

Building Soils Organically: Is This A Moving Target?

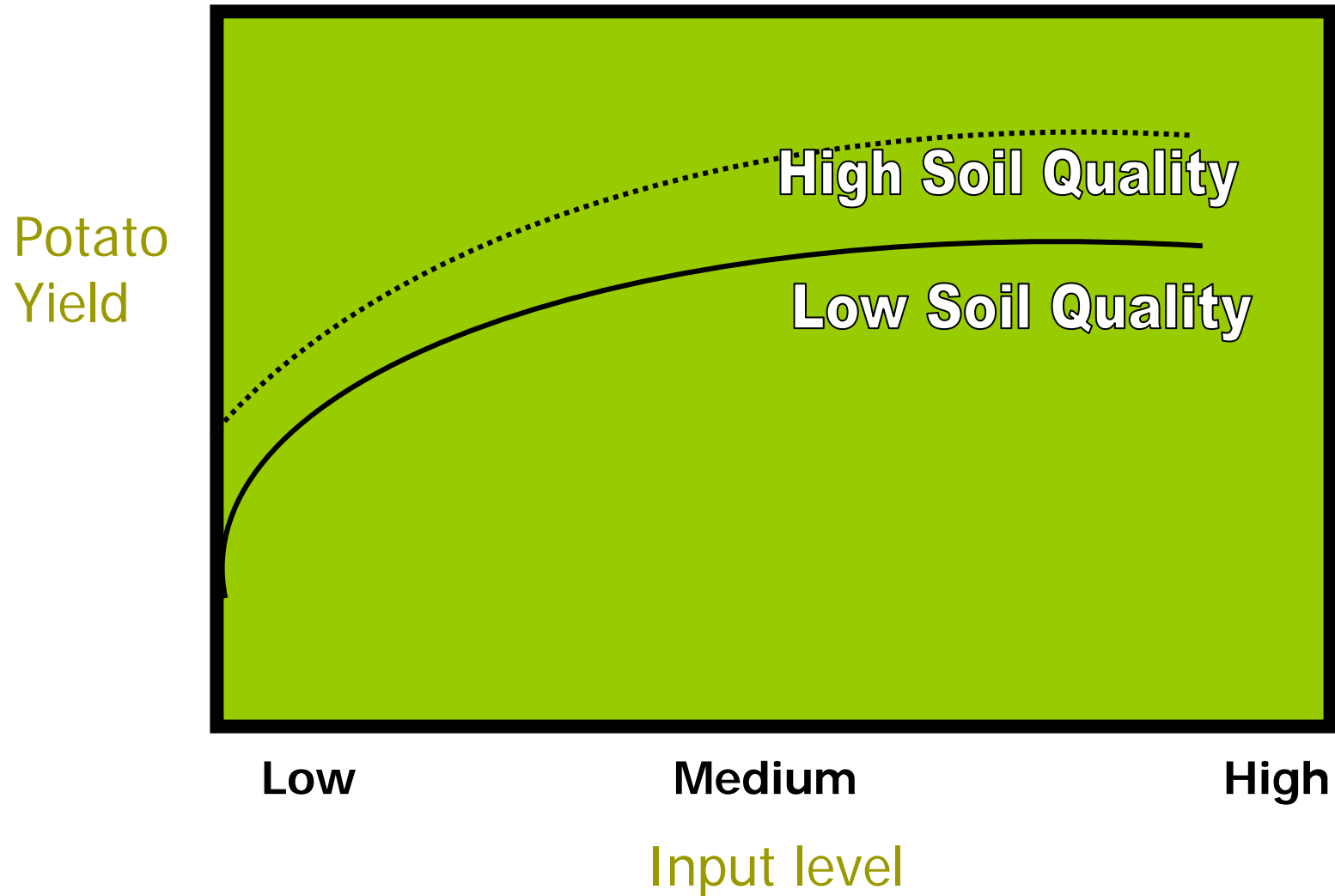


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Building Soils Organically - Principles

- Build organic matter
- Diversity:
 - # of species
 - Type of species: promote living cover and diverse root types
- Review
 - Rethink each decade

Long-term organic matter additions improve soil and crop response



How do we know we have built soil quality? Sieving soil for active SOM



Quality in=quality out

- ❑ Plant inputs are the original source of organic matter (through the manure route in some cases)
- ❑ ~ 70% carbohydrates (feedstock), plus important other compounds lignins (beams) and glycoproteins (glues)



