IAEA Technical Cooperation Programme

Science for sustainable development

The impact of science on soil conservation

Land degradation and soil erosion threaten agricultural productivity, food security and environmental sustainability. Because the formation of new soil takes place over thousands of years, in human terms soil is essentially a finite resource. Human activity has accelerated erosion rates through inappropriate land management practices. The Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture[1] and the European soil thematic strategy[2] have identified accelerated soil erosion as a major threat that is exacerbated by population growth and climate change.

Soil erosion has severe environmental consequences. As well as providing the medium for plant growth and food production, soil is essential to the supply of clean water, and for resilience to flood and drought. Soil is also the largest store of terrestrial carbon: its preservation contributes to climate change adaptation and mitigation, while its erosion can lead to the damage or even destruction of infrastructure. Globally, 1.5 billion people depend on degrading land or soil, with 42% of the world's poor living in degraded areas[3].

Soil erosion research addresses:

- Accurately assessing and quantifying soil erosion rates and identifying the exact source of eroded sediments for each environment; and
- Identifying, developing and evaluating the best land management practices for soil conservation.

Partnerships for soil conservation

Through the **technical cooperation programme** and the **Joint IAEA/FAO Division**, and in cooperation with the **United Nations Convention to Combat Desertification** (**UNCCD**), the IAEA helps Member States use radionuclide (including Fallout Radionuclide)[4] and stable isotopic technologies to study soil erosion and land degradation. The IAEA, together with partners, uses soil science and technology to assist Member States with improving soil fertility, increasing crop yields, developing evidence-based land use planning and furthering decision making.

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[1] http://www-naweb.iaea.org/nafa/
[2] http://ec.europa.eu/environment/soil/three_en.htm
[3] Von Braun, Heidhues, Zeller The Economics of Land Degradation: Toward an Integrated Global Assessment (2011).
[4] Radioactive isotopes that were released into the environment during atmospheric atomic tests.

Sustainable Development Goal, Target 15.3:

By 2020, combat desertification, and restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world

In the Loess Plateau in northern **China**, isotopic technologies have been used to measure soil erosion and determine sedimentation patterns. The analysis led to the implementation of improved soil conservation measures in the region, including terracing and vegetated hill slopes, and contour cultivation. Soil erosion rates were reduced substantially.

In **Viet Nam** 75% of the territory is comprised of sloping land with a high level of vulnerability to soil erosion. A study of 27 sites in the region of Lamdong province measured soil erosion rates using isotopic technologies. This improved understanding, and allowed the adoption of appropriate soil conservation practices such as inter-cropping, the growing of green-manure plants, the creation of basins near coffee trees, and the use of contouring and terracing in different landscapes. These measures ultimately led to a 45% reduction in soil erosion rates.

Assessing soil erosion and the effectiveness of soil conservation practices

Assessing soil erosion helps stakeholders to determine where the eroded sediments are coming from, and to calculate the rate of erosion and deposition. Carrying out the assessment can be challenging but the information is crucial for the development of effective and targeted solutions that make best use of available resources. Isotopic technologies, such as those supported through IAEA technical cooperation projects, can provide this information to decision-makers and to affected populations.

The IAEA has recently published a guideline[5] on the use of Fallout Radionuclides. This provides comprehensive step-by-step guidance for investigating soil erosion and soil redistribution affecting agro-ecosystems.

[5] http://www-pub.iaea.org/books/IAEABooks/10501/Guidelines-for-Using-Fallout-Radionuclides-to-Assess-Erosion-and-Effectiveness-of-Soil-Con

2015 International Year of Soils

Celebrating the International Year of Soils

For more information on partnerships in the field of soil erosion and conservation:
www.iaea.org/technicalcooperation/Develop/Soil.html
www-naweb.iaea.org/nafa/swmn/index.html

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