

世界著名水土保持专家, 意大利巴勒莫大学教授Carmelo Dazzi先生论: 土壤基因侵蚀: 一个基于新环境挑战和新土壤范式的新概念



摘要: [目的] 为了使政治家和行政管理人员更加关注土壤资源的保护, 作者提出了一个土壤侵蚀新概念和新视角, 旨在为土壤侵蚀防治和生态环境保护提供新的思路。[方法] 通过提出建议, 解释概念, 实例研究和总结归纳的方法创建土壤侵蚀新概念。[结果] 建议将经济价值赋予土壤服务功能, 并提出了“土壤基因侵蚀”这一新概念。[结论] 土壤是一种多样化的自然资源, 维护良好的土壤健康状态, 必将会对区域社会经济系统产生积极的影响和推动作用。

关键词: 土壤基因侵蚀; 生态环境保护; 自然资源; 经济价值

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Soil Genetic Erosion: A New Concept for a New Environmental Challenge and a New Soil Paradigm

—Commented by Mr. Carmelo Dazzi, Professor at University of Palermo, Italy,
A World Renowned Scientist of Soil and Water Conservation Research

Abstract: [Objective] The author proposes a new concept of soil erosion to shed new light on soil erosion and ecological environment conservation in order that politicians and administrators could pay great attentions to preserve soil resources. [Methods] A new concept of soil erosion is suggested by proposing ideas, explaining concepts, summarizing and case studies. [Results] The “economic value” should be assigned to the soil ecosystem services and the new concept of soil erosion that could be called “soil genetic erosion” is proposed. [Conclusion] Soils are very diverse natural resources that positively affect and promote the economy of the social systems if they are maintained in good health.

Keywords: soil genetic erosion; ecological environment conservation; natural resource; econmic value

The history of soil science highlights that this discipline has tended to leap forward most significantly when a crucial event or significant social pressure drives researchers to focus attention on a specific challenge, or on a few of them. For instance, the 1930s Dust Bowl Drought on the US Great Plains was an environmental crisis with failure of agricultural systems, landscape denudation, and elevated atmospheric dust loads. The public concern associated with the Dust Bowl caused a significant research effort and major soil conservation programs to be launched and the

creation of the US Soil Conservation Service. In Europe, in response to an increased consciousness on soil erosion dangerousness, the European Society for Soil Conservation was founded on November 4, 1988. Soil erosion is a very hot issue in the database, and many related articles are published every year. To shed a new light on soil erosion and ecological conservation, and to identify the key challenges faced by soil erosion and particular ecotones characterized by pedotechnique applications to increase the farmers’ income, we should consider a new concept of soil erosion that

should be called “soil genetic erosion” .

1 The Concept of Soil Genetic Erosion

Soils are living systems as well as animals and plants. When living systems decrease, the biodiversity declines and may diminish the human wellbeing linked to the services that ecosystems can provide for people.

These are the premix of the great problem of the erosion of the genetic resources and, by extension, of the concept of “soil genetic erosion”! When soil diversity decreases, also soil security and its ability to provide ecosystem services decreases. In this case, we can refer to “soil genetic erosion”!

2 A Case Study on Soil Genetic Erosion

To illustrate this new concept of “erosion” and to show that this is a new environmental challenge for soil scientists because soil genetic erosion may be even more dangerous than the “traditional” one. I wish to refer to a study case in Southeast Sicily (Italy), in an area with a Mediterranean climate and with several kind of soils (Inceptisols, Vertisols, Mollisols, Alfisols and Entisols). These soils performed a strong capacity in producing ecosystem services, helped also by a maquis vegetation (Fig.1) and a considerable presence of biota.



Fig.1 The original maquis vegetation in study area

The awareness perceived by the farmers that it was possible to increase their income, was the beginning of the end for many of these soils and in particular for the Mollisols. When the farmers realized that calcium carbonates have a positive effect on the quality of the grapes they start to grow because of calcium increase the crunchiness of the fruits, they start to plough the Mollisol up to a depth of 100 cm with a mouldboard one-furrow plough.

The aim was to increase the amount of calcium carbonate in the whole profile.

