



Sustainable, Balanced Soil Fertility System

Attaining soil fertility goals means first measuring, then planning a strategy, and finally taking control — leveraging nature to work with us, not against us in sustainable production and composting technology.

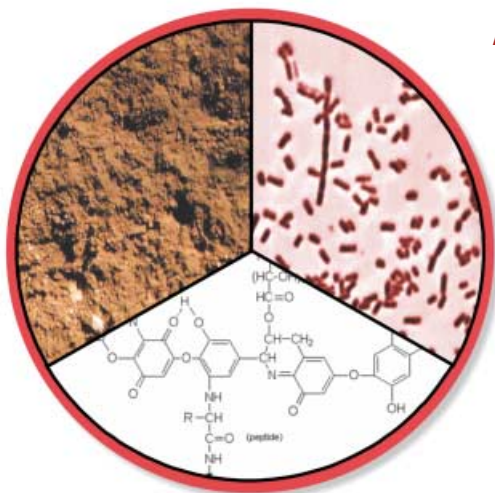
At Midwest Bio-Systems, we approach sustainable production by looking at the three aspects of soil — **chemical nutrient, physical, and microbiological**. We have established a set of nine critical factors, three in each aspect that correlate with yield and quality. Measuring, controlling, and monitoring these critical factors gives a more complete view of the soil fertility and a greater degree of control over the growing environment.

Physical

- Specific Gravity
- Penetrometer
- Sieving

Chemical Nutrient

- Base Saturation Balance
- Available Nutrients
- Micronutrients




Microbiological

- Diversity
- Aerobe:Anaerobe Ratio
- Enumeration of 6 Functional Groups

... all present in the proper balance and in a chemical form that plant roots can absorb.



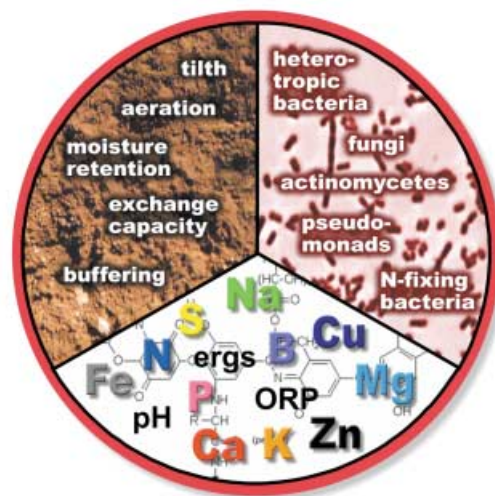
Managing sustainable production means taking measurements


International Bio-Solutions				
Baseline Analysis Results For:				
		Program: 15 North and South Organic: No Acres: 80 Crop: Corn		
		Lab: Midwest Bio-Systems, Inc. Lab ID: Sample ID: S326	Date Sampled: 3/10/2003 Date Submitted: 3/10/2003 Date Reported: 3/10/2003	Sample Location: North and South Sample Acres: 80
Chemical		Result	Desired Range	
CEC	Cation Exchange Capacity	6.3		
Percent Base Saturation	Nutrient		Units	
	Potassium	K	%	10.2 5.9
	Calcium	Ca	%	75.3 69.76
	Magnesium	Mg	%	11.2 15.19
	Hydrogen	H	%	3.2 0.5
	Sodium	Na	%	0.2 .5-2.0
Ammonium Acetate (T) Bray 2 Extracts + Soluble Test (A) or Morgan Extract	(T) Calcium	Ca	Lbs/Acre	1900 1200-3000
	(A) Calcium	Ca	Lbs/Acre	540 600-1500
	Available/Total		%	29% 40-50%
	(T) Magnesium	Mg	Lbs/Acre	170 300-500
	(A) Magnesium	Mg	Lbs/Acre	40 150-250
	Available/Total		%	24% 40-50%
	(T) Phosphorus	P	Lbs/Acre	310 200-400
	(A) Phosphorus	P	Lbs/Acre	150 100-200
	Available/Total		%	48% 40-50%
	(T) Potassium	K	Lbs/Acre	500 300-650
(A) Potassium	K	Lbs/Acre	200 150-375	
Available/Total		%	40% 40-50%	
	Sodium	Na	PPM	3 30-80
Micro-Nutrients	Zinc	Zn	PPM	10.5 4
	Manganese	Mn	PPM	31 18
	Iron	Fe	PPM	86 18
	Copper	Cu	PPM	1.0 1.6
	Boron	B	PPM	0.9 1.4
Water Soluble Tests	Nitrate	N	Lbs/Acre	22 20-70
	Sulfur	S	Lbs/Acre	36 50-90
	Conductivity		Ergs US	220 200-300
	Redox Potential			25.5 26-29
	pH			6.2 6.5-7.0
SMP	Buffer pH			6.7 6.7-7.3
	Organic Matter		%	1.6 2.0-4.0


Measuring the Baseline CPBH

CPBH stands for the Chemical, Physical, Biological, and Historic information required to develop an effective soil fertility program. A Baseline CPBH consists of laboratory analysis that gives us the chemical nutrient and microbiological profiles of the soil, measurements that quantify the physical characteristics, and documentation of the recent fertility history of the field.

