Using covercrops to some, is about as natural.

As Two IOWA farmers Driving around.....IRELAND

Driving around, with just DEAD RECKONING.
6 days...... later, we got this mastered
PUTTING CARBON IN SOIL

IS ABOUT LIKE PUTTING GENIE BACK IN
Carbon Streaks
We Found From 2006
FFWD to 2016
Rapid recovery of water-stable macroaggregates

Y = 92.3(1 - 0.424e^{-0.436X})

r^2 = 0.99

Changes in aggregation and organic carbon in prairie soil

Macroaggregates

\[ Y = 92.3(1 - 0.424e^{-0.438x}) \]
\[ r^2 = 0.99 \]

Carbon recovery slower than aggregation

Organic C

\[ Y = 96.6(1 - 0.637e^{-0.012x}) \]
\[ r^2 = 0.98 \]

We monitored for nitrates.

- Well -- 6.2 ppm
- Spring in woods -- 19 ppm
- Tile outlet 50/50 blend -- 25 ppm
- Tile Outlet isolated COB covers 13 ppm
As The journey of our evolution continues we strive to keep improving
The pieces of the puzzle coming together
RoBands, InnerSeed, permaculture
Beyond sustainable to Restorative
Map 2. Length of the growing season (in days).
Corn into diverse N producing mix
Somewhere along the line.....it hit me
I was trying to reinvent the wheel

Eureka Moment
IF YOU BUILD IT, THEY WILL COME
OR THEY WON'T. HARD TO SAY.
what I'm doing is not new

Reaching back

John Deere-Van Brunt Model “X” Combination Fertilizer-Grain Drill. Hand lever at the side of the box regulates the flow of fertilizer.
$15 an acre in seed = 15 bu
October 10, 2016....
Corn going to Corn
Focus on cool Legumes and Brassicas

Corn going to beans
Focus on cool grasses, control burn Legumes and Brassicas

Bean going to Corn
Drill TwinRow Cereal Rye drill chasing combine

But
This was 78% stable soil aggregates
At least 5yr COC permaculture
Relay cropping & the start of Companion cropping
Relay/Companion Crop pluses

- Window for double crop
- Better Cash Flow
- Time management
- Labor management
- Utilize Water availability
- Weed Control

Keeping a living roots and Biology active
Relay/Companion Crop minuses

Window for CoverCrop
The Abys/unknown
Time management
Labor management
Water availability
Weed Control

Paying attention to Detail
MotherNature’s sense of humor
WHEN IT COMES TO READING YOUR PLAN
MOTHER NATURE IS ILLITERATE
Some things can make you see RED

GOing with cheaper herbicide options
Seeding rates
Relative Maturity and timing
Somebody not adhering to strict CTF
DISEASE issues
Apparently 120* can throw relay crop into stroke
Hail and wind…..can make for interesting harvest or lack of

Insurance Options are limited
Cover Crops
Iowa, Minnesota, and Wisconsin

What is a cover crop?
A cover crop is a crop generally recognized by agricultural experts as agronomically sound for the area for erosion control or other purposes related to conservation or soil improvement.

Cover Crop Special Provisions
Insurance coverage begins on a crop following a cover crop when:
- The cover crop meets the definition provided in the Basic Provisions;
- Planted within the last 12 months; and
- Managed and terminated according to the Natural Resources Conservation Service (NRCS) guidelines.

If the growing conditions warrant a deviation from the guidelines, producers should contact their Extension or local NRCS for management guidance. For information on cover crop management and termination guidelines, refer to the Cover Crop Termination Guidelines published at www.nrcs.usda.gov/psp/portal/main/national/landing/covercrop.

Can I harvest a cover crop before the insured crop is planted?
Yes, the cover crop can be grazed or harvested as hay or silage; however, if it is harvested as grain or seed in the same year, the conservation cover crop will be considered a "crop" and double crop rules will apply.

What are my options for planting and harvesting a cover crop on acres prevented from being planted to an insured crop?
- Plant a cover crop and receive a full prevented planting payment (but do not harvest or graze this cover crop before November 1 or otherwise harvest at any time).
- Plant a cover crop after the late planting period or after the final planting date, if any late planting period is available. You may also harvest or graze the cover crop at any time, and receive a prevented planting payment equal to 35 percent of the prevented planting guarantee.

Can I insulate a spring crop following a cover crop?
Yes, a spring crop following a cover crop can be insured; however, the cover crop must be terminated prior to the NRCS's Cover Crop Termination Guidelines and Cover Crop Termination Zones Maps.

