use of soil resources, finding alternatives to degrading practises through participatory experiential processes, taking into account sensitivity to issues of gender and the rights of indigenous peoples. In order to achieve these objectives, it is proposed that the GSP should address five main pillars of action:

1. Promote sustainable management of soil resources for soil protection, conservation and sustainable productivity.
2. Encourage investment, technical co-operation, policy, education awareness and extension in soils.
3. Promote targeted soil research and development focusing on identified gaps and priorities and synergies with related productive, environmental and social development actions.
4. Enhance the quantity and quality of soil data and information: data collection (generation), analysis, validation, reporting, monitoring and integration with other disciplines.
5. Harmonization of methods, measurements and indicators for the sustainable management and protection of soil resources.

A short description of each pillar of action is presented below. However a Plan of Action for each pillar will be prepared separately through consultative processes and subject to approval by the GSP Plenary Assembly.

Promote sustainable management of soil resources for soil protection, conservation and sustainable productivity

There is an urgent need to update the vision and guiding principles as specified some 30 years ago by FAO Member Countries in the World Soil Charter (FAO, 1981). The 13 principles listed in the Charter are still valid, but need to be updated and revised in the light of the new scientific knowledge gained over the past 30 years, especially in respect to new issues which emerged or were exacerbated during recent decades. These include climate change and its adaptation and mitigation needs, as well as the impact of urban sprawl on soil availability and functions due to current social and economic functions accelerating concentration of increasing populations. New priorities for action as well as follow-up activities should be identified, taking stock of past experiences and learning from the failures and mistakes

that have resulted in a still persistent global problem of soil degradation and unsustainable use of available soil resources.

In this respect, it is important to note that the concept of soil/land potential as laid out in FAOs concept and methods of Land Evaluation and Planning and the Millennium Assessment, includes production as well as social and economic functions of the soil/land resource base and the capacity to sustain the range of ecosystem services. Moreover, the costs and benefits and expected impacts of various soil management technologies and intervention approaches, the costs of inaction and the need for multi-disciplinary processes need to be taken into account in updating the Charter and developing the road map for sustainable soil management and protection.

The GSP should become the platform for discussion and agreement among policy-makers and stakeholders on the best way forward to achieve measurable soil protection and management targets in a reasonable time frame and adapted to the particular conditions of different regions. New issues could be incorporated in a renewed Soil Charter, such as those arising from increased pressures on fertile and non-fertile soil resources. Special attention should also be paid to ethnopedology (sustainable indigenous soil management), as it has shown its importance in terms of adoption and sustainability. Ideally, the GSP should facilitate the compilation of a new World Soil Charter incorporating the new knowledge and experiences gained over the past 30 years and addressing the world-wide diversity of soils (recently described as 'pedodiversity').

Encourage investment, technical co-operation, policy, education awareness and extension services in soils

Investment and technical co-operation in soils over the last two decades have been lacking, but now greater attention is devoted to this invaluable resource. Soil knowledge and soil implications in water, climate, biodiversity or poverty issues are not properly addressed in the general education system, so a wide effort is needed to create public awareness on the importance of sustaining soils and their functions. This will require promotional and communication tools to raise awareness and educate and mobilize the informed involvement of stakeholders in the consultative processes. Soils expertise has been diminishing in international and national institutions, because it has not been seen by the younger generation and the employment market as of interest in addressing the challenges of today's world. On the other hand, today's global challenges of food security, poverty and climate change are significantly affected by how we protect and manage the Earth's soil resources. Soils deserve much greater investment in all fields, including awareness raising and technical co-operation to train a new cadre of soil scientists with an interdisciplinary perspective capable of bringing the crosscutting issue of soils back into the centre of agricultural and environmental development processes.

The GSP should develop guidelines and recommendations on investment and technical co-operation on soils and how to mobilize investments through ongoing processes:

- Investment by farmers, other land users and their societies.
- Investment by countries through national programmes and processes.
- Investment by development banks, GEF (Global Environment Facility) and other donors.

It will also assess the available soils expertise, capacities and interests of both the private and public sectors in supporting:

- Technical co-operation by countries' research, education, extension and development agencies.
- Technical co-operation and support by the UN system and international bodies.
- Technical co-operation with land users and environmentalists and inclusion of their local knowledge.

Such a needs' assessment will lay the basis for the development of a co-ordinated strategic investment programme and plan of action for technical co-operation on soils, including increasing awareness of a range of stakeholders and the general public on the importance of soils, enhancing expertise on soils and capacities and co-ordinated actions from local to national, regional and global levels.

Creating awareness at all levels about the importance of soil resources for supporting life will be a key element of this pillar. Awareness raising campaigns, institutionalizing the World Soil Day (together with relevant institutions, such as IUSS) and a diverse range of mechanisms will be used in order to raise awareness and related support activities. Furthermore, education in the field of soil science should be reinforced as soil science as a profession has been neglected and, consequently, there are limited technical capacities available for dealing with sustainable soil management issues.

Promote targeted soil research and development focusing on identified gaps, priorities and synergies with related productive, environmental and social development actions

There are many research activities and projects related to soils around the world. Many projects would benefit from increased co-ordination with other on-going research activities. Communication amongst research communities dealing with the various aspects of soil is often limited or inexistent and inter- and trans-disciplinary research is still very limited. Building bridges between the various research communities could bring large benefits to the global scientific knowledge base and lead to more coherent soil related activities. Breaking disciplinary barriers between geology, soil science, agronomy, forestry, pasture/rangeland management, hydrology, water resource management, agro-climatology, ecology, soil biology and ecosystems research could improve the quality and applicability of research and provide new avenues for future integrated research and development programmes. The biophysical aspects of research must be associated with relevant research into social, political and economic issues that are inherently tied to the whole questions of soil protection/conservation and soil management.

The GSP should closely link to new global research initiatives, such as 'the Global Research Alliance on Agricultural Greenhouse Gases,' and should also provide input and support to the main scientific advisory bodies of the three Rio Conventions: IPCC for the UNFCCC, IPBES for the CBD and the UNCCD.

The GSP implementing mechanisms should be able to identify and support soil research and development priorities to address key soil issues that are relevant to the main problem areas that are currently undertaken, often in an unco-ordinated way, by diverse organizations and institutions dealing with sustainable soil resource management, food security, climate change adaptation and mitigation, and water supply and quality. The aim will be to help focus and bring together wide-ranging soils research and knowledge to address the specific development challenges and concerns of today.

Enhance the quantity and quality of soil data and information: data collection (generation), analysis, validation, reporting, monitoring and integration with other disciplines

Even though much of the existing worldwide soil data are rather outdated (for some actual applications, though for change assessment these data are still very valid), as well as being inconsistent, incomplete and at coarse resolution, nonetheless the wealth of soil related information (soil legacy data) gathered during fieldwork is of tremendous value. It is of utmost importance to the GSP, that existing legacy of information (in the form of hard copy documents, reports and maps), is scanned, digitized and made available through updated soil databases and information systems. Current global databases are still essentially using a mixture of information collected over 50 years ago at the time of the compilation of the first global soil map by FAO/UNESCO and subsequently the more recent collection of new soil legacy data under SOTER (Soil and Terrain Database) and other regional and national programmes. The most recent Harmonized World Soil Database is essentially a compilation of these existing soil data into a common raster at 1 km resolution. With the development in information technologies, there is an urgent need for updated high-resolution data and information on global, regional and local soil resources, for food security, climate change related issues and biodiversity conservation, amongst others. Integration with other disciplines (e.g. hydrology, forestry, climate, engineering) is essential. Detailed and updated information on soil health and fertility, soil organic and inorganic carbon content from soil profiles and soil pollution and water holding capacity is missing in many countries.