When the hard iron-spade of a plough penetrate deeply in it, the Mollisol feels its essence completely devastated. Some of its part, in particular the remnants of the peds belonging to the mollic horizon continues to survive inside such devastated soil continuing to function inside a new soil shape showing a positive value of the entropy. After this, it was covered with a thick layer of human transported marly limestone that was completely overturned with a mouldboard one-furrow plough, providing also a complete and deep mixing of the whole soil material. In this way, the Mollisol was completely destroyed and transformed in an anthropogenic soil!

3 Pedodiversity in the Study Area

Tab.1 reports the evolution of the pedodiversity indices measured at great group level in the study area after the spread of table grapes cultivation. As well as concerns the soil subgroup, the study area showed a richness values equal to 15 in 1955 and equal to 16 in the following years. For the predicted 2050, richness values decrease to 13 as three soil classes could not be present (suborders: Typic Haploxerolls, Calcic Haploxerolls, and Pachic Haploxerolls). Diversity values showed a slight increment of pedodiversity from 1955 to 1966, a rapid decreasing trend till to 2010 and then a more remarkable decrease again in the simulated 2050 when three soil types disappear from the soilscape.

So, due to soilscape transformation, not only animals and plants disappear form the Earth’s surface, but also the soils disappear (Fig. 2).



Fig.2 Land use change with the transformation of the soilscape originated wide areas with only one soil type (anthropogenic soil)

Tab.1 Pedodiversity in the Study Area (1955—2050)

Pedodiversity indexes	Symbol	1955	1966	1987	1997	2000	2008	2050
Richness	S	15	15	16	16	16	16	13
Shannon's Diversity	SHDI	2.145	2.180	1.620	1.300	1.251	1.195	0.662
Simpson's Diversity	SIDI	0.840	0.843	0.688	0.564	0.544	0.521	0.306
Modified Simpsons Diversity	MSIDI	1.834	1.849	1.165	0.830	0.785	0.736	0.365

4 Conclusion

The maintenance and improvement of the capacity of the soils to produce food, fiber and freshwater contribute to energy and climate sustainability, and maintain the biodiversity and the overall protection of the ecosystem, relies on the soil ecosystem services, i.e. the overall benefit that people derive from soils. With the beginning of the Anthropocene, the inter-relationships between soils and social issues, such as food safety, sustainability, climate change, carbon sequestration, greenhouse gas emissions, degradation by erosion, loss of organic matter and nutrients, are fundamental elements of the recently proposed soil security concept that relies on the soil ecosystem services, i.e. the benefit that people derive from soils. In order to ensure that soil security and ecosystem services are not merely abstractions, we believe mandatory to consider soils also as media producing economy. Such consideration should be aligned with the need for policy to help ensuring soil security by encouraging sound and sustainable soil management practices that will drive us towards the fulfillment of the sustainable development goals.

Thus, some question arose as follows: ① how to control soil genetic erosion? ② how to ensure soil security? ③ how to save soil ecosystem services? ④ how to fulfill the sustainable development goals in an era characterized by the ever prevalent influence of man on soil and a continuous lack of consideration from politicians and administrators concerning the importance of soils in the environmental equilibriums?

A new way forward in the field of soil science and “to shed a new light on soil erosion and

ecological conservation”, could be to assign an “economic value” to soil ecosystem services. To attract the attention of politicians and administrators, we should focus the attention on the economic value of the soil. This is the reason why, to reach such goal, I wish to propose a new soil paradigm: “Soils are very diverse natural resources that, if maintained in good health, would influence and drive positively the economy of the social systems”.

Reference

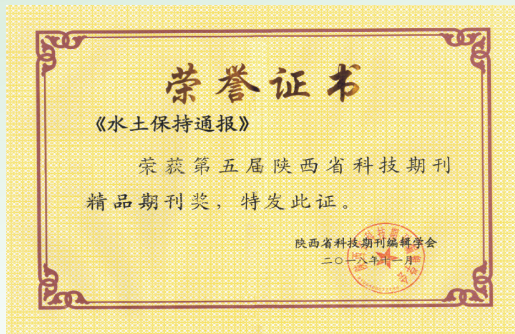
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