Multiple Crops: DeKalb Yellow Corn – Switzerland Greenhouse (p. 1-5)
Cinchona Tree – Switzerland Greenhouse (p. 5)
Coffee – Switzerland Greenhouse (p. 5)
Flower, African Violet – Switzerland Greenhouse (p. 5)
Flower, Bromeliad – Switzerland Greenhouse (p. 5)
Tobacco, Virginia – Switzerland Greenhouse (p. 5)
Tobacco, Latakia – Zimbabwe Field Test (p. 5-6)
Tobacco, Virginia – Zimbabwe Field Test (p. 5-6)

Language: English (Translation from original German)

Location: Romanshorn, Switzerland
Harare, Zimbabwe, Africa

Date: 1993-1995

Title of Study:

"Use of MicroSoil® to determine the feasibility of recovering fallow, over-planted and chemically poisoned soil on crop tested, DeKalb Yellow Corn, and associated Greenhouse and Field Tests in Switzerland and Zimbabwe"
Institut für Pharmakologie und Klinische Pharmakologie (Institute for Pharmacology and Clinical Pharmacology)

Landwirtschaftlich und Pharmakologie Unternehwtung

Romanshorn, Schweiz
Harare, Zimbabwe

Translation: Original German

Product Tested: MicroSoil, Organic Nitrogen Stabilizer, U.S. Origin

Dates: October 4, 1993 - June 30, 1994

Objective: To determine the feasibility of recovering fallow, over planted, and chemically poisoned soil. The crop tested is DeKalb Yellow Corn.

Soil Base: Initially, 200 m^3 soil was imported from Egypt. The soil was provided by the Egyptian Ministry of Agriculture, Cairo. The soil was tested prior to delivery by the Alexandria University Agricultural Laboratory. Furnished test data indicated organic content less than 0.5%, pH range 3.8-4.2, and contamination from borax effluent (mining) such as Toncal, MgO, etc. Bacterial colonies less than 6,000/cm^3 were also reported.

Independent analyses were contracted at Technische Universitat von Aachen and Zuricher Institut fur Biologischewissenschaft. These studies confirmed finding of the Egyptian scientists. Opinions were presented that the soil would not support agriculture in any form.

Test Location: Romanshorn greenhouse #14

Conditions: Constant 25° +/- 4° Celsius, 24 hours daily, no artificial light, 58-85% humidity, watered daily, in non-copious amounts.

MicroSoil Prep: One (1) liter concentrate mixed with 100 liters normal water (source Lake of Konstanz), non-treated, but potable. Same water source used for irrigation.

Soil Preparation: Soil was representative of 1.0 mio hectares of "contaminated" soil. Prior to introduction into isolated greenhouse, soil was mixed for one hour to insure homogeneity. After mixing for this purpose, the soil was divided into four (4) equal quantities. These were labeled "A" through "D".

The samples were treated as follows:

Sample "A": Normal fertilization with 46% minimum content urea (Application rate = 800 Kg/Hectare)

Sample "B": 25% normal treatment with 46% minimum urea. (application rate = 200 Kg/Hectare), plus recommended treatment with MicroSoil (Application rate= 25 U.S. Gallons per hectare of diluted product, 100:1 dilution)

Sample "C": 50% normal treatment with urea plus standard MicroSoil Treatment

Sample "D": 75% Normal treatment with urea plus standard MicroSoil Treatment

The above treatments were replicated four (4) times at three week intervals, application intervals were measured from introduction to plants in test beds,

Seed Germination: DeKalb yellow corn seed was germinated in water prior to planting in test beds. This was done in lieu of normal germination to allow sorting of plants to insure parity among test samples. Germination rates were <u>not</u> the subject of test.

Seedlings were allowed to develop in water for two weeks (coincidentally allowing germination of MicroSoil mixture per instruction). At the end of two (2) week germination period, the seedlings were culled, 400 seedlings, 10 cm in length +/- 1 cm were selected and 100 were planted in the test beds. The clock was started at this point for replicated soil treatments.

Observations: First Quartal-

All plants appear to grow with the following differences:

"A" plot plants developed black and white mold spots and some leaf discoloration. Height about 30 cm average.

