

sustainability

Benefits of the Soil Foodweb™

soil microbiology explained 2005



Benefits of a healthy food web

About compost tea

Benefits of using compost tea

Where do you get a compost tea brewer?

How do you get compost tea on to your soil and plants?



Putting the life back into the soil and profits back into farming

Prepared with SFI and



Living Proof Systems

PO Box 121

Bangalow NSW 2479

A Sustainable Consultancy Service of
Look Tropical and Footprint Directions

www.footprintdirections.com

looktropical@bigpond.com or

greg@footprintdirections.com

Tel: (02) 6688 2324

Mobiles: 0414 580 780 or 0408 662 468

Benefits of the Soil Foodweb™

soil microbiology explained 2005



In a healthy soil with good organic matter and a healthy biology, a *soil food web* is created. Plants exude simple sugars, proteins and carbohydrates in hundreds of different forms. These then **trigger** responses from the soil biology.

The bacteria, protozoa, beneficial nematodes and fungi respond to these **triggers** to provide the plants with nutrition and to protect the plants from disease. The biology holds the plant nutrients within their own bodies and their own systems (non leachable forms) and “trades” them with the plants for mutual benefit.

Fungi have the ability to “wick” water and nutrients from many metres below the soil surface to the plant roots (reduce water needs by more than 30%). They also have the ability to produce antibiotics to combat pathogens.

Bacteria also have the ability to generate antibiotics to fight off plant pathogens. They also store vast amounts of nitrogen that are made available to the plants through the actions of a healthy *soil foodweb*. Both beneficial fungi and beneficial bacteria successfully fight plant disease by occupying the sites on leaf and root surfaces where pathogens would otherwise attack.

Compost tea (or soil microbe sprays) is designed to re- establish a healthy soil food web in degraded and toxified soils. This is so that plants can enjoy living in a healthy, disease free environment where the soil biology can moderate soil PH and make plant-available nutrients form “parent material” already present in the soil.

From Paul Taylor of “Look Tropical” – Suppliers of the new Living Proof Brewer

We make aerobic compost tea from aerobic compost; properly made aerobic compost is full of millions of species of bacteria and thousand of species of fungi (whereas anaerobic compost can be toxic to plants).

We then take the aerobic compost and add it to highly aerated water held at a desired temperature, add microbe nutrients that feed and thus select the species of microbes desired for the conditions as determined by the SFI laboratory testing and make a highly cultured “brew” full of beneficial fungi and bacteria to apply to the soil.

The compost tea programme will make soil more productive, less toxic and sustainable.

By sustainable we mean that every year your soil will improve in health and productivity and every year we will need fewer inputs (fertilizer, pesticides, herbicides, water and energy) for greater, more profitable and healthier production.”