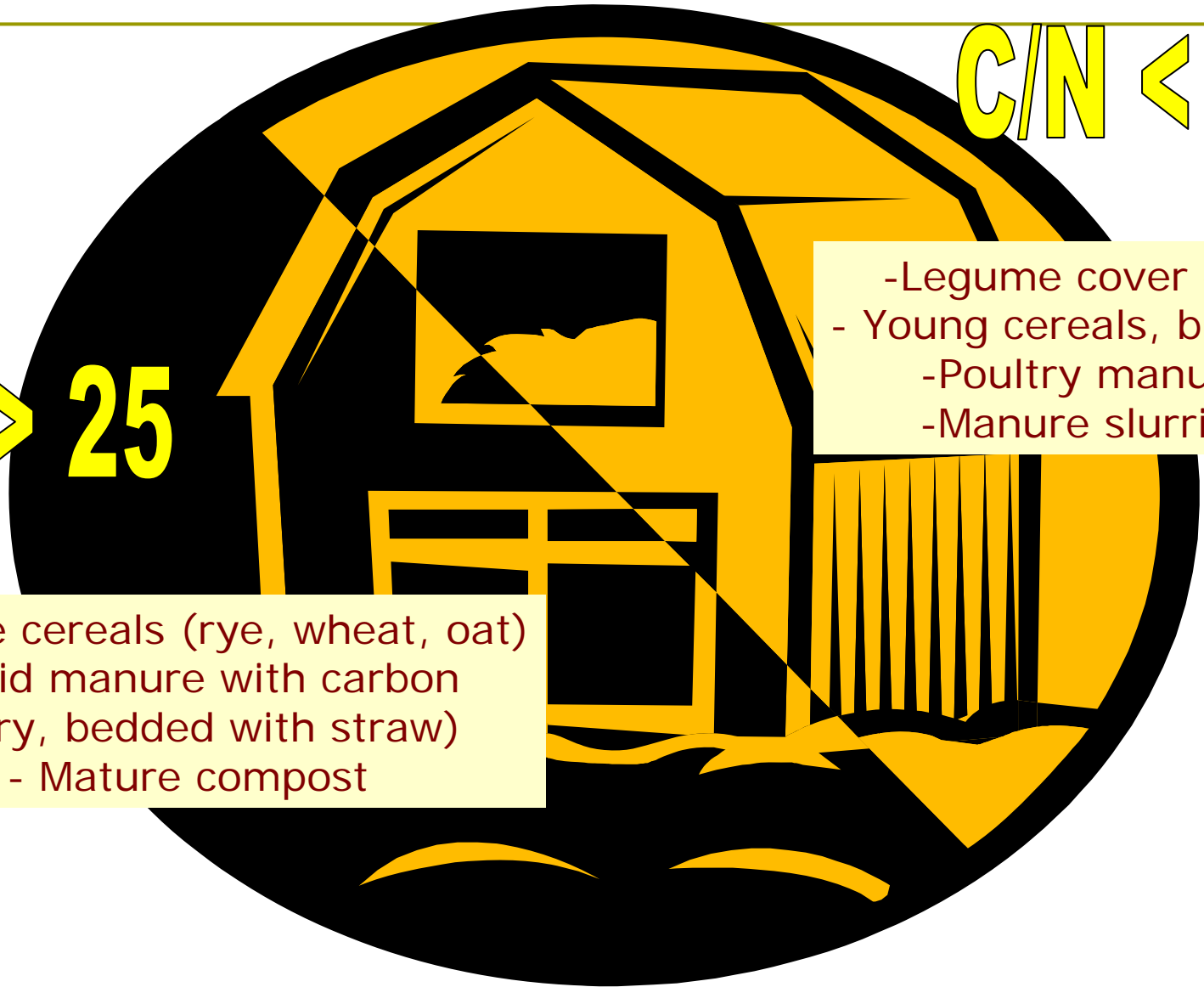
Organic matter quality

$C/N < 25$

$C/N > 25$

- Legume cover crop
- Young cereals, brassica
- Poultry manure
- Manure slurries

- Mature cereals (rye, wheat, oat)
- Solid manure with carbon (dairy, bedded with straw)
- Mature compost



Living Field Laboratory – KBS

Organic row crops since 1994



LFL Corn-Soybean-Wheat vs Cont Corn

Integrated Fertilizer (IF):

- Transition to cover crops vs. fallow
- N supply = Synthetic fertilizer (PSNT) + N credits

Integrated Compost (IC):

- Cover crops vs. fallow
- N supply = Composted dairy manure (4 Mg ha^{-1}) + covers + fertilizer

Organic (OR):

- All with cover crops: **perennial vs annual crops**
- N supply = Composted dairy manure (4 Mg ha^{-1}) + red clover (recently changed to alfalfa)

