

# **THE MIGHTY EARTHWORM**

*The biologist Charles Darwin stated in his 1881 book about earthworms and humus:*

*“It may be doubted whether there are many other animals which have played so important a part in the history of the world as these lowly organized creatures.”*

*Earthworms have been the most neglected creatures on our earth; everywhere we hear the cries for help to save endangered species of flora and fauna but our humble and silent earthworm has had only a handful of support. This is all slowly changing with the increased awareness of the benefits of consuming organic and bio-dynamic produce. The growers of these types of produce know that “man’s best friend” does not have four legs, but is a loyal worker turning waste products into a usable fertilizer 24 hours a day seven days a week. In the soil there are two main types of worms. First there are the shallow dwellers, generally living in the top six inches of the soil. These worms are your main composting ones – they devour any organic matter laying on the surface and take it below ground to the cool moist environment where feeder roots from plants live so happily. As they burrow their way along aerating the soil at the same time, they also allow increased root development through forming tunnels. These tunnels also allow increased water absorption and the castings left behind act like sponges. After these we have the deeper burrowing ‘night crawlers’ – these sometimes rather large creatures burrow down some meters below the surface and greatly help to reduce water-logging as well aiding in prolific root growth. Only occasionally after torrential rain will these beings venture above ground to escape drowning and can at first glance be mistaken for a small snake.*

*The efficiency of the earthworm lies entirely in its design. As Aristotle so rightly said “worms are the intestines of the earth”. With a few ingenious modifications, the earthworm really is one long intestine. These modifications include three pairs of calciferous glands, which are constantly producing calcium carbonate, adding it to any food input and balancing any acidity of the food to a more neutral substance thus being able to lift pH in acidic soils, and the buffering action of carbonic acid reduces pH in alkaline soils. So, with whole armies of earthworms we can achieve natural balance in the soil, reducing any need for limestone applications.*

*Through their constant burrowing into the sub-soil, earthworms gradually deepen the topsoil while also bringing essential minerals to the surface.*

*The most serious problem facing modern agriculture has been the rapid decline in humus (organic carbon) levels in our soils. As reported in Appendix B Pt. I G, of the now infamous “agriculture lectures” delivered by Dr. Rudolph Steiner, that “humus and humus again should be given to the soil in every conceivable form (compost, leaf mold, etc.)”. Anhydrous ammonia is the greatest threat to this humus formation, for with even only one application of this*

*powerful substance, whole colonies of earthworms have been totally destroyed. This practice must stop in order to rectify the inevitable result, which will be a completely unusable desert. Our humble earthworm is the most efficient producer of humus, transforming up to its own body weight per day of organic matter into humus.*

*Cover crops, manures and compost must be added to the agricultural program. "Feed your soil and your soil will feed your plants", such is the cry of the organic farmer. Applying chemical fertilizer to your soil is not feeding it, but bypasses it, going directly to the plants making the soil nothing but a growing medium and destroying it in the process.*

*From all this, we can say that the earthworm has a great impact on our soil with its burrowing and humus making activities, however there are problems in re-establishing good earthworm populations in soils that have been subjected to heavy chemical treatment or those that have suffered from nutritional neglect. Merely sending in new recruits to the battlefield is useless unless management practices are altered.*

*Reduced tillage and increased surface mulch are two important management changes that will improve conditions. The use of tillage systems that leave surface residue is an important technique to increase earthworm populations. This residue creates a mulching effect, which protects the soil from drying out as well as protecting it from extreme temperatures, allowing the earthworms to feed and produce for longer in both spring and autumn.*

*Earthworms are prime indicators of soil health, but it has never been convincingly determined whether they are the instigators or merely contributors to high fertility. They certainly do contribute to higher levels of bacteria in the soil, but if given the opportunity to choose between an existing microbe rich environment and a sterile situation, they will always gravitate to the former.*

*As Ehrenfried Pfeiffer, a bio-dynamic farmer who received the directions for this method of farming directly from Dr. Rudolph Steiner states in Chapter 13 of Bio-Dynamic Gardening and Farming Vol. 2:*

*"Two processes are significant on the path of life which leads to the formation of organic matter. One is the up building process which all matter undergoes when it is organized by the living bodies of plants, animals and man. The other is a breaking down which impairs and transforms "life" matter after it has been used up and fulfilled its task for the building up, growth and maintenance of the living organism. In nourishment we have a special case, where outside matter (food) is broken down through digestive action and transformed into forms of matter to be used "inside" for the growth and maintenance of the body. This however is not a complete breaking down but fermentation. Fermentation is therefore a third process which stands in the middle between the building up and breaking down of organic matter as a kind of "mediator".*