Can grazing be used as a form of terminating the crop?
Yes, cover crops may be grazed or harvested as hay or silage, unless prohibited by Risk Management Agency (RMA) crop insurance policy provisions. Cover crops cannot be otherwise harvested, such as for grain or seed, etc.

Can I harvest a cover crop before the insured crop is planted?
Yes, the cover crop can be grazed or harvested as hay or silage; however, if it is harvested as grain or seed in the same year, the conservation cover crop will be considered a "crop" and double crop rules will apply.

What are my options for planting and harvesting a cover crop on acres prevented from being planted to an insured crop?
- Plant a cover crop and receive a full prevented planting payment (but do not harvest or graze this cover crop before November 1 or otherwise harvest at any time).
- Plant a cover crop after the late planting period or after the final planting date, if any late planting period is available. You may also harvest or graze the cover crop at any time, and receive a prevented planting payment equal to 35 percent of the prevented planting guarantee.

Will over-seeding or interseeding a conservation cover crop into an insured grain crop affect insurability?
No, as long as the cover crop is seeded at a time that will not impact the yield or harvest of the insured crop. If there was any damage caused by over-seeding the cover crop, uninsured cause of loss approaches would be applied to the insured crop.

Will interplanting a conservation cover crop into an insured grain crop affect insurability?
No, unless prohibited by your crop insurance policy or crop provision. If the cover crop is planted in a way that permits separate agronomic management or maintenance, then the cash crop may be insurable. However, the cash crop is not insurable if the conservation cover crop is interplanted into a cash crop that interacts with the agronomic management and the

Where to Buy Crop Insurance
All multi-peril crop insurance, including Catastrophic Risk Protection policies, are available from private insurance agents. A list of crop insurance agents is available at all USDA service centers and on the RMA website at www.rma.usda.gov/about/agent.

Contact Us
USDA/RMA
St. Paul Regional Office
367 7th Street East, Suite 1990
St. Paul, MN 55101
Phone: (651) 290-3340
Fax: (651) 290-4139
E-mail: rma@rma.usda.gov.

Download Copies from the Web
Visit our online publications/leaflets page at www.rma.usda.gov/publications/leaflets.html

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Places to test and fail….Learned Callisto and other residuals cause issues season long
May 15, 2016 drilling beans
$20 seed cost......2 crops

June 15, 2016
August 22, 2016
Sept 08, 2016
There comes a time when you have to build
The tools & the toolbox

What's in Your Toolbox?
The start of CoverCrops and Evolution to permaculture
Started figuring out the need for InnerSeed
HINIKER Reurrection

Drilled Soybeans, AirDrop InnerSeed
Drilled MultiSpecies CoverCrop mix
TwinRows & InnerSeeding & Relay/companion
The Future
DAWN DuoSeed RowUnits
LockUp

Deere sensor w/20/20 Monitor

Open shank for different seed tubes

Seed firmer

RowCleaner

1.5” seed tube
HINIKER box on for Soybeans
Roll/Crimp + sidedress \ Inner Seed pass
25# bin run cereal rye
15# cereal rye
Goal for 2017 Roll/Crimp Termination
In standing corn...Stay Tuned
Advantage will be less herbicides & increased biomass
Part of the reasoning for the Contolled Burn
On fields Rotating to Beans (learned by accident)
GREEN COVER COMEDY TOUR

FEATURING MADE'R SALAD
**ASPARAGUS** - Likes tomatoes, i.e., any vegetables. Dislikes rue, Repels mosquitoes.


**BEANS** - Likes most vegetables, flowers and herbs. Dislikes onions, garlic, gladiolus.

**BUSH BEANS** - Likes potatoes, cucumbers, corn, strawberries, celery, summer savory. Dislikes onions.

**POLE BEANS** - Likes corn, summer savory. Dislikes onions, beans, kohlrabi, sunflowers.

**BEE BALM** - Improves growth and flavor of tomatoes.

**BEETS** - Likes onions, kohlrabi. Dislikes pole beans, borage.

**BORAGE** - Helps tomatoes, squash, strawberries. Deters tomato worms.

**CABBAGE FAMILY** (broccoli, cauliflower, kale, kohlrabi, etc.) - Likes potatoes, celery, dill, chamomile, sage, thyme, mint, rosemary, lavender, beets, onions. Dislikes strawberies, tomatoes, pole beans.

