

# AS THE WORM TURNS

## UNDERGROUND AND UNDERAPPRECIATED LIVESTOCK

by Av Singh

**Most urban centres have bylaws restricting access to ‘agricultural livestock’ leaving some gardeners trying to sneak a hen or two into their basements. Without question, the most productive and prolific of livestock is one that all urban gardeners and rural farmers need to appreciate more—the ‘lowly’ earthworm.**

### Earthworms as soil health indicators

In “Subterranean Homesick Blues,” Bob Dylan wrote “You don’t need a weatherman to know which way the wind blows.” The same could be said for soil health. Farmers and gardeners often turn to agronomists or soil scientists to learn about the health of their soil when they simply need to dig and look. The presence (or lack thereof) of the earthworm will speak volumes of the health of the soil and its potential for food production. Long known as an ‘ecosystem engineer,’ the earthworm plays an integral role in the cycling of water and nutrients in soil, and building better soil structure.

The earthworm’s role as a barometer for soil health has largely gone unnoticed by conventional agricultural wisdom. Many agricultural practices such as tillage, monocropping, and the use of chemical fertilizers and biopesticides have decimated earthworm populations. Therefore, if it is widely accepted that soil health is linked to earthworm health, most conventional agricultural practices would be under increased scrutiny.

Ironically, the farming practices that kill earthworms are actually substitutes for the benefits that earthworms naturally provide. For example,

#### Welcomed immigrant

Hard to believe but the earthworms found in our gardens and farms are invaders or have been introduced by settlers. During the last glaciation period, native earthworms were unable to survive. Even now, many areas could benefit from the reintroduction of earthworms.



*Earthworms feed on soil and dead or decaying organic matter, including straw, stubble, leaf litter and dead roots.*

earthworms till soils. In doing so, they break compaction, and increase water infiltration and retention. Earthworms ingest organic matter, and the castings (a fancy word for their poop) they leave behind are rich in nutrients ready for plant uptake. Earthworms reduce the need for soil fumigants and fungicides by creating conditions that are unfavourable for harmful nematodes and disease pathogens.

### Earthworms as creators of soil health

Earthworms perform many functions in the soil, including the following:

- **Break soil compaction:** instead of ripping, disking or rototilling the earth (all practices which will compact soil), earthworms help mix large and small soil aggregates, thus helping to rebuild soil and provide both micro- and large pores.

- **Enhance water infiltration and water retention:** earthworms create mazes as they tunnel through soil, thereby creating pathways for water to permeate, as well as spaces for water storage.

---

## The linings of earthworm tunnels are saturated with N-fixing bacteria.

---

- **Neutralize soil pH:** earthworms have calciferous glands which excrete a buffering solution in the ingestion of soil which gives their castings a higher pH than the soil they ingested.

- **Increase nutrient cycling and nutrient availability:** nutrients such as phosphorus and potassium are far more available in soils when earthworms are added. So, if your soil test shows low levels of P or K, you may first want to introduce earthworms to help make available nutrients that are in the soil but do not show up on your soil test. Similarly, nitrogen is more freely available because of the nutrient-rich mucous lining of earthworm burrows. The linings of these tunnels, which often become channels for plant roots, are saturated with N-fixing bacteria.

- **Stimulate microbial populations and decompose plant litter:** The incorporation of surface plant residue is one of the earthworm's most valuable roles. Earthworms bring organic matter underground where it can be consumed by other members of the soil foodweb. In doing so, they remove material that could be winter food for disease pathogens. The increased presence of earthworms has been correlated

with reduced populations of pathogenic nematodes, owing largely to earthworms eating nematodes and outcompeting with them for resources.

- **Increase productivity:** New Zealand research revealed that after earthworms were introduced to a worm-free pasture, there was a short-term increase in pasture growth of 70–80%, with a long-term increase of 25%. Researchers in the U.K. have found that pastures prone to being 'mucked-up' recover faster and level out more quickly when they have higher worm populations.

