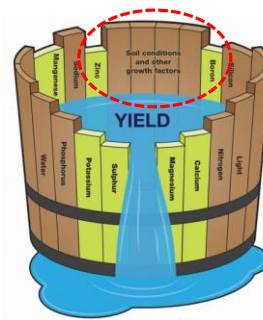
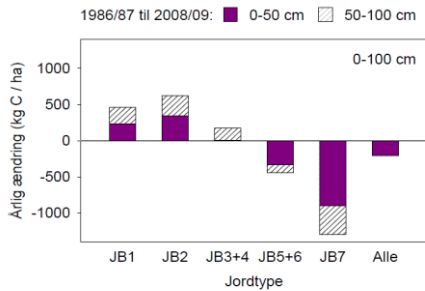


Ingredients for soil fertility in vegetable production

Richard de Visser
HortiAdvice Scandinavia A/S



1. Organic matter management
2. Green manure strategy
3. Controlled traffic farming in vegetable production



Soil and organic matter



Significance for physical properties

- Building soil structure and glue for aggregates
- Stores and discharges water – increases ability for soil water retention
- influence on aeration and temperature

Significance for chemical properties

- Retaining an supplying nutrients
- Cation-exchange-Capacity
- Acts as pH buffer
- Availability og micronutrients
- Filtration

Significance for biological properties

- Energy for micro-organisms and larger OM consuming organisms
- Mineralization of organically fixed N, P, S
- Root development
- Stimulates microbiological activity and increases soil resilience

gartneri RÅDGIVNINGEN Soil organic matter properties on soil type

- Heavy soils
 - Improve water and air management
 - Increase tillage opportunities
- Loamy soils
 - Improve water and air management
 - Less vulnerable for (surface) erosion
- Sandy soils
 - Reduce Drought sensitiveness
 - Increases plant available water
 - Higher nutrient retention
 - Higher resistance to wind

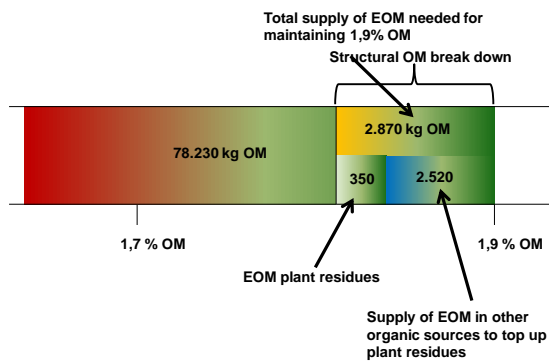
gartneri RÅDGIVNINGEN Effective Organic Matter (EOM)

Is the organic matter from manure, compost, crop residues and green manures, which remains one year after application

- Crop residues and catch crops 10-30%
- Slurry and manure 30-70%
- Compost 60-90%



gartneri RÅDGIVNINGEN OM balance



gartneri RÅDGIVNINGEN Organic Matter Balance

2-3% OM breaks down yearly

Danish top 25 cm soil contains 110 tons OM/ha (kvadratnetsundersøgelser)

Which means 2,2 – 3,3 tons OM/ha disappears every year

To maintain OM-level it will need 2,2 tons EOM/år in crop residues, organic amendments, cover crops

...which can be outlined on a crop rotation level or pr.year

gartneri RÅDGIVNINGEN Effektiv Organisk Stof (EOM)

Afgrøderester	kg EOS/ha	Efterafgrøder/gødning	kg EOS/ha
Broccoli	640	Oil radish	875
Løg	300	Red clover, undersown	1165
Gulerød	100 - 700	Grass, 1 year	1200
Kartofler, konsum	875	Grass, 3 year	
Porre	100 - 450	Lucerne, 2.år	2050
Græskar	250	Sow slurry (pr.tons)	9
Hovedsalat	160	Cattle slurry (pr.tons)	50
Havre	1570	Deep litter (pr.tons)	109
Havrehalm	900	Champost (pr.tons)	106
		Compost(pr.tons)	182

gartneri RÅDGIVNINGEN Organic Matter Balance


Example	EOM crop, kg/ha	EOM organic fertilizer kg/ha	Total
Summer barley/undersown clovergrass, straw left in the field	1310+850+630	280	3070
Potato	875	420	1295
Carrot	700	420	1120
Pea/oil radish	170+850	0	1020
Oats/undersown red clover/straw left in the field	1570+850+900	210	3530
Average EOM pr.year			2007

gartneri RÄDGIVNINGEN **Maintaining OM in top soil**

Soil Organic Matter	O.M. decomposition			
	1%	2%	3%	4%
1%	375	750	1125	1500
2%	750	1500	2250	3000
3%	1125	2250	3375	4500
4%	1500	3000	4500	6000
5%	1875	3750	5625	7500
6%	2250	4500	6750	9000


