Opportunity, Trends and Issues in Organic Waste Management

TRANSFORM Compost Systems

John Paul, PhD PAg

There is one opportunity, and several trends. If we simply follow trends, we may miss the opportunity resulting in issues

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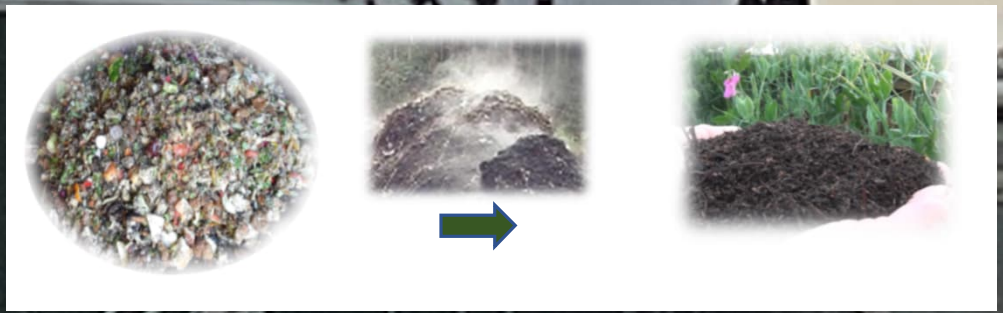
Trends

- Diverting Organics to Reduce GHG
- Diverting Organics to Increase Landfill Life
- Anaerobic Digestion
- State of the Art Composting
- Kitchen “composters”



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Issues

- Plastics and other contamination
- Greenhouse gas emission during composting
- Creating misplaced landfills
- Odour
- PFAS - polyfluoroalkyl substances

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The Opportunity

In our communities, we produce organic waste. We are continually learning why recycling this organic matter and nutrients is so important for the health of our planet, including managing greenhouse gas during the process as well as emissions from the soil on which the compost is applied.

How do we do this and what is it that is so important?

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The Opportunity – What's Important

The organic material must go back to the soil to recycle the nutrients and organic matter – why?

- There is an incredible cost to losing carbon in our soil – we need to replace and maintain it.
- The climate change benefit to adding organic matter is staggering
- We need to recycle nutrients in organic waste

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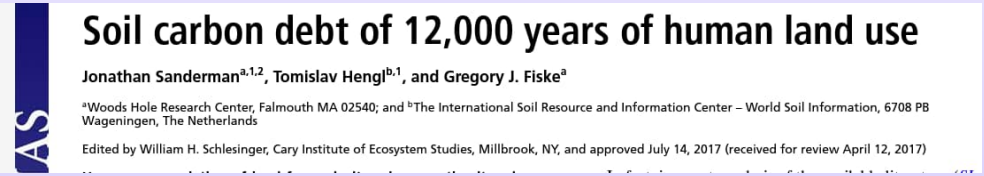
The Opportunity – The Cost of Losing Soil Organic Matter

- Worldwide, we have already lost 130 billion tonnes of soil carbon (8% of soil carbon)



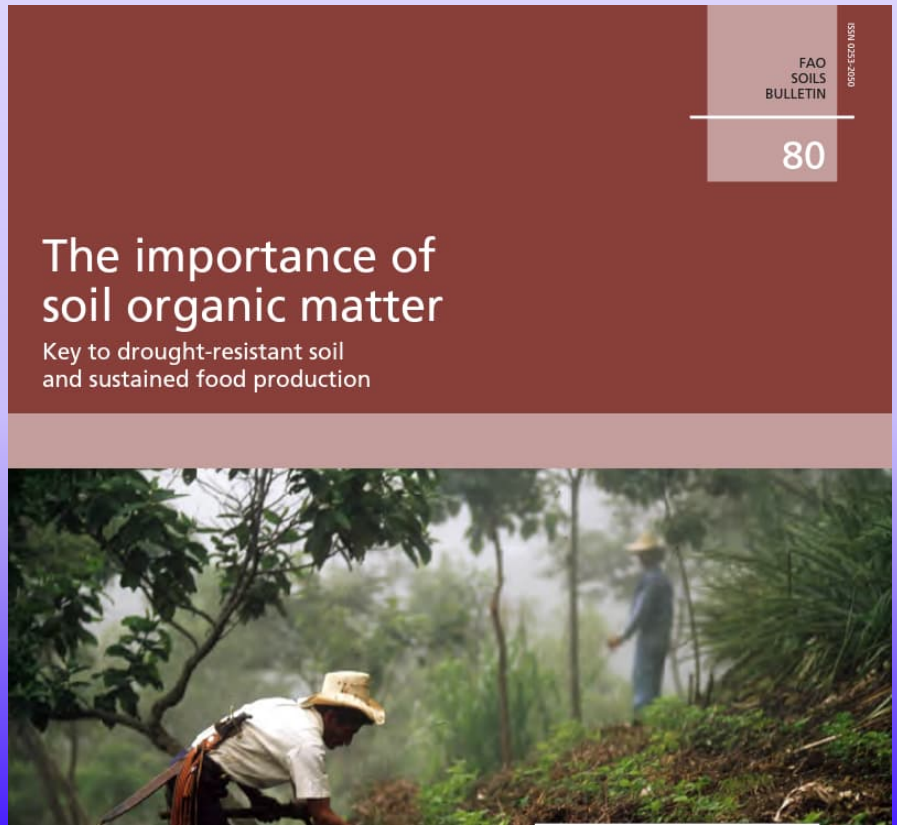
Soil carbon debt of 12,000 years of human land use

Jonathan Sanderman[a,1,2], Tomislav Hengl[b,1], and Gregory J. Fiske[a]

[a]Woods Hole Research Center, Falmouth MA 02540; and [b]The International Soil Resource and Information Center – World Soil Information, 6708 PB Wageningen, The Netherlands

Edited by William H. Schlesinger, Cary Institute of Ecosystem Studies, Millbrook, NY, and approved July 14, 2017 (received for review April 12, 2017)

"Composting can be an important method of sustainable and productive agriculture. It has ameliorative effects on soil fertility and physical, chemical and biological soil properties. Well-made compost contains all the nutrients needed by plants. It can be used to maintain and improve soil fertility as well as to regenerate degraded soil."