*We must think of our soil as in a constant process of fermentation, continually transforming matter into nourishment for our living plants. To keep our soils in this mediating role requires certain numbers of beneficial bacteria and enzymes. Declines in these bacteria also mean a*

*decline in nutrition for our plants. Bacteria counts have not yet become a part of routine soil analyses, but it is hoped that in the future such important contributions will not be overlooked.*

*Adding UltraGrowth to your soil creates a fertile ecosystem for these beneficial bacteria, thus creating a worm friendly environment as well as instigating the right type of fermentation whilst eliminating any putrefaction activity which hinders healthy plant life. E. Pflffer goes on, "This is the secret of composting methods: to introduce such conditions of life that no final decay or putrefaction can occur, but that the micro life of the soil resumes it's activity, bringing about a complicated yet stable structure of organic matter. Humus is not so much a definite chemical formula but rather a state of existence of transformed organic matter in connection with soil, soil life, moisture and air. It is a balanced state of matter, almost a living organism or condition itself."*

*To add fertilizer to your soil should really mean adding "soil food". UltraGrowth is the medium that allows soil food to be produced through the microbial breaking down of organic matter as well as allowing for the proliferation of earthworms. UltraGrowth is an ecosystem balancing product providing plants and soil alike to have balanced micro and macro organisms that provide the nutritional benefits.*

## THE EARTHWORM DIGESTIVE SYSTEM

The earthworm literally eats its way through the earth or organic material to form burrows. It goes around materials too large and hard to swallow. Small particles pass through the mouth and the cavity of the pharynx or throat, along the esophagus by the calciferous glands, which excrete chalk (calcium carbonate) thus marginally reducing acidity of the food material eventually assembling in the crop where the enzymes and bacteria controlled by the calcium carbonate solution break it down in preparation to be treated in the gizzard, which is a sac surrounded by strong muscle where digestive juices, small grains of stone and mineral particles grind the food to enable it to pass through the intestine.

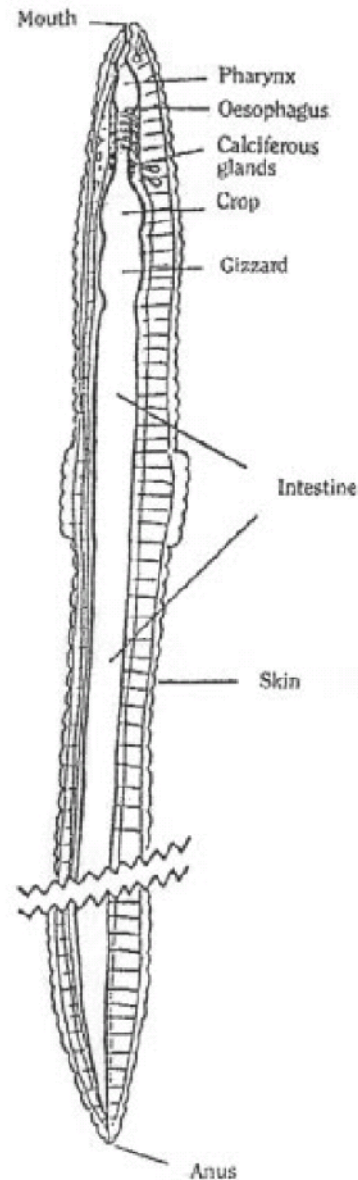
The smaller particles of food are absorbed through the intestine walls into blood capillaries and proteins and sugars are distributed to body cells while waste matter passes to the outside skin as mucous which lubricates the earthworms progress through the soil.

The undigested and larger particles of food pass through the intestines to the anus where they are excreted as nitrogen laden worm castings.

The whole process takes about 24 hours from eating to excretion. Some microorganisms from the worm's digestive tract pass out with the castings to continue the digestive process in the soil. Some of this material passes through the worm again as it repasses and repasses through the soil.

The digestive process of the earthworm is aided by bacterial action in the soil, which decays the food in a predigestion process.

Predigestion is best in slightly acid, but not strong acid, conditions.



### MANAGEMENT LESSON

Healthy worms require pH conditions between 6.8 and 7.2 for best digestion of food. Tiger worms will tolerate greater acidity. Worms will eat their own body weight in a day so food supply must be reliable.