## Earthworms in bioremediation

In urban gardens where the topsoil might contain toxins, gardeners may find peace of mind by increasing their earthworm populations. The recent interest in earthworm-assisted bioremediation is not surprising as humans are finding it more and more difficult to find land that has not been affected by past industrial waste.

It has been well documented

that soil microbes, such as bacteria, fungi, protozoa and nematodes, can break down or biotransform chemicals including growth hormones and certain pesticides. However, the ability of microbes to bioremediate hydrocarbons, PCBs and sewage sludge is not well understood. Earthworms can bioaccumulate (store within their bodies) many of these chemicals. A study at Colorado State University monitoring the application of biosolids on soybean fields revealed that earthworms accumulated twenty chemicals, including detergents, flame retardants, perfumes and disinfectants.

## Encouraging worms in gardens and farms

Some farmers may think it quaint to try to introduce worms to their large farms. However, if you consider that worms can spread in the same way as wild mustard or oats, you might see the value of these introductions (see the sidebar on Worm facts for further convincing). As mentioned above, earthworms are great indicators

### A who's who of worms . . .

***Lumbricus terrestris*** – commonly referred to as nightcrawlers or dew worms, these long, pinkish worms form burrows in the soil and are chiefly responsible for incorporating crop residue.

***Eisenia foetida*** – commonly referred to as red wigglers or manure worms, these small, thin reddish worms are often used in vermicomposting as they are able to ingest large volumes of undecomposed litter. Red wigglers are quite susceptible to climatic and environmental changes and typically have a short yet prolific life cycle.

***Aporrectodea spp.*** – this group of worms is often the most numerous. They are similar in appearance to nightcrawlers but much smaller. Their major role is the ingestion of organic rich soil. They also aid in root decomposition and soil mixing, but tend to travel horizontally in the soil profile.

for soil conditions suitable for plant growth and tend not to like soils that are too acidic, alkaline, wet, dry, hot or cold. So, efforts to encourage their populations should involve such practices as liming to ensure that the soil pH is in the range of 5.5 to 7.0.

Quite simply, the best way to encourage earthworms is to feed them. Earthworms feed on soil and dead or decaying organic matter including straw, stubble, leaf litter, and dead roots. The mowing and shallow disking of green manure crops with perhaps a sprinkling of compost or animal manure will provide an excellent source of organic matter to keep populations on the rise.

Of course, some of the best ways of increasing earthworm

populations is by not harming them. The overuse of chemical fertilizers or fungicides (including copper-based ones) can be detrimental to earthworm numbers. Frequent deep tillage will

not only expose earthworms to an unwelcoming dry environment and hungry birds, but it reduces their food source by increasing decomposition of ground cover. Zero-till soils have been shown to have four times as many worms as cultivated soils.

### Do it yourself – worm bed

Worm beds can be as simple as putting a few cinder blocks together and filling the space between them with two-thirds topsoil, and topping it up with decaying material, such as leaf litter, grass clippings or kitchen waste. Remember, unless you are trying to create vermicasts (worm compost) instead of worms, this should not become a compost pile. On that note, compost worms (red wigglers) don't do well when introduced into gardens.

When harvesting worms, a good idea is to place some fresh food on the top and just watch them come to the surface. Most earthworms are more active at night, so to inoculate your gardens, it is best to dig them in the early morning when many are in the top two inches of the soil. Remember to top up their bedding after harvest.

### Worm facts – did you know?

- An acre (0.4 ha) of good agricultural soil can contain more than a million earthworms, while a long-term pasture or hayland can carry twice as many.
- Even when ample organic matter is available, earthworms will consume large amounts of soil. The mixture of the two creates a rich humus with more available plant nutrients than from the original material.
- An earthworm produces its own weight in castings each day, and a healthy earthworm population can produce almost five tons (4.5 tonnes) of castings per year in good agricultural soil. This is the equivalent of five percent of the soil (to plow depth), and suggests that earthworms are critical in speeding up the creation of topsoil from centuries to years.
- Earthworms are amazing diggers and earthmovers (moving stones fifty times their weight) and are credited with moving over fifty tons of soil per acre (55 kg/ha) per year. They can burrow down fifteen feet (4.6 m) and thus mix and disperse nutrients throughout many different soil horizons.
- Some earthworm species can produce over 250 eggs per cycle and complete a life cycle every six weeks.



