Organic Food and Farming

Feed production on farms without animals is not environmentally sustainable

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In this presentation we state that

- **production of feed on farms without animals is not environmentally sustainable**
- **the magnitude of the effects of the animal and plant production separation is not sufficiently appreciated by the public opinion, and therefore**
- **the separation of animal from plant production will continue, unless …**
- **the focus is on the balance between plant and animal production – Nitrogen surplus is used as an example**

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The large N surplus is both a local and a global problem

- **Only about 10 % of N entering agricultural is recovered in the final products**
  - **=> Eutrophication,**
  - **=> Water pollution**
  - **=> Nitrous oxide (N_2O) emission**

- **North Sea agreement (1987 + 1995)**
- **EU's nitrate directives (1991)**
- **EU's water pollution directives (2000)**
- **Kyoto agreement**

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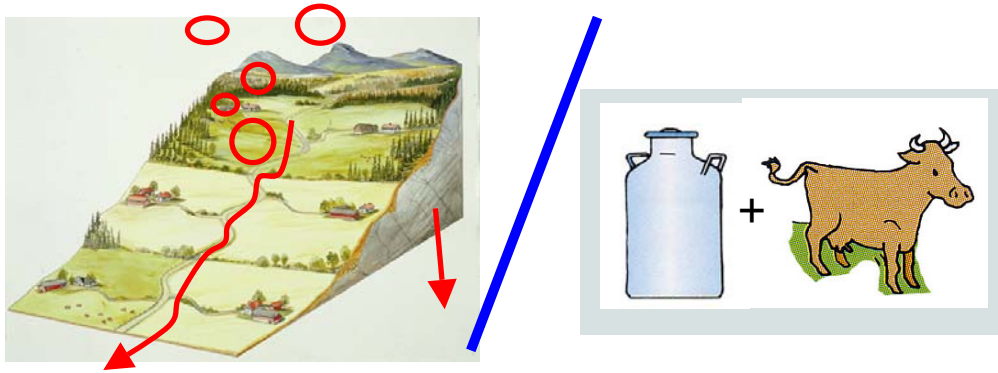
Indicator:
Nitrogen emission per unit of produce

Surplus / Produce

(kg N / kg N)



Any N surplus is a potential pollutant

1 kg N ~ 200 kg milk
1 kg N ~ 40 kg living animal

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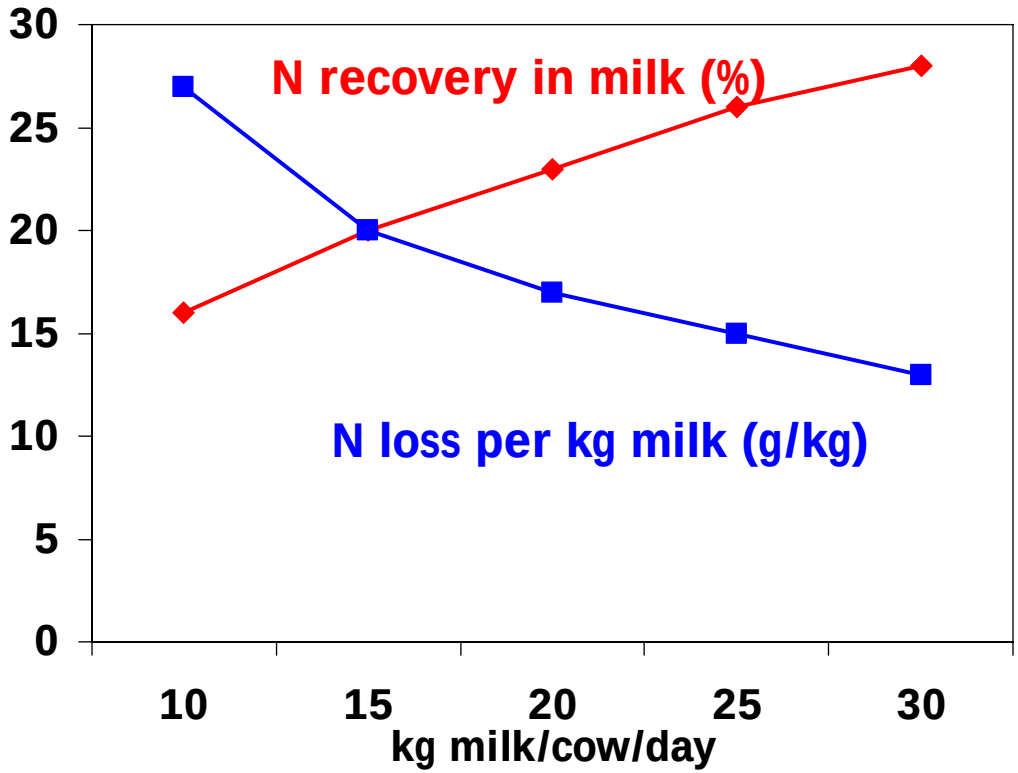
A common view:
Concentrate supplementation increases the milk yield per cow and thus the N recovery of dairy farms