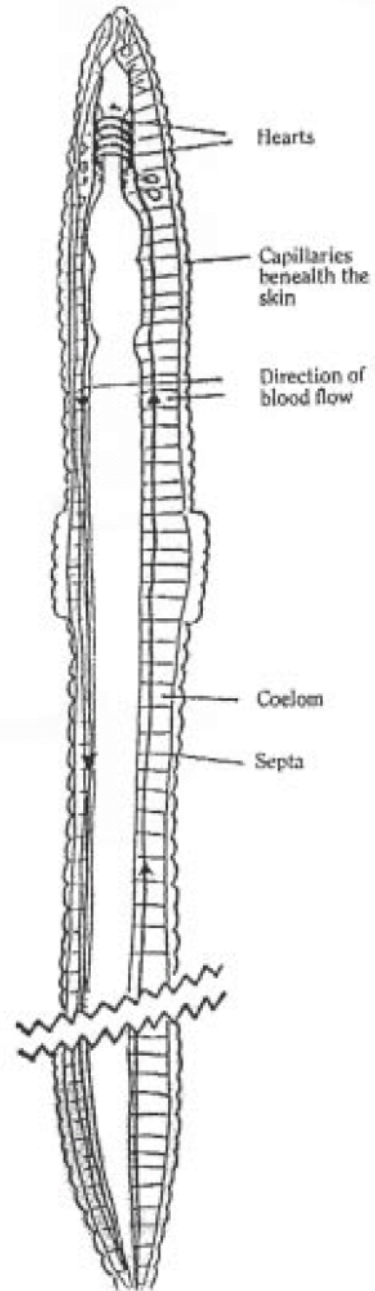
## WORM CIRCULATORY SYSTEMS

Earthworms have up to five hearts located at the anterior end, which pump blood to the posterior end through the main ventral blood vessel beneath the digestive tract. It returns through another larger dorsal blood vessel to the hearts. In the process the blood spreads to and from the organs and the skin through capillaries which exchange nutrition and water for waste matter.\* The dorsal and ventral vessels are interconnected in most segments of the worm. The walls of the capillaries are extremely thin allowing for easy exchange of nutrition and oxygen for waste fluids and gases.

\* This waste matter is a mucous secretion, which acts as a powerful wetter – sticker agent, so essential for foliar fertilizing.

### MANAGEMENT LESSON

The worm circulatory system is extremely fragile so care should be exercised in handling them. Never use a spade and use forks with care.

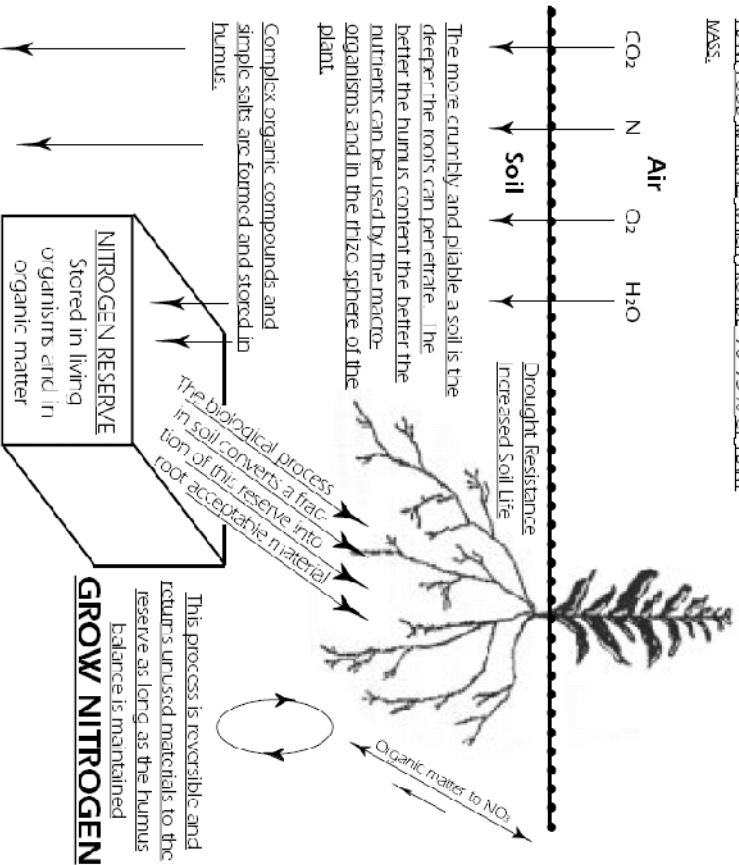


# The Bio-Dynamic versus The Mineral Concept of Availability - Nitrogen -

## Warmth

THE ENERGIES PLUS "LIFE"

