The UNEP Magazine for Youth

TUNZA

UNEP

for young people · by young people · about young people

Soil - the forgotten element

Earth: the living layer

Enriching soils, enriching lives

TUNZA
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Partners for Youth and the Environment

UNEP and Bayer, the German-based multinational involved in health care, crop protection and high-tech materials, are working together to strengthen young people's environmental awareness and engage children and youth in environmental issues worldwide.

A partnership agreement, originally signed in 2004 and renewed in 2007 and 2010, runs through 2013. It lays down the basis for UNEP and Bayer to implement the projects under the partnership. These include: TUNZA Magazine, the International Children's Painting Competition on the Environment, the UNEP Tunza International Youth and Children's Conferences, youth environmental networks in Africa, Asia Pacific, Europe, Latin America and the Caribbean, North America and West Asia, the Bayer Young Environmental Envoy Program and a photo competition, 'Ecology in Focus', in Eastern Europe.

The long-standing partnership between UNEP and Bayer has become a public-private partnership that serves as a model for both organizations.

Soil: did you know?

- An average soil sample is 45 per cent minerals, 25 per cent water, 25 per cent air and 5 per cent organic matter; the organic portion can rise to 10 per cent in a well-maintained garden soil.
- The mineral portion of soil is made up of weathered rock.
- Many soils have been transported over long distances by glacial movement, water flows and wind, settling far from their original 'parent rock'.
- Central and South American rain forests get most of their mineral nutrients from the Sahara, as soil dust from North Africa is transported across the Atlantic.
- It is the size of the mineral particles that gives the soil its texture, from very fine clay to coarse sand. Fine clay is used to make porcelain.
- Volcanic soil is among the most fertile on the planet.
- A healthy soil reduces the risk of floods and filters out pollutants from water.
- Red and yellow soils contain iron and are low in organic matter.
- Dark brown to black soils are high in organic carbon and are good for agriculture.
- Blue to purple soils suffer waterlogging.
- Rainforest soils contain little organic matter because the heat and humidity break it down too quickly for it to penetrate below the soil surface. This is why such soils degrade so quickly after deforestation, making them inappropriate for conversion to agriculture.
- Humus is organic matter that has reached a point of stability where it will break down no further if conditions do not change. A high humus content improves soil structure, promoting moisture retention and aeration.
- Bacteria and fungi secrete sticky substances that help bind the soil together.
- Soil classification is extremely complex: scientists have identified more than 10,000 soil types in Europe and more than 20,000 in the USA.

EDITORIAL

We live, all our lives, less than 25 centimetres away from extinction. For that is the average thickness of the thin dusting of topsoil that is all that stands between us and a barren planet, and on which we utterly depend. And yet we abuse it recklessly.

Every one of those centimetres can take 500 years to form, yet, neglected, it can be – and often is – eroded away in just a few years. Every year more than 24 billion tonnes of priceless topsoil are washed or blown away worldwide, as the land is overcultivated and overgrazed and trees and forests are cut down. About a quarter of the world's agricultural land, the United Nations reports, has already been degraded, and another 12 million hectares – an area the size of the African country of Benin – is lost to farming each year.

Desertification now threatens the livelihoods of more than a billion people in some 100 countries across the globe. It is at its worst in the drylands, where patches of desert erupt and grow like a rash on the face of the Earth. And it is no coincidence that about 80 per cent of the conflicts that have recently broken out around the planet are in arid areas where growing deserts are forcing neighbouring peoples to compete for the remaining fertile land.

And yet it is a forgotten crisis. Nearly 20 years ago – at the 1992 Rio Earth Summit – the world's governments agreed to a treaty to combat it, but have done little to put the treaty into practice. This autumn, when the UN General Assembly hosts a special one-day summit on the issue, will offer the best chance in two decades to bring the issue back to international attention. Governments must come to the table resolved, literally, to hold their ground.

DESERTIFICATION:
NOT ABOUT DESERTS

Design Pics/Still Pictures

www.flickr.com/photos/tpeek

UNEP/Topham

The United Nations Convention to Combat Desertification, established in 1994, is the only international agreement that links environment, development and the promotion of healthy soils. TUNZA spoke to LUC GNACADJA, the Executive Secretary of the Convention, about an issue that affects us all.