Several new projects have been initiated aiming towards the rapid compilation of new digital soil maps of the world. The GlobalSoilMap.net consortium (aiming to produce soil property maps), partially funded by the Bill and Melinda Gates Foundation, as well as the EU funded eSOTER Project within the Global Soil Data task of the GEO/GEOSS work programme, are the most relevant on-going initiatives. In addition, several regional and national soil data collection programmes are on-going, such as the Africa Soil Information Service (AFSIS), the European Soil Information System (EUSIS) and others. A main task of the GSP will be to build a partnership among the various soil data collection programmes in order to develop synergies and cost-savings by avoiding duplication of efforts. Ultimately the GSP should provide a common soil data and information platform responding to the various users needs at global, regional, national and local scales. Providing the soil data, metadata and derived information needed by end-users should be a guiding principle of the GSP, avoiding past experiences of large-scale data collection programmes that fail to deliver specific data relevant to actual user needs and capitalizing on the various ongoing processes. An extensive survey of the actual end-user needs and requirements should be part of the work programme of the GSP from its early stage. Particular effort should be given to include soil information in ongoing and future projects on related topics (e.g. the National Forest Inventories and other natural resource surveys, national adaptation and mitigation plans).

Past land capability classifications and land suitability assessments need to be revised, due to the adoption of new planting and sowing technologies, changes in farming systems, cropping patterns, modernization of irrigation systems, the development of cultivars or new species adapted to stressed environments and climate change. In some places, soils that were evaluated as being unsuitable for cropping are now being planted for cash crops using adapted germplasm and management technologies and with reasonably good results for farmers. The research under focus may be distinctly different in fertile compared to marginal lands and according to the scale of intervention from smallholder to large-scale commercial farms.

The provision of soil data and information needed by end-users should be a guiding principle of the GSP. An extensive survey of the actual end-user needs and requirements should be part of the work programme of the GSP from its early stage.

Harmonization of methods, measurements and indicator for the sustainable management and protection of soil resources

While the availability of soil data and information is dealt with in a separate pillar, it needs to be emphasized that information about soils must be first gathered in a harmonized way; otherwise, experiences cannot be shared and combined. This is of utmost importance, for example, to utilize soil information for policy development and the building of observation systems. Harmonization and establishing guidelines and standards should not be a goal *per se* of the GSP. Standardization always implies a cost for the various stakeholders and, therefore, a clear cost/benefit analysis needs to be provided in order to justify any standardization activity. Many standards for soil measurements, observations, data collection and data management exist. The GSP will act to federate and facilitate a partnership among the various actors in order to develop synergies and cost savings for all partners.

Ongoing efforts, as well as standards developed by the International Union of Soil Sciences (IUSS) and by other regional and national standardization committees and institutions, need to be brought within a common framework that will reduce duplication of efforts and the proliferation of standards and methods (both laboratory and field) that are often incompatible. A well-documented example of lack of co-ordination and political will is soil classification, with still two (or more) main systems used in many parts of the world that are difficult to compare (correlate) and harmonize (like the US Soil Taxonomy of USDA and the World Reference Base (WRB) of the International Union of Soil Sciences (IUSS) endorsed by FAO). The recent initiative towards the development of a common Universal Soil Classification (USC) should be facilitated by the GSP by providing a common platform for such a future system.

Harmonization should cover all aspects related to soil observation and measurement (both in the field at different scales and in the laboratory). This should include indicators, notably the development of a shared definition among stakeholders of soil quality, soil health and function indicators specific for various land uses and the standards for communication between soil scientists and other stakeholders. Previous work in the OECD framework for the development of soil quality indicators, as well as on-going work in the EU and USA and similar initiatives in the various regions, should be brought under a common framework within the GSP. The development of common standards for soil health and fertility will facilitate the implementation of Integrated Soil Fertility Management (ISFM) and support ongoing regional activities, like the Soil Health Programme of AGRA in Africa and others and will ensure due co-ordination with organic best practises/guidelines in regard to soil conservation and management.

Harmonization is particularly beneficial for data management and integration. Adopting common flexible (as soils are highly variable globally and locally) standards for soil data will allow integration of soil information within wider spatial information systems for agricultural, environmental and land use planning objectives. Data interoperability (distinct from standardization) requires translation tools with shared definitions and metadata catalogues will facilitate data access and use. Standardization at a global scale, like the Global Spatial Data Infrastructure (GSDI) and Open Geospatial Consortium (OGC) or the globally inter-operable distributed data system of the ICSU World Data System, as well as regional initiatives, like

the Infrastructure for Spatial Information in the European Community (INSPIRE) Directive of the EU, should be taken into account for the establishment of common standards for geo-referenced soil data and information. There is a need to develop a global harmonized soil information system that would allow access and use of data across a broad range of international initiatives (such as the Global Earth Observation Systems, GEOSS and INSPIRE) as well as supporting national, regional and local data inter-operability and integration. The GSP could act as a facilitator for these various global and regional harmonization efforts.

Financial Assessment and Implications

It is of crucial importance to assess the financial implications of the establishment and implementation of the Global Soil Partnership. This assessment should include an estimate of the financial needs for establishing the Secretariat, establishing the Intergovernmental Technical Panel on Soils and implementing the actions for the coming four years at international level and co-ordinated through the Regional partnerships. Moreover, the financial assessment should guide the development of a longer-term strategic investment and technical co-operation programme with interested funding partners. An example of the funding strategy is presented in Figure 2.

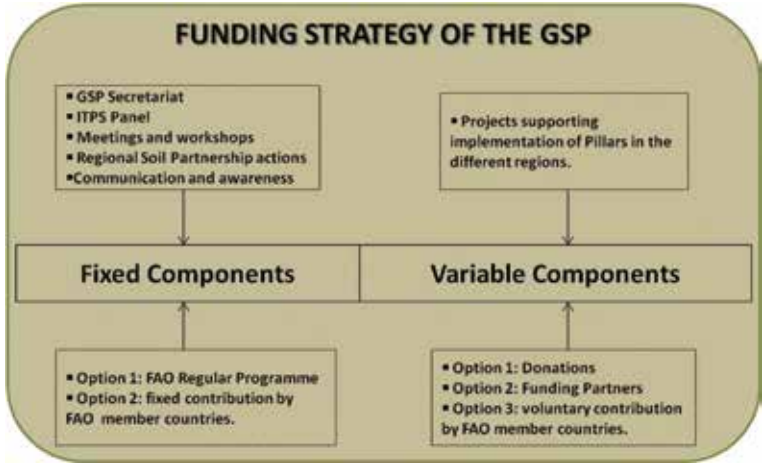

Figure 2: Funding strategy of the Global Soil Partnership.