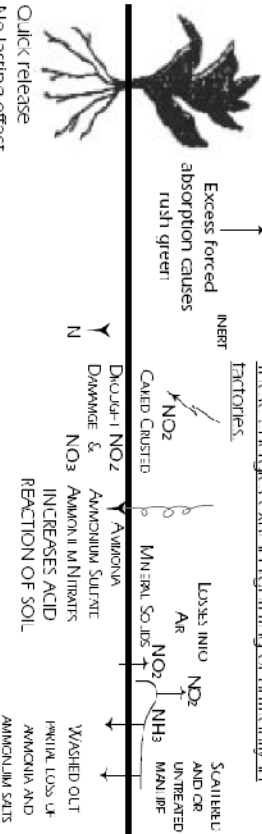
UNLIKE THE INFLUENCE OF LIGHT LIFE UTILIZES ORGANICALLY CONVERTED INTO CHEMICAL ENERGY, THE PLANT ABSORBS CARBON DIOXIDE, OXYGEN AND WATER DIRECTLY FROM THE AIR. THESE ARE THE PLANT FOOD MATERIALS WHICH PROVIDE 90-95% OF PLANT MASS.



## Light

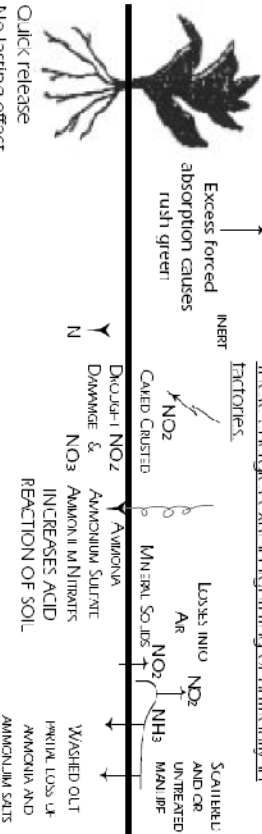
THE MATERIALS: OXYGEN, HYDROGEN, NITROGEN and CARBONDIOXIDE- THESE ARE THE BODY BUILDERS, WATER IS THE MEDIATOR

EXCESS  $NO_3^-$  IN PLANT TISSUE:  
 - TOXIC TO ANIMALS  
 - SOMETIMES MORE PROTEIN 5% BUT LESS NUTRITIOUS VALUE BECAUSE OF UNFAVORABLE AMINO ACID BALANCE



## Air - Water

Nitrogen in the air is inert and has to pass through the soil and nitrogen-fixing organisms in the soil to be activated and converted into acceptable material. Tremendous electrical energies are employed to convert nitrogen into useful forms. These energies exist in lightning or artificially in factories.



Complex organic compounds and simple salts are formed and stored in humus.

This process is reversible and returns unused materials to the reserve as long as the humus balance is maintained

CONTRACTON AND UNFAVORABLE REACTIONS IN MINERALIZED SOIL CAUSE HORIZONTAL AND HORIZONTAL. MUCH OF THE EXCESS FERTILIZER CAN BE FOUND HERE AND IS UNACCESSIBLE TO ROOTS

**BASIC IDEA: FEED THE SOIL - LIFE AND SOIL WILL FEED THE PLANT.**

**BASIC IDEA: FEED THE PLANT DIRECTLY AND USE THE SOIL AS A VEHICLE ONLY TO CARRY NUTRIENT SOLUTION**

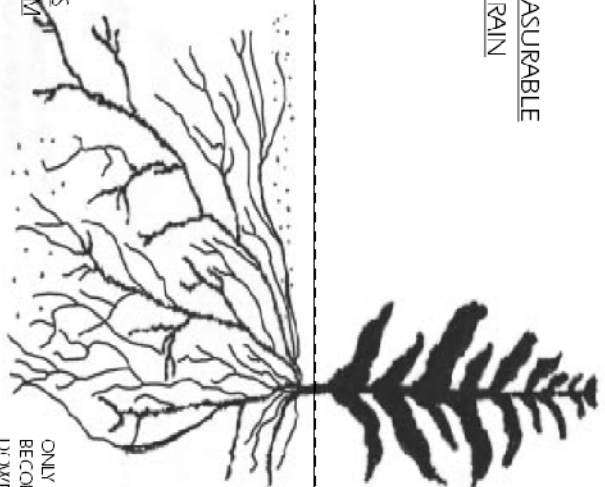
At 2% organic matter - The organic nitrogen reserve can be 2000lbs/acre  
 At 3% organic matter - The organic nitrogen reserve can be 3000lbs/acre  
 At 4% organic matter - The organic nitrogen reserve can be 4000lbs/acre  
 But in Biodynamic soils we have often found two and three times as much. This is possible because of the activation of the living process.