The Convention to Combat Desertification is about more than just drylands, isn't it? Can you tell us how many people are currently affected by land degradation, and how much of the world's land is affected?

Indeed, and it is not about deserts either! Although it focuses on the drylands, which cover 41 per cent of the Earth where more than 2 billion people – or one third of the world population – live, all the people in the world depend on the drylands because they contain 44 per cent of the world's food production system and produce half of the world's livestock. Twelve million hectares of land are lost every year due to desertification. That's the size of my country Benin. The annual land lost could produce 20 million tonnes of grain. So the health of soil in the drylands is very important to the future of our entire global community. Put another way, land degradation directly affects 1.5 billion people whose livelihoods depend on degraded areas, but indirectly it affects every one of us in the world.

J. Sawalha/UNEP/Topham

Do you feel that climate change is the main driver of desertification?

Certainly it is one of the main drivers, but the reverse is also true: desertification is one of the main drivers of climate change. Climate change is known to bring extreme weather events such as prolonged and unpredictable droughts. The percentage of the Earth's land area stricken by serious drought has more than doubled since the 1970s, and there is a prediction that climate change will depress agricultural yields by some 15-50 per cent in most countries by 2050, given current agricultural practices and crop varieties.

I must stress that healthy soil can play an important role in climate change mitigation. Carbon sequestration in the soil serves a dual purpose: firstly, global warming can be mitigated significantly by removing atmospheric carbon dioxide and sequestering it in soil (if the soil is healthy that is!). Secondly, increased carbon in the soil has great value as a food-producing asset.

UNEP's forthcoming GEO (Global Environment Outlook) assessment suggests that population growth is a major driver of environmental change. Could you relate this to desertification?

Population growth is a serious challenge. It is estimated that there will be 9 billion people on our planet by 2050 and, to feed them all, we

need to increase our food production by 70 per cent in the next 40 years. That is a big ask. If we consider that 1.9 billion hectares of land worldwide have become degraded since 1950, the challenge is even greater. Behind that is another serious challenge: the risk of overexploitation. If the population grows in a starving world, humans are likely to overexploit and degrade the land more and more. In addition, we would lose the capacity of soil to sequester carbon, contributing negatively to climate change mitigation. Humans can be drivers of the problem but they can also be the solution. And the solution is feasible: land degradation can be reversed.

J. Salam/Still Pictures

Are modern, intensive farming practices a factor? And how does this relate to the rich world's levels of consumption?

Current increasingly intensive soil use is leading to significant land degradation. Mostly due to erosion, 24 billion tonnes of fertile soil disappear each year.

Virtually everyone in rich countries depends on the drylands for food. The wheat, rye, oats, barley and olives we eat or the cotton clothes we wear have their origins in drylands. But land degradation threatens not only the rich world's consumption but also global food security. Moreover, if the land is further degraded and becomes no longer productive, rural people will be forced to abandon their farms and migrate somewhere else in order to make a living.

All these things point to the importance of sustainable land management. Farming is needed to feed the ever-increasing population, but this can be done in a sustainable manner so that we no longer degrade arable land. Sustainable land management helps improve local livelihoods, reduce hunger, restore natural ecosystems and mitigate the effects of climate change.

Are you hopeful for the future? What do you feel are the key things that can be done?

Our generation could set humanity on the path to sustainable development or to self-destruction. The good news is we can still chose sustainability by making sustainable agriculture and forestry cornerstones of the green economy. In fact, two-thirds of the degraded lands offer restoration opportunities. Land degradation can be prevented, degraded lands reclaimed and drought mitigated using sustainable techniques for land and water. For that to happen, policy makers, governments, farmers, scientists and communities must work together.

Investment in sustainable land management is a local concern, a national interest and a global obligation. Thus it must be given priority at the local level to increase income, to improve food security and to contribute to poverty reduction; and at the national and global levels to help alleviate hunger and malnutrition, to reduce poverty, to protect the world's climate, to safeguard natural resources and ecosystem services, and in many cases to preserve cultural heritage.

There is a need to document and evaluate success stories and assess their impact on ecosystem services. Sharing success stories helps others take similar action for achieving their own goals, or for scaling up their practices. Moreover, there is a great need to clarify the impact of different sustainable land-management practices and adapt and optimize them under different conditions. And there is still a need to raise awareness of the causes, the context and the impacts of inappropriate resource use.

