

**Guest editorial – Policies and practices in action to address soil erosion**  
**A special issue from the Global Symposium on Soil Erosion 2019**

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## **Abstract**

This special issue is the second published after the Global Symposium on Soil Erosion (GSER, 15-17 May 2019, Rome, Italy) and includes contributions dealing with the 2<sup>nd</sup> theme of the GSER: *Policies and practices in action to address soil erosion*. While there is a good scientific understanding of the physical measures that can be used to prevent or mitigate soil erosion, the main constraints to progress often relate to policy development and or implementation as well as socio-economic aspects that provide limitations to implementation of sustainable soil management (SSM) practices including those directed to control erosion. There are no right or wrong answers to which policy or approach is most effective. Some combination of approaches needs to be adopted that work in the particular political, cultural, and socio-economic environment under consideration. The papers included in this special issue provide examples, from the national to local level, that could be adapted, or used, to improve uptake and implementation of SSM practices to prevent or reduce soil erosion.

Regardless of what policy or plan is developed there has to be effective interaction with the local farmers and land managers as they are key to implementing any actions that will make a practical difference on the ground. Effective policies cannot be developed or implemented without bringing the land managers “on board” and the needs and limitations of the local farmers must be thoroughly understood and considered in any policy or plan development.

## **1. Introduction**

Worldwide, soil erosion is recognized as one of the biggest soil threats (FAO & ITPS, 2015), addressed in the Voluntary Guidelines for Sustainable management (FAO, 2017b) and constitutes a sub-indicator to the Sustainable Development Goal (SDG) 2.4 (target 2.4.1). The FAO predicts that reducing and restoring eroded soils would contribute to achievement of at least half of the SDGs (FAO, 2019a).

Sustainable soil management (SSM) practices are key to control soil erosion. Although many of these practices have been identified (FAO, 2017b; FAO & ITPS, 2021; WOCAT, 2019) they are inherently site-specific and implementation and effectiveness depend not only on environmental and physical factors, but also on the social, cultural, economic, and political conditions where they are applied.

This special issue gathers selected contributions presented at the Global Symposium on Soil Erosion (GSER), held at the Food and Agriculture Organization of the United Nations (FAO of the UN) headquarters, Rome, Italy on 15-17 May 2019. Information on the GSER Symposium is presented in an Outcome document (FAO, 2019) and in Lefèvre *et al.*, (2020). This special issue focuses on the 2<sup>nd</sup> theme of the GSER: *Policies and practices in action to address soil erosion*. The objective of this special

edition is to provide perspectives, from the national to local level, that could be adapted, or used, to improve uptake and implementation of SSM practices to prevent or reduce soil erosion. Six contributions that address a range of soil erosion policies and practices, with examples from Africa, Latin America and Europe, are included.

## **2. Findings of the Global Symposium on Soil Erosion 2019**

The main constraints to implementation of erosion control practices, and more broadly sustainable soil management (SSM) practices, and the potential solutions to overcome constraints have been broadly studied (e.g. Amelung *et al.*, 2020; Aznar-Sánchez *et al.*, 2020; FAO, 2017b) and were identified in the GSER Outcome document (FAO, 2019). While there is a good scientific understanding of the physical measures that can be used to prevent or mitigate soil erosion, the main constraints to progress may be policy-specific. Socio-economic aspects also provide limitations to implementation of SSM practices including those directed to control erosion. It was evidenced in the GSER thematic discussions that when SSM and soil erosion-related policies exist, they are sometimes not specifically focussed on soil erosion. In some cases potentially overlapping policies are managed by several different departments or ministries. The various bodies involved sometimes have little link between them, or worse, their objectives may be contradictory. When appropriate policies are lacking then a major challenge is to get suitable SSM and soil erosion prevention policies developed and implemented. It was also evidenced during these thematic discussions that lack of local awareness and knowledge are broadly recognized limitations to SSM implementation particularly at the farm scale. In many regions there is a need for information on the best practices, along with the benefits of their use, in a form that is relevant and accessible to the local people. The lack of understanding, by policy-makers and advisors of the everyday realities of farmers is also critical. Local connection is necessary to correctly set and implement workable policies and approaches at any given location (FAO, 2019).

It was also stated (FAO, 2019) that land tenure is a key variable for successful policy implementation. Farmers with insecure land tenure are not willing to invest in SSM unless it is subsidised and/or compensated for. In addition, in spite of many well-established methods to prevent, remediate or mitigate soil erosion, implementation may be limited due to lack of incentives and short-term returns to farmers. In general, there is less motivation to prevent soil erosion than other soil degradation processes, because fighting against erosion does not always immediately translate into higher productivity, unless a tipping point is passed and the effects of soil loss become obvious and concerning.