The financial implications of the GSP rely on its principle of 'partnership.' Each partner contributes with different inputs for the successful implementation of the GSP. FAO will lead the GSP process and it should through a prioritization in its Programme of work guarantee a basic budget from its regular programme to facilitate its proper implementation.

Work Plan and Timetable

The partnership process should lead to the identification of priority actions to be conducted at international level and in each region for the period 2012 – 2014 under the five pillars of the GSP. These will be integrated into the initial biennial work plan and budget of the GSP. Advocacy for the establishment or strengthening of the regional partnerships should generate required support for implementing the work plan and contributing to the five pillars.

A number of consultative workshops will be organized in order to discuss and develop specific plan of actions for each pillar of the GSP taking into account the regional priorities.

Communication strategies and soil awareness

The GSP will need global and regional communication strategies for advocacy and sharing of information, experiences and tools, information development and scientific and technical support among the different partners and stakeholders. The GSP should develop such communication strategies and initiatives in close collaboration with regional and national partners working on soils and other concerned bodies that guide and support international, national and local development and investment programmes. The GSP should promote soil awareness and education at all societal levels and must report frequently on its activities to the various forms of media.

For further information, please visit the GSP web site:
http://www.fao.org/nr/water/landandwater_gsp.html

Appendix 1 – Application Form

APPLICATION TO BECOME A PARTNER OF THE GLOBAL SOIL PARTNERSHIP (GSP)

Please submit completed application form to the nearest Country or Regional Soil Partnership, or, in their absence, directly to the GSP Secretariat at FAO HQ in Rome, Italy

We (name of organization):

.....

apply to become a Partner of the Global Soil Partnership. The organization hereby:

- agrees to abide by the World Soil Charter Principles
- pledges a willingness to actively participate in the GSP network
- act in accordance with the Terms of Reference for the Global Soil Partnership
- confirm that the information submitted with the application is correct, and ensure that any changes in the information will be reported to GSP.

Signature of the Chief Executive

Officer .....

Name.....

Date.....

Organization Stamp/Seal

The following staff member is assigned as the GSP contact person:

Last Name .....

First Name .....

Designation.....

The Applicant is hereby accepted as a Partner of the Global Soil Partnership, with the benefits, rights and obligations set out in the Global Soil Partnership's Policy on Partners:

For the Global Soil Partnership.....
Executive Secretary, Global Soil Partnership

Signature.....

Date.....
GSP Seal/Stamp

Arid Land Restoration and Combatting Desertification: Setting Up a Drylands and Desert Restoration Hub (European Union COST Action ES1104)

Dr Benz Kotzen
School of Architecture, Design and Construction
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UK

Cost Action ES1104 held its Kick-Off and 1st Management Committee (MC) Meeting at the COST offices in Brussels in early April 2012, with over 20 members from the 15 participatory countries. Since then membership has grown and the 2nd MC meeting is expecting 35 members from 18 participatory countries and this is expected to grow with additional participants from beyond the EU.

Funded by the EU under Framework 7 (FP7), this Action has been devised to bring together an array of experts from a variety of fields to create a hub of knowledge and expertise relating to drylands and desert restoration and to combat desertification. MC and Working Group (WG) members thus stem from a wide variety of EU and other countries, institutions and disciplines and this diversity and wealth of expertise and knowledge will help to create a 'one-stop shop' where all stakeholders may be able to obtain data on past and current successes in restoration, as well as imparting their knowledge into this network of knowledge. As drylands increase, deserts expand and water becomes less abundant due to man-made as well as 'natural' climatic reasons, the hub is considered a timely and necessary fulcrum of information, which is at present largely dissipated and hermetic (Plates 1 and 2).

Plate 1: Traditional micro-landscape manipulation of lava fields in Lanzarote (Canary Islands, Spain) to produce grapes for wine making. No additional water is added above the natural precipitation (125 – 150 mm per year).

There are numerous reasons for this action. There are the broader considerations of the effects of desertification on people and the environment, the loss of livelihoods, hunger and starvation, brought about by the loss of land quality and habitats. To help combat this scenario, this Action has at its heart the complex and often very challenging aims of restoring vegetation and thence the appropriate management of vegetation, which benefits man and the environment. In order to achieve initial establishment of plants and then carry this forward sustainably into the future requires the skills, knowledge and expertise of various fields, as well as the co-operation and involvement of local people and, in many cases, the understanding and use of historical and traditional methods.

The skills and knowledge collected into this network of experts includes hydrologists, ecologists, landscape architects, agronomists and soil scientists. The Action has five Working Groups (WGs), which are essentially think-tanks of specialists. Thus, WG2 is a creating and designing think-tank, which has its focus particularly on soils and hydrology, including 'traditional and innovative systems.' The core remit of the WG is "*understanding the issues and problems through European, international and interdisciplinary exchange and technical know-how, particularly on vegetation establishment relating to soils and hydrology and allied issues. This includes the appropriate use of existing soil information at national and European levels to support land use planning and the efficient and appropriate use of water.*"

Plate 2: Establishing small oases in the Negev Desert of Israel. Using native species improves microclimate and benefits other flora and fauna. Additional water flows to this lower lying area when sufficient rain falls. Mean annual precipitation 100 mm.

The five WGs include:

WG1: Understanding Land Degradation and Causality: The Bigger Picture and Focus on Europe: An Analytical and Remedial Think-Tank.

WG2: Traditional and Innovative Systems: Focus on Soils and Hydrology, A Creating and Designing Think-Tank.

WG3: Traditional and Innovative Systems: Focus on bioprocesses (including plants, ecology, plant physiology and mycorrhizzal fungi), A Creating and Designing Think-Tank.

WG4: Focus on Land Management; Creating and Designing Think-Tank.

WG5: Knowledge Transfer, Outreach and Training.

Although the Action has an emphasis on Europe and particularly southern Europe, as well as North Africa, the design of the Project is to be inclusive and to gather data and to facilitate outreach to stake-holders of arid areas around the world. The Action welcomes links to and co-operation and participation with members of the ESSC and other organisations. This four-year project has at its core programmes for learning, particularly for Early Stage Researchers (ESRs) and there is potential for Ph.D. students and Post-Doctoral Researchers to attend Training Schools (TSs) and Short Term Scientific Missions (STSMs). These will be advertised on the COST 'Arid Lands and Combat of Desertification' website at: **http://www.cost.eu/domains_actions/essem/Actions/ES1104**

This website is regularly updated. Please contact Benz for more information and how it may be possible to link in and participate with this exciting and timely project.