THESE UNFAVORABLE CONDITIONS PREVAIL BELOW 1.5% ORGANIC MATTER IN MINERALIZED SOILS  
 Virgin soil: 4 - 8% organic matter  
 Today's soil: U.S. Average 1.5%

CONTAMINATION OF GROUNDWATER WITH  $NH_3$  FROM MANURE SLUDGE OR  $NO_3^-$  FROM EXCESS N IN DEEP WELL WATER

# The Bio-Dynamic versus The Mineral Concept of Availability - PHOSPHATES -

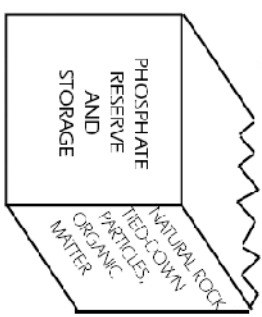
PHOSPHATES ARE PRECIPITATED IN MEASURABLE AMOUNTS WITH SNOW AND WINTER RAIN



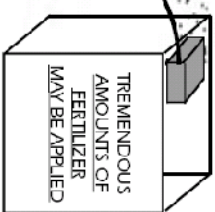
THE SITUATION IN ORGANIC "LIVING" SOILS:

PHOSPHATE COMPOUNDS ARE DISPERSED IN THE SOIL IN LIVING AND DEAD ORGANIC MATTER. ORGANIC AND INORGANIC ACIDS CAN RENDER THEM AVAILABLE. THE MORE DIGESTED ORGANIC MATTER (HUMUS) THAT IS PRESENT THE GREATER THE AVAILABILITY FROM PARTICLE TO PARTICLE TO SOIL SOLUTION TO ROOT AREA. THERE EXISTS "A DYNAMIC EQUILIBRIUM". BECAUSE OF IT, PHOSPHATE PARTICLES DO NOT MIGRATE MUCH BUT UNDER UNFAVORABLE CONDITIONS THEY CAN BE PRECIPITATED AND LAY IN POSITION BUT INERT.

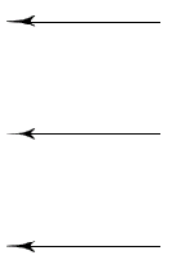
PHOSPHATES ARE ALSO CONTAINED IN MANURES AND COMPOSTS.



"THE NATURAL BALANCE" DECIDES HOW MUCH IS AVAILABLE OR TIED DOWN



ONLY 2-10% REMAIN AVAILABLE. THE REST BECOMES UNAVAILABLE AND IS TIED DOWN WITH CONFINED UNFAVORABLE CONDITIONS. IT WILL REMAIN TIED DOWN AND WILL BE EVENTUALLY LOST



THE SITUATION IN MINERALIZED "DEAD" SOILS:

THE SOIL BALANCE DECIDES HOW MUCH WILL REMAIN AVAILABLE AND NOT THE AMOUNT OF APPLICATION. THE MORE THAT HAS BEEN APPLIED THE BETTER THE CHANCES OF TYING DOWN, RESULT: LOCKED UP NUTRENTS

ACID SOILS ALLOW BETTER AVAILABILITY ALKALINE SOILS FAVOR UNAVAILABILITY

IN EXCESSIVELY PHOSPHATE FERTILIZED SOILS, LARGE DEPOSITS OF PHOSPHATE HAVE BEEN BUILDING UP WHICH CAN BE UTILIZED WITH THE "BIOLOGICAL ACTIVATION" OF THESE SOILS.

IF THE BIOLOGICAL ACTIVATION IS NOT DONE AND THE SOIL BALANCE IS NOT MAINTAINED, THEN PLANTS CAN ONLY LIVE FROM THE MINERAL COMPOUNDS CONTAINED IN THE SOIL SOLUTION, AND THE MINERAL FERTILIZER THEORY APPLIES

