Renewable Farming
By Dr. William Jackson

Summary:
Humic material is what makes the whole soil and crop bio-cycle go around. If our soils don't have it, they short-circuit and end up with such stress we'll have to pay for later. Microbial digestion builds humus, and thus enhances topsoil. Thus, humus is involved in all aspects of growing plants. Soil nutrients built through digestive tracts of soil life are ready for the plant to take up quickly. They're surrounded with amino acid proteinate, which the plant is adapted to.
Microbial life needs an energy source, primarily carbon. This can be animal wastes, old seedbed materials or other blends of digestible waste materials. After the complete breakdown of these materials through microbial and enzymatic processes, the beneficial humus is formed.

What kind of humus serves you best? What's usually best is what's available from natural recycling. You know what's *not* best. We always demonstrate at our seminars how ammonia makes carbon soluble. And you've heard how the Army built South Pacific runways by injecting anhydrous ammonia: It dissolves the humus and locks particles of soil so tightly that it's tough like concrete. Plants can't penetrate it. After WWII, the plants for making anhydrous remained, and chemical companies demonstrated to farmers that anhydrous could break down humates more rapidly than micro-organisms were doing it. The result: Yields rose about 30%. We burned up about 10 years of humus building to get one year's yield increase.

Now, more than 30 years after widespread use of anhydrous, the remaining humus structures are more difficult to break down with anhydrous. Farmers wonder why yields are drifting lower with the same amount of applied NH3.
You can add more, but in many cases we've reached a point where even moderate rates of anhydrous are increasingly toxic: Microbial life and larger soil creatures like earthworms and night-crawlers begin to die off, or go dormant.

If we ever totally lose our army of micro-organisms, we're in serious trouble. It's exciting for me to see clients interested in life and energy in the soil, because we *must* do something to counter chemical overuse.
I don't say, *"Never* use chemical salts." But I suggest you cut down rates and add more humus. You need to reduce toxicity in your soil at least to the point where microbial life can exist.

I have colleagues with PhD's who really fuss with me over this issue of nurturing soil microbiological life. First they said I was crazy. Then they saw some producers doing a marvelous job with the concept, and backed off enough to say, "Well, he's a maverick, but we'll see if he's correct over time."

I've already seen it work over a long time. My old granddad was a Dutchman who plowed with horses. Two horses could pull a one-bottom, 14-inch or even 16-inch plow all day with regular rest. But in most cases today, two horses couldn't plow most of the farmland we have, even if you could keep a walking plow in the ground. Very slowly, we've been making concrete of it, bonding soil particles together.

In some parts of the country, the soil is so burned out you can't even grow weeds. 1 can buy some ground for $50 per acre. It used to grow crops. But it's not only biologically dead - it has such chemical toxicity it won't grow anything at all.

How long would it take for *your* land to become that toxic - no humus left, reduced microbial life?

The encouraging thing is that people like you are saying - wait a minute! We need to turn this process

around. You have the privilege of recovering recognition of Humic material in crop production. It will take a little time and a little courage. You'll make it work.

Where do we get Humic material? Some of it is so close you're possibly not aware of it, such as cover manure spread on fields, and crop residue.

The commercial and "scientific" propaganda is that we don't have enough Humic material to go around - that to replace chemical fertilizer you'd have to cover cropland with several inches of manure every year. Don't believe it.
Animal waste alone in the United States would offer more than adequate Humic material to cover every acre. And it would be practical if it weren't for transportation problems. We have the sources of Humic material, and we can raise even more, if we have the sense to use it.

Two weeks ago, officials in one state advised farmers to take their cellulose - the straw from their farms - and sell it for $7 an acre to make chip board. It's worth a lot more to work into the soil as a carbon source. It's food for your army!
If we mess up the cycles, they will self-correct, but it will take time, long after we're gone. One benefit of the Conservation Reserve Program is that we stopped abusing the soil for 10 years. Weeds, if allowed to grow, were part of the healing process, selectively replacing nutrients lost in years of salt-based fertilizers and intensive cropping.

The more you give your microbes to digest, the more you can stimulate growth of microbes. So tease them into it. First make them a bit hungry, then give them plenty to eat, and they'll love you.

When they do their thing, neighbors will ask, "How come your crops are growing and I can only grow weeds?
One answer is that humus holds water, and water is crucial to temperature control of soils; a kind of thermostat to preserve life in the earth. Ground water percolates down, then is drawn back up into the roots. Part of this exchange depends on the difference in temperature of ambient air versus soil. Nature can express this need to balance soil temperatures. If soil is toxic or the pH out of balance, broadleaf's like dandelions in a lawn in effect say, "I'll come on real fast in the spring and cover the ground quickly to hold down its temperature."

Earthworm castings are typically closer to neutral pH than the soil around them. They are used by nature to restore balance.
Microbes can even clean up soil contaminants like diesel oil and other hydrocarbons. The right conditions and microbes can clean up a diesel spill in 20 days.

Typical soil has about 700 lbs. per acre of microbes, and even more live weight in larger soil creatures like earthworms. But microbes respond the fastest. Under ideal conditions, the weight of microbe soil can double every 24 hours.

Humus from microbial life also helps plants "condition" their immediate environment by preserving soil moisture. One reason drought is so deadly is that the plant can't get enough moisture to both cool itself and carry on the metabolic processes that build plant tissue.

If you could watch the live action on the surface of a leaf through a microscope, you'd see a little geyser of water vapor emitted from every stomata, or pore, of the leaf. This cooling system fails without adequate soil moisture. It's also less efficient without adequate trace minerals in the soil. If the plant needs twice as much water to obtain adequate trace minerals, soil moisture will be depleted at a faster rate. If the plant is well-fed with balanced minerals including trace minerals, it can survive and produce a crop on less water.