E-mail: **B.Kotzen@greenwich.ac.uk**

THE NEWSLETTER AND SUPPORTING Ph.D. RESEARCH

Editor's note:

At the ESSC Council meeting in Lleida (Spain) in September 2006, the interactions between the ESSC and younger soil scientists were discussed (see Newsletter 2006/3, p. 5-8). It was decided that the ESSC should be more proactive in its support of younger scientists. As part of that initiative, we welcome articles from both Ph.D. researchers and supervisors. We would like to hear from recent Ph.D. graduates; what advice and experience do you have which you would like to share with your colleagues in earlier stages of their research? We would also like to hear from current Ph.D. researchers; what are the factors which both encourage and limit progress? What are the particular challenges facing part-time Ph.D. researchers? We also invite contributions from experienced Ph.D. supervisors. What experience would you like to share with less experienced colleagues? If you are a less experienced Ph.D. supervisor, what supervisory issues do you find challenging? In short, please tell us "what I know now, which I wish I knew then!"

Editor's note:

The citation details of Ph.D. theses by ESSC members since and including 2004 have been added as an additional page to the ESSC web site. To date, 50 Ph.D. theses are quoted. On the ESSC web site, please look under 'Publications.' Please forward the citation details of any additional Ph.D. thesis completed since the year 2000 by an ESSC member to any of the Editorial team. We will then add the thesis citation details to the web site.

RECENT PUBLICATIONS BY ESSC MEMBERS

Included are the citation details of papers and books produced by ESSC members. These provide a growing resource for exchange of valuable information to both research and teaching. The cumulative citation list is being added to and updated on the ESSC web site. Students of ESSC members (both undergraduate and postgraduate) are increasingly accessing this facility in their literature searches. Currently, the number of quoted publications cited on the web page is 630. Please e-mail the citation details of papers in international refereed journals since and including the year 2000 to any member of the Editorial team.

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SHORT BIOGRAPHIES OF THE NEW ESSC EXECUTIVE COMMITTEE (Part 3)

Four biographies of national representatives on the ESSC Committee are presented. Subsequently, we will publish the biographies of all remaining national representatives on the ESSC Committee.

SHORT BIOGRAPHIES OF ESSC NATIONAL REPRESENTATIVES

Anna María Ágústsdóttir
(National Representative for Iceland)
Gunnarsholt, Iceland

Anna María Ágústsdóttir is a Senior Researcher at the Soil Conservation Service of Iceland. Anna María has conducted research on wind erosion and been involved as policy advisor for conservation and restoration of soil and vegetation in Iceland. Anna María has a Master of Science (MS) degree from Pennsylvania State University, USA, where she conducted research on volcanic degassing estimates of long-term heat and volatile fluxes from the sub-glacial volcano Grímsvötn in Iceland. Anna María was awarded the degree of Ph.D. in Geosciences from Pennsylvania State University. There she worked with Dr Richard B. Alley on abrupt climate changes, investigating the effects of North Atlantic deep-water formation using a global climate model and comparison with palaeoclimatic data from events of the Younger Dryas (the cold event of 8200 years BP) to the present day. Current research interests include monitoring wind erosion and dust emission of natural aerosols, natural hazard and disaster risk reduction in Iceland, the impact of climate change and mitigation actions, sustainable land use and improved governance of soil and natural resources.

Anna María has been appointed as a national expert for several projects, such as Iceland's current accession negotiations with the European Union. She is also a national representative to the European Environment Agency.

E-mail: **annamaria@land.is**

Frank Glante (National Representative for Germany)
Dessau-Rosslau, Germany

Frank Glante studied biology at the Humboldt University in Berlin, with a major in plant physiology. From 1984 to 1991 he co-operated on various projects on the use of bacterial and fungal symbioses in agriculture at the Müncheberg Research Centre for Soil Fertility (www.ZALF.de). Frank earned his doctorate in 1988 on 'The selection, propagation and application of arbuscular mycorrhizal fungi on maize and lucerne.' Frank has been a Research

Associate of the Federal Environment Agency since June 1991, and Head of the 'Soil Quality, Soil Monitoring' Section since November 1992. Frank became Head of the Soil Protection Commission (KBU) Office in January 2007.

Frank in Kathmandu (Nepal) in 2010.

For more information, please visit:
http://www.umweltbundesamt.de/boden-und-altlasten-e/index.htm

E-mail: **frank.glante@uba.de**

Jane Rickson (National Representative for the UK)
National Soil Resources Institute, Cranfield, UK

Jane Rickson was appointed Professor of Soil Erosion and Conservation, within the National Soil Resources Institute of Cranfield University (UK), in 2007. She is an applied geomorphologist by training, specialising in soil science and management, natural resource management and land use planning. She has over 26 years of scientific experience in the fields of soil and land degradation processes (especially soil erosion); soil conservation and slope stabilization using agronomic, engineering and soil tillage practises; soil erosion hazard and risk assessment; the economic, social and environmental impacts of land degradation; evaluation of erosion control products (e.g. geotextiles, soil conditioners); experimentation in erosion research, especially the use of rainfall simulators, and soil management policy. Field experience includes the monitoring of soil erosion, using experimental plots and rainfall simulation. Jane has over 20 years of experience in research project management for Government and private sector clients, including UK Government Departments (Department for the Environment, Department for Food and Rural Affairs, and the Environment Agency); the European Commission; the EU LIFE Programme; UNCTAD and Syngenta. She has extensive administrative, personnel, financial and technical experience.

Jane with 'unorthodox' surveying equipment for measuring gully volume in potato fields in Herefordshire, UK.

Current projects include 'Soil Strategies to Inform Soil Protection Policy,' 'The Total Costs of Soil Degradation,' 'Cost Effective Monitoring of Soil Erosion in England and Wales' and 'Soil Quality Indicators: Physical Properties.' Current overseas work includes the use of natural fibre geotextiles (including jute, coir and wood) in environmental projects in India and Bangladesh. Jane is a Chartered Environmentalist, and a Fellow of the UK Institution of Agricultural Engineers and of the Higher Education Academy. She is also a member of the International Erosion Control Association (IECA). Jane acts as referee to many international journals and is author or co-author to over 100 publications in peer reviewed journals and scientific books.

For more information, please visit:
http://www.cranfield.ac.uk/sas/aboutus/staff/ricksonj.html

E-mail: **j.rickson@cranfield.ac.uk**

Per Schjønning
(National Representative for Denmark)
Foulum, Denmark

Per Schjønning (PSC) is a soil physicist from Aarhus University, Denmark. He graduated with a M.Sc. in Agronomy (Soil Physics) from the Royal Veterinary and Agricultural University in Copenhagen in 1980. PSC was the main actor in the creation of a soil physical laboratory in the former Danish Institute of Plant and Soil Science, which is now merged with Aarhus University. In that context, he invented new techniques and modified existing methods for the characterization of soil physical properties. These include methods for gas diffusivity, thermal conductivity, uniaxial confined compression, torsional shear strength, and micro-relief topography quantification in field studies of water erosion.

PSC has covered a wide range of research topics. The focus area generally relates to soil quality of managed ecosystems, especially soil physical properties and functions as related to soil productivity and environmental impacts. More specifically, research topics include: Soil structural stability (clay dispersibility, aggregate strength, bulk soil mechanical strength); Gas diffusion and air permeability; Pore characteristics in relation to gas- and water flow in soil; Self-organization in

the soil-microbe system; Soil abiotic conditions affecting microbial and chemical processes in soil; Management effects on soil structure (e.g. soil tillage, crop rotation, fertilization); Soil tillage; and Soil compaction (processes and modelling).