gartneri RÄDGIVNINGEN **Comparison of effective organic matter input**

LOW
1000 kg EOM/ha/jr
Conventional




Mineral concentrate & mineral fertilizer

STANDARD
2000 kg EOM/ha/jr
Conventional



Pig & cow slurry & mineral fertilizer

HIGH
3000 kg EOM/ha/jr
Organic



Farm yard manure & cow slurry

gartneri RÄDGIVNINGEN **Crop rotation Vredepeel**

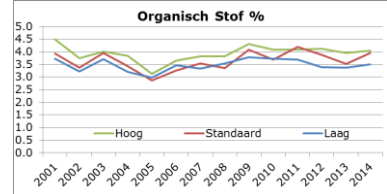


Sandy soil, 3,5 - 4% OM



Nutriënten Waterproof 2005/8-11 zand PPO-WUR

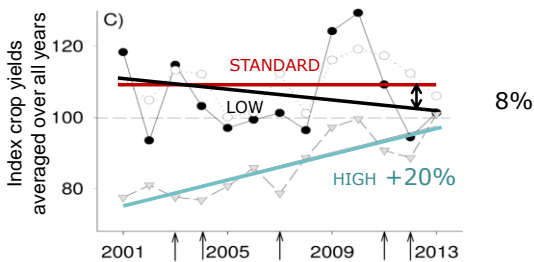
gartneri RÄDGIVNINGEN **Organic matter content of the soil**



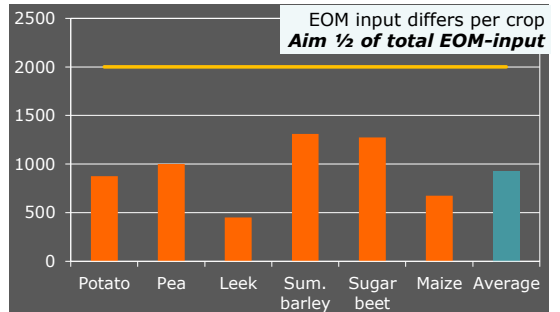
No trend on the short term
Net input small compared to soil stock
Relatively large error of measurement

O.S. Input	Start	After 30 years	After 30 years +compost
High	3.7	3.9	4.6
Standaard	3.7	3.7	4.35
Low	3.7	3.45	4.1

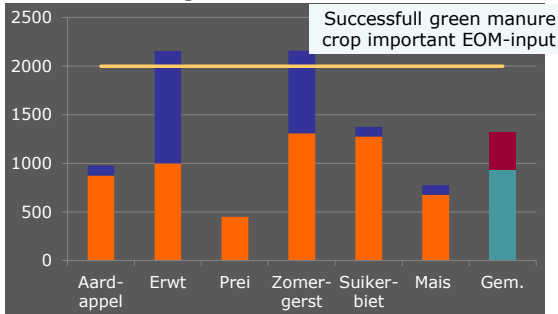
gartneri RÄDGIVNINGEN **Trends in crop yield 2001-2013**



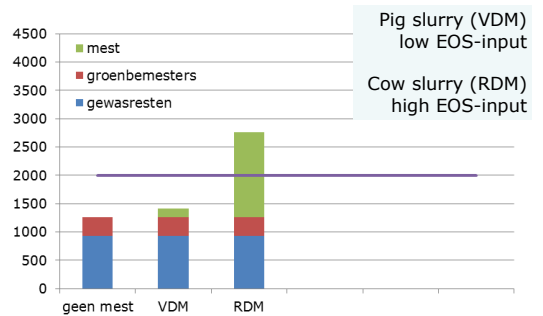
gartneri RÄDGIVNINGEN **EOM input crop residues**



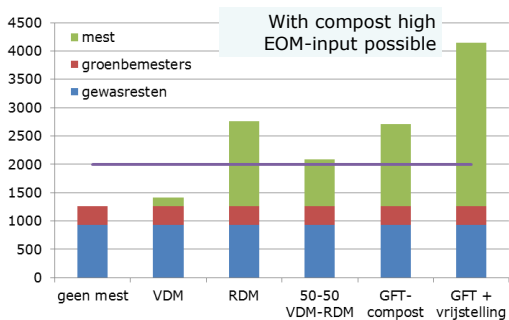
gartneri RÄDGIVNINGEN EOM input crop residues + green manure



gartneri RÄDGIVNINGEN EOM input + manure (22 kg P input)



gartneri RÄDGIVNINGEN EOM input + manure (22 kg P input)



gartneri RÄDGIVNINGEN Conclusions

Increasing input of Effective Organic Matter gives

- Increasing Yields
- Decreasing nitrogen leaching fraction on the long term
- Better and more stable soil quality



gartneri RÄDGIVNINGEN EOM supply

Animal manure

- Deep litter > cattle slurry > pig slurry > sow slurry
 - Choice of crop and crop rotation
 - Cereals are low-cash-crop, but positive in EOM-supply
 - Leave straw
 - Ley or alfalfa
- ### Green manure
- Dependant on species
 - Be aware of nematodes
- ### Compost
- Stable organic material



gartneri RÄDGIVNINGEN External sources

Composted household waste ?

Garden waste – 800.000 tons

Sewage – 650.000 tons

Straw – 6 mio tons

Pig slurry – 6.400 mio tons

Cattle slurry – 9.000 mio tons