"B" plot plants	normal growth, no mold, height 35 cm average, no discoloration.
"C" plot plants	normal growth, no mold, height 35 cm average, no discoloration.
"D" plot plants	normal growth, no mold, height 36 cm average, no discoloration.
Second Quartal-	
"A" plot plants	white mold spots increased, leaf discoloration became more severe with 'drying". Height about 45 cm average
"B" plot plants	normal growth, no mold, height 60 cm average, no discoloration.
"C" plot plants	normal growth, no mold, height 58 cm average, minor discoloration of lower leaves
"D" plot plants	normal growth, no mold, height 36 cm average, some yellowing of bottom leaves.
Third Quartal-	
"A" plot plants	white mold spots continued to increase, black leaf mold appeared, leaf discoloration became much more severe with nutrient deprivation becoming more pronounced. Growth rate drastically reduced. Plant appears to be unable to absorb nourishment, shows signs of oxygen starvation. Height only 52 cm with severe withering.
"B" plot plants	normal growth, no mold, height 95 cm average, no discoloration, tassels (55%) forming. Overall height less than 50% of normal growth expected from this strain, but plant appears healthy and normal in all other respects.
"C" plot plants	Height 98 cm average, minor discoloration of lower leaves. Tasselling (40%) but less than in plot "B".
"D" plot plants	normal growth, no mold, height 110 cm average, some yellowing of bottom leaves, tasselling (35%), some withering.
Fourth Quartal-	
"A" plot plants	Stalks dead. Black @ while mold appear to have taken over. Soil cakey and stalks split.
"B" plot plants	normal growth, no mold, height 140 cm average, no discoloration, tassels (55%) blooming. Overall height less than 50% or normal growth expected from this strain, but plant appears healthy and normal in all other respects. No pollination due to absence of insects.
"C" plot plants	Height 142 cm average, minor discoloration of lower leaves. Tassels ripe but not pollinated (48%). Some tassels added.
"D" plot plants	normal growth, no mold, height 141 cm average, some yellowing of bottom leaves, tasseling (45%), withering decreased.

Conclusion, Phase I:

1. MicroSoil (Formula 1) is capable of supporting nitrogen fixation and subsequent vegetation growth in relatively short order. A second test phase is indicated, and will be performed.
2. Unused MicroSoil mixture was studied in laboratory and found to have stratified. This sedimentation" was advised to manufacturer who promised to make immediate revision in "carrier" solute to correct problem.
3. Plant tissue samples analyzed to determine health. MicroSoil treated plants appeared normal, but "mature" size was only half of what is normally expected from this corn variety at maturity.
4. All MicroSoil stalks tasseled, but were infertile due to lack of pollination.
5. soil analysis indicated extraordinary low levels of essential elements, but remaining bacteria colonies were 20,000 times initial levels. No toxins detected! Soil samples sent to Swiss Ministry of Health and Ciba Labs for evaluation. Only detrimental/harmful content to be examined. Report expected 2-4 weeks.
6. Preliminary examination, our labs, indicate no polymerization, or bacteria mutation. Since our lab is not equipped to make more than perfunctory examination in this regard, additional controlled samples sent to Aachen and Zurich for biological exam. Results expected 4-6 weeks.

Translation: Original German

Accountability: RLGO/RG-FY94.021sp

Phase II, Test: MicroSoil, Organic Nitrogen Stabilizer, U.S. Origin (MicroSoila)

Dates: August 1- December30, 1994

Objective: To conduct a follow-up to test #94-G-E2001-1. The sole factor to be considered is the feasibility of recovering fallow, over planted and chemically poisoned soil. The crop variety tested is DeKalb Yellow Corn, same seed lot as original test.

The test procedure to be followed was designed to be compatible with conditions existing in developing nations, that is to say shortage of agricultural expertise, qualified laboratories, and technical personnel. The basic aim is to determine a simple means for the recovery and utilization of fallow natural resources.

Soil Base: Same soil as used in original test. The crop from the original test was processed as follows to be added as organic material to the original soil.

