



What is the effect of no organic manure use on yield and soil quality?

Janjo de Haan, Willem van Geel
E-mail: janjo.dehaan@wur.nl

Research question

Can nitrate leaching be reduced while maintaining yield levels with no use of organic manure?

Systems research

Since 1989 development of sustainable arable and vegetable farming systems in the S.E. of the Netherlands on sandy soils which are sensitive to nitrate leaching. Systems have balanced fertilisation and relative low organic manure use.

Since 2001 division of fields in two systems:

- with regular organic matter input: effective organic matter (EOM) input about 1500 kg/ha,
- without organic manure input: EOM-input about 900 kg/ha.

No difference in total available N for crop growth, 6-year full rotation since 2004: potato – triticale – lily – fresh peas followed by winter leek – silage maize – sugar beet.

Measurements each year of marketable fresh yield, dry matter yield, nitrogen uptake by crop. Crop yields were compared with yields from commercial fields of the farm with same cultivar and cropping period, but higher input of organic manure.

Results

- Nitrate content of the soil water amounted 120 mg NO₃/l with organic manure and 99 NO₃/l without organic manure.
- No clear differences in yields between two systems.
- Large differences between years and fields.
- Yields are obvious lower without organic manure in field 16 and 26.

- Differences cannot be correlated to soil chemical characteristics (org. matter%, P-water, total N, CEC) or nitrogen supply.
- Differences may be linked to qualitative characteristic of drought sensitivity of fields.
- Large yield differences after 20 years of lower organic manure input compared to commercial fields for potato, triticale and silage maize.

There is no good explanation of differences.

Future

Two systems are continued. Ecological and physical soil measurements are done to get better explanation of differences

Table 1. Marketable yields of the systems in ton/ha. Reference are yields realized at experimental farm outside the experiment with same cultivar and cropping period.

	Organic manure	No organic manure	Reference
Potato	50.5	53.1	62.4
Sugarbeet ¹	13.3	12.9	13.4
Triticale	6.6	6.2	7.7
Silage maize ²	15.3	15.6	17.8
Fresh peas	5.6	5.9	5.5
Winter leek	31.3	28.8	—

¹ yield in ton sugar/ha

² yield in ton dry matter/ha

Table 2. Index dry matter yield per field and per year of the two systems. Background colors mean: green, sugar beet; purple, potato; yellow, triticale, blue, fresh pea and leek; orange, silage maize, white no data lily.

Feld	16		17		18		26		27		28		Average	
	with org. manure	without org. manure	with org. manure	without org. manure	with org. manure	without org. manure	with org. manure	without org. manure	with org. manure	without org. manure	with org. manure	without org. manure	with org. manure	without org. manure
2005	84	78	*	*	88	88	89	82	96	101	86	95	89	89
2006	89	86	84	79	*	*	86	81	85	85	113	106	91	87
2007	97	86	86	96	96	92	85	71	*	*	102	95	93	88
2008	*	*	97	95	107	107	80	86	98	89	92	91	95	94
2009	85	66	88	103	102	110	102	86	106	113	109	109	99	98
2010	106	100	*	*	94	117	*	*	108	110	*	*	103	109
Average	92	83	89	93	97	103	88	81	99	100	104	100	95	93

Applied Plant Research (Praktijkonderzoek Plant & Omgeving, PPO)

Edelhertweg 1
P.O. Box 430, 8200 AK Lelystad
The Netherlands
Phone: +31 (0) 320 - 29 11 11
E-mail: infoagv.ppo@wur.nl
Internet: www.ppo.wur.nl