


MIDWEST BIO-SYSTEMS

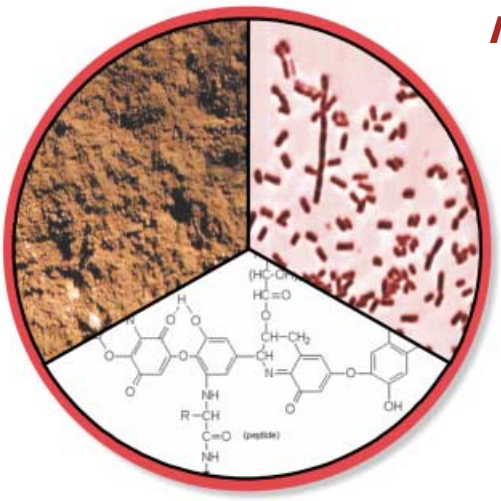
Sustainable, Balanced Soil Fertility System

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**



Microbiological

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

Chemical Nutrient

- **Base Saturation Balance**
- **Available Nutrients**
- **Micronutrients**

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

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(815) 438-7200 • www.midwestbiosystems.com

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

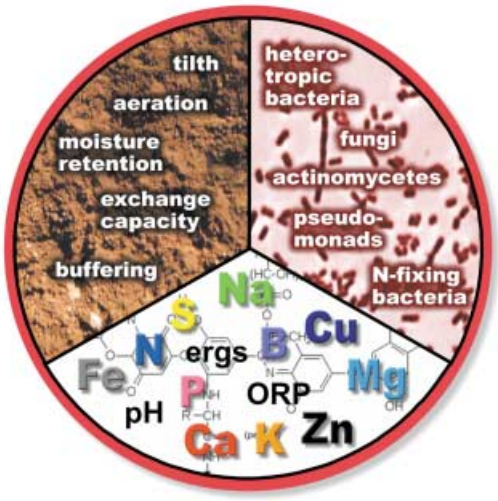
Sample Location: North and South
Sample Acres: 80

Chemical				Result	Desired Range	
CEC	Cation Exchange Capacity			6.3		Base Saturation Balance
	Nutrient		Units			
Percent Base Saturation	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 + Soluable Test (A) or Morgan Extract	(T) Calcium	Ca	Lbs/Acre	1900	1200-3000	Available Nutrients
	(A) Calcium	Ca	Lbs/Acre	540	600-1500	
	Available/Total		%	28%	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	Micro Nutrients
	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	Supporting Data
	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 **C**hemical, **P**hysical, **B**iological, and **H**istoric 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: 40375
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	Aerobe : Anaerobe Ratio 8.4 : 1
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	Diversity

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

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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 cuntinuous 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:

Nitrogen/Nutrient Source	*Approx. % of total nutrients*
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.

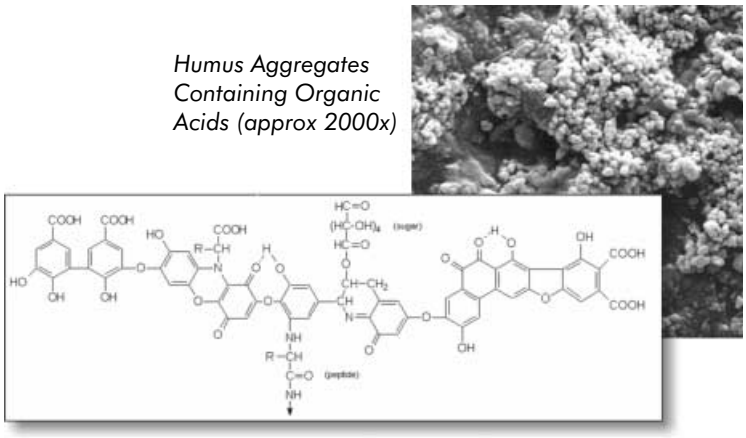
Weeds and crops do not generally like the same soil chemical profile. Crops like well balanced soils while weeds prefer soils that are out of balance. To reduce weed pressure, start by balancing the soil. Cover crops and crop sequence also reduce weed pressure. Some cover crops reduce weed pressure by 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

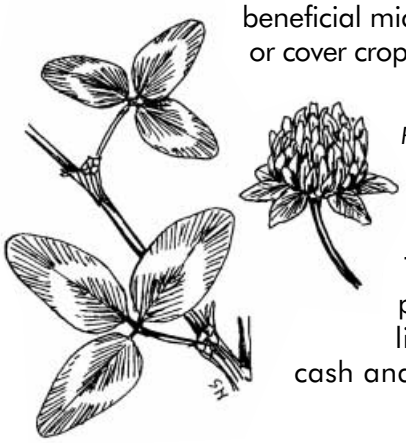
The Baseline told you where you are, the crop sequence tells you where you plan to go, and the fertility program gives you a firm grip on the fertility controls necessary to be successful.



Humus Aggregates Containing Organic Acids (approx 2000x)

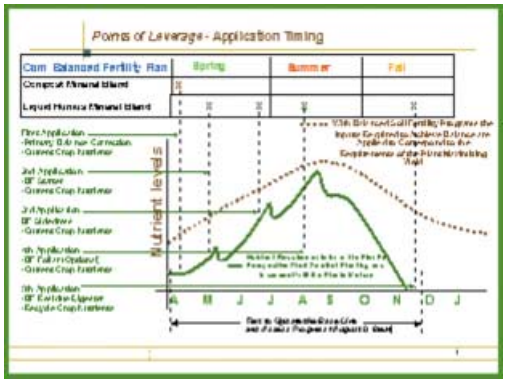
Humus Chemistry — At the heart of the Sustainable Balanced Soil Fertility System is high quality humified compost. Compost is used as the medium to deliver the chemical nutrients called for by the baseline analysis. Humic substances in compost react with chemical nutrients, thus keeping individual nutrients 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.

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