FAO SOILS BULLETIN

80

The importance of soil organic matter

Key to drought-resistant soil and sustained food production

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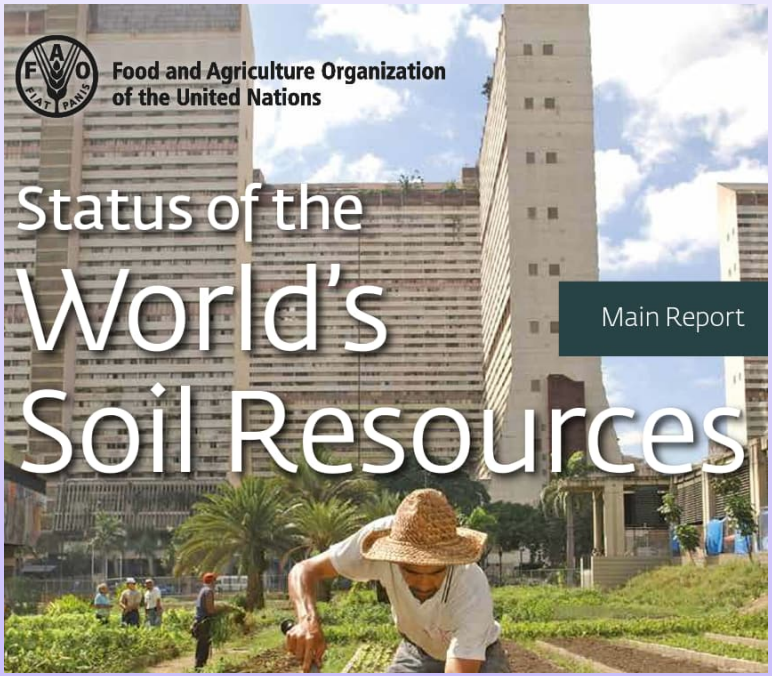
The Opportunity – The Cost of Losing Carbon in our Soil

"Soils are the foundation of food production and food security, supplying plants with nutrients, water, and support for their roots. Soils function as Earth's largest water filter and storage tank; they contain more carbon than all above-ground vegetation, hence regulating emissions of carbon dioxide and other greenhouse gases; and they host a tremendous diversity of organisms of key importance to ecosystem processes."



"Without soil organic matter – there is no life." *Dr. John Paul*

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The Opportunity – Impact on Climate Change

The organic material must go back to the soil to recycle the nutrients and organic matter – why?

- There is an incredible cost to losing carbon in our soil – we need to replace and maintain it.
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- We need to recycle nutrients in organic waste

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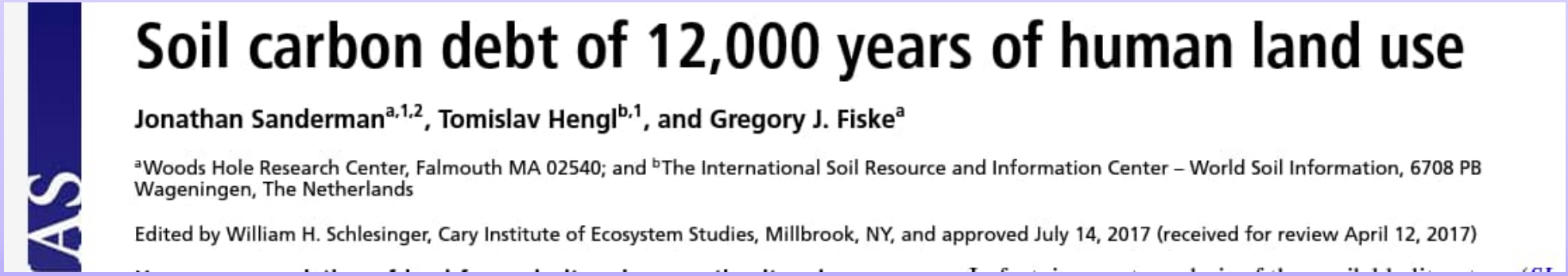
The Opportunity – Impact on Climate Change

With adoption of best management practices, two thirds of lost SOC [soil organic matter] can be recovered. If the two-thirds figure is accurate, then SOC sequestration has the potential to offset 88PgC (322PgCO2) of emissions.