Once we numerically document the situation, we can formulate a plan to get to the fertility level we want, and we have a "yardstick" that lets us measure our progress.



International Bio-Solutions				
Baseline Analysis Results For:				
		Program: 15 North and South Organic: No Acres: 80 Crop: Corn		
		Lab: BBC Laboratories Lab ID: 40376 Sample ID: Rolley A	Date Sampled: 3/8/2004 Date Submitted: 3/9/2004 Date Reported: 3/16/2004	Sample Location: North and South Sample Acres: 80
Biological		Enumeration	Desired Range	Diversity
Aerobic		32,000,000	10million - 1billion	1.6
Anaerobic		3,800,000	>1/10 of aerobes	0.5
Fungi		10,000	500,000 - 5million	0.2
Actinomycetes		43,000	100,000 - 1 million	0.9
Pseudomonads		100,000	1000 - 1 million	1.2
N-Fixing Bacteria		2,300	500,000 - 2 million	0.3
Total Species Richness Diversity (SRDT)				>9.5 4.7
			Aerobe : Anaerobe Ratio 8.4 : 1	

International Bio-Solutions				
Baseline Analysis Results For:				
		Program: 15 North and South Organic: No Acres: 80 Crop: Corn		
		Lab: Midwest Bio-Systems, Inc. Lab ID: South Quarter Sample ID: South Quarter	Date Sampled: 3/8/2004 Date Submitted: 3/9/2004 Date Reported: 3/16/2004	Sample Location: North and South Sample Acres: 80
Physical		Result	Desired Range	
Penetrometer		150	200-300 lbs.	
Sieving		250	>50% Stable Aggregates	
Specific Gravity		70	Depends on Soil Type	



Managing sustainable production means **planning**

With a CBPH Baseline that gives us a current snapshot of your soil fertility, you can initiate a plan to maximize yield and quality, balance the soil, feed the crops, and activate defenses against weeds, insects and diseases.



FERTILITY PROGRAM

A **balanced fertility program** is a series of fertilizer applications timed to have the maximum impact on crop quality and yield. It takes into consideration the baseline, fertility history, crop sequence, and nutrient package in determining the chemical nutrients and microbe species needed to balance the soil, feed the crop, and activate nature’s defense systems. Balanced fertility programs are custom-designed using humus mineral blends, liquid humus extract blends, and our Balanced Fertility line of sustainable and organic fertility products.

CROP SEQUENCE

More than a rotation of cash crops, the **crop sequence** is an integrated sequence of cash and cover crops that addresses nitrogen and nutrient sources, reduced weed pressure, and protection of the beneficial microbial population with a continuous supply of growing roots.

NUTRIENT PACKAGE

Assembling a “**nutrient package**” for the crop — starting with the sources nature provides — specifically captures as many of the nutrients from the previous crop’s residue as possible and manages the microbial population so that N-Fixing Bacteria provide their share of the nitrogen requirements. A cover crop provides another significant portion of the nitrogen and nutrients the next crop will need. The following percentages will vary by situation and crop sequence, but a typical nutrient package breakdown is:

<i>Nitrogen/Nutrient Source</i>	<i>Approx. % of total nutrients</i>
The microbially digested residue of the prior crop	25%
Nutrients scavenged by a cover crop	30%
Nitrogen captured from the atmosphere by N-Fixing bacteria	20%
Supplemental nutrients applied as humified compost mineral blends and liquid humus nutrient blends	25%

The sum of these sources provides the nutrient package the crop needs. **The favorable economics come from leveraging nature for 75% of the crop’s nutrient package while purchasing and applying the remaining 25%.**

ACTIVATED NATURAL DEFENSE

Nature provides mechanisms to defend the crop against weeds, insects, and diseases. All we need to do is activate the natural defense mechanisms to reduce weed, insect, and disease pressure.

Weeds and crops do not generally like the same soil chemical profile. Crops like well balanced soils while weeds prefer soils that are out of balance. To reduce weed pressure, start by balancing the soil. Cover crops and crop sequence also reduce weed pressure. Some cover crops reduce weed pressure by outcompeting the weeds for resources or by smothering them. Other cover crops excrete allelopathic residues that can hinder the germination of many weed varieties.