Are we addressing the problem at the right trophic level and at the right scale?



Methods

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- **Farm N Balances, 20 cases**
  - surveys (averages of several farms)
  - prototype studies

	Min	Max	Median
Milk production *l / ha*	3000	13000	5000
N in milk + livestock *kg N / ha*	17	80	33
Feed import *kg N / ha*	20	180	40

- 45° - 60° N
- 9 countries
- 11 sources (published articles)
- conventional, integrated and organic farms

Only farms where feed imports < 50% of total ration

The dairy system

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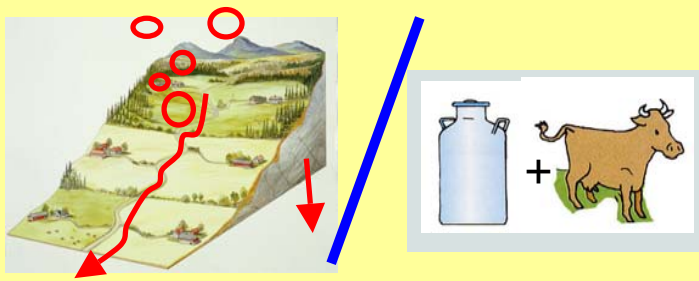
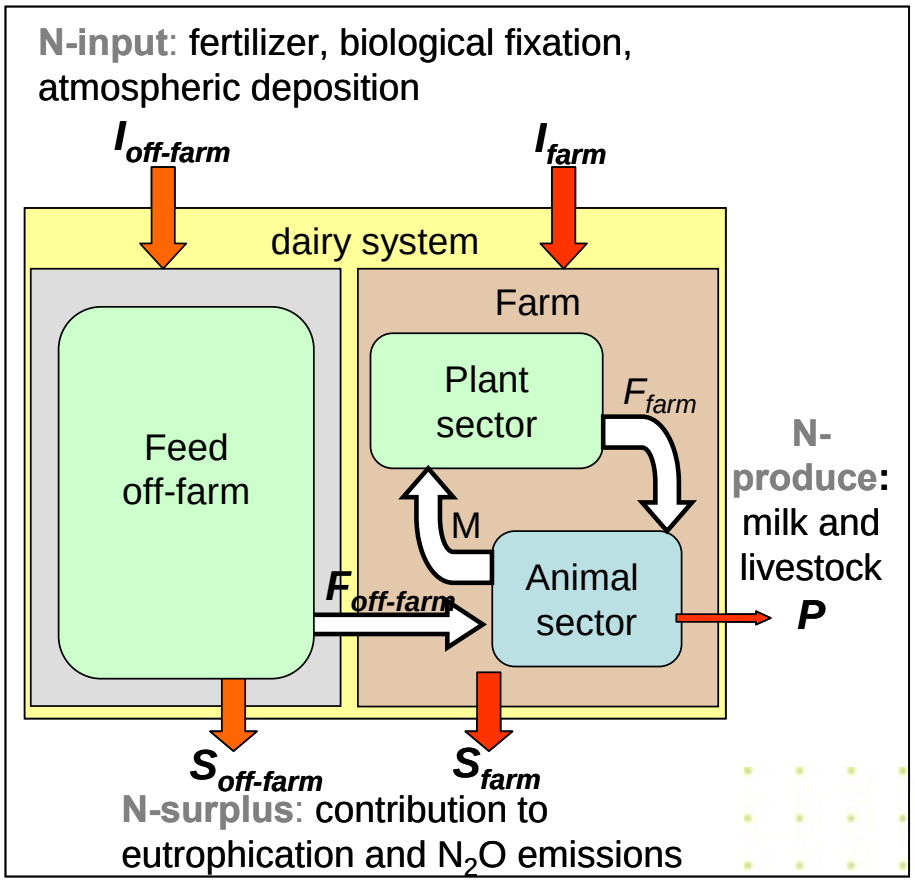
N Emission factor per unit of produce
(kg N /kg N)