PSC has served as the primary investigator for numerous national and international research projects focusing on soil properties in managed soils. Currently he chairs an international research project 'POSEIDON' (www.poseidon-nordic.dk) focusing the long-term impacts of subsoil compaction on soil functions and ecosystem services. Another current task is the creation of an online decision support system for minimizing subsoil compaction, which takes place in the context of an international project 'PredICTor,' with the participation of Finland, Switzerland and Denmark (EU ERA-NET, ICT-AGRI).

PSC has supervised several Ph.D. students and serves as a peer reviewer for several research journals. He has authored over 250 publications of which (as of June 2012) 90 are in international refereed journals, 21 are national peer-reviewed papers, 10 are book chapters, and over 80 are conference papers. PSC edited an international book on soil quality in relation to soil management (CAB International, 2004) and wrote a report (2009) on threats to soil quality in Danish agriculture, reviewed within the context of the upcoming EU Soil Framework Directive.

E-mail: **Per.Schjonning@agrsci.dk**

ANNOUNCEMENTS

Re-launch of the Soil Erosion Discussion List

The SE-LIST (the Soil Erosion Discussion List) has been re-launched. It was started in 1993 as a forum for discussion on any topic related to soil erosion (see Bernsdorf and Favis-Mortlock, 1995). The list was originally hosted by the University of Trier, Germany. It then went through several changes before Mark Nearing (USDA-ARS) agreed to run it. During Mark's term of office, the list was hosted at Purdue University, Indiana, USA. It grew into a useful global resource for information exchange, discussion and debate.

In 2011, Mark decided to give up running the list, and pass it to someone else. I agreed to take it on. It has taken a while to get the list set up here in Oxford University (UK), but it is now operational once again. However, it has not been possible to copy the list of subscribers from the Purdue hosting. Thus, members of the old SE-LIST will usually need to re-subscribe.

How to use the List

To unsubscribe or subscribe, or check who is subscribed, send an e-mail to:
ouce-soil-erosion-help@maillist.ox.ac.uk.

You will be sent a return e-mail with a list of instructions.

As before, SE-LIST is intended to be a low-volume list. Based on past experience, I envisage just a few e-mails per week. SE-LIST will not clog your inbox!

The formal name of SE-LIST is now **ouce-soil-erosion@maillist.ox.ac.uk** (sorry about the rather long name: it was not my choice!) To post to the list, please send an e-mail to:
ouce-soil-erosion@maillist.ox.ac.uk.

Your e-mail will then be sent to all list members. You can only do this if you are subscribed to the list, of course.

If you have any problems posting to the list, e-mail me at:
ouce-soil-erosion-owner@maillist.ox.ac.uk.

I hope that SE-LIST will again prove useful!

Acknowlegements

Sincere thanks to Mark Nearing for running the previous version of SE-LIST so well! Thanks also to Oxford University for hosting the current version of the list.

Reference

Bernsdorf, B. and Favis-Mortlock, D.T. (1995). SE-LIST (the Internet Soil Erosion Discussion List): growth and activity in the first year. ESSC Newsletter 1995/4, 6-10.

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Oxford University Environmental Change Institute: www.eci.ox.ac.uk

ESSC MEMBERSHIP LIST AND CONTACT DETAILS

Web Based Bulletin Board

The ESSC wishes to rapidly disseminate information to its members. Please forward information to the ESSC web site to be placed on our ESSC Bulletin Board. These could include searches for potential collaborators for research proposals, calls for research proposals, job opportunities, research studentship opportunities, impending conferences and other items of important information for rapid dissemination. Of course, we will also continue the regular circulation of information via our Newsletter. The ESSC web site is:
http://www.essc.sk

ESSC MEMBERSHIP LIST AND CONTACT DETAILS

The full ESSC membership list is held on the ESSC web site. Under 'members' you can obtain a full listing. Also under 'members' you can click on any member country and find a listing of members in the selected country.

We are trying to keep the membership list on the web site up-to-date. Please check your details and let us know if there are any necessary correction(s). If your details change, also please let us know. Some members have requested that we do not add their e-mail addresses to the web site, to avoid uninvited 'spam' e-mails. Of course, we respect this request. Therefore, while we retain a list of the e-mail addresses of ESSC members, this list will not be available on the web site.

Editorial matters in Bratislava are handled by Ing Karol Végh. In terms of membership lists, contact details and the ESSC web site, please send updated information to Karol at:
E-mail: **k.vegh@vupop.sk**

Please also use and refer to the **'Directory of European Organizations and Persons Working on Soil Protection'** as a reference source for European colleagues, both members and non-members of the ESSC. This publication contains the e-mail addresses of most ESSC members and will be subject to periodic updates. The reference citation is:

Rubio, J.L., Imeson, A.C., Bielek, P., Fullen, M.A., Pascual, J.A., Andreu, V., Recatala, L. and Ano, C. (2006). **Directory of European Organizations and Persons Working on Soil Protection.** Soil Science and Conservation Research Institute, Bratislava, 190 pp. (plus CD-Rom).

Editor's Note
Developments at the Soil Science and Conservation Research Institute (SSCRI), Bratislava

On 1 July 2012, Dr Radoslav Bujnovský left his post at SSCRI, Bratislava. On behalf of the ESSC, the ESSC Executive Committee thanks Radoslav for his hard work and dedicated service handling ESSC editorial and publishing matters in Bratislava. We offer Radoslav our best wishes for the future!

General responsibility for ESSC publications (desktop publishing, printing, final booklet processing and the ESSC web site) lies with Ing. Karol Végh. We thank Karol for his continued support for ESSC publication activities.

In May 2012, Associate Professor Dr Jaroslava Sobocká was appointed the new Director of the Institute. Jaroslava will take responsibility for the ESSC Newsletter.

FORTHCOMING DATES FOR YOUR DIARY

7TH INTERNATIONAL SYMPOSIUM ON SOIL MINIMUM TILLAGE SYSTEMS, CLUJ-NAPOCA, ROMANIA, 2-3 MAY 2013

Dear Colleagues

I have pleasure in inviting you to the scientific Symposium **Soil Minimum Tillage Systems** to be held at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, from 2-3 May 2013. The Symposium will provide an ample opportunity for debate concerning the present and the future of soil tillage systems, for the promotion of the latest achievements in the field, innovative creativity and developing partnerships with a view to implementing European projects and programmes.

Please visit the Conference website:
http://www.usamvcluj.ro/SMDT/symposium2013/index.php

The scientific Symposium **Soil Minimum Tillage Systems** is organized at USAMV Cluj-Napoca, Faculty of Agriculture, Research Centre for Minimum Tillage Systems and Sustainable Agricultural Technologies. The Centre brings together leading figures from academia and research institutions, as well as specialists, students and farmers. The Symposium aims to present the latest scientific findings on issues of research, innovation and agro-technical development, displaying rational solutions with practical applicability on agricultural holdings faced with practical situations generated by economic, technical and professional training needs.