A. Plot "A" crop remnants were ground up and thoroughly mixed with the soil. originally used in Plot "A" and then treated with an activated dilution of MicroSoil (revised formula) and allowed to compost for three (3) weeks.
B. Plots "B,C & D" were separately mixed and composted with the remnants of the plants originally grown on them respectively. In these plots, as well, the revised formulation of MicroSoil was used.
C. Soil analyses were made prior to planting, Plot "A" contained approximately 0.8% organic matter and only traces of retained Nitrogen from the original urea application. Plots "B,C & D" were also analyzed and contained an amount of Nitrogen approximately equal to 5 Kg/Hectare. The organic content was approximately 2.05%. This imbalance gave a preliminary indication that the MicroSoil had effectively acted as an accelerator for the composing process. Details were maintained, but should not be considered definitive on a scientific foundation.

Test Location: Romanshorn greenhouse #14

Conditions: Constant 25o +/- 4o Celsius, 24 hours daily, no artificial light, 56-65% humidity, watered daily, in non-copious amounts.

MicroSoil Prep: One (1) liter concentrate mixed with 100 liters normal water (source Lake of Konstanz), non-treated, but potable. Same water source used for irrigation. This was exactly the same procedure followed in the original test, but the new formulation MicroSoil was used.

Plot Treatment: The samples were treated as follows:

Sample "A": Normal fertilization with 48% minimum content urea (Application rate=800 Kg/Hectare)

Sample "B": 25% normal treatment with 45% minimum urea (Application rate =200 Kg/Hectare), plus recommended treatment with MicroSoil (Application rate = 25 U.S. Gallons per hectare of diluted product, 100:1 dilution).

Sample "C": 25% normal treatment with urea plus standard MicroSoil Treatment

Sample "D": 25% Normal treatment with urea plus standard MicroSoil Treatment

The above treatments were replicated four (4) times at three week intervals, application intervals were measured from introduction of plants in test beds.

The reason for using the same treatment, albeit not scientifically correct, was to as nearly as possible, utilize the same method which would most probably be used in

developing nations to minimize the cost of the program. It was also realized, after consultation with WFO (UN) and WHO (UN) that any program not showing ascertainable results would be abandoned by the target countries.

Note: At this point, a request came from our Zimbabwe sister to study the effect on mold problems with varieties of Virginia tobacco on their farms. We only had a few sample plants in our greenhouse, so decided to make an "unofficial" application to these, and send enough MicroSoil for a five (5) hectare field test in Zimbabwe.

Seed Germination: DeKalb yellow corn seed from the original plot was planted 10 cm deep and spaced 40 cm apart. The water germination method was abandoned for this test, seeding took place September 1, 1994.

Irrigation: During germination period of seed, water was applied every fifth day. Once sprouts were visible, watering was decreased to once per week, with amounts increased 5% with each application to allow more water uptake commensurate with the plants' needs.

Pollination: A small hive with 100 honey bees was placed in the greenhouse.

Observations:

First Quartal (3 weeks)

All plants appear to grow with the following differences:

"A" plot plants	Germinated normally, average height about 35 cm, no mold or discoloration as observed in initial test.
"B" plot plants	Germinated normally, no mold or discoloration. Height 45 cm average
"C" plot plants	Germinated normally, no mold or discoloration. Height 47 cm average
"D" plot plants	Germinated normally, no mold or discoloration. Height 49 cm average

Second Quartal (6 weeks)

"A" plot plants	Normal growth, no mold or discoloration, height 56 cm average
"B" plot plants	Normal growth, no mold or discoloration. Height 78 cm average
"C" plot plants	Normal growth, no mold or discoloration. Height 80 cm average, very minor discoloration of lower leaves
"D" plot plants	Normal growth, no mold, height 81 cm average, some yellowing of bottom leaves.

Third Quartal (9 weeks)

"A" plot plants	Slow growth, but healthy. Some minor discoloration. No mold, average height 75 cm, stalk appears disproportionately thick for height. Tasseling (40%)
"B" plot plants	normal growth, no mold, height 120 cm average, no discoloration, tasseled (70%) forming. Some very minor discoloration (yellow)
"C" plot plants	Height 120.5 cm average, very minor discoloration of lower leaves. Tasseling (70%)
"D" plot plants	Height 120.5 cm average, very minor discoloration of lower leaves. Tasseling (70%)

Fourth Quartal (12 weeks)

"A" plot plants	Height 80 cm average, ears forming (pollination successful.
"B" plot plants	Normal growth, no mold, height 180 cm average, minor discoloration, ears forming (80%). Overall height less

than normal growth expected from this strain, but plant appears healthy and normal in all other respects. Pollination successful.