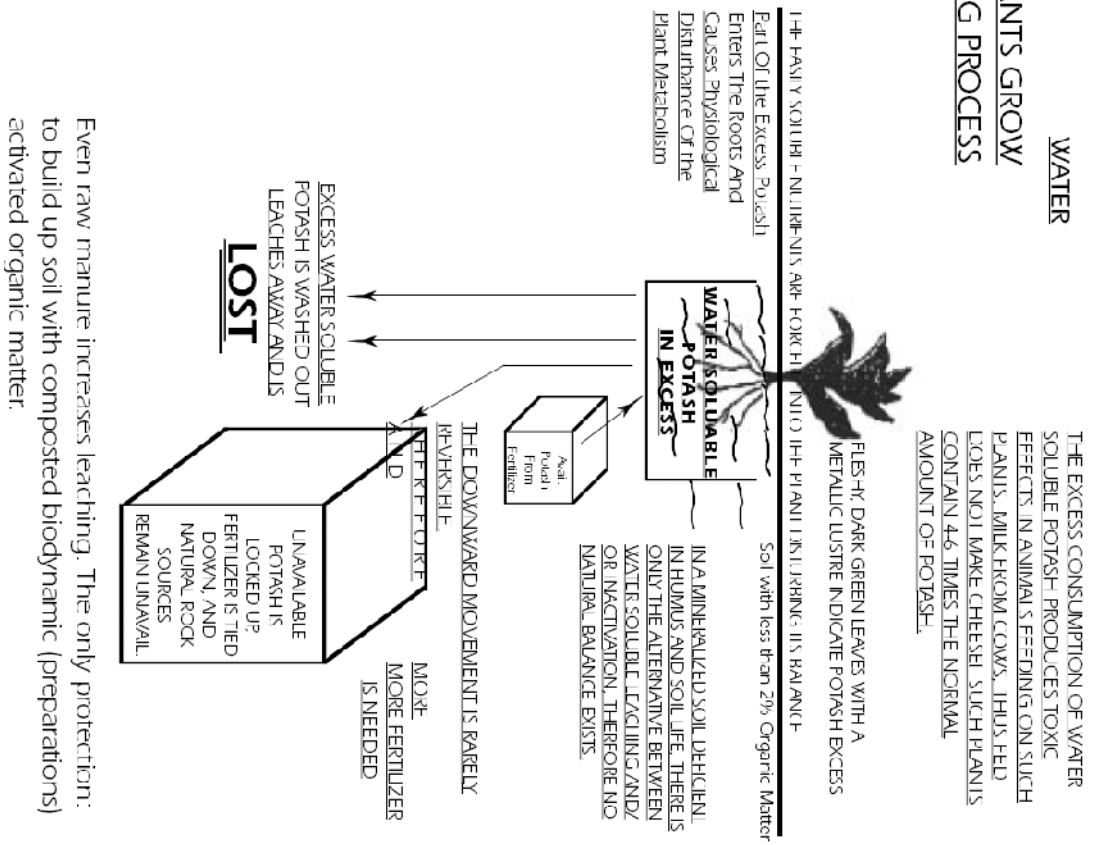
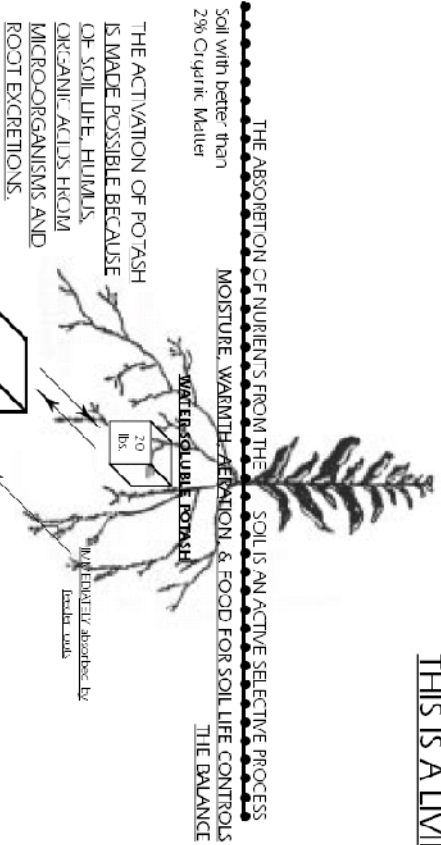
WITH BIOLOGICAL ACTIVATION AND MAINTENANCE OF SOIL BALANCE, NATURAL RESOURCES ARE UTILIZED AND ONLY THE ACTUAL REMOVAL BY WAY OF CROPS NEEDS TO BE COVERED.

# The Bio-Dynamic versus The Mineral Concept of Availability

LIGHT - **POTASH** - WARMTH

AIR WATER

MAKE THE PLANTS GROW  
THIS IS A LIVING PROCESS





*UltraGrowth* has been designed mainly with the organic farmer/gardener in mind but can be confidently used by conventional farmers as well. Organic practice requires copious amounts of manure or compost prior to planting to enable the soil to come alive. This practice works to varying degrees, because nitrogen is often locked up in the soil. It is the microbial activity in the soil that determines how much of the organic nitrogen is transformed into nitrates, in addition to the nitrate sources from manure and fertilizers.