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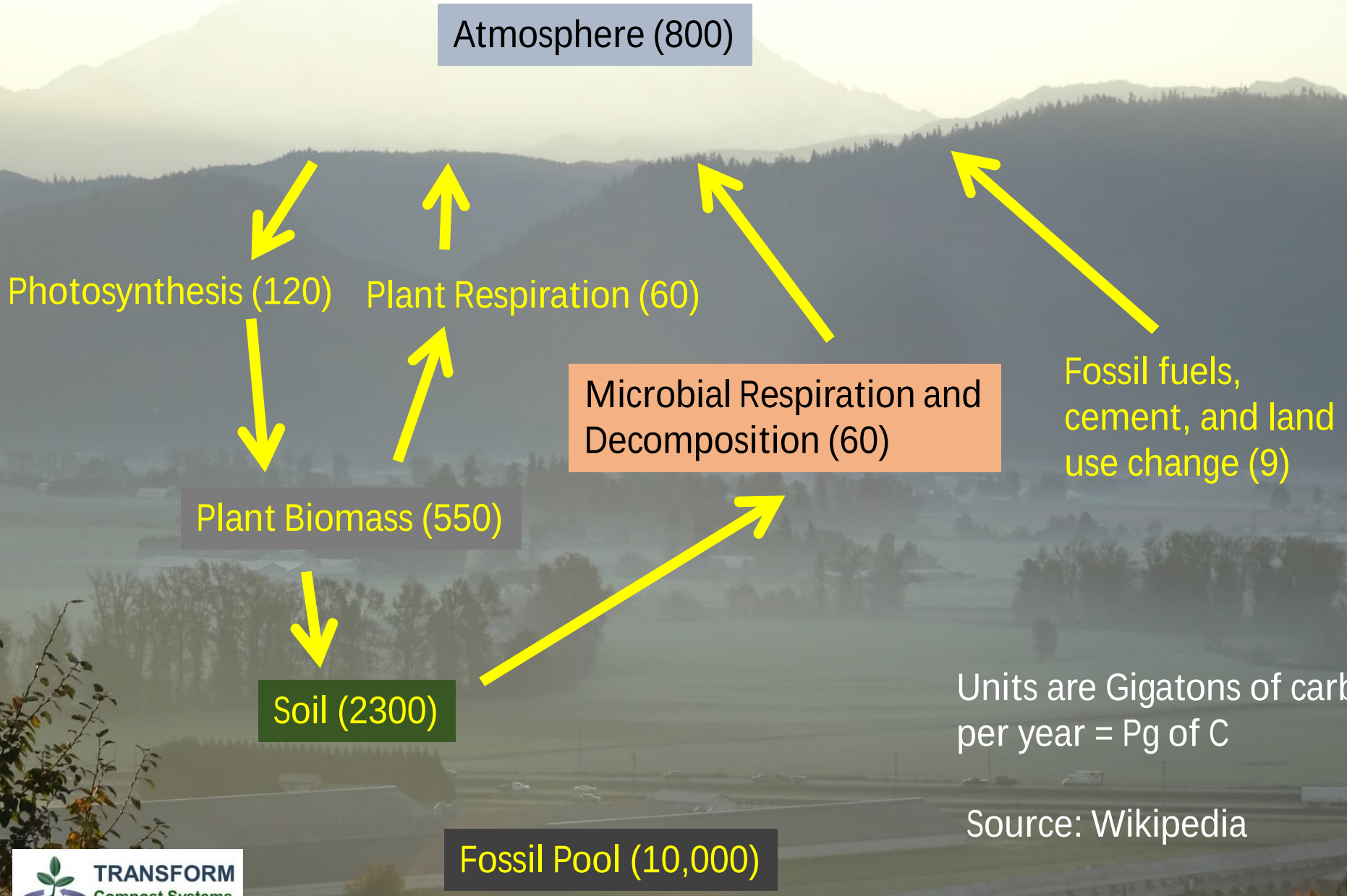
Terrestrial Carbon Balance



Units are Gigatons of carbon per year = Pg of C

Source: Wikipedia

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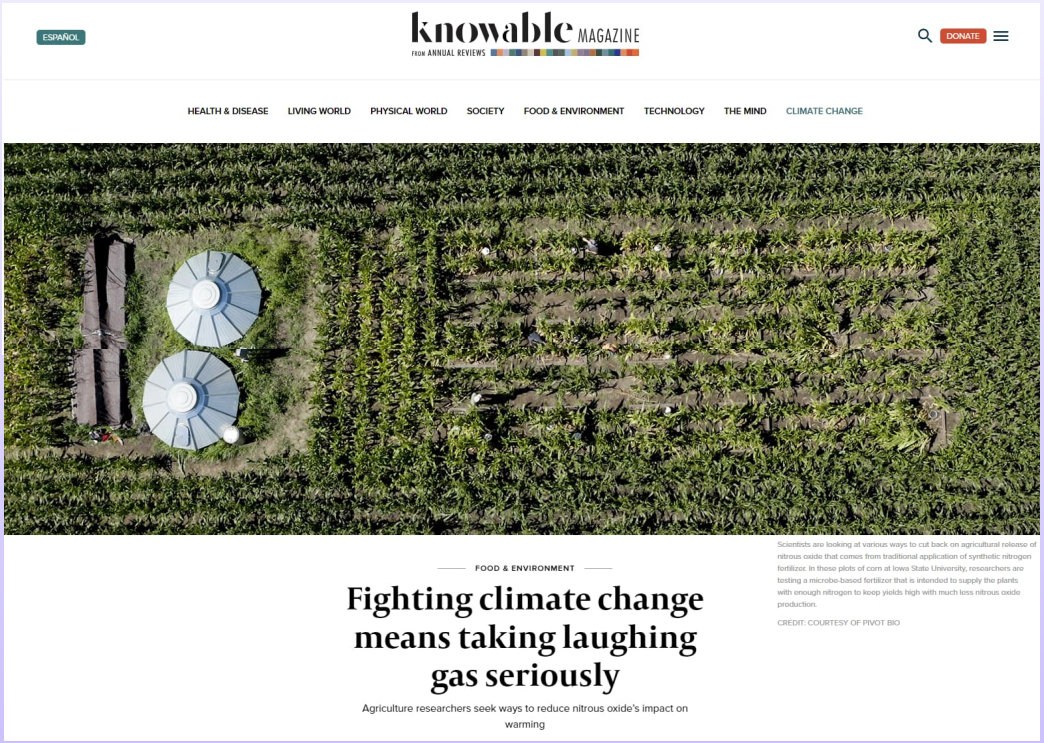
FEATURE

Can Dirt Save the Earth?

Agriculture could pull carbon out of the air and into the soil — but it would mean a whole new way of thinking about how to tend the land.

The Opportunity – Impact on Climate Change

"Agriculture accounts for 16 to 27 percent of human-caused climate-warming emissions (IPCC). But much of these emissions are from nitrous oxide."



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FOOD & ENVIRONMENT

Fighting climate change means taking laughing gas seriously

Agriculture researchers seek ways to reduce nitrous oxide's impact on warming

Scientists are looking at various ways to cut back on agricultural release of nitrous oxide that comes from traditional application of synthetic nitrogen fertilizer. In these plots of corn at Iowa State University, researchers are testing a microbe-based fertilizer that is intended to supply the plants with enough nitrogen to keep yields high with much less nitrous oxide production.