**CARROT** - Likes peas, lettuce, chives, onions, leeks, rosemary, sage, tomatoes. Dislikes dill.

**CATNIP** - Deters fleas (beetles) (plant in borders)

**CELERI** - Likes leeks, tomatoes, bush beans, cauliflower, cabbage.

**CHAMOMILE** - Improves cabbage, onions.

**CHIVE** - Improves carrots. Deters insects from fruit trees and berries. Dislikes peas, beans.

**CORN** - Likes potatoes, peas, beans, cucumbers, pumpkins, squash.

**CUCUMBERS** - Likes beans, corn, peas, radishes, sunflowers. Dislikes potatoes, aromatic herbs.

**DILL** - Improves cabbage. Dislikes carrots. 

**Eggplant** - Likes beans (protects from beetles).

**FLAX** - Likes and improves carrots, potatoes.

**GARLIC** - Likes roses, raspberries. Deters mosquitoes, flies, and other insects.

**HORSERADISH** - Likes potatoes. Deters beetles.

**HYSSOP** - Improves grapes, cabbage. Antagonizes radishes.

**LEeks** - Likes onions, celery, carrots.

**Lettuce** - Likes carrots, radishes, strawberries, cucumbers.

**MARGOLD** - Deters nematodes and most insects. Plant between vegetables. Dislikes potatoes, garlic, gladiolus, tomatoes, chives.

**PETUNIAS** - Protects beans. Helpful throughout garden.

**Pigweed** - Improves potatoes, onions, corn. Keep thinned.

**Potatoes** - Likes beans, corn, cabbage, horseradish, eggplant. Dislikes pumpkins, squash, cucumbers, sunflowers, tomatoes, raspberries.

**Pumpkin** - Likes corn. Dislikes potatoes.


**ROSEMARY** - Helps carrots, beans, cabbage, sage. Deters cabbage moth, bean beetles and cabbage flies.

**RUE** - Helps roses, raspberries. Deters flies, lice, bean, nasa beetles. Antagonizes sweet basil.


**Sow Thistle** - Helps tomatoes, onions, corn (erradicates) 

**SOYBEANS** - Grows with anything, helps everything.

**Spinach** - Likes and helps strawberries.

**Squash** - Likes nasturtiums, corn, radishes.

**Strawberries** - Likes bush beans, spinach, borago, lettuce. Dislikes cabbage.

**SUMMER SAVORY** - Improves beans, onions. Deters beetles.

**SUNFLOWERS** - Benefits corn, cucumbers. Antagonizes beetles.

**Tansy** - Helps roses, raspberry, blackberry, goose. Repels borers, Japanese beetles, squash bugs, flies, ants.

**Thyme** - Good throughout garden. Deters cabbage worm.

**Tomato** - Likes chives, onions, parsley, asparagus, carrots, limas, marigolds, nasturtiums. Dislikes cabbage, kohlrabi, potatoes, fennel.

**Turnips** - Likes peas, radishes. Dislikes cabbage lettuce. 

**Valerian** - Good anywhere in the garden.
CoverCrop totes, a great learning tool most of these are leftover garden seeds from a local farm store and free.

We used to garden in these TOTES.
Termination Plan = anytime or anyplace
This is the kind of thing that drives me
multiple passes throughout the yr, perfect
scouting, the change you see.....7bpa
Cover crops 201

Chris Teachout
Top Soil Lost over Time

Inches

15.0
11.3
7.5
3.8
0

1850 1900 1950 1975 2000

2050
Temperature below heavy rye
Temperature below no rye
Variety selection of Covers
<table>
<thead>
<tr>
<th>Species</th>
<th>%</th>
<th>Lot</th>
<th>Origin</th>
<th>Germ</th>
<th>Purity</th>
<th>Other</th>
<th>Inert</th>
<th>Wt.</th>
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<tr>
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<td>6%</td>
<td>PF-CV-13</td>
<td>NE</td>
<td>96%</td>
<td>99.6%</td>
<td>0.0%</td>
<td>0.4%</td>
<td>0.8%</td>
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<tr>
<td>4010 Spring Peas</td>
<td>6%</td>
<td>LN-MT-13</td>
<td>MT</td>
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<tr>
<td>Spring Forage Barley</td>
<td>33%</td>
<td>MSH5580</td>
<td>ND</td>
<td>96%</td>
<td>99.7%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>0.0%</td>
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<tr>
<td>Rockford Oats</td>
<td>33%</td>
<td>MISC.RF-13.1</td>
<td>KS</td>
<td>96%</td>
<td>99.7%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Brown Mustard</td>
<td>1%</td>
<td>110753-B</td>
<td>ID</td>
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<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Broadleaf Mustard</td>
<td>1%</td>
<td>L9-12-MUS1</td>
<td>OR</td>
<td>90%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Defender Radish</td>
<td>1%</td>
<td>DE010-130481</td>
<td>GR</td>
<td>90%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Rapeseed &quot;Buckbuster&quot;</td>
<td>1%</td>
<td>RP-11</td>
<td>ID</td>
<td>95%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
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<td>MN</td>
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<td>Safflower</td>
<td>2%</td>
<td>8045</td>
<td>SD</td>
<td>90%</td>
<td>98%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
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<tr>
<td>Buckwheat-Mancan</td>
<td>7%</td>
<td>8218</td>
<td>ND</td>
<td>85%</td>
<td>98%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
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<tr>
<td>Phacelia-Balo</td>
<td>2%</td>
<td>BN 4120-1330</td>
<td>Ger.</td>
<td>70%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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You control the Diversity
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<td>Spring Forage Barley</td>
<td>42%</td>
<td>MSH5580</td>
<td>ND</td>
<td>96%</td>
<td>99.7%</td>
<td>0.6%</td>
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<tr>
<td>Rockford Oats</td>
<td>42%</td>
<td>MISC.RF-13.1</td>
<td>KS</td>
<td>96%</td>
<td>98.9%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Flax-Shelby</td>
<td>10%</td>
<td></td>
<td></td>
<td>5367</td>
<td>MN</td>
<td>92%</td>
</tr>
<tr>
<td>Safflower</td>
<td>5%</td>
<td></td>
<td></td>
<td>8045</td>
<td>SD</td>
<td>90%</td>
</tr>
</tbody>
</table>