$E_{farm} = S_{farm} / P$

$E_{tot} = (S_{farm} + S_{off\text{-}farm}) / P$



Farm N Balance

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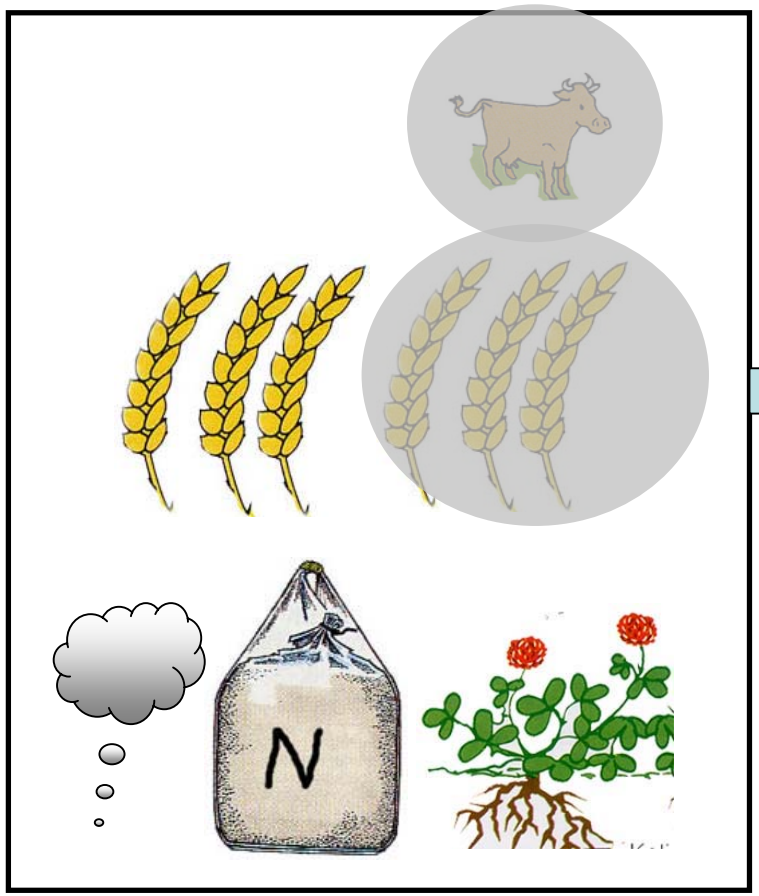
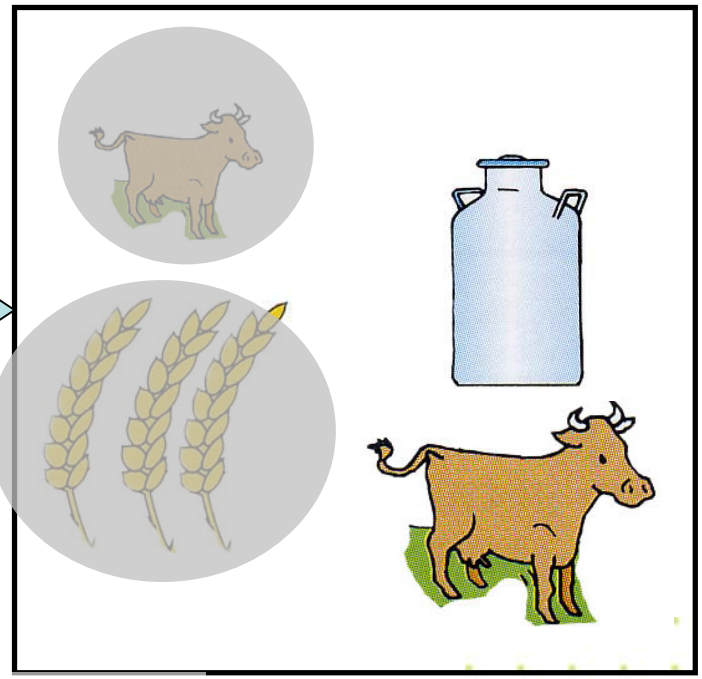
Net Inputs