Nona Robinson

---

### The best way to encourage earthworms is to feed them.

---

In pastures, you can simply cut pieces of sod rich in earthworms and transplant them to paddocks low in earthworm numbers. If you then follow many of the management tips provided above, you will see a dramatic increase in worms in two years. Transferring their environment is more effective than just simply throwing some worms or eggs out on pasture. Similarly, if you decide to create distinct worm beds (and I do recommend this for all gardeners and farmers), it is highly beneficial that the worms be inoculated in your gardens and farms with some of their existing material.

## Earthworms and you

As mentioned earlier, earthworms aren't going to get the respect they deserve from the academic world because they are too good at telling us that we are screwing up. So, once again, it's up to our pioneer farmers and gardeners to re-excite the agricultural world on what earthworms offer. If you need further convincing, try some of these tips and document what you see:

- To better combat apple scab, try introducing earthworms and some of their bedding (compost/ animal manure) on the fallen leaf litter in the fall. Next spring, you will likely notice that there is less leaf litter on the ground and hopefully, less scab on the fruit.
- The next time you are incorporating green manures, try topping certain strips with earthworms and document if, later on, crop yields in those strips are greater.

• If you are interested in zero-till, try a comparison of worm counts between your cultivated patches and document yield comparisons.

- Send your observations and experiences with earthworms to *TCOG Letters* to the Editor.

Worms are no snake oil but neither are they the magic bullet to solve bad management practices. We can turn to the philosophy of nature knows best, and we can try to optimize, rather than maximize, productivity. Providing earthworms with the proper environment (organic matter, moisture, soil pH) could be an integral part of the equation.

*Av Singh, PhD, PAg, is the Organic and Rural Infrastructure Specialist with AgraPoint in Nova Scotia and is available for comment or question at a.singh@agrapoint.ca or at 902-896-0277.*



## ORGANIC COMPOST AVAILABLE

Organic Compost certified to Canadian standards is available to be purchased from the City of Sarnia.

This compost is a blend of leaves, grass, horse, turkey and cattle manure.

Interested parties can contact Mr. Frank Velle at **519-332-0330 ext 266.**



**OCIA Canada**  
A Division of OCIA International  
Organic Crop Improvement Association

*The World's Largest and Most Trusted Leader in Organic Certification*

- Global Market Access
- Regionalized Customer Service
- Efficient Certification Process
- Import/Export Documentation Assistance
- Multiple Organic Certifications
- On-line Transaction Certificates
- Proficient on Canada Organic Standards & Regulation

Certifying:

- Crops
- Livestock
- Processing Facilities
- Community Grower Groups
- Private Label

*Protecting the integrity of organic products worldwide*

**OCIA CANADA OFFICE:** Phone: 306-682-3126 E-mail: [canada@ocia.org](mailto:canada@ocia.org)  
**Cornwall Office:** Phone: 613-933-6093  
**Business Development Coordinator:** Arnold Taylor  
 Phone: 306-252-2783 E-mail: [ataylor@ocia.org](mailto:ataylor@ocia.org)

[www.ocia.org](http://www.ocia.org)

## Rare Breeds Canada

*Conserving Heritage Livestock*



### The Bashkir Curly Horse Listed as Critical

This gentle, hardy Canadian heritage breed is hypoallergenic. Allergic to horses? Check out a Curly horse.

*Make your next livestock purchase a rare breed.*

Join RBC. Help conserve the genetic diversity of Canada's poultry and livestock AND get valuable membership benefits.

1-341 Clarkson Road  
RR #1 Castleton, ON K0K 1M0  
905-344-7768  
[rbc@rarebreedscanada.ca](mailto:rbc@rarebreedscanada.ca)  
[www.rarebreedscanada.ca](http://www.rarebreedscanada.ca)