Benefits of the Soil Foodweb™

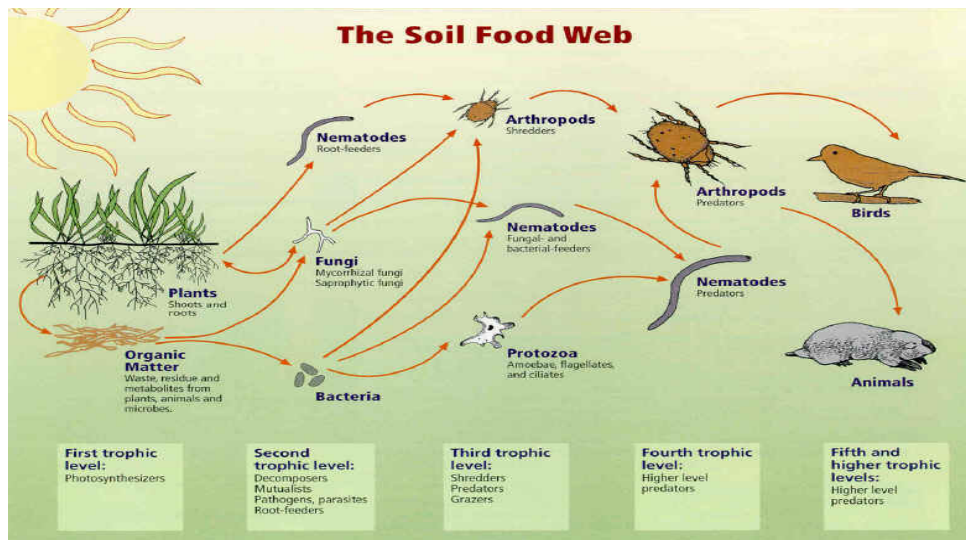
soil microbiology explained 2005



I. Benefits of a healthy food web

A healthy foodweb occurs when:

1. **Present & Accounted For:** All the organisms the plant requires are present and functioning. These include mycorrhizal fungi, beneficial bacteria, protozoa, nematodes and micro-arthropods.
2. **Take Up of Nutrients:** Nutrients in the soil are in the proper forms for the plant to take-up. It is one of the functions of a healthy foodweb to hold nutrients in non-leachable forms so they remain in soil, until the plant requires the nutrients. Then the plant "turns-on" the right biology to convert the nutrients into forms the plant can take-up. These nutrients are typically very leachable.



3. **Ratio Levels are correct:** The correct ratio of fungi to bacteria is present, and ratio of predator to prey is present, so soil pH, soil structure, and nutrient cycling occur at the rates and produce the right forms of plant nutrients.



The Soil Foodweb™ concept was researched, developed and registered by Dr Elaine Ingham, the president of the Soil Foodweb International. Dr Ingham is also an adjunct professor with Australia's Southern Cross University. Head Office Laboratories are in Oregon & New York with Australia lab in Lismore, New South Wales. Much of the data and many images in this document are supplied by the Soil Foodweb Institute of Australia www.soilfoodwebinst.com.au.





II. The seven functions of a healthy foodweb are to:

1. **Retain nutrients** so they do not leach or volatilize from the soil. The nutrients include nitrogen, phosphorous, potassium and calcium. Reduction or complete removal of inorganic fertilizer applications is possible and highly desirable.
2. **Cycle nutrients** into the right forms at the right rates for the plant desired. The right ratio of fungi to bacteria is needed for this to happen, as well as the right numbers and activity of biological predators.
3. **Build soil structure**, so oxygen, water and other nutrients can easily move into the soil and into deep, well-structured root systems.



Current concepts of plant root systems as being at the surface of the soil is the result of current agricultural and urban practices, not a real condition of plants.

Roots should go down into the soil for at least several to tens and perhaps 100's of metres, but the compaction that humans impose on soil results in toxic materials being produced. This compaction prevents good root penetration.

Pictured above left shows a healthy root system – denser, deeper, holding soils and building soil structure. This was achieved by application of compost tea with humates and other soil foods. The plant on the right, however, has sparse and broad root systems making it sub-standard in terms of nutrient retention, disease suppression and soil building.

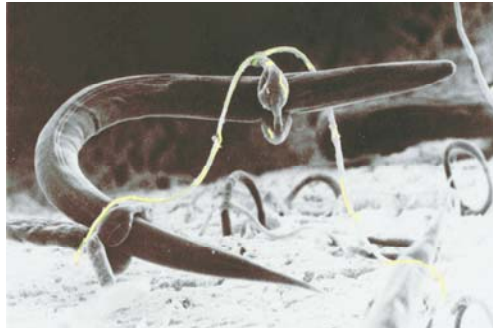
The only way to deal with compaction is to have the proper biology build the structure in the soil again, so oxygen and water can move into the soil.

When the biology is functioning properly, **water demand is reduced**, the need for fertilizers is reduced, and plant production is increased. Significant cost-benefits are found after initial investment in composting or application of brewed liquid compost solutions (compost tea).

Continued/...3

II. The seven functions of a healthy foodweb (continued) are to:

4. **Suppress disease-causing organisms** through competition with beneficials, by setting up the soil and foliar conditions to help the beneficials instead of the diseases.