Net Produce



Surplus

Results (1)

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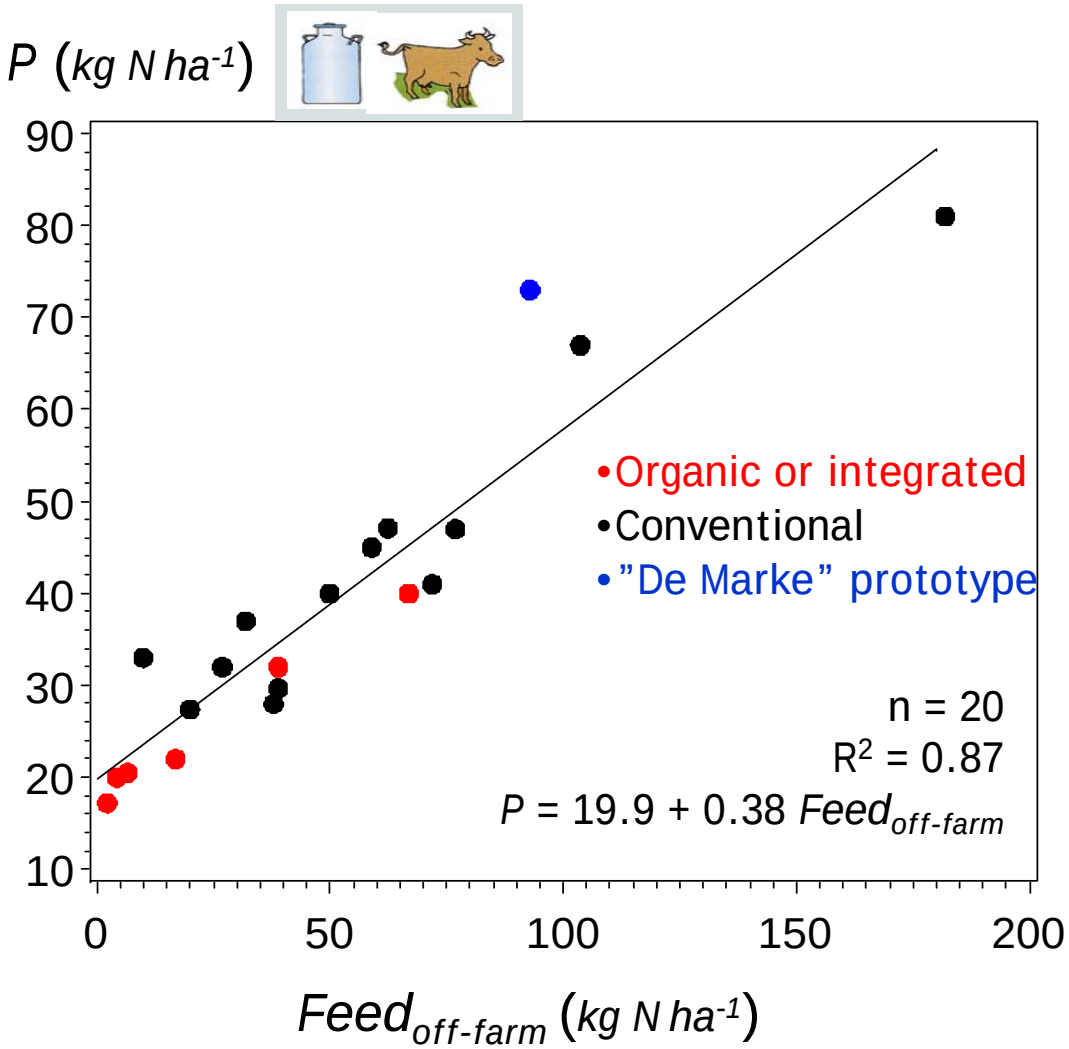
Use of *Feed*$_{off\text{-}farm}$ increased *Produce*



Results (2)