Larger soil organisms, which can get killed in the war against insect pests, are important in restoring soil balance, too. USDA analyzed the castings of the more complex soil creatures, including earthworms, mites and others.

Although they didn't publish the results widely, they found that the castings generally had a 500% higher level of nitrate than the surrounding soil. Available phosphorus ran 700% higher; exchangeable potassium was an astounding 1,200% higher and exchangeable calcium 150% higher. Organic carbon and available magnesium were twice as high.

And all these nutrients were in a form which is not toxic to plants. It had been all organically digested and made available in plant-usable form. If you have your own "fertilizer factory" of soil life working for you free, giving you nutrients in a safe and stable complex, how can you convince me that you have to put on a maximum load of commercial type NPK?

But you need to rebuild your living underground factory before you drastically cut back your fertilizer bill. Start by using nutrients that enhance rather than destroy soil organisms. Then work toward cutting applied nutrients by half, meanwhile applying humus building materials. As your crops improve over two or three years, set a goal of reducing purchased NPK.

I'll give you an example. Adolph Dreisel at Klamuth Falls, Ore., grows potatoes. Three years ago he grew mostly B-grade potatoes; 147 sacks per acre.

Then he used humic and fulvic material, and his yields jumped to 284 sacks per acre.

The third year his yield went to 342 sacks of grade A potatoes. By now his potatoes qualified as organically grown. An organic buyer came by, and Dreisel is getting $12 per 100-1b. sack. His competitors are getting less than $3 because the potato market is so depressed.

Try to tell him growing potatoes naturally is a disadvantage!

I watched a tomato grower at Modesto, Calif., make a similar change. A good average there is 30 tons of tomatoes per acre. He applied humic and fulvic acids and his yield went up to 60 tons per acre.

Then he stimulated micro-organisms drowsy from years of conventional fertility, and went up to 74 tons per acre.

Try to tell him doing it naturally doesn't pay! You stop degradation of soil. Soil is never really dead, just dormant. You can bring it back.

Also, those potato and tomato crops grade better. The tomatoes don't bruise as easily; their foliage has stronger stems to resist wind and rain damage. Sugar content is up as shown with a brix instrument.

I worked with a watermelon grower near Phoenix after he checked his sugar level at harvest and found it was two full points below standards. The buyer refused to accept those melons, but fortunately the owner knew the sugar content before he harvested.

In 24 hours, using a water soluble humus foliar spray and a natural stimulant, we raised the sugar in the melons by four brix points, two points beyond the minimum.

That made a difference of $87,000 to that grower, all in 24 hours. Now that grower wants to start

early on the next crop.

We need to learn to think like our crops; like a tomato, for instance.

If a tomato senses the stress of a dry year or poor nutrient balance, it'll hurry to replicate - even if all it can do is make a couple of tiny tomatoes containing some seed.

However, let's think like a tomato stimulated by natural hormones. It takes off like crazy, plus its genetic computer sends the message that this is going to be a good year. It starts by focusing on foliage. We grew tomatoes with vines spreading 12 feet.

Then I quit putting on natural hormones. The plant thinks, "Oops, no fruit yet."

It blossoms profusely, and I start treating it again to grow big tomatoes. Two weeks before frost, the tomatoes were still green. I quit watering the plant and stopped the hormones so the fruit ripened fast.

When we did this with cherry tomatoes, some plants yielded 500 tomatoes; one even did 700.

A tomato grown this way is beautiful. When you slice it, the centre is firm, not soft and weepy. It tastes good, and there's lots of it.

Don't be surprised if you could do this uniformly over 100 acres, and go from 30 tons up to 74 tons.

With a base of actively alive and balanced soil, you can control insects naturally. In 1990, EPA had over 44,000 pesticide registrations.

Many work for one generation. Insects adapt and build up immunity. The insect's job is to eliminate sick plants, and they'll eventually find a way around pesticides. But insect damage recedes if you have healthy plants that aren't sending out distress signals, which attract insects. An easy way to test if your plants are healthy is to find some tomato worms and place them on your naturally grown plant. If your tomato is healthy, the worms will drop off to the ground or climb down as fast as they can.
If you've stressed a plant with toxic soil or imbalanced nutrients, the plant's electrical current drops. The stressed plant exudes chemical signals, and bugs come to take out the weakest.
Pesticides make a weak plant even weaker. The plant's electrical energy, the charge it carries, is the only thing keeping insects away. All life operates with electrical conductivity and potential. In effect, every cell in a plant or animal is a tiny bipolar battery. The nucleus carries a positive charge, the cytoplasm surrounding it is negative.

Insects hovering over a healthy field can't handle the electrical current; they'll be repulsed.

When you think like a plant and know what it needs, you're mentally equipped to do the things needed to restore energy in the soil and thus in the plant. It's done on a sustained basis by humification of the soil, starting with energy for the microbes.

Dr. William Jackson is an author, educator, researcher and entrepreneur with Enviro Consultant Service of Evergreen, Colorado. He earned his PhD from the University of Denver. He has authored or co-authored several textbooks and contributed to professional publications. His book, ***Humic, Fulvic and Microbial Balance: 0rganic Soil Conditioning***, received the 1994 National First Place Non-fiction Award from *Writer's Digest journal*. His latest book is *Environmental Care & Share.* He has received professional accolades and is listed in several Who's Who publications. This is a condensation of his Renewable Farming presentation at Princeton in February 1997.