And lastly, how can young people in particular help fight desertification in their own lives?

Young people who are enthusiastic about nature and the environment can be front-line players in the collective fight against desertification. I have met many young people who have taken the time to teach themselves about desertification and how they can help drylands by fair trading, tree planting and saving energy. But I wish schools would teach more about desertification and sustainable development to help more young people understand the issues better and support the search for solutions.

Think about this – a drought can occur anywhere, whether in developed or developing countries. But in developed countries, drought doesn't kill people. What is happening now in Somalia and other East African countries would probably not happen in Australia. I invite young people to think why a drought implies famine in one place and not in another, and what would be the total cost of action now and that of inaction for our common future.

M. Hamblin/OSF/SpecialistStock

Bayer


Lumbricus

Getting dirty


Lumbricus


Lumbricus

Every year at the Bayer Young Environmental Envoy conference in Leverkusen, a visit to a mobile laboratory and classroom powered by a photovoltaic roof is a highlight for the young environmentalists. Housed in a 7.5-tonne bus, the lab is named *Lumbricus*, meaning earthworm, and it demonstrates Ottmar Hartwig's enthusiasm for nature and environmental education – and a particular passion for soil. The TUNZA team thought our soil issue would be incomplete without talking to Ottmar about what he does, and why he thinks that educating young people about soil is a matter of urgency.

'How did I come to spend my days on an ecobus? Maybe it was all the gardening I did with my father in the 1960s, or the wildlife shows of the era – from Jacques Cousteau to Bernhard Grzimek to David Attenborough. And my love of nature prompted me to study biology and geography at Cologne University.

'But as far as I'm concerned, you can't learn without getting your hands dirty. One thing I always say is: "If you want to learn to swim, you have to go into the water. If you want to learn about ecology, you have to go into nature – at least once!" In my years of teaching, I've observed that young people are increasingly losing direct experience of nature – not just plant growth or insect metamorphosis, but even bad weather! So for many of our students, collecting invertebrates in steep forest soil or digging to discover different soil layers in a muddy riverbank, under a lot of weeds, is a new experience.

'Which brings me to soil. The local and global importance of natural soils is a favourite theme of mine, and, according to the International Union of Soil Sciences and the German Soil Science Society, a subject that's too often ignored in the classroom. Yet soil, along with water, is fundamental for life on the planet, and is connected to agriculture, afforestation, water production, water storage and filtration and biodiversity. Under natural circumstances it takes 10 years to produce 1 millimetre of soil, and it takes a minute to destroy it: we are losing fertile soil at an alarming rate, and I fear the loss of productive soil worldwide will give rise to major social and political problems.

'But when young people come to *Lumbricus*, soil is not always a favourite subject: they think it's just dirt! We teach them that soil is actually an ecosystem with a bundle of important processes and many helpers. The methods we use to get children close to soil differ according to age group and interest. For the little ones, we offer a microscopic look at the soil inhabitants. Older pupils drill into soil to obtain a "soil-sausage", so that they can observe different soil layers. More mature students might analyse a soil sample's pH to determine acidity. In the end, every team presents its results and documents it digitally for further use back in the classroom.

'These lessons give only a glimpse of soil science to children, but it's a subject well worth teaching. In our humble ecobus – named after the worms who do such an important undercover job for the world – we have reached more than 70,000 young people, and plan to keep going. We know we're making an impact: we've seen some of the documented results of *Lumbricus* outings persist in school classrooms for years. But best of all is when pupils from years past return as adults, now young teachers themselves, bringing their own pupils to learn about nature by digging in.'

Youth action: saving our soils

There are many things young people can do to improve soil right where they are. Browse our compost guide (see page 15) for ideas and see what methods might be right for you. In the meantime, be inspired by these examples promoting soil improvement and sustainability, led by young people from the UNEP-partnered Bayer Young Environmental Envoy (BYEE) and Volvo Adventure young environmentalist programmes.

Haneesa Zahidah, Malaysia, BYEE 2010

As president of the green team at my university, I was looking for something sustainable that ordinary people could do. That's when I found out about Takakura composting, a well-structured yet straightforward method that I thought would work for Malaysian households, as it's time-efficient and suitable for the tropics. Invented by Japanese scientist Koji Takakura, this method of composting takes a maximum of 26 days to produce compost, less than a third of the usual time.