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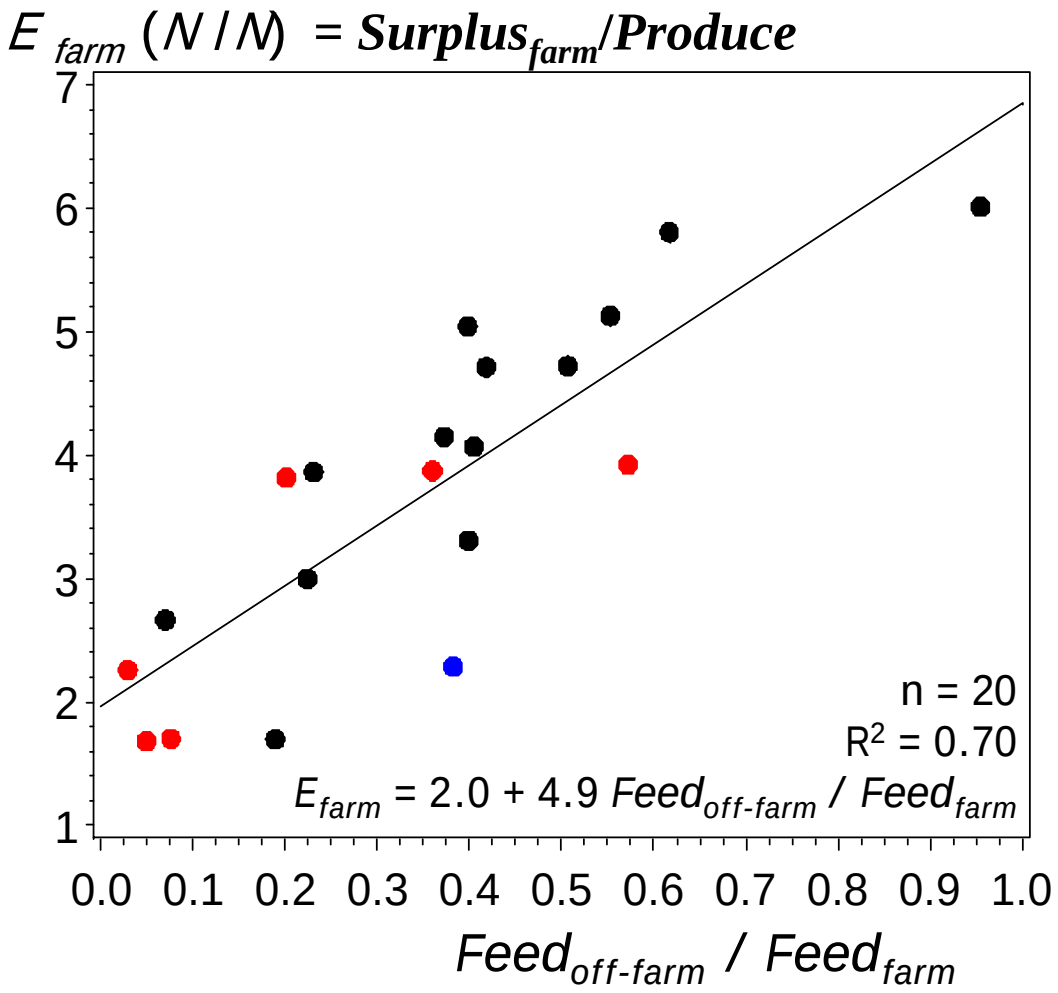
E_{farm} increased with the ratio $Feed_{off\text{-}farm}$ / $Feed_{farm}$