In response to the limitations to implementation of soil erosion prevention measures, the conclusions of the GSER highlight 9 solutions as follows (FAO, 2019):

1. Approaches to control erosion need to be defined in a holistic manner.
2. Policies should be defined both at farm and catchment scales to deal with the on-site and off-site effects of soil erosion.
3. Traditional and indigenous knowledge must be taken in account to prevent and/or remediate soil erosion
4. Expressing policies in simple local language could help to fulfill the gap between scientists, politicians, and the land users who will ultimately need to implement the required measures.
5. Scientific information is key to support actions to prevent and/or remediate soil erosion.
6. Scientists and policy makers must appreciate farmers' concerns and consider the local knowledge.
7. Raising awareness among farmers and then helping them find the best adapted solutions for their specific situation and needs.

8. The use of participatory approaches in policy development are an important lever to foster the change in attitude and to scale up the implementation of SSM.
9. To be implemented correctly, SSM practices should be simple and cost-effective to ensure a maximum benefit to farmers and the environment. Changes in land management, towards more sustainable practices, will only be adopted if farmers are willing and able to do so. Therefore farmers need to be well-informed and aware of the benefits.

### **3. Key highlights of this Special Issue**

The papers included in this special issue provide a fascinating snapshot into a range of different issues related to policies and practices that contribute to effective implementation of improved soil management to prevent soil erosion with a variety of examples from around the world. Key questions that come into play, which these papers provide insights into, relate to:

- the effectiveness of “top down” national, and regional, versus “bottom-up” local grassroots action;
- the use of new technology (e.g. drone photos) versus simple, accessible, tools (e.g. farmer hand drawn map showing key features) that are readily available to local people;
- the need for ongoing outside support versus endeavouring to empower local people to educate their peers to enable spread of adoption of improved SSM practices; and
- the cost and effectiveness of incentives versus enforcement measures.

Two studies provide an analysis of existing policies at national scale, in Brazil (Stuchi *et al.*, 2021), this issue) and in Bosnia and Herzegovina (Kapović Solomun *et al.*, this issue). First, Stuchi *et al.* (this issue) analyse seven existing, federal policies that relate to soil and water conservation in Brazil. They discuss the range of sometimes overlapping policies, and the challenges of introducing a new “Brazilian National Plan for Soil and Water Sustainable Management”. Their analysis aims to determine ways “to turn the strengths and gaps in the existing policies into recommendations and opportunities for a more robust new National Plan”. Second, Kapović Solomun *et al.* (this issue) illustrates the difficulties to develop coherent policies to achieve the land degradation neutrality at country level in an environment where conflict has led to declining population. There are complex institutional structures, with four levels of government, and a weak cooperation between institutions and stakeholders.

At a regional scale Filho *et al.* (this issue) provide a good example of strong policy implementation, with both incentives and enforcement, in the Rio do Peixe watershed (Sao Paulo state, Brazil). They provide clear evidence of the benefits of twelve years of soil conservation work incentivized and controlled by the local government through remote sensing (which provides greater efficiency when dealing with extensive land areas and large numbers of land holdings) along with field assessments.

Another study from Brazil (Polidoro *et al.*, this issue) analyses the impacts of policies and plans established at the national and regional levels by the Brazilian Government, and the efforts of public and private institutions to encourage farmers to use the practices for controlling soil erosion and toward the massive adoption of zone tillage and conservation agriculture and integrated crop-livestock management systems under conservation agriculture in Brazil.

At the local scale Kessler *et al.* (this issue) working in Burundi and Blake *et al.* (this issue) in neighbouring Tanzania, describe “bottom up” approaches with projects based on participatory and holistic actions to foster actions to mitigate soil erosion. Kessler *et al.* (this issue) describe use of an integrated farm planning (PIP, “Plan Intégré du Paysan) approach, a bottom-up and inclusive approach that aims to empower communities to develop strategies to face land degradation. (Kessler *et al.*, 2021) (this issue) provide an example of a hands-on interaction with the local farmers using a farmer-

drawn plan of the environment that captures the key features before and after implementation of SSM practices. They use methods that are simple and easy for farmers to adopt and share among themselves, to potentially provide a catalyst to ongoing spread of the improved practices once outside intervention ceases. Blake *et al.* (this issue) describe a project that aims to inform and raise awareness, within local communities, of soil erosion (previously assessed by remote sensing) through participatory workshops and use of drone aerial photos. The increased understanding of the hydraulic inter-connectedness of the landscape from the photos helped build motivation that led to tree planting and grass seed sowing in selected areas.

#### **4. Take home message**

There are no right or wrong answers to the key questions posed above, about which policy or approach is most effective. Some combination of approaches needs to be adopted that work in the particular political, cultural, and socio-economic environment under consideration. The papers included in this volume provide a source of examples that may be considered by anyone planning actions to improve uptake of SSM practices. In the end, no matter what policy or plan is developed, there has to be real interaction with the local farmers and land managers as they are key to implementing any actions that will make a practical difference on the ground. Effective policies cannot be developed or implemented without bringing the land managers “on board” and the needs and limitations of the local farmers must be thoroughly understood and considered in any policy or plan development.