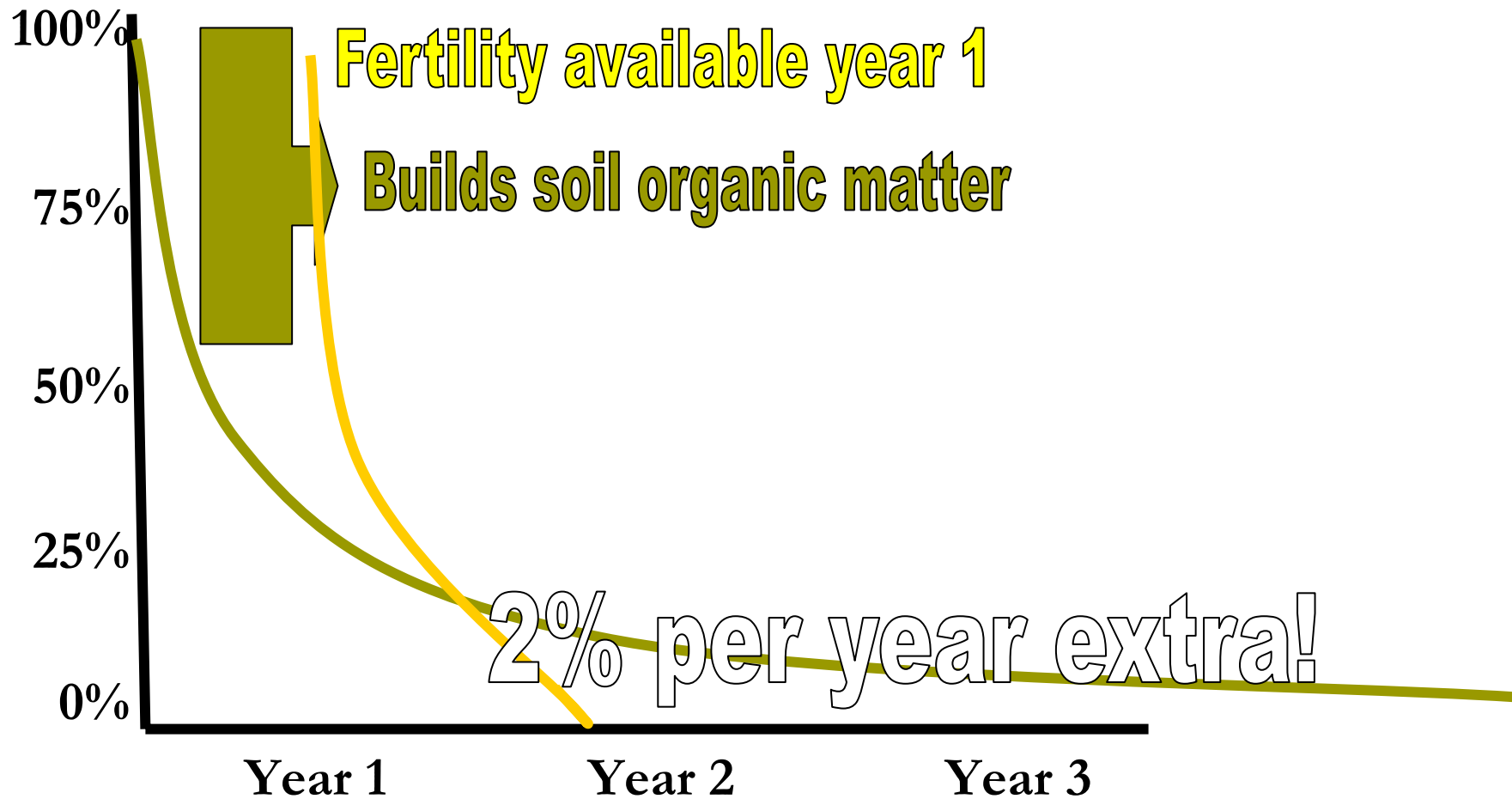
Composted dairy manure application (4 Mg ha⁻¹) and frost seeding cover crop



LFL Organic Corn Yield and Soil

1994 Soil OM = 1.4%	Average 2006-07	Soil OM	Plant N accumulation
Continuous corn + compost	106 bu/A	2.0%	90 lb N/A
Rotated C-S-W + compost	126 bu/A	2.3%	95 lb N/A
<i>Rotated C-S-W + compost + cover crops</i>	<i>143 bu/A</i>	<i>2.4%</i>	<i>144 lb N/A</i>

Organic amendment over time



Building Soils Organically - Principles

- Build organic matter: This has consequences for organic fertility management, **scale back on compost and legumes over time?**
- Review
 - Soil tests and evaluate crop growth (corn is a great indicator crop)
 - **Rethink each decade!**
- Diversity:
 - Which species? Promote living cover and diverse root types through perennials, mixed cover crops

Perennial crops for organics: nutrient efficiency and weed management?

Plant rye or red clover

Bare

Plant Crop

Annuals: cover crop, followed by grain crops

Regrow

Forage harvest or graze

Forage/Pasture

Fall

Winter

Spring

Summer

New directions in organic: perennial vs annual grain crops test in the LFL

- ❑ Perennial wheat (new crop) + alfalfa
- ❑ Annual organic rotation: corn, soybean, wheat, frost-seeded alfalfa