"C" plot plants — Height 165 cm average, minor discoloration of lower leaves. Ear formation (80%). No mold.

"D" plot plants — Normal growth, no mold, height 165 cm average, some yellowing of bottom leaves, ears forming (80%). No mold.

Conclusion, Phase II:

1. MicroSoil (Formula 2) accomplished the intended purpose.
2. Unused MicroSoil mixture was studies in laboratory and the problem, with the original formula found to have been resolved.
3. Plant tissue samples analyzed to determine health. All plants appeared normal, but "mature" size was considerably less than normal for this corn variety at maturity. The purpose of this test was achieved and no further analysis of yield undertaken.
4. All tasseled and formed ears. Ears were small, kernel size was also small but the fruit appeared of good color. Sugar and starch content were proportionate to kernel size.
5. Post growth soil analysis indicated higher colony bacterial colony density. Toxin testing yielded no toxins or pathogens.

Notes:

Note: (Associated with greenhouse test)

1. Coincidental application made to Bromiliads, African Violets, Chinchona, Tobacco and several Coffee varieties yielded substantially the same results. However, the plants were "Normal" plants grown in healthy soil. These were all hot house plants, and were only tested for growability with reduced chemical fertilizers. The results were comparable to those achieved with normal fertilizer applications in previous years. However, no fungicides or pesticides were used. This opens a totally new area for investigation, since pesticide and chemical contamination are major costs in refining extracts for pharmaceutical purposes.

2. The reduced incidence of molds normally associated with high humidity and common practice greenhouse procedures raises the question of applicability in general greenhouse culture where molds are easily propagated and account for a high percentage of crop loss. The producer of MicroSoil makes no claims for anti-fungicidal properties or performance, nor for nutritional content. This would make the product usable under current European Union law and regulations without further testing since it contains only natural enzymes and bacterium strains normally found in healthy soil.

Notes:

(Associated with field test in Zimbabwe)

1. Indications from the field test indicate miraculous results relative to control of the reported mold problem. The original test plot will be planted with peanuts as an interim crop, treated with MicroSoil. Following the harvest of the peanuts, a more scientifically controlled large scale test will be undertaken.
   A. The crop yield in the treated plot was 28% higher than the average of the untreated acreage. This crop was also harvested 12 days earlier. The leaf exhibited a better vein structure, but no conclusion is drawn due to the single purpose of this test. Two varieties of tobacco were treated-Virginia (Cigarettes) and Latakia (pipe blending).
   B. A peripheral observation was made that weed growth seemed to be reduced (not empirically substantiated) and beneficial insects did not appear to be effected in any detrimental way. No external irrigation was applied in the test field, of those used for comparison.
   C. Ground water tests have been ordered to make comparative analysis with normally treated crops. In the region, water considerations are more important.
   D. The combination of shorter seed to crop time, possible lower water pollution levels, reduced pesticide use indicate significant economic benefits and are sufficient grounds for continued use on a larger scale. Final decision will be reserved until all detailed chemical analyses are reviewed.

2. Ciba advised of our peripheral results in greenhouse and Zimbabwe field test/ They have indicated interest in a joint-venture testing program involving 10-12 "special" crops, the

cultivation of which they have under contract for their pharmaceutical programs. They want a meeting with management promptly to establish this venture.

General Comment:

The results of these tests appear to have successfully answered the question relative to the applicability for rejuvenation of depleted agricultural soils. However, looking beyond the initial objective, several additional possibilities hae been presented which indicate a much broader field of applicability. The conclusions drawn, and the obvious absence of corresponding detrimental factors, warrant a more concentrated and scientifically based study. We the undersigned herewith request consideration of a budgetary allowance and authorization for pursuit of this program as part of our normal research and development program.

Signed: Dr. rsr. nat Albert Spengler — March 31, 1995
Director, R & D

Signed: Dr. Biol. Karl-Heinz-Durer — March 31, 1995
Asst. Director, R & D - Agriculture