CREDIT: COURTESY OF PIVOT BIO

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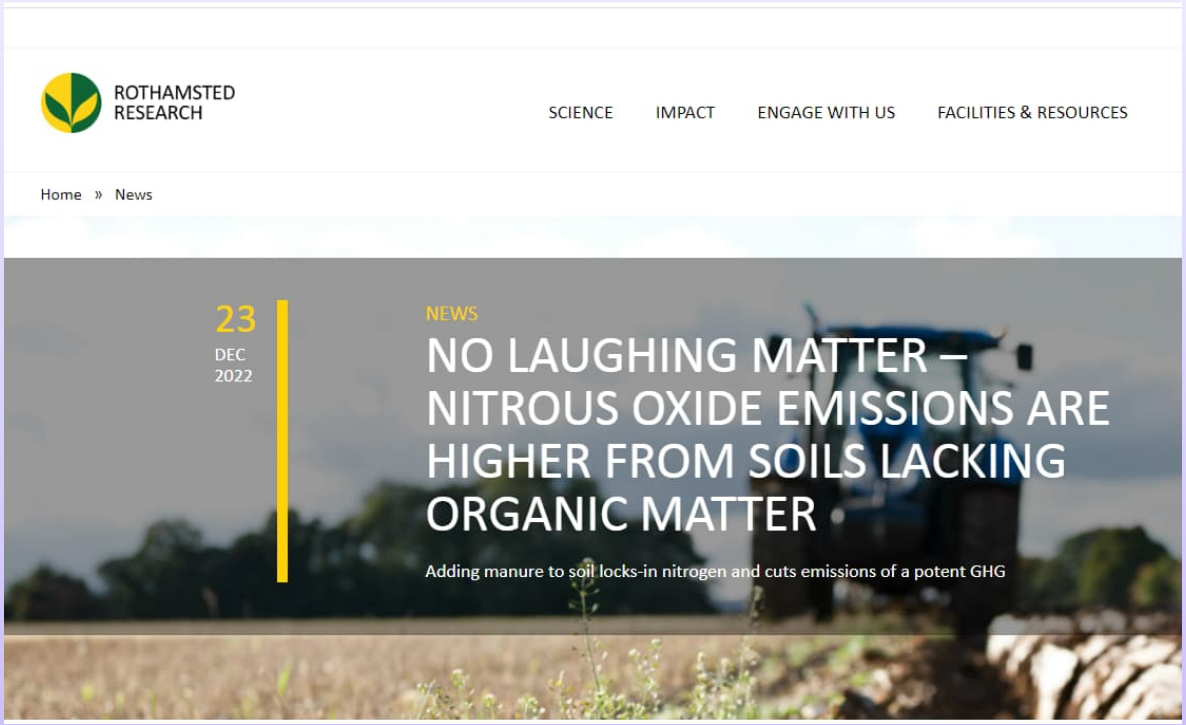
The Opportunity – Impact on Climate Change

"This means wider application of organic matter in arable systems has the potential to reduce nitrous oxide emissions and agriculture's contribution to climate change."



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The Opportunity – Importance of Recycling Nutrients

The organic material must go back to the soil to recycle the nutrients and organic matter – why?

- There is an incredible cost to losing carbon in our soil – we need to replace and maintain it.
- The climate change benefit to adding organic matter is staggering
- We need to recycle nutrients in organic waste

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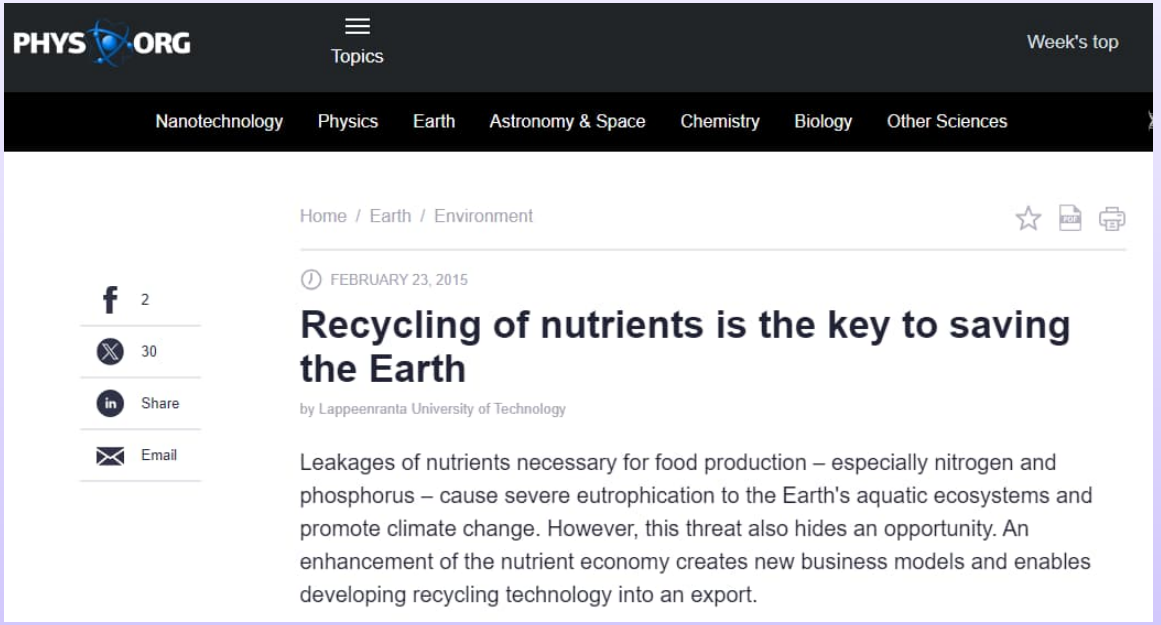
The Opportunity – Importance of Recycling Nutrients

"Leakages of nutrients necessary for food production – especially nitrogen and phosphorus – cause severe eutrophication to the Earth's aquatic ecosystems and promote climate change."



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The Opportunity – Importance of Recycling Nutrients

"Nutrient recycling is mainly focused on nitrogen (N) and phosphate (P) as these components can replace chemical fertilizers to minimize extraction of fossil P resources and to reduce the environmental impacts of mineral nitrogen fertilizer production."