For example, root-feeding nematodes are controlled by beneficial nematode species.

5. **Protect plant surfaces**, above or below ground by making certain the foods the plant surfaces release into the soil are used by beneficial, (not disease organisms). This is to make certain that infection sites on plant surfaces are occupied by beneficial and not disease-causing organisms.



And plant surface protection ensures predators that prefer disease-causing organisms are present to consume disease-causing organisms.

6. **Produce** plant-growth-promoting hormones and chemicals. This can result in larger root systems. Whether forcing larger root systems on plants is a positive result needs to be understood at a complex level.
7. **Decompose** toxic compounds.

Benefits of the Soil Foodweb™

soil microbiology explained 2005



III. Why use compost tea?

Compost tea is used for two reasons:

- to inoculate microbial life into the soil or onto the foliage of plants, and
- to add soluble nutrients to the foliage or to the soil to feed the organisms and the plants present.

The use of compost tea is suggested any time the organisms in the soil or on the plants are not at optimum levels.

Chemical-based pesticides, fumigants, herbicides and some synthetic fertilizers kill a range of the beneficial microorganisms that encourage plant growth, while compost teas improve the life in the soil and on plant surfaces.

High quality compost tea of will inoculate the leaf surface and soil with beneficial microorganisms, instead of destroying them.



Pictured above left is a banana leaf previously managed in this manner, but since 2001 only organically managed. No compost or compost tea applied.

High quality compost tea of will inoculate the leaf surface and soil with beneficial microorganisms, instead of destroying them.

Pictured right is a banana leaf after application of compost and tea (folia spray). These photographs have been supplied by Graham Taylor, from the Taylor Organic Plantation in Coffs Harbour. Graham presented this data at our Soil Symposium held in Byron Bay in 2004. See the next page for evidence of better quality, higher yield and more profitable fruit.

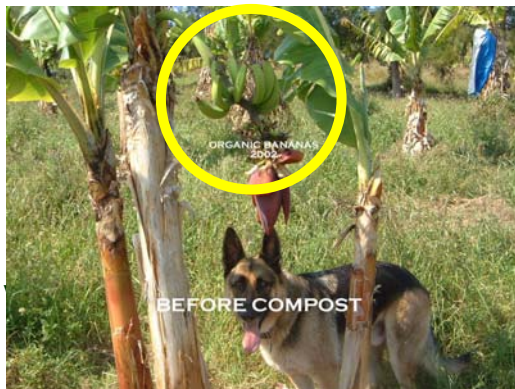
IV. Examining your soil and developing a Soil Foodweb programme



After you have had soil samples sent to the SFI laboratory for testing, you will receive written results.

An analysis and programme will be designed for your soil by SFI Certified Advisors. The programme considers the following elements:

- topology, climate, water availability and history of the site's use
- management history (including the use of additives, chemicals etc.)
- crop history and plans, design and management strategies
- soil analysis from a usage and yield suitability perspective, and
- cycle of compost and compost-tea applications required to elevate the life in the soil.
- seasonal or annual costs associated with applications of compost tea or compost.



Pictured above left is a banana bell and poor quality organic fruiting bunch.

Picture above right is a tree from the same plantation area, after the application of aerobic compost supplied by a Certified Soil Foodweb Institute advisor. The time lapse between the two photographs is 18 months.

Photos supplied by Graham Taylor of Taylor Organics (no relation to Paul Taylor).

Benefits of the Soil Foodweb™

soil microbiology explained 2005



V. What is compost tea?

Compost tea is a brewed liquid produced by leaching soluble nutrients and extracting bacteria, fungi, protozoa and nematodes from compost. It is easier to produce, transport and apply than compost.



Good, aerobic, living compost (pictured left) contains a huge diversity of organisms. Foods extracted from the compost, or added to the tea, grow beneficial organisms.

A large diversity of food resources is extracted from compost. The species diversity of organisms in actively aerated compost tea is much higher than those hundred or so species of bacteria that grow on the food resources added by people. Together, the beneficial bacteria and fungi growing on the compost foods, and on the added foods, result in a many individuals of many different species. Molecular methods are used to understand true species diversity in compost.