Co-organizers of the Symposium include the Academy of Agricultural and Forestry Sciences 'Gheorghe Ionescu Sisești,' Cluj-Napoca Branch; Research Station, Agricultural Development Turda; the Romanian National Society of Soil Science (Transylvania Branch) and the Soil and Agrochemical Studies Office Cluj-Napoca.

Best wishes

Professor Dr Teodor Rusu
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University of Agricultural Sciences and Veterinary Medicine
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This work is supported by CNCS – UEFISCDI, Project number PN-II-ID-WE-2012-4-092/2012.

International Association of Geomorphologists

Romanian Association of Geomorphology

European Society for Soil Conservation

'Al. I. Cuza' University of Iasi, Department of Geography, Romania

6TH INTERNATIONAL SYMPOSIUM ON GULLY EROSION IN A CHANGING WORLD (6TH ISGE), IASI, ROMANIA, 6-12 MAY 2013

Dear Colleagues

We are pleased to invite you to join the **'6th International Symposium on Gully Erosion in a Changing World (6th ISGE),'** scheduled to be held in Iasi, Romania, from 6-12 May 2013. This Symposium continues the sequence of successful Symposia held in Leuven (Belgium, 2000), Chengdu (China, 2002), Oxford (USA, 2004), Pamplona (Spain, 2007) and Lublin (Poland, 2010). The Conference will be held at the 'Alexandru Ioan Cuza' University of Iasi, located in the Moldavian Plateau of Eastern Romania.

This Symposium targets all scientists undertaking research on gully erosion and embraces national and international studies and established newly initiated investigations. The objectives of the Symposium are to communicate exciting scientific developments, to identify current gaps in knowledge and to discuss ways in which soils and land can be better managed to meet the challenge of protecting the environment against the impacts of climate change and increased human-induced pressure.

We encourage you to contribute an oral or poster presentation to the 6th ISGE in 2013. Deadline submission of the abstracts is 30 November 2012. Please note that there is preliminary interest in preparing a special issue to be published in 'Natural Hazards' (a Springer Journal).

The main Symposium topics include: Advances in measurement techniques; Gully erosion processes; Gully development and rates; Gully erosion models and Gully erosion control.

Full details are available at:
www.gullyerosion2013.com

You are kindly requested to bring this information to the attention of colleagues.

We look forward in seeing you in the City of Iasi, Romania!

Professor Dr Ion Ionita
'Alexandru Ioan Cuza' University of Iasi
Department of Geography
Carol I Blvd. No. 20 A
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Tel: 00 40 232 201483 (Office)
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E-mail: **ion.ionita72@yahoo.com**

SCS Iceland

Landbúnaðarháskóli Íslands
Agricultural University of Iceland

UNITED NATIONS UNIVERSITY
UNU-LRT
Land Restoration Training Programme

SOIL CARBON SEQUESTRATION
A SOLUTION FOR CLIMATE, FOOD SECURITY AND ECOSYSTEM SERVICES
ICELAND, 27-29 MAY 2013

FIRST ANNOUNCEMENT

Sponsored by: Soil Conservation Service of Iceland, Agricultural University of Iceland, University of Iceland, UNU-Land Restoration Training Programme, European Society for Soil Conservation, EC-Joint Research Centre, Global Soil Partnership, SoilTrec, and FSC-Sink Network

The aim of this Conference is to highlight the growing importance of conserving and restoring soil organic carbon for multiple 'win-win' benefits within various land systems. Carbon has a crucial role in soil fertility, and hence for food security, nutrient and water retention, biodiversity and ecosystem services. The Conference will review our state of knowledge and identify where further research is needed. Discussed topics will include land use and land restoration practises that enhance SOM, how to verify carbon sequestration, and linkages with UN-FCCC and other global goals, agreements and negotiations. The question of how to increase the flow of climate linked funding for restoration of soil and land quality will also be explored.

Iceland provides an appropriate setting for such a meeting. With over a century of experience in battling land degradation, Iceland offers excellent examples of how carbon sequestration can be an integral component in mitigating severe land degradation, restoring land quality and combating climate change.

On Sunday 26 May there will be an optional field excursion with opportunities to examine carbon sequestration issues, land degradation and restoration of land quality within the beautiful landscapes of Iceland. For the Conference days (27-29 May), papers and posters are welcome which address the various aspects of soil carbon sequestration. The Conference will be followed by a training course for Early Stage Researchers organized by the FP7 Environment funded SoilTrEC Project.

A circular with further information will be sent out soon. In the meantime, please fill out and send us the 'Expression of Interest in Participation' form below.

Andres Arnalds
On behalf of the Organizing Committee
Soil Conservation Service of Iceland.

LINKING SCIENCE, POLICY AND ACTION

Expression of Interest in Participation

CONFERENCE AND FIELD EXCURSION IN ICELAND: 2013

SOIL CARBON SEQUESTRATION
A SOLUTION FOR CLIMATE, FOOD SECURITY AND ECOSYSTEM SERVICES
SCIENCE, POLICY, ACTION

26-29 May 2013

SOIL CONSERVATION SERVICE OF ICELAND, AGRICULTURAL UNIVERSITY OF ICELAND AND EUROPEAN SOCIETY FOR SOIL CONSERVATION (ESSC)

(Please return this form at your earliest convenience via e-mail to: **arna@land.is**)

First name:.....

Family name .....

Address: .....

.....

Contact e-mail:.....

Fax: ..... Telephone:.....

Position, Department (or unit), and Institution:.....

.....

.....

Are you interested in the optional pre-tour on 26 May? .....

Do you plan to present a scientific paper at the Conference 27-29 May?

If yes, oral or poster presentation?.....

Would you like more information on the SoilTrec Training Course for Early Stage Researchers

30 May–2 June?.....

Comments (optional):.....

.....

(Note that this is not a formal registration, but intended to aid us in sending you more information, planning the Conference and reserving sufficient hotel space for participants).

8th International Conference on Geomorphology of the International Association of Geomorphologists (IAG) on 'Geomorphology and Sustainability,' 27-31 August 2013, Paris (France)

The International Association of Geomorphologists (IAG/AIG) is a scientific, non-governmental and non-profit organisation, whose principal objectives are the development and promotion of geomorphology as a science through international co-operation and the dissemination of knowledge of geomorphology. The IAG/AIG was founded at the 'Second International Conference on Geomorphology' in Frankfurt am Main (Germany) in 1989 in order to strengthen international geomorphology. IAG/AIG fulfils its aims through the establishment of working groups and task forces, organization of conferences, publication activity and information exchange. Membership of the IAG/AIG is normally by countries. At present, 58 countries are affiliated to the IAG/AIG through their National Scientific Members. The activity of the IAG/AIG is steered by its Executive Committee.

The 8th International Conference on 'Geomorphology of the International Association of Geomorphologists (IAG)' will take place in Paris at the 'Cité des Sciences de La Villette' from 27-31 August 2013. The main topic of this 8th Conference is 'Geomorphology and Sustainability.'

The Conference is organized by the 'Groupe Français de Géomorphologie (GFG)' and is open to all scientists and practitioners. The Conference will include 26 scientific sessions, four key-note lectures and one Workshop devoted to Young Geomorphologists. Before, during and after the Conference, about 20 field trips in various parts of France and neighbouring countries will be available to participants.