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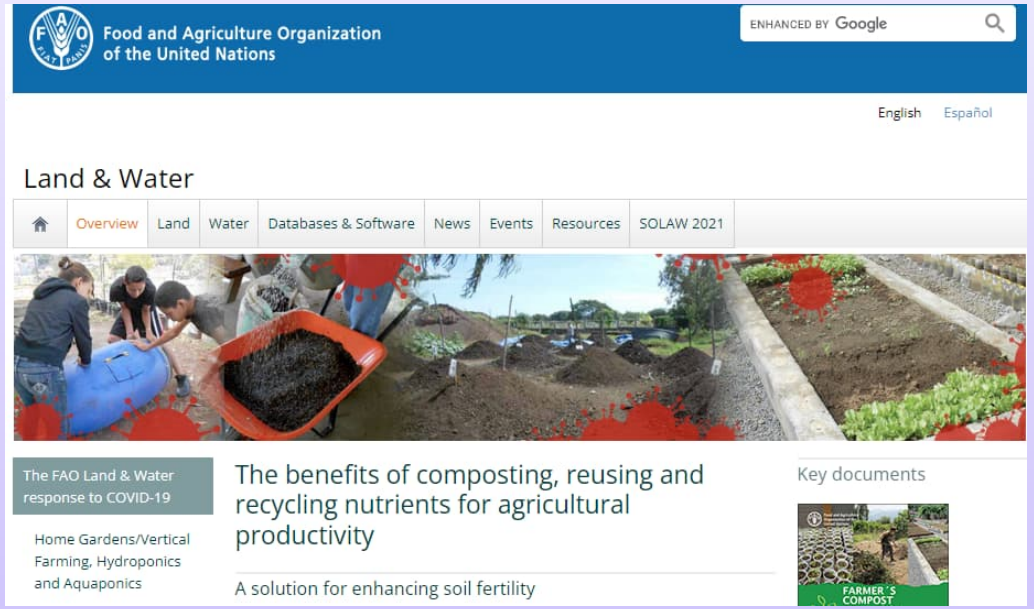
The Opportunity – Importance of Recycling Nutrients

"Composting reduces pollution, reuses organic waste, reduces the cost of fertilizers and agricultural production inputs and more importantly, returns nutrients needed for food production back to the soil"



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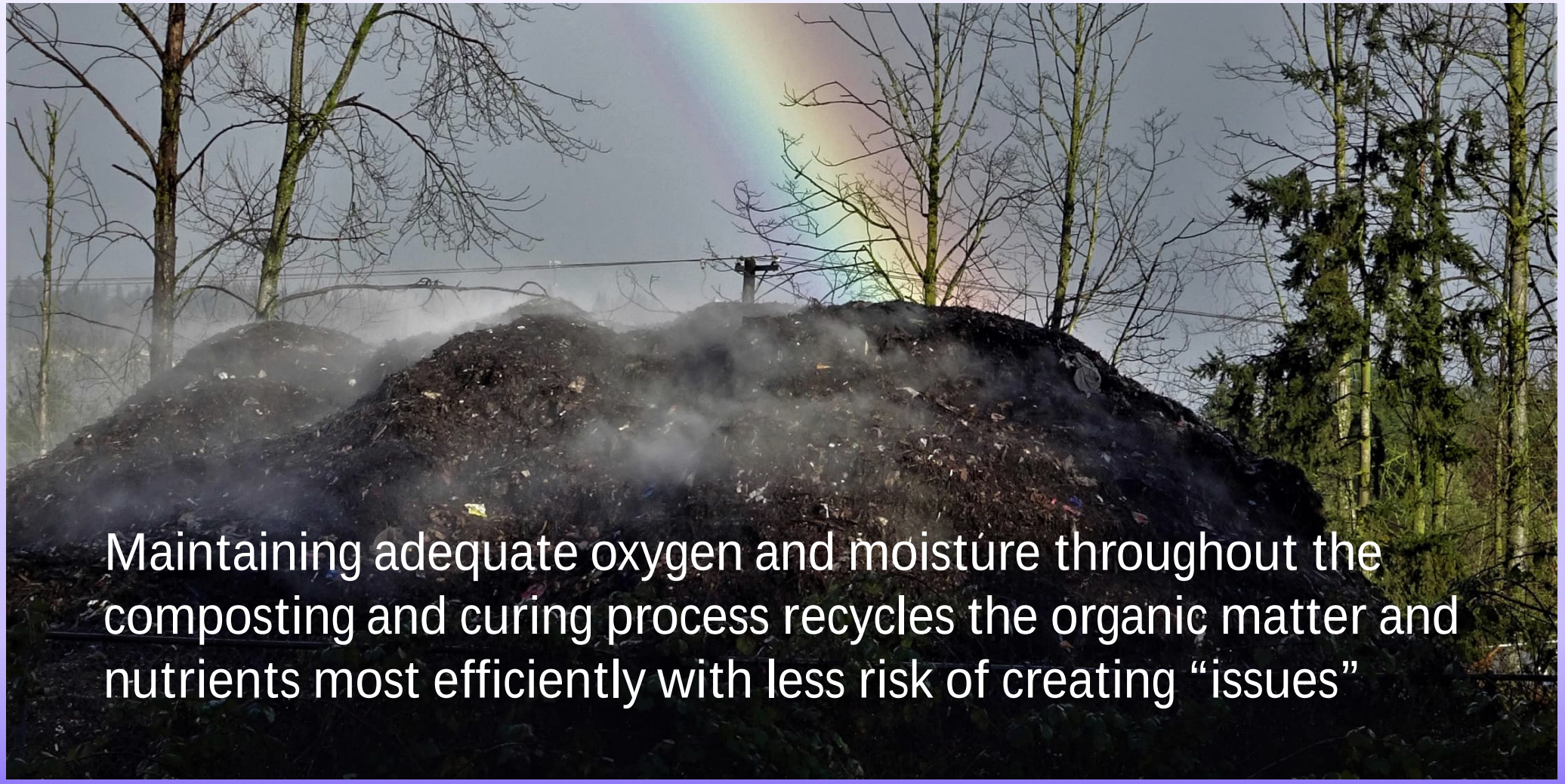
The Opportunity – What's Important



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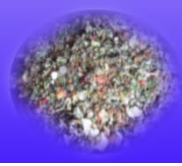