The brewing process is performed at constant temperature, although the growth of the organisms may elevate temperature as a result of their reproductive heat produced. Tea production is a brewing

process, similar to making beer or wine. The best teas across the globe have been brewed here in Australia, as independently measured and tested by the Soil Foodweb Institute and prepared by Living Proof & ASAP certified Soil Foodweb Advisors.

The science of compost-tea brewing is many thousands of years old. However, a precise procedure and specifically targeted ingredients must be used over a 24 hour brewing period to ensure high quality beneficial fungi and bacteria grow and survive until application time. Specialists are required to brew it, in carefully designed and tested brewers.



If you want to inoculate a highly beneficial group of bacteria and fungi, protozoa and possibly nematodes, buy good compost that has these organisms, and make actively aerated compost tea. Our supplier company, ASAP has a range of excellent, tested tea makers on the market (see our site www.asapsupplier.com) or contact paul@asapsupplier.com.

VI. Benefits of using compost tea containing the whole foodweb include:

- Improve plant growth as a result of protecting plant surfaces with beneficial organisms which occupy infection sites and prevent disease-causing organisms from finding the plant
- Improve plant growth as a result of improving nutrient retention in the soil, and therefore reduce fertilizer use, and loss of nutrients into ground and surface waters
- Improve plant nutrition by increasing nutrient availability in the root system as predator-prey interactions increase plant available nutrients in exactly the right place, time and amounts that the plant needs
- Reduce the negative impacts of chemical-based pesticides, herbicides and fertilizers on beneficial microorganisms in the eco-system
- Improve uptake of nutrients by increasing foliar uptake as beneficial micro-organisms increase the time stomates stay open, while at the same time reducing evaporative loss from the leaf surface
- Reduce water loss, improve water-holding in the soil, and thus reduce water use in your system
- Build better soil structure. Only the biology builds soil structure, and ALL the groups in the foodweb are required to be successful. You can't have just bacteria; you must have fungi, protozoa, nematodes and micro arthropods as well!



Above Right: SFI advisor photograph of six-week old turf root system after four applications of compost tea.

Above Left : Under the microscope, the secret life of soils is revealed. Here a mature Nematode is found with a young nematode seen in the top left corner.

Benefits of the Soil Foodweb™

soil microbiology explained 2005



VII. What is in compost tea?



Tea contains all the soluble nutrients extracted from the compost, but also contains all the species of bacteria, fungi, protozoa and nematodes in the compost. Making sure only beneficial species are present in the compost is therefore critical. Good, aerobic compost contains a huge diversity of organisms.

Only aerobes are desired. Anaerobes make alcohols that kill plant tissues very rapidly. Putrefying organic matter, which is anaerobic, also contains organisms, just not organisms that do anything beneficial for your plants.

The Soil Foodweb Institute advocates that when buying a tea brewer, you should ask the manufacturer to provide information about oxygen during the tea brewing cycle in the compost basket or bag. SFI also recommends you insist on being given analyses of diversity, and total and active bacteria and fungi, and protozoa results, present in the tea made under standard conditions. **These tests are available for all Living Proof Brewers.**



Many advocates of sustainable agriculture imply you need to compromise the business side of your farming operation for the sake of the environment. Not us. Our proven technology and sustainable agriculture programs are helping farmers of all types and sizes achieve remarkable results, including:

1. Increased yields.
2. Higher quality crops.
3. Lower watering and input expenses.
4. Reduced reliance on expensive chemical fertilizers and pest controls.
5. Higher profits.

VIII. The Living Proof Approach

It's no secret that many traditional chemical fertilizers and pest controls actually reduce soil fertility. But for most farm and landscape operations, they have become a necessity - largely because no effective natural alternatives are available. With ASAP Supplies, we can help you move from conventional chemical based farming practice to contemporary sustainable farming and landscape management methods. We do this without sacrificing yield levels or crop quality.