The dairy system

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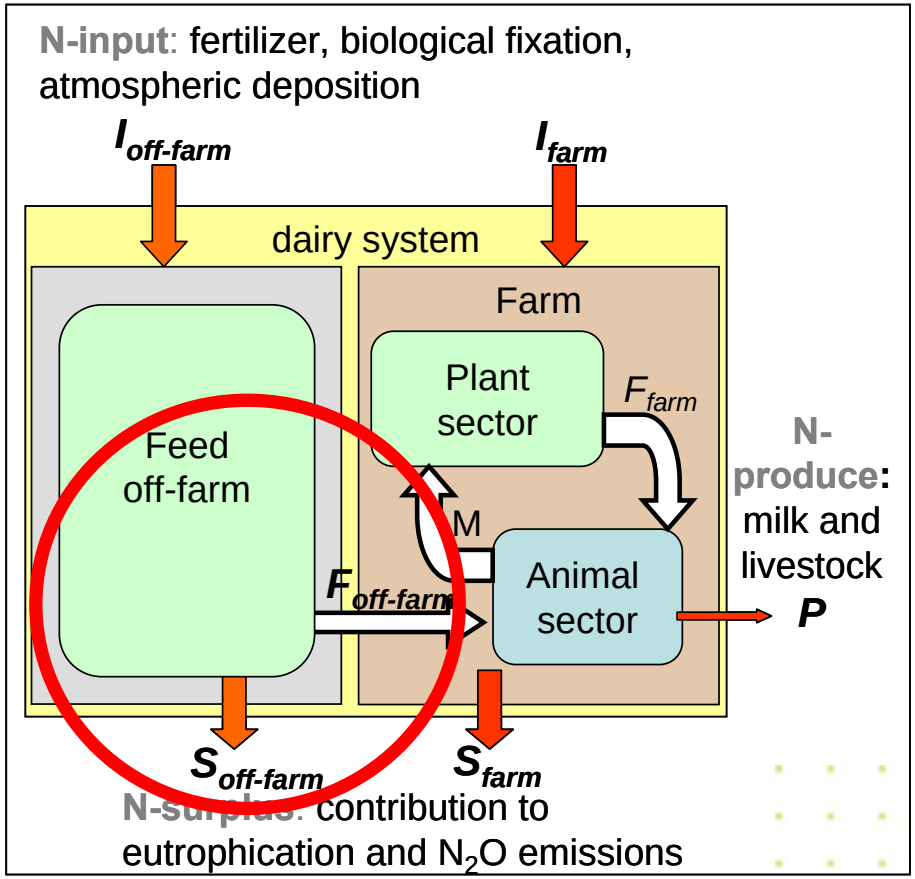
$S_{off\text{-}farm} = F_{off\text{-}farm} \cdot X$

X: factor for emission from plant production systems

How to choose X?

- Constant value (we do not know were the feed is imported from)?

- Specific values (green manure systems more leaky than fertilizer based monoculture?)?



Results (3)

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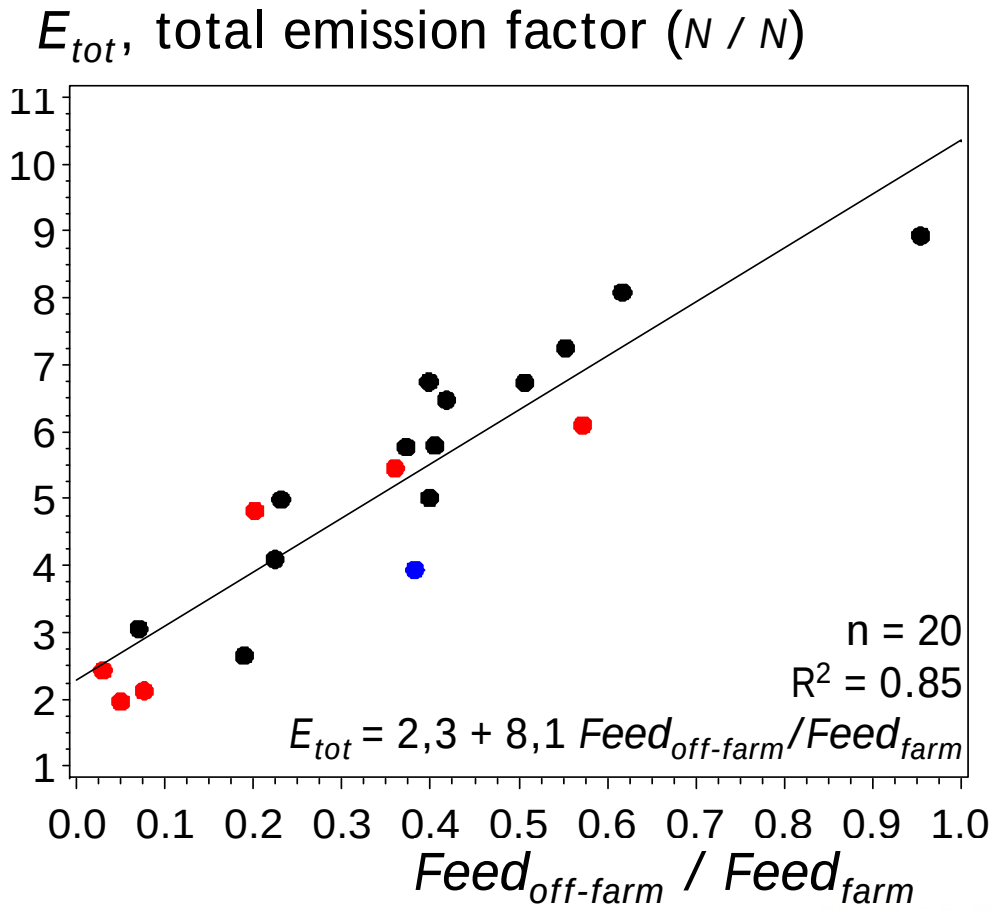
E_{tot} increased with feed purchase relative to the farms' carrying capacity