You are all most welcome to attend this major event in late August 2013!

Further information is available on the Conference website, which is regularly updated:

http://www.geomorphology-iag-paris2013.com/

RENDEZ-VOUS IN PARIS!

Planned sessions include:

S1. History and epistemology of geomorphology.
S2. Geomorphology and earth system science (IAG-WG).
S3. Planetary geomorphology (IAG-WG).
S4. Mega-geomorphology.
S5. Tectonic geomorphology (including neotectonics and palaeoseismology).
S6. Volcanic geomorphology: towards a quantitative assessment of volcanic landforms, processes and hazards.
S7. Magnitude and frequency in geomorphology including:
- S7A: Extreme events in geomorphology (IAG-WG).

S8. Geomorphic processes and long-term landscape evolution.
S9. Rock control on geomorphic processes and landforms including:
- S9A: Sandstone geomorphology (Danxia IAG WG), extended to quartzites.
- S9B: Karstic geomorphology: from hydrological functioning to palaeoenvironmental reconstruction.

S10. Quaternary geomorphology (including FLAG, GLOCOPH and PAGES-LUCIFS).
S11. Geomorphology and global environmental change.
S12-16. Anthropocene geomorphology.
- S12. Geoarchaeology (IAG-WG).
- S13. Human impacts on landscapes (IAG-WG).
- S14. Geomorphic hazards, risk management and climate change impact (IAG-WG).
- S15A: Anthropogenic drivers of cultural stone deterioration and conservation.
  – S15B: Geomorphosites (IAG-WG) including geoparks and WHS.
  – S15C: Managing landscape dynamics in protected areas.
  – S15D: Teaching and disseminating geomorphology.
- S16. Forum francophone: la géomorphologie au service du développement durable.

S17. Geomorphology and the Critical Zone (including weathering, soils and biogeomorphology).
S18. Hillslope processes and mass movements (including CERG sub-session).
S19. Fluvial geomorphology and river management including:
- S19A: Large rivers (IAG-WG).
- S19B: Small catchments (IAG-WG).
- S19C: Other subsessions (e.g. river management and restoration).

S20. Sediment budgets (IAG-WG covering all environments).
S21. Coastal geomorphology and management including:
- S21A: Reef forms (IAG-WG).
- S21B: Rocky coasts (IAG-WG).
- S21C: Other subsessions.

S22. Submarine geomorphology.
S23. Aeolian systems and arid geomorphology (including sub-arid margins).
S24. Tropical geomorphology.
S25. Cold region geomorphology including:
- S25A: Glacial and paraglacial geomorphology.
- S25B: Permafrost and periglacial geomorphology (in co-op. with IPA).
- S25C: Mountain geomorphology.

S26. Methods in Geomorphology including:
- S26A: Modelling in geomorphology.
- S26B: Remote sensing (including laser scanning and applications of radar).
- S26C: DEM, GIS and spatial analysis.
- S26D: Statistics in geomorphology.
- S26E: Dating methods (including cosmogenic nuclides).
- S26F: Applied geomorphological mapping (IAG-WG).

S27. Young Geomorphologists Session.
S28. Open session.

INTERNATIONAL SYMPOSIUM ON
SOIL FORMING FACTORS AND PROCESSES
FROM THE TEMPERATE ZONE:
TERROIRS, VINEYARDS AND WINES
20-22 SEPTEMBER 2013

Field application in Romania and the Republic of Moldova: Relations between terroir-vineyards and the specificity of wines

Organizers
Romanian Academy, Iaşi, Romania, Collective of Geography.
Chair UNESCO 'Culture et Tradition du Vin,' Université de Bourgogne, Dijon, France.
Department of Geography, Alexandru Ioan Cuza University of Iasi, Romania.
The State University of Moldova.
Romanian Society of Geography.

Invitation
It is our pleasure to invite you to participate in the scientific work of the 22nd International Symposium on 'Soil Forming Factors and Processes from the Temperate Zone.' This Symposium will take place in Iaşi (Romania) on 20-22 September 2013.

The programme of the Symposium includes:
20 September: Communications session (Faculty of Geography and Geology, Amphitheatre B8).
21-22 September: Field applications in eastern Romania and the Republic of Moldova (passport required).

Organizing Committee
Professor Constantin Rusu, Ph.D.
Professor Jocelyne Perard, Ph.D.
Professor Eugen Rusu, Ph.D.
Professor Gheorghe Jigau, Ph.D.
Teaching Assistant Ionut Vasiliniuc, Ph.D.

All information concerning accommodation and costs will be made available in the Second circular, and on the site of our journal: **www.soilscience.ro.**

Contacts:
Ionut Vasiliniuc
E-mail: **vasiliniucionut@yahoo.com**
Tel: 00 40 743029112.

Professor Eugen Rusu
E-mail: **ruseug552003@yahoo.fr**
Tel: 00 40 744755627.

Summary of forthcoming conferences

Information on forthcoming conferences will be presented both in the ESSC Newsletter and on the ESSC web site. Below are the essential details of forthcoming conferences which have already been announced in the ESSC Newsletter.

Our thanks to Professor Jean Poesen (Leuven, Belgium) for this helpful suggestion.

2nd SUSTAINABLE WATERSHED MANAGEMENT CONFERENCE (SuWaMa 2013)
22-25 April 2013, Hilton Dalaman, Sarigerme, Turkey
Conference web site:
http://www.igemportal.org/?Dil=1&SID=689
Registration can be arranged online:
http://www.igemportal.org/?Dil=1&SID=690

XVII Conference of the International Soil Conservation Organization (ISCO): Environmental Sustainability through Soil Conservation,'
8-12 July 2013, Medellin, Colombia (South America)
Further information is available from:
Susana Salazar (ISCO Secretary): **ssalazar2@alaska.edu**
Luz Marina Otalora (Executive Secretary of the 'Sociedad Colombiana de Ciencias del Suelo'): **scsuelo@cable.net.co**
Ildefonso Pla Sentis (ISCO Board of Directors): **ipla@macs.udl.cat**
The Second Circular (containing comprehensive Conference details) is available on the ESSC web site.

Reminder for the next issue

Articles, reports, letters, views or comments on any aspect of soil erosion and conservation in Europe are always welcome.

We invite proposals for special thematic issues of the Newsletter. We also welcome any comments on the ESSC Newsletter and suggestions on how it can be improved and developed.

Do not forget to send in your details of the following information:

(i) Reviews of recent conferences.
(ii) Recent grant awards.
(iii) The citation details and abstracts of completed Ph.D. and M.Sc. theses.
(iv) Newly enrolled Ph.D. research students, title of their research topic and names of research supervisors.
(v) Recent staff institutional movements/promotions.
(iv) A reference list of your 'new' international refereed scientific journal papers, which have been published recently (since and including the year 2000).
(v) At the ESSC Council at Průhonice (Czech Republic) in June 2009, it was agreed that the Newsletter will present a series of national reports on soil erosion and soil conservation activities in individual European countries. If you would like to volunteer a contribution, please contact any member of the Editorial team.