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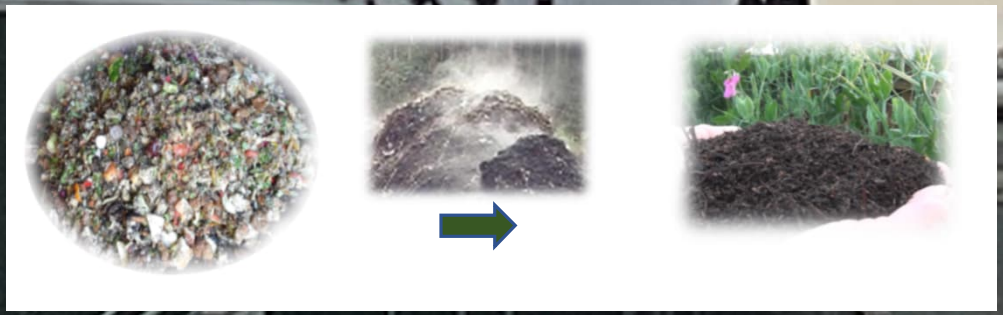
- Diverting Organics to Increase Landfill Life
- Anaerobic Digestion
- State of the Art Compost Technology
- Kitchen “composters”



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Objectives Of Composting

- Environmental
  - Reducing waste to landfill
  - Reducing greenhouse gas emissions
  - Recycling organic matter and nutrients

Transform Compost Systems
Turning Waste Into An Opportunity

Trends – Reducing GHG from Landfill

"Diverting organic waste away from landfills and processing it at composting or anaerobic digestion facilities avoids the generation of landfill methane and extends the lifespan of the landfill."

Français

Government of Canada | Gouvernement du Canada

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Waste and greenhouse gases: Canada's actions

When organic wastes – such as food, yard and paper – are disposed in landfills, they produce methane, a powerful greenhouse gas. This process occurs over many years, which means that the methane generated in landfills today is the result of decades of disposal of organic waste.

According to Canada's Greenhouse Gas Inventory, in 2020:

- Emissions from Canadian landfills account for 23% of national methane emissions.
- About 1,401 kilotonnes (kt) of methane were generated, 418 kt were recovered and 885 kt of methane (equivalent to 22 Mt CO_2) were emitted.
- Of the recovered methane used to create energy, 52% was used to generate low-carbon electricity, 17% to produce renewable natural gas and 30% was used directly at a nearby facility.

For an overview of how landfill methane emissions in Canada are estimated, please consult the *National inventory report: greenhouse gas sources and sinks in Canada*.

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Issues – How Much GHG Are We Actually Producing During the Compost Process?

Are we accounting for methane and nitrous oxide emissions during the entire composting process?

- Nitrous oxide emission can be as high as methane emissions (CO_2 equivalents).
- Most of the methane emissions can occur after primary composting

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Issues – Are We Creating Secondary Landfills?

We need to stay focused on the opportunity to recycle organic matter and nutrients to avoid the risk of displaced landfills.

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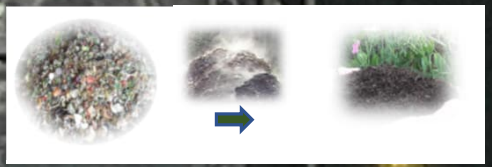
Trends – Anaerobic Digestion

In a new, more nuanced model, the EPA is putting renewed attention on anaerobic digestion

https://www.wastedive.com/news/epa-wasted-food-scale-food-waste-landfill-methane-emissions/697294/



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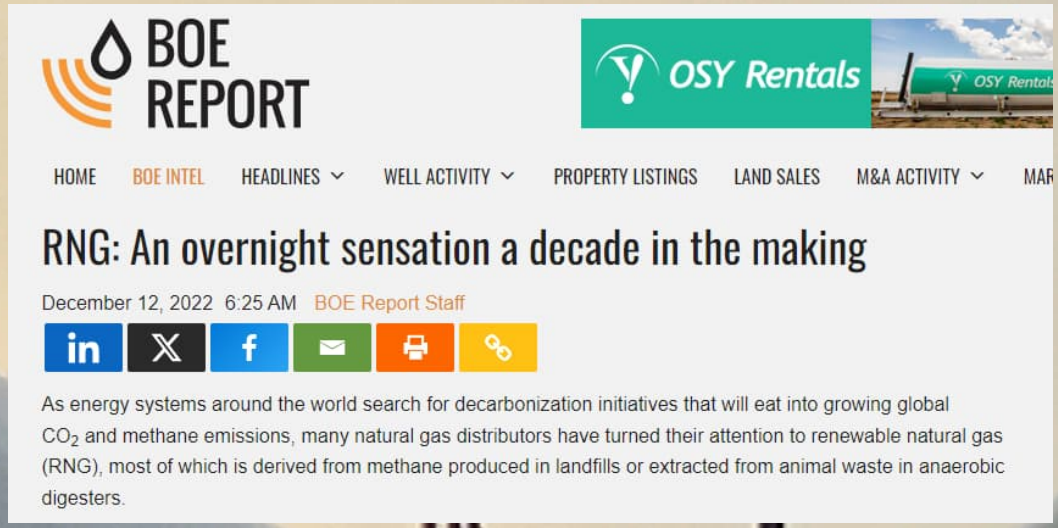
Trends – Anaerobic Digestion to Produce Renewable Natural Gas (RNG)

By injecting this RNG – some of which can actually yield "net negative" greenhouse gas emissions – they can lower the carbon footprint of their supply and avoid the production of fossil natural gas elsewhere in the value chain.



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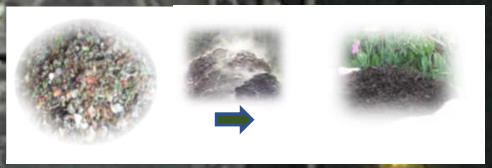
RNG: An overnight sensation a decade in the making

December 12, 2022 6:25 AM BOE Report Staff

As energy systems around the world search for decarbonization initiatives that will eat into growing global CO_2 and methane emissions, many natural gas distributors have turned their attention to renewable natural gas (RNG), most of which is derived from methane produced in landfills or extracted from animal waste in anaerobic digesters.



