OHIO STATE UNIVERSITY EXTENSION

Using Cover Crops to Tie Up Manure to Prevent Losses

James J. Hoorman hoorman.1@osu.edu
www.mccc.msu.edu

The Ohio State University College of Food, Agricultural, and Environmental Sciences

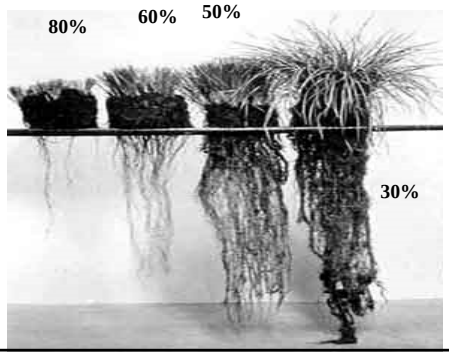
Mimic Mother Nature with Application of Manure

60 Million Bison in USA in early 1800's

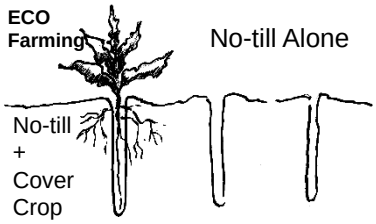
Did they stop eating or pooping in winter?

Water Quality?

Managing plant roots affects nutrient recycling

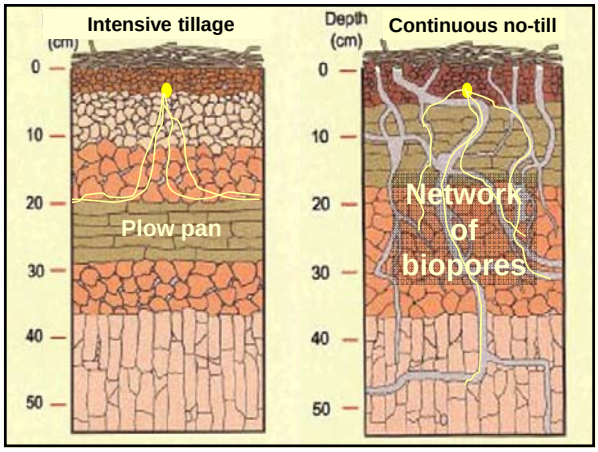


ECO Farming
N0-TILL + COVER CROPS



ECO Farming acts like biological valve or plug to absorb N and P

Illustrated by Cheryl Bolinger-McKirnan & Jim Hoorman



SOM and Available Water Capacity
Inches of Water/Per one foot of Soil

Berman Hudson Journal of Soil & Water Conservation 49(2) 189-194 March-April 1994

Percent SOM	Sand	Silt Loam	Silt Clay Loam
1	1.0	1.9	1.4
2	1.4	2.4	1.8
3	1.7	2.9	2.2
4	2.1	3.5	2.6
5	2.5	4.0	3.0

The average soil in the USA has lost 50-60% of its SOM (Lal, 2011)

Saving Nutrients in the Soil

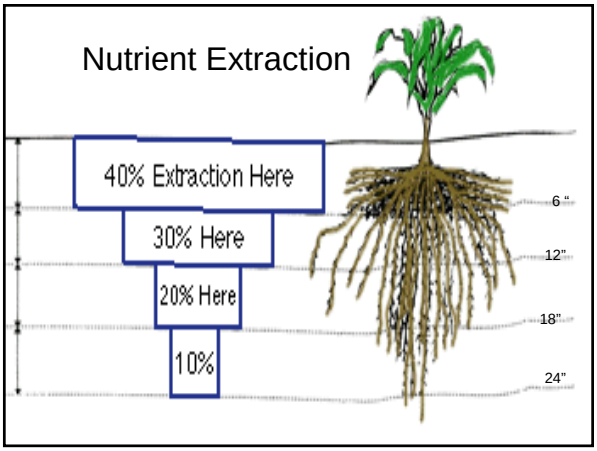
…is related to the speed of Water!

If the velocity of water is doubled, how many more nutrients travel with the water in a stream?
2^6 = 64 times more nutrients lost!

1	to	2 mph	64x
2	to	4 mph	128x
4	to	8 mph	256x
8	to	16 mph	512x
16	to	32 mph	1,024x

Cover crops & live plants reduce the speed of water.

Nutrient Extraction



What Cover Crops to Use

- Grasses versus Brassicas versus Legumes
- Grasses tie up N and P with fibrous roots.
- Live year round: Most grasses (not oats).
- Grasses provide some traction/less mud.
- Brassicas have high N concentrations.
- Legumes already make their our N but readily absorb free N.

OHIO STATE UNIVERSITY EXTENSION

Type of Cover Crops

Grasses: Scavenger nutrients (fine roots), C:N ratio depends on killing date: cereal rye, triticale annual ryegrass, barley, wheat, oats, Sorghum-Sudan, millets

Brassicas: Good for surface compaction and take up N readily: radish, turnips, kale, rape

Legumes/Clovers: Make Nitrogen, low C:N ratio, taproots: cowpeas, winter pea, hairy vetch, common vetch, red clover, sweet clover, alfalfa, soybeans

OHIO STATE UNIVERSITY EXTENSION

Nitrogen Uptake

ARG had 5-5.3% N in the tissue with 400-450# of N being recycled.

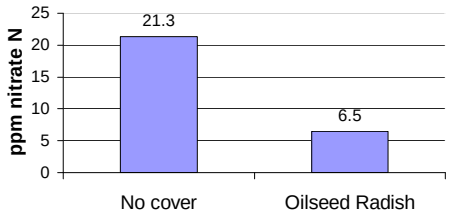
Cereal ryegrass has 4-4.5% N in tissue or 350 to 400# of N.

Daikon radish-Highest uptake 5.3-5.5%N Also fastest release.

OHIO STATE UNIVERSITY EXTENSION

OHIO STATE UNIVERSITY EXTENSION

Fall soil nitrate after manure application



Average of 24 tests, 7 field sites

The Ohio State University College of Food, Agricultural, and Environmental Sciences

Best Cover Crops for Manure Uptake

1) Oats, Radish
2) Cereal rye*, Annual ryegrass*
3) Wheat*, Barley*
4) Kale*, Rape*, Turnips, Radish
5) Winter Peas*, Crimson clover*, Red clover*, Sweet clover*, Hairy Vetch*, cowpeas

* Means they generally survive the winter

Annual Ryegrass 45 Days 6,000 Gallons Swine Manure

Cover Crops for Winter Manure

What do we want to in a good cover crop if we are applying manure in the winter?

1) Live plant to absorb N and P.
2) Fibrous Root system vs Tap root
3) Hold up equipment in wet weather.
4) Forage possibilities
5) Easy to kill
6) No carryover problems for next crop (insects, weeds, nutrient tie up).

Cover Crops for Winter Manure

Good Cover Crops
- Cereal rye
- Annual Ryegrass
- Triticale
- Barley
- Wheat

Mixtures/Minimize
Radish
Oats
Legumes

Other Issues
Short pasture
Alfalfa hay

OHIO STATE UNIVERSITY EXTENSION

Using Cover Crops to Tie up Manure Losses

James J. Hoorman hoorman.1@osu.edu
www.mccc.msu.edu