In some areas where government institutions and policies are weak, or poorly resourced, then a bottom up approach may make significant differences to the sustainable management of the soil resources, and thus to the lives of the local people. In parts of the world where there are wealthy, well educated, landowners with larger land holdings, then wider policy and plans with incentives and, if necessary, enforcement may be the best approach.

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#### **Declaration of competing interest**

The authors declare no conflicts of interest.

#### **References**

- Amelung, W., Bossio, D., de Vries, W., Kögel-Knabner, I., Lehmann, J., Amundson, R., Bol, R., Collins, C., Lal, R., Leifeld, J., Minasny, B., Pan, G., Paustian, K., Rumpel, C., Sanderman, J., van Groenigen, J. W., Mooney, S., van Wesemael, B., Wander, M., & Chabbi, A. (2020). Towards a global-scale soil climate mitigation strategy. *Nature Communications*, 11(1), 5427. <https://doi.org/10.1038/s41467-020-18887-7>
- Aznar-Sánchez, J. A., Velasco-Muñoz, J. F., López-Felices, B., & del Moral-Torres, F. (2020). Barriers and Facilitators for Adopting Sustainable Soil Management Practices in Mediterranean Olive Groves. *Agronomy*, 10(4), 506. <https://doi.org/10.3390/agronomy10040506>
- Blake, W. H., Kelly, C., Wynants, M., Patrick, A., Lewin, S., Lawson, J., Nasolwa, E., Page, A., Nasser, M., Marks, C., Gilvear, D., Mtei, K., Munishi, L., & Ndakidemi, P. (2021). Integrating land-water-people connectivity concepts across disciplines for co-design of soil erosion solutions. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3791>

- FAO. (2017a). *Soil Organic Carbon: The hidden potential*. Food and Agriculture Organization of the United Nations.
- FAO. (2017b). Voluntary Guidelines for Sustainable Soil Management. *155th Session of the FAO Council, Rome, Italy, 5th December 2016*, 15.
- FAO. (2019). *Outcome Document of the Global Symposium on Soil Erosion* (p. 28). Food and Agriculture Organization of the United Nations.  
<http://www.fao.org/3/ca5697en/ca5697en.pdf>
- FAO & ITPS. (2015). *Status of the World's Soil Resources (Main Report)* (p. 608). Food and Agriculture Organization of the United Nations, Intergovernmental Technical Panel on Soils.  
<http://www.fao.org/3/a-i5199e.pdf>
- FAO, & ITPS. (2021). *Recarbonizing global soils: A technical manual of recommended soil management practices* (Food and Agriculture Organization of the United Nations, Vol. 1–6).
- Filho, O. J. V., Kanno, O. Y., Arabori, R. M., Caldas, J. F. B., Penteado, R. B., Scachetti, E. A. M., Quiessi, J. A., Camargo, M. B., & Carvalho, T. (2021). Twelve years of soil preservation and rehabilitation at Rio do Peixe watershed, promoting conservation agriculture. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3834>
- Kapović Solomun, M., Ferreira, C. S. S., Barger, N. N., Tošić, R., & Eremija, S. (2021). Understanding the role of policy frameworks in developing land degradation in stakeholders perception from a post-conflict perspective in Bosnia and Herzegovina. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3744>
- Kessler, A., Reemst, L. van, Beun, M., Slingerland, E., Pol, L., & Winne, R. D. (2021). Mobilizing farmers to stop land degradation: A different discourse from Burundi. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3763>
- Lefèvre, C., Cruse, R. M., Cunha dos Anjos, L. H., Calzolari, C., & Haregeweyn, N. (2020). Guest editorial – soil erosion assessment, tools and data: A special issue from the Global Symposium on soil Erosion 2019. *International Soil and Water Conservation Research*, 8(4), 333–336. <https://doi.org/10.1016/j.iswcr.2020.11.004>
- Polidoro, J. C., Freitas, P. L. de, Hernani, L. C., Anjos, L. H. C. dos, Rodrigues, R. de A. R., Cesário, F. V., Andrade, A. G. de, & Ribeiro, J. L. (2021). Potential impact of plans and policies based on the principles of conservation agriculture on the control of soil erosion in Brazil. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3876>
- Stuchi, J. F., Hernández, D. G., Andrade, A. G. de, Monteiro, J. M. G., & Hissa, H. R. (2021). Analysis of Brazilian public policies which aim to support participatory construction of the National Plan for Soil and Water Sustainable Management. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3860>
- WOCAT. (2019). *WOCAT, the World Overview of Conservation Approaches and Technologies*.  
<https://www.wocat.net/en/>