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Issues – Anaerobic Digestion

"Several challenges remain for the digestion of potential feedstocks. Low biodegradability, process inhibitions, and digester toxicity are still limiting the adaptation of many potential feedstocks. Although various techniques are being investigated to mitigate these challenges, economic viability is a major roadblock for their implementation."

https://zerowasteeurope.eu/press-release/policy-briefing-food-systems/

Open Access Published by De Gruyter January 13, 2022

Anaerobic digestion fundamentals, challenges, and technological advances

Md Mosleh Uddin and Mark Mba Wright

From the journal Physical Sciences Reviews

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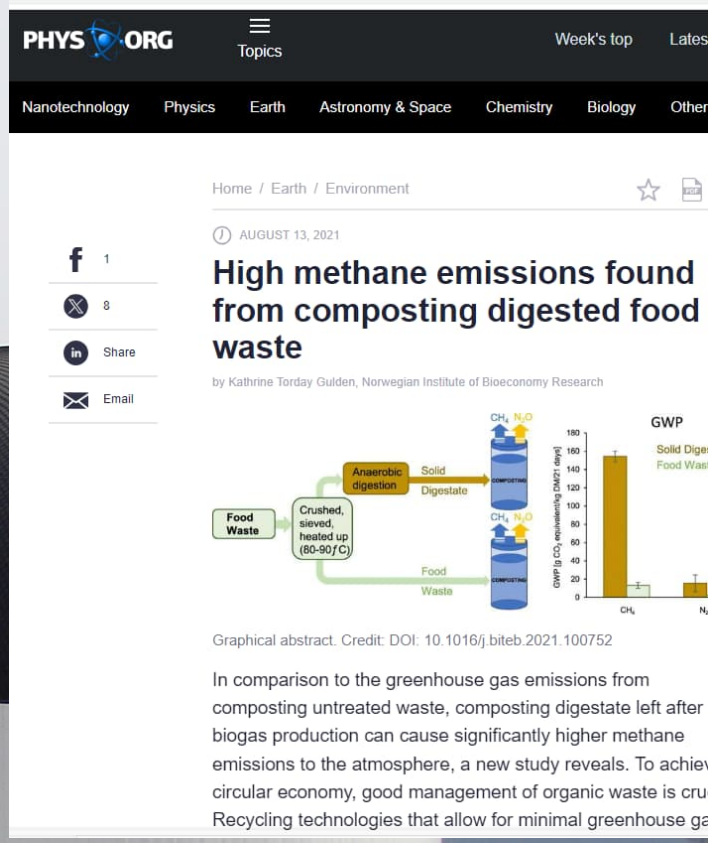
Anaerobic Digestion – Staying Focused

We need to understand and quantify lifecycle GHG emissions – and stay focused on the opportunity we have to recycle organic matter and nutrients safely and effectively.



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AUGUST 13, 2021

High methane emissions found from composting digested food waste

by Kathrine Torday Gulden, Norwegian Institute of Bioeconomy Research

Graphical abstract. Credit: DOI: 10.1016/j.biteb.2021.100752

In comparison to the greenhouse gas emissions from composting untreated waste, composting digestate left after biogas production can cause significantly higher methane emissions to the atmosphere, a new study reveals. To achiev circular economy, good management of organic waste is cru Recycling technologies that allow for minimal greenhouse ga

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Anaerobic digestion does have a place in recycling organic matter and nutrients to improve the health of our planet

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John Paul, PhD PAg

Trends – State of the Art Composting

- Are we considering the entire process, or just the primary aerated portion?
- Are we considering feedstock preparation?
- Are we considering the non-compostable material?

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Issues – State of the Art Composting

- What about methane and nitrous oxide emissions following the state of the art composting?
- Are we dealing with the non-compostable material?

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Issues – State of the Art Composting

We need to keep our focus on recycling organic matter and nutrients to create healthy soil

VANCOUVER SUN

News / Local News

'Meagre' progress made in removal of garbage from farmland near Chilliwack

To neighbours' dismay, about three per cent of the waste, or 19 truckloads out of more than 500, has been removed from a field above Cultus Lake so far.

Glenda Luymes

Published Aug 06, 2023 • Last updated Aug 06, 2023 • 4 minute read

Join the conversation

A file photo of the waste dumped on Columbia Valley farmland last year. Only three per cent has been removed as of July 31, according to the Agricultural Land Commission. PHOTO BY JASON VASILASH

Finding an appropriate dumpsite for hundreds of truckloads of Metro

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Topsoil came with glass, rocks, condoms, claims Langley lawsuit

Family seeks $80,000 to excavate yard and start with new turf

Matthew Claxton
Oct 13, 2023 12:58 PM
Updated Oct 13, 2023 1:15 PM

A lawsuit claims new topsoil full of glass, rocks, and other garbage made a Langley family's lawn too dangerous to mow. (Black Press Media files)

A Langley family is suing a Surrey topsoil company for more than $80,000 after the firm provided dirt that allegedly contained rocks, glass, and condoms.

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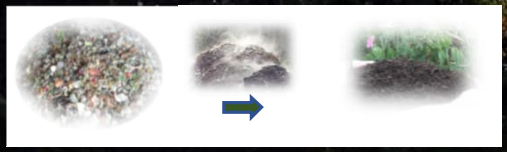
Issues – State of the Art Composting

- Odour – odour management is more about understanding the process and managing it effectively than about a particular technology
- The conditions for good composting are good air supply, mixing and addition of water to maintain uniform water content

(Nordic Ministers for the Environment 2009)



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Trends – Kitchen “Composters”