Man-made fertilizers speed up the rate of bacterial action to such an extent that they actually burn themselves out, leaving the soil lifeless. After the organic matter has gone nothing is left to cycle the nutrients. *UltraGrowth* balances soil and promotes earthworm activity, which in turn builds organic matter which increases moisture retention, microbial activity preventing water and wind erosion. Earthworms further break down organic matter into food for plants just as our own intestines break down the organic matter that feeds us. The more man made or chemicals or unnatural fertilizers in the soil, the harder it is for worms and their related bacteria to survive. The more bacteria, the more worms thrive.

With frequent applications of *UltraGrowth* the soil will maintain a high concentration of microbial activity to ensure the constant breaking down of organic matter into humus to keep the soil alive and productive, enabling crops to have ready access to these locked up nutrients. *UltraGrowth* may be used on all crops, from vegetables to grains to cut flowers. It can be used to minimize transplant shock and can even be used as a base for N.P.K. or trace element additives if required.

*UltraGrowth* improves germination rates and provides a flying start for seedlings. It also satisfies "hidden hungers" in plants requiring nutrient boosts at times of stress. It can also be used as a rescue remedy during times of stress and can increase flowering, fruit production and the quality of all produce.

Both aerial and under leaf foliar spraying are highly recommended and beneficial for both plants and soil but for the home gardener as well you can simply dilute in water and give to your plants, indoor or outdoor, once or twice a week. It does no harm to use diluted *UltraGrowth* every time you water. For ornamentals like roses, you will notice larger blooms, deeper colors, shinier leaves, less fungal and insect attacks. Ferns and orchids can take the drops directly on the crown without burning them and it's all they need. For hungrier plants like tomatoes, sprinkle a little compost around the base of the plant then give *UltraGrowth* to maintain excellent cropping.

## **WHY SHOULD I USE *UltraGrowth*?**

In this modern age we are becoming increasingly aware of the damage "chemical fertilizers" are doing to our soils and ultimately our health. Food crops grown with these fertilizers are unnaturally forced into rampant growth to maximize yields so that the farmer can maximize his profits.

*By using these fertilizers, a user destroys the plant friendly bacteria that are naturally found in the soil. Chemical fertilizers work through the water element, so excess water is a must with this type of farming. As the plant takes up this additional water, it also takes up the fertilizers through osmosis. The plant, now thoroughly drenched in water, is pushed to its outer most limits. This "forcing" stretches the plants "skin" so that it is thin enough for insects to have no trouble at all to eat to its hearts content. Nitrogen fertilizers further lower sugar level in the plant and cause it to be in a succulent state. With this "fast food outlet", insects and disease breed prolifically and causing the producer's profits to plummet from the expense of buying the fungicides or pesticides to keep these insects and diseases in check. Every few years increases or changes of the toxic material is needed to combat the ever increasingly problems. Soil dynamics further change allowing unwanted species to invade into the newly formed ecosystem.*

*Through this form of agriculture then relies on herbicides and synthetic hormones to regain control of the land destroying any "life force" which may have been present. This "life force" can be detected by our sense of taste. Just eat a hydroponic grown tomato and then eat an organically grown one!*

*This "life force" need for our health. We only need to look at when man-made chemicals were first used in agriculture, and then look at when our modern diseases began to flourish to make a connection.*

*Now more than ever, we need to restore this "life force" to our soils UltraGrowth does just that. Providing a comfortable oasis for earthworms and other beneficial "critters" that help in the building up of humus, for it is humus and humus alone that our plants need to live in. By applying UltraGrowth over a period of time, humus levels increase, giving plants access to minerals deep in the soil, enabling our food crops to deliver what they were meant to do.... supply man with the "life force" for his health.*

## **WHAT MAKES UltraGrowth SO superior?**

*With the "agricultural revolution", scientists discovered that high concentrations of nitrogen, phosphorous and potassium, or N.P.K. could grow crops at a faster rate than the traditional method. Now many years down the track, we are finding that this revolutionary method has not only destroyed the humus level of the soil, but to grow the same crops in the same soil requires higher levels of this N.P.K. as well as higher levels of pesticides and fungicides. And this still can't produce the same yields as it did in previous years!*

*Man made fertilizers, when added to the soil disrupt and ultimately change the rate of bacterial action to such an extent that the soil fungistasis is changed. Fungistasis is the ability of the soil to actually inhibit and then promote other organism growth. After the beneficial bacteria have gone the vacuum is filled with undesirable plants, micro and macro organisms thriving on a desolated soil. This literal bankruptcy of the soil forces the miss management to stop because of the high economic costs, allowing nature to rebuild and rebalance the ecosystem. Without help most ecosystems require decades, centuries and even millennium to recover.*