And the Cost
# Cover Crop Chart

**Growth Cycle**
- A = Annual
- B = Biennial
- P = Perennial

**Relative Water Use**
- ◊ = Low
- ◊◊ = Medium
- ◊◊◊ = High

**Plant Architecture**
- γ = Upright
- ♦ = Upright-Spreading
- ≈ = Prostrate

---

**Cool Season**

--- Grass ---
- Barley (A)
- Oat (A)
- Phacelia (γ)
- Flax (γ)
- Ryegrass (A/P)
- Spinach (B)
- Turnip (B)
- Field pea (γ)
- Berseem clover (γ)
- Medic (γ)
- Chickpea (γ)
- Sunflower (γ)
- Sudan grass (γ)

--- Broadleaf ---
- Kale (A/B)
- Radish (γ)
- Lentil (B/P)
- Red clover (B/P)
- Birdsfoot trefoil (γ)
- Cowpea (γ)
- Safflower (γ)
- Teff (γ)
- Canola (A/B)
- Beet (A/B)
- Lupin (A/B)
- White clover (A/B)
- Sainfoin (A/B)
- Soybean (γ)
- Squash (γ)

--- Legumes ---
- Triticale (A/B)
- Annual fescue (A/P)
- Mustard (A/B)
- Carrot (A/B)
- Vetch (A/B)
- Sweetclover (γ)
- Alfalfa (γ)
- Mung bean (γ)
- Chicory (γ)

--- Grass ---
- Pearl millet (A)
- Foxtail millet (A)
- Proso millet (γ)
- Amaranth (A)
- Buckwheat (γ)
- Prosopis (γ)
- Grain sorghum (γ)
- Corn (A)

--- Warm Season ---

--- Grass ---
- Pearl millet (A)
- Foxtail millet (A)
- Proso millet (γ)
- Amaranth (A)
- Buckwheat (γ)
- Prosopis (γ)
- Grain sorghum (γ)
- Corn (A)
Interplanting
We have done this
when nothing else would grow. Cowpeas not only increased the fertility but decreased blowing by adding to the humus in the soil. Farmers and editors recommended that they be planted at least every third year to arrest the declining fertility caused by successive crops of corn, wheat, or cotton. As a mixed crop, cowpeas were probably used more than any other crop. They were planted with corn in alternate rows or interplanted in the row after the second plowing or when the corn was laid by.

Cowpeas produced abundant vine, almost covering the ground, and, if left uncut on the land during the winter, protected the soil admirably.

Leave a cover crop of peavines on the land through the winter and when spring comes you may have some of your neighbor's soil but he will have very little, if any, of yours (70).
Soil Health Testing

- Laboratory Testing
- Haney soil test
- Solvita Respiration test
- S Y U
- T B I
# Soil Nutrient & Health Premium Test