$E_{tot} = (Surplus_{off\text{-}farm} + Surplus_{farm}) / Produce$

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Organic Farms

	% bought of total feed	Plant production	Milk+	Manure	E_{tot}
		(kg N ha^{-1})			
Norway, prototype	**3**	77	17	62	2.4
Austria, n = 40	**5**	88	20	72	2.0
Austria, n = 51	**7**	88	21	74	2.1
Germany, n = 6	**17**	84	22	79	4.8
Denmark, n = 14	**26**	108	32	124	5.5
Wales, prototype	**36**	117	40	144	6.1
		X 1.5	**X 2.4**	**X 2.3**	**X ~ 3**

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IFOAM - Principle of ecology

”Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them”

This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. For example, ….; for animals it is the farm ecosystem; …..

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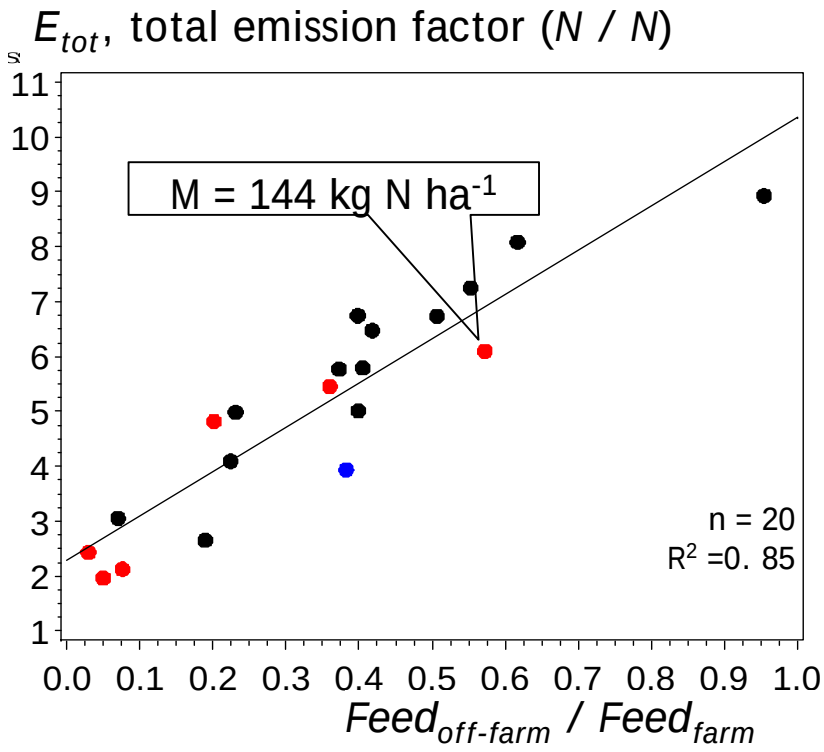
There are no adequate regulations to ensure a closed plant-animal loop in organic agriculture

- USA: **”none”**
  (Organic Food Production Act 1990)
- IFOAM: **”The prevailing part (>50%) of the feed shall come from the farm unit itself ”**
  (Draft 2004)
- EU: **maximum feed import 50% of total ration animal manure limited to170 kg N ha^{-1}**
  (EU Regulation No 2092/91)



Tentative recommendations for IFOAM standards

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- Max. 5 % alien feed
- 10% in exeptional (disaster) years?