*Current commercial agriculture has gone on way too long. The health of our soils have been ignored to the extent that only weeds will grow on much of our farmland. This must stop! By applying ULTRAGROWTH, the soil once again comes to life. Beneficial bacteria can be added then cultured in the soil with ULTRAGROWTH. Earthworm activity returns as does the soil health. Excess water through heavy rain no longer causes deep erosion, but is sopped up by the return of organic matter in the soil. Crops begin to show signs of life again, losing their plastic look and taking on an oily, shiny luster that oozes with health.*

*The humble earthworm is the key factor in soil health. The more earthworms, the healthier are the soil. Aristotle was right when he called earthworms the “intestines of the earth”. They break down organic matter into food for plants, just as our own intestines break down organic matter to feed us. The more chemicals in the soil, the harder it is for worms and their related bacteria to live there. The more friendly bacteria, the more worms there are.*

*So, if earthworms are the key, then ULTRAGROWTH is the door that opens up the wealth of health for our soils, building up the humus level to house all of the beneficial creatures for our plants. By applying ULTRAGROWTH today, you are improving your soil for tomorrow.*

## **UltraGrowth IN AGRICULTURE**

*ULTRAGROWTH has been designed mainly with the organic farmer/gardener in mind but can be confidently used by conventional farmers as well. Organic practice requires copious amounts of manures or compost to be spread on the ground prior to planting to enable the soil to come alive. This practice works to various degrees, because nitrogen is often locked up in the soil. It is the microbial activity in the soil that determines how much of the organic nitrogen is transformed into nitrates, in addition to the nitrate sources from manure and fertilizers. With frequent applications of ULTRAGROWTH, the soil will maintain a high concentration of microbial activity to ensure the constant breaking down of organic matter into humus to keep the soil alive and productive, enabling crops to have ready access to those locked up nutrients. ULTRAGROWTH may be used on all crops, from vegetables to grains to cotton and even cut flowers. ULTRAGROWTH should be used to minimize transplant shock, and can even be used a base for N.P.K. or trace element additives if required.*

*ULTRAGROWTH improves germination ratio and provides a flying start for all seedlings. ULTRAGROWTH also satisfies “hidden hungers” in plants requiring nutrient boosts at times of stress. It can be used as a rescue remedy during these times of stress and can also increase flowering, fruit production and quality of all produce.*

*Aerial spraying and boom spraying is highly recommended, and beneficial for both plant and soil.*

*Foliar application by boom spraying is highly recommended and is of benefit to both plant and soil.*

## **UltraGrowth FOR THE HOME GARDENER**

*The entire ULTRAGROWTH product range may be used by the home gardener. Simply dilute in water and give to your plants once or twice a week. It will do no harm by using ULTRAGROWTH every time you water your plants, and in many situations has even proved beneficial, increasing yields and shortening maturation time with vegetables and flowering plants.*

*For ornamental plants such as roses, etc., ULTRAGROWTH is indispensable. Larger blooms with greater intensity of color and thicker, shinier, oilier leaves will be your reward. Less fungal attack and less insect attack will be noticed simultaneously with regular use. ULTRAGROWTH works on the plants immune system so that plants can tolerate those annoying fluctuations in the weather better than they did before.*

*Just make sure the plants don't dry out, and add the drops directly around the base of the plants once or twice a week, at your leisure. Ferns and orchids can take drops directly on the crown without fear of burning.*

*Don't forget foliar feeding. At the same dilution rate, spraying the foliage, particularly underneath, at regular intervals, will be a treat for our little green aphid friends, further strengthening their resistance against pest and disease.*

*For hungry plants such as tomatoes, sprinkle a little compost around the base of the plant and then give ULTRAGROWTH to maintain excellent cropping. For delicate plants such as ferns or orchids, there is no need to use anything else but ULTRAGROWTH.*

## **FOLIAR FERTILIZING**

*The importance of foliar fertilizing has now been recognized as a highly effective technique in boosting plant health. Suggestions of up to twenty times more efficiency in using the foliar route are hard to ignore. To boost this efficiency in an organic way, UltraGrowth accomplishes these goals.*

*The activated water and content of the product combines and creates an ecosystem that allows for the ideal environment to mine existing minerals in the soil through the activity of beneficial microbes and earthworm proliferation. Recognizing the enormous potential of this breakthrough, we here at UltraGrowth have been working diligently to develop liquid plant food based on promoting these beneficial micro and macro organisms.*