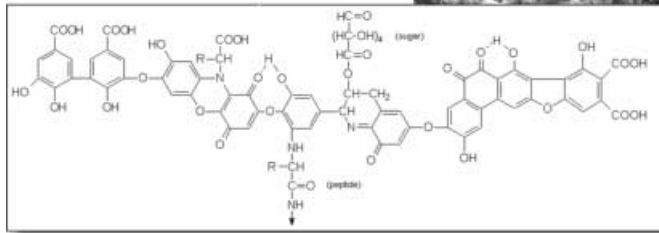
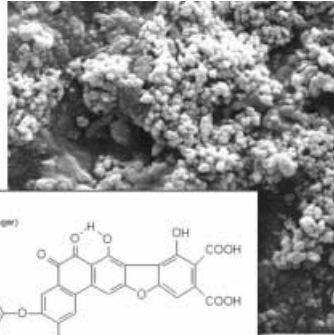
Insects prefer plants with low sugar (or Brix) levels. Leaves with a Brix reading over 12 are actually poisonous to most insects. Brix readings are most directly related to phosphorus levels in the plant. Fungi play a direct role in increasing phosphorus uptake into the root system.

Disease pressure builds when pathogenic fungi and species of anaerobic bacteria increase in numbers relative to the beneficial aerobic bacteria. If the number of “good” aerobes falls below a ratio of 10 “good” to 1 “bad” anaerobic microbe, disease pressure can increase. The key to reducing disease pressure is to manage the soil environment to favor the “good guys.” If maintained in sufficient numbers, the “good guys” have several mechanisms for keeping the “bad guys” in check.

Managing sustainable production means taking control

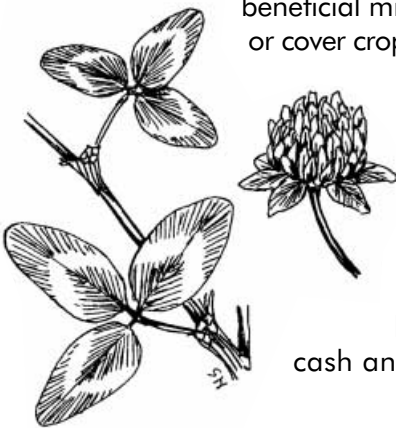
The Baseline told you where you are, the crop sequence tells you where you plan to go, and the fertility program gives you a firm grip on the fertility controls necessary to be successful.

Humus Aggregates Containing Organic Acids (approx 2000x)



Humus Chemistry — At the heart of the Sustainable Balanced Soil Fertility System is high quality humified compost. Compost is used as the medium to deliver the chemical nutrients called for by the baseline analysis. Humic substances in compost react with chemical nutrients, thus keeping individual nutrients from reacting with one another or becoming tied up. This method of nutrient delivery expedites bringing base saturation levels into balance, which, in turn, positively impacts the physical structure of the soil.

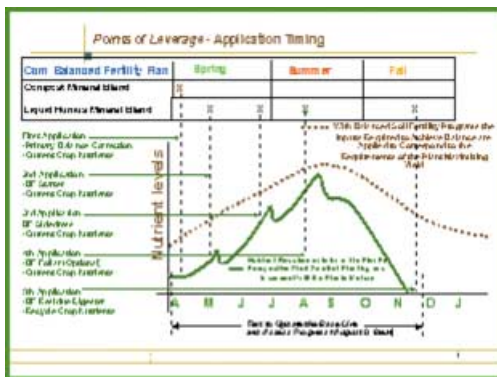
Microbial Environment — Microbiological critical factors are influenced by the microbial environment. Manipulating the microbial environment causes it to favor the microbe species that are beneficial to plant growth, yield and quality, and unfavorable for plant pathogens. Managing air and water in the soil, eliminating the use of materials that are harmful to beneficial microbes, and continuously growing either a cash or cover crop all help improve the microbial environment.



Red Clover (*trifolium pratense*)

Cover Crops and Crop Sequence — Cover crops scavenge nitrogen and nutrients that can be utilized by subsequent crops. Their presence reduces erosion and protects the beneficial microbial population with a continuous supply of growing roots for the species that need live plant roots present to stay alive. The sequence of cash and cover crops can be used to reduce weed pressure.

We use specific Points of Leverage or fertility controls to manipulate the Nine Critical Factors, driving them toward optimum.



Application Timing — Understanding when each crop's peak nutrient demands occur is used in developing sustainable balanced fertility programs. Our programs are designed to provide the nutrients the crop needs at the time it needs it. In addition to feeding the crop, many programs supplement the microbial profile with diverse beneficial species and provide microbial food sources formulated to be more favorable to the beneficial species than the harmful species.