**For:**
Chris Teachout
Teachout Harvest
1653 400 Ave
Shenandoah, IA
51601

**Lab ID:** 9325.0   **Acct No:** 2890
**Sample:** Soil: Home West
**Crop Intended:** Corn-200

### Measured Factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Symbol</th>
<th>Units</th>
<th>Level Found</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Soluble N</td>
<td>ppm</td>
<td>41</td>
<td>MH</td>
<td></td>
</tr>
<tr>
<td>Nitrate Only</td>
<td>NO₃-N</td>
<td>ppm</td>
<td>39</td>
<td>MH</td>
</tr>
<tr>
<td>Soluble Exuclate Carbon</td>
<td>Cₐg</td>
<td>ppm</td>
<td>471</td>
<td>M</td>
</tr>
<tr>
<td>SLAN Humus, detritus-N</td>
<td>NH₄-N</td>
<td>ppm</td>
<td>158</td>
<td>M</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>P</td>
<td>ppm</td>
<td>34</td>
<td>M</td>
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<tr>
<td>Potassium (K)</td>
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<td>ppm</td>
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<td>MH</td>
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<tr>
<td>Calcium</td>
<td>Ca</td>
<td>ppm</td>
<td>600</td>
<td>L</td>
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<tr>
<td>Exr. Aluminum</td>
<td>Al</td>
<td>ppm</td>
<td>590</td>
<td>H</td>
</tr>
</tbody>
</table>

### Calculated Availability

| Nitrogen (N-avail.)     | lb/a   | 143   | H           |
| Potassium of Vegetable  | Probability: | Moderately unlikely |
| Phosphorus P₂O₅        | lb/a   | 155   | M           |
| Potassium K₂O          | lb/a   | 466   | MH          |

### Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Units</th>
<th>Value</th>
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<tr>
<td>Potential acidity (Fe+Al)</td>
<td>ppm</td>
<td>969</td>
</tr>
<tr>
<td>P-Acid-Saturation Index</td>
<td>P(Al+Fe)</td>
<td>3.5</td>
</tr>
<tr>
<td>Calcium Saturation</td>
<td>Ca(Fe+Al)</td>
<td>62%</td>
</tr>
</tbody>
</table>

### Nutrient Calculations, Value as $/acre available

<table>
<thead>
<tr>
<th>N + P₂O₅ + K₂O</th>
<th>$/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>334</td>
<td>0.35</td>
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### Nutrient Requirements

<table>
<thead>
<tr>
<th>Corn-200</th>
<th>N/Acre</th>
<th>P/Acre</th>
<th>K/Acre</th>
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</thead>
<tbody>
<tr>
<td>57</td>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Mix Recommended

- 10% Legume and 90% Grass/Non-Legume.

### Optional Tests (included with Premium Soil Test)

- Soil Organic Matter: LOI % 5.6
- Basal CEC: ppm 18
- Effective CEC**: cmol/kg 11.2

### USDA Climate Zone Used for this report: 5b

**Ratings:**
- VL=Very Low
- L=Low
- M=Moderate
- MH=Medium High
- H=High
- VH=Very High

- 1HSA ARS-Harvey Extract
- **Effective CEC = HSA extracted + Air-Dry-Mg/H+; optional SLN by LOI [Q/3H₂O] C

### Methods:
- Soil Health Test, USDA-ARS Temple TX; Soil Test Procedures for the NE USA Bulletin #93; VT Aluminum Index.
Can drinking tea help us understand climate change?

Yes. Teabags can provide vital information on the global carbon cycle. And consumers worldwide can improve climate modelling without much effort or equipment. That is why we want you, tea consumers, to become tea researchers and help us to plant tea.

The idea

We developed a simple and cheap method to measure decay rate of plant material by using tea. The method consists of burying tea bags with Green tea and Rooibos and digging them up ca. three months later. In this period, the tea will decay, and will therefore show what will happen with normal plant material in the soil. This method was developed and tested by a team of researchers from the University of Utrecht, Umeå University, The Netherlands Institute of Ecology and the Austrian Agency for Health and Food Safety Ltd.

The scientific value of this new method has already been acknowledged and experiments are currently running in countries all over the world. Many school children and other citizen scientists joined. The idea is to use this new method to collect data on decay rates from all over the world. With this data we will make a global soil map, and consequently improve global climate models that use these maps.
Use two types of tea bags as easy indicators

Rooibos
C:N = 43

Green
C:N = 12

~$20 for 60 pyramids

adapted from Keuskamp et al. (201)
The Tea Bag Index (or TBI) of Soil Health

Unhealthy Soil

Healthy Soil

\[ TBI_{US} = \frac{(1.0 - 0.8)}{(1.0 - 0.35)} = 0.3 \]

\[ TBI_{HS} = \frac{(1.0 - 0.6)}{(1.0 - 0.35)} = 0.6 \]

The closer to 1, the more healthy the soil is.

- Red = Rooibos Tea
- Green = Green Tea
Thank You
You never know what
You will find in your field
Get out and observe