You start by making fermentation solutions with sugar and salt. The sugar solution consists of water, brown sugar and fermented soy (known as *tempeh* in Malaysia); the salt fermentation solution consists of water, vegetable scraps and/or fruit peels, and salt. These are left for five days to ferment.

When the solutions are ready, they're mixed with a combination of rice husk and bran and left for five days in a cardboard box, until a layer of white mould forms. Then the mixture is ready for scraps. A small plastic or wicker container lined with cardboard is filled with the mixture to about the 60 per cent level, and chopped vegetable and fruit scraps are added. It is covered with cloth, and stirred daily, and more scraps are added until the container is full. The compost is then transferred to a sack and left to mature for two weeks.

Takakura is a particularly good method for any country that produces rice, as the husk and bran are only used for chicken feed or otherwise thrown away. In 2010, I introduced Takakura composting at my university, gathering organic waste from the cafeteria and setting up a small composting site at the Faculty of Architecture. In two months we produced about 50 kilos of compost, used for landscape gardening on campus. I've now begun a training project at a school in a neighbouring state; they intend to use their compost in their science garden.

I plan to carry on promoting composting as a waste management system in more schools and institutions while giving away compost samples; seeing, touching and smelling soil helps people realize how valuable composting can be.

Haneesa Zahidah


Haneesa Zahidah


Volvo Adventure

Büyük Kolej team, Turkey
Oxygen Instead of Waste, Volvo Adventure 2011 Finalist

Between 1980 and 2005, 40 million tonnes of trash were thrown into the 100-hectare Ankara Mamak City Dump without proper care. Closed since 2005, the dump threatened to pollute groundwater and still gives off bad smells. In our research, we learned that waste can destroy the structure of soil, pollute groundwater and produce harmful toxic gases.

Today, 60 per cent of the area is piped to extract methane, but the remainder lies idle. We decided to create a forest there. With the support of our parents, school, and engineers who advised us on soil structure and what trees to plant, we started a campaign to inform the public. We raised enough donations to plant 4,000 saplings. Then local government joined in and planted 15,000 saplings. Ultimately, we aim to plant 400,000 trees on the site, preferably cedar, the most appropriate for the climate. Our success will improve the soil, rehabilitate habitat for living organisms, and create a park in which children will be able to play.

Youth action: saving our soils **Youth action:**

M. Edwards/Still Pictures

Kennedy Mbeva, Kenya, BYEE 2010

We're always looking at modern solutions, looking to the future. But what if we look back? In May 2010, I read about how farmers in Burkina Faso re-greened degraded land simply by laying stones to capture moisture. It's a simple, inexpensive project and involves the community. I decided to take it to Yatta, an arid area in eastern Kenya, where they grow maize and beans mainly for subsistence. Their land has been degraded due to deforestation and poor agricultural practices, leading to soil erosion.

The project, still in its pilot stage, involves laying rows of fist-sized stones in rows called *cordons pierreux* or *diguettes* along contours, retaining rainwater and preventing topsoil from eroding. In front of these stone lines, we will dig 30-centimetre holes into which the water will percolate. The holes will be filled with cow, goat and chicken manure to attract termites, which break it down and help create fertile soil. We will then plant these holes with indigenous trees, such as *Prunus africana* and species of the genus *Aningeria*, as well as fruit trees, so that eventually the lines of stones will be transformed into lines of trees – a forest that will help stabilize the soil and further draw down moisture.

We are just begining to lay our stones, and the residents are eager to give it a try. It's a long-term project based on trial and error, and depending on the results we will seek more support, both financially and from the Kenyan government. It'll take at least three years, but it's worth the wait.

Jerry Lee, Malaysia, BYEE 2010

I present an interactive, mobile environmental education exhibition to young people in Malaysia to promote the recycling of sewage sludge and treated effluent. In Malaysia, we are running out of landfill space to accommodate sewage sludge. But we also have the technology to treat

The main problem is that the public thinks that sewage products are dirty; that they're unsafe. But research shows that they're not. Ironically, Malaysian farmers tend to use a much more hazardous fertilizer, a mixture of peat soil and chicken dung, which harbours *E. coli*, salmonella and other