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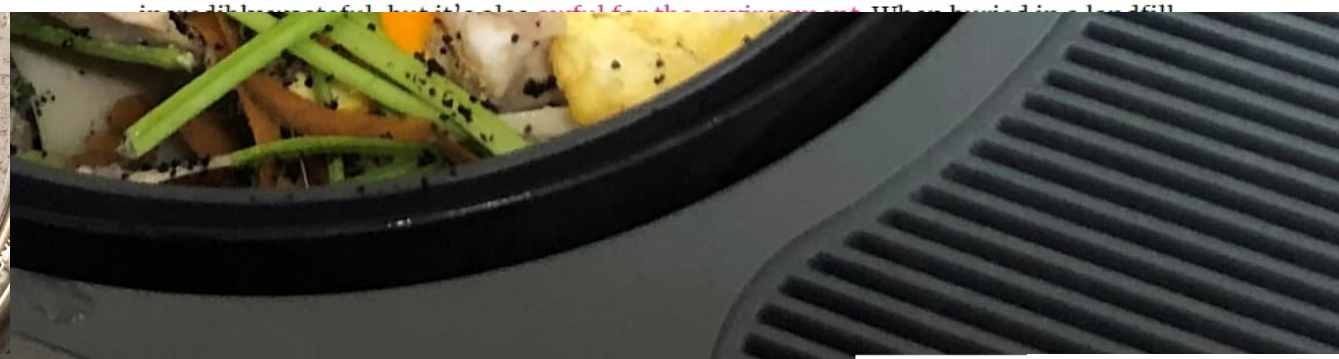
We Tried 5 Countertop Composters—Here’s How They Stacked Up

If you don’t have a curbside green bin program, a countertop composter could be just the ticket.

Natalie Michie
Updated April 20, 2023

Every year, Canadians throw away nearly 2.2 million tonnes of food. Not only is this



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Trends – Kitchen "Composters"

- An excellent way to dry and grind food scraps – avoiding issues with outdoor collection bins – wildlife etc.
- Great option if material composted or sent to anaerobic digestion

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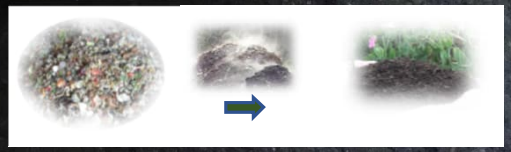
Issues – Kitchen "Composters"

- This is not compost – it will mold and smell if it gets wet



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Issues – Kitchen "Composters"

- When added to soil – may mold, attract rodents and does not grow as well as with compost

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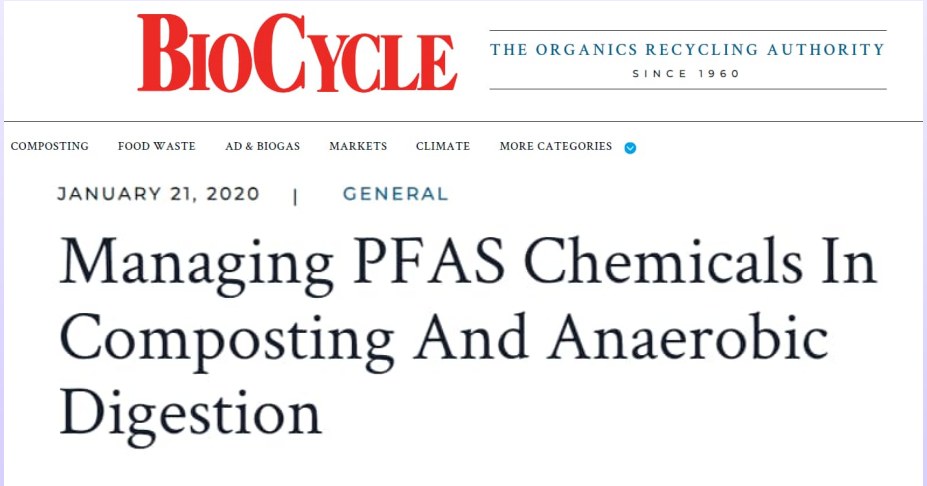
Issues - PFAS

"Polyfluoroalkyl substances (PFAS) are a large group of compounds used in nonstick coatings, textiles, paper products, some firefighting foams, and many other products. These compounds have many manufacturing and product applications because they repel oil and water, resist temperature extremes, and reduce friction."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THE ORGANICS RECYCLING AUTHORITY
SINCE 1960

COMPOSTING FOOD WASTE AD & BIOGAS MARKETS CLIMATE MORE CATEGORIES

JANUARY 21, 2020 | GENERAL

Managing PFAS Chemicals In Composting And Anaerobic Digestion

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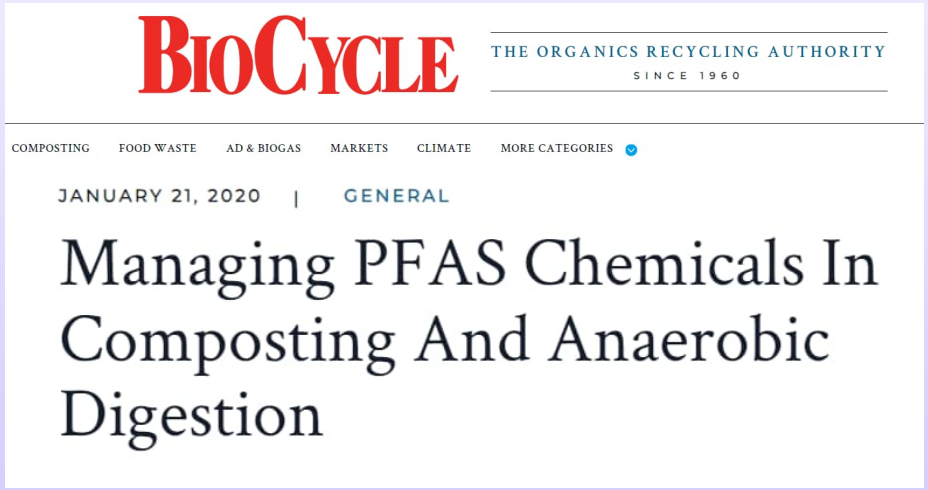
Issues - PFAS

"If you make compost from biosolids and/or from food scraps, it is likely your compost does contain PFAS chemicals."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COMPOSTING FOOD WASTE AD & BIOGAS MARKETS CLIMATE MORE CATEGORIES

JANUARY 21, 2020 | GENERAL

Managing PFAS Chemicals In Composting And Anaerobic Digestion

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Opportunity, Trends and Issues in Organic Waste Management

Let's learn to focus on what really matters – and have that direct our planning and implementation!

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John Paul, PhD PAg