Send these details to either:
Professor Mike Fullen: **m.fullen@wlv.ac.uk**
or
Dr Colin Booth: **colin.booth@uwe.ac.uk**
and they will include this information in the next issue.

PLEASE NOTE:
We publish two Newsletter issues per year. The deadlines are:
1 March and 1 September.

Some Closing Thoughts

The following three verses are a selection of translated ancient songs (ballads) of the Hani minority people of Yuanyang, Yunnan Province, south-west China. The Hani are world-famous as the builders and guardians of the rice terraces of Yuanyang. Until recently, the Hani had no written language. These ballads were collated by Hongzhen Zhang, based on meetings with the Mopi (elders of the Hani). The verses were abstracted from:
Hongzhen Zhang (2010).
Interpretations of the Hani Seasonal Production Ballads.
Yunnan Press Group Company and Yunnan Art Press Company, Kunming, 248 pp.
(ISBN 978-7-5489-0034-4)

Rules and regulations were set by the ancestors,
And the calendar was figured out by the ancestors.
Ancestral saying is as rare as oil extracted from stone,
As important as arteries to a living creature.

Water and fish coexist happily in the river,
As close as brother and sister.
The eldest brother should inherit the ancestral saying.
And the rules and regulations were taught by the aged.
If the eldest brother does not convey the ancestral sayings,
The next generation has no way to know;
If the aged do not pass down the rules and regulations,
The future generations have no idea about them;
The ancestral rules and regulations were firmly set like the mature walnut in July,
And the advice of the ancestors is as plain as mature bamboo leaves in October.

Pleasant words should not be confined in your heart,
And delicious foods should not be left in the bottom of the bowl;
If pleasant words remained unspoken,
They will become loam with the death of the man;
If delicious foods are kept in the bottom of the bowl,
They turn rancid with the passing of time.

"Upon this handful of soil our survival depends. Husband it and it will grow our food, our fuel and our shelter and surround us with beauty. Abuse it and the soil will collapse and die, taking humanity with it."
(The Vedas, Ancient Vedic Sanskrit scripture of India, circa 1500 BC)

"Earth turns to gold in the hands of the wise." *(Jalel al-Din Rumi, 1207 – 1273)*

"While the farmer holds the title to the land, actually it belongs to all the people because civilization itself rests upon the soil." *(Thomas Jefferson, 1743 – 1826)*

"…as the springs return
regardless of time or man –
so is HOPE!
Sometimes but a tiny bud
has to push up
through the hard shell
of circumstance
to reach the light
of accomplishment.
Do not give up HOPE!"
(Dorothy Miller Cole)

"Go within every day and find the inner strength so that the world will not blow your candle out."
(Katherine Dunham)

"Be far away, far away from the world of chaos and misery, live in it, untouched… The meditative mind is unrelated to the past and to the future and yet is sanely capable of living with clarity and reason."
(Jiddu Krishnamurti, 1895 – 1986).

"The most vital time to relax is when you don't have time for it." *(David Baird, 2000)*

"No passion in the world is equal to the passion to alter someone else's draft."
(H. G. Wells, 1866 – 1946)

"A professor is one who talks in someone else's sleep." *(W. H. Auden, 1907 – 1973)*

AIMS OF THE SOCIETY

The ESSC is an interdisciplinary, non-political association, which is dedicated to investigating and realizing soil conservation in Europe. The ESSC pursues its aims in the scientific, educational and applied sectors by:

Supporting investigations on soil degradation, soil erosion and soil conservation in Europe.

Informing the public about major questions of soil conservation in Europe.

Collaborating with institutions and persons involved in practical conservation work in Europe.

The ESSC aims at co-ordinating the efforts of all parties involved in the above cited subjects: research institutions; teachers and students of geosciences, agriculture and ecology; farmers; agricultural planning and advisory boards; industries and government institutions.

ZWECK DER VEREINIGUNG

Die ESSC ist einer interdisziplinäre, nicht politische Vereinigung. Ihr Ziel ist die Erforschung und Durchführung des Schutzes der Böden in Europa. Die ESSC verfolgt dieses Ziel auf wissenschaftlichem, erzieherischen und angewandtem Gebiet:

Durch Unterstützung der Forschung auf den Gebieten der Boden-Degradierung, der Bodenerosion und des Bodenschutzes in Europa.

Durch Information der Öffenlichkeit über wichtige Fragen des Bodenschutzes in Europa.

Durch Zusammenarbeit mit Institutionen und Personen, die an der Praxis des Bodenschutzes in Europa beteiligt sind.

Die ESSC will alle Personen und Institutionen zusammenführen, die sich für die genannten Ziele einsetzen: Forschungsinstitutionen, Lehrer und Studenten der Geowissenschaften, der Landwirtschaftswissenschaften und der Ökologie, Bauern, landwirtschaftliche Planungs- und Beratungsstellen, Industrieunternehmen und Einrichtungen der öffentlichen Hand.

BUTS DE L'ASSOCIATION

L'ESSC est une association interdisciplinaire et non politique. Le but de l'association est la recherche et les réalisations concernant la conservation du sol en Europe. L'ESSC poursuit cette finalité dans les domaines de la recherche scientifique, de l'éducation et de l'application:

En encourageant la recherche sur la dégradation, l'érosion et la conservation du sol en Europe.

En informant le public des problemes majeurs de la conservation du sol en Europe.

Par la collaboration avec des institutions et des personnes impliquées dans la pratique de la conservation du sol en Europe.

L'ESSC souhaite favoriser la collaboration de toutes les personnes et institutions poursuivant les buts définis ci-dessus, en particulier: institutions de recherche, professeurs et étudiants en géosciences, des agriculteurs, des institutions de planification et des conseil agricole, de l'industrie, et des institutions gouvernementales.

OBJECTIVOS DE LA SOCIEDAD

La ESSC es una asociación interdisciplinar, no-politica, dedicada a la investigación y a la realización de acciones orientadas a la conservación del suelo en Europa. La ESSC persigue sus objectivos en los sectores cientificos, educacionales y aplicados, en al ámbito europeo:

Promocionando la investigación sobre degradación, erosión y conservación de suelos.

Informanto al público sobre los principales aspectos de conservación de suelos.

Colaborando con instituciones y personas implicadas en la práctica de la conservación de suelos.

La ESSC aspira a coordinar los esfuerzos, en los temas arriba mencionados, de todas las partes implicadas: centros de investigación, profesores y estudiantes de geo-ciencias, agricultura, selvicultura y ecología, agricultores, servicios de extensión agraria, industrias e instituciones gubernamentales.

Visit the ESSC Website: http://www.essc.sk

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- One year € 25.00
- Three years € 70.00

Institutional Membership € 15 per member per year.

Institutional membership involves the payment of a flat rate of € 15 (per member per year) for institutes/societies with at least 10 members. This fee is irrespective of the country.

Members of the specific institute or society would be full members of the ESSC and receive the ESSC Newsletter.

Students:

50 % reduction on above rates for three years
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Please send this form to: ESSC Treasurer, Professor Dr Wim Cornelis
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Wim.Cornelis@UGent.be