‚Workshop on self-sufficiency in organic farming‘

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Contribution of organic livestock farming to face the challenge of climatic changes

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Guide

- Global implications
- System-related benefits
- Nutrient efficiency and self-sufficiency
- Résumé and conclusion

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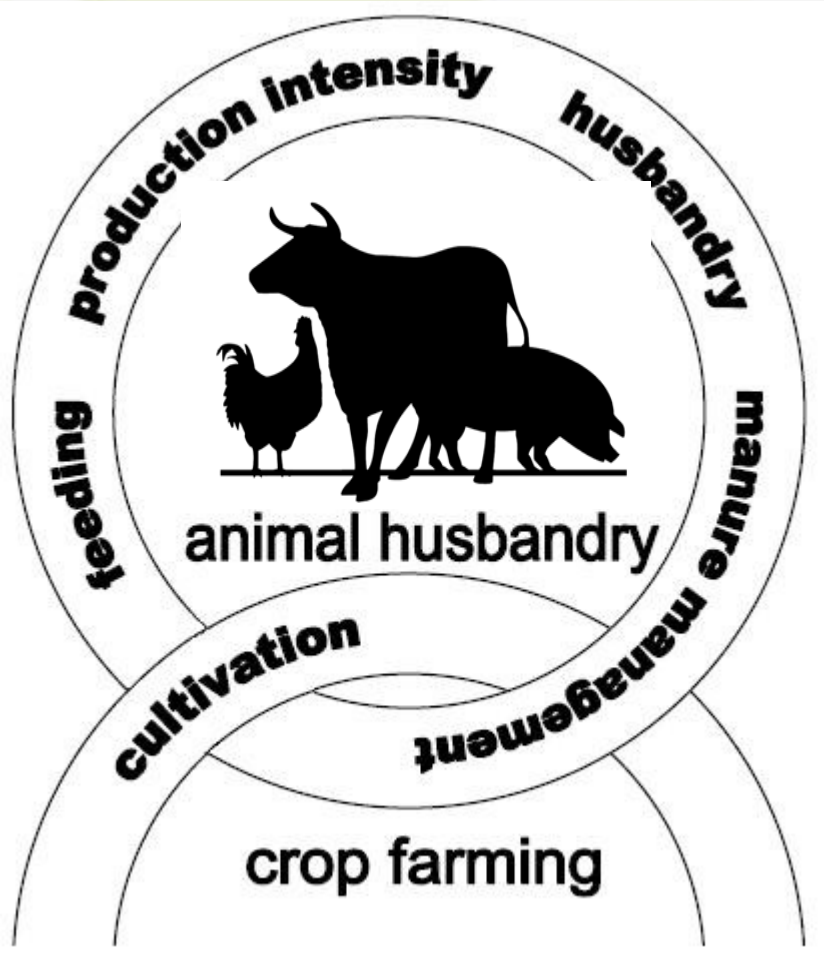
Globalised dairy cow, partly using nutrients from all over the world, fossil energy and excreting nutrients and gases (CH_4) with global impacts

Re-organisation of the farm system when striving for self-sufficiency



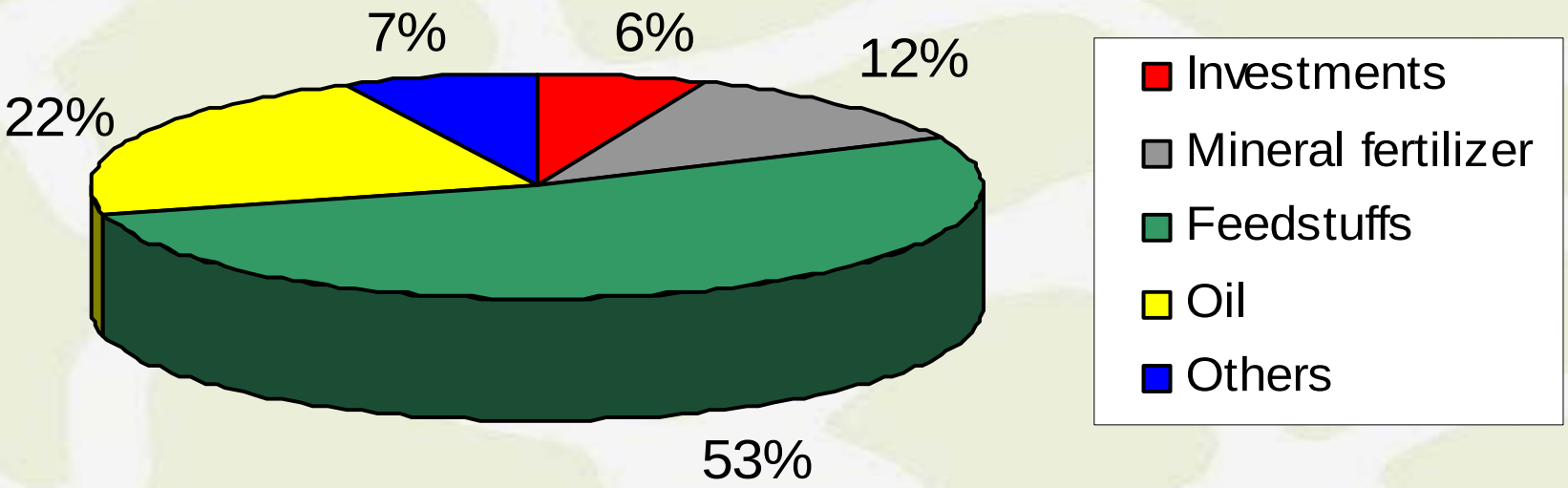
Conversion to organic farming requires a comprehensive re-organisation of the farm structure, where the demands of plant cultivation have to be balanced with the requirements of livestock production, and stocking density and yield of animal production have to be adapted to the nutrient potential of home-grown feeds.

Benefits with regard to an environmentally friendly production related to the organic production method

- Ban of pesticides and other risk factors incl. GMO
- Reduced use of fossil energy and non renewable resources

Proportion of different production tools in relation to the energy-input in conventional livestock production

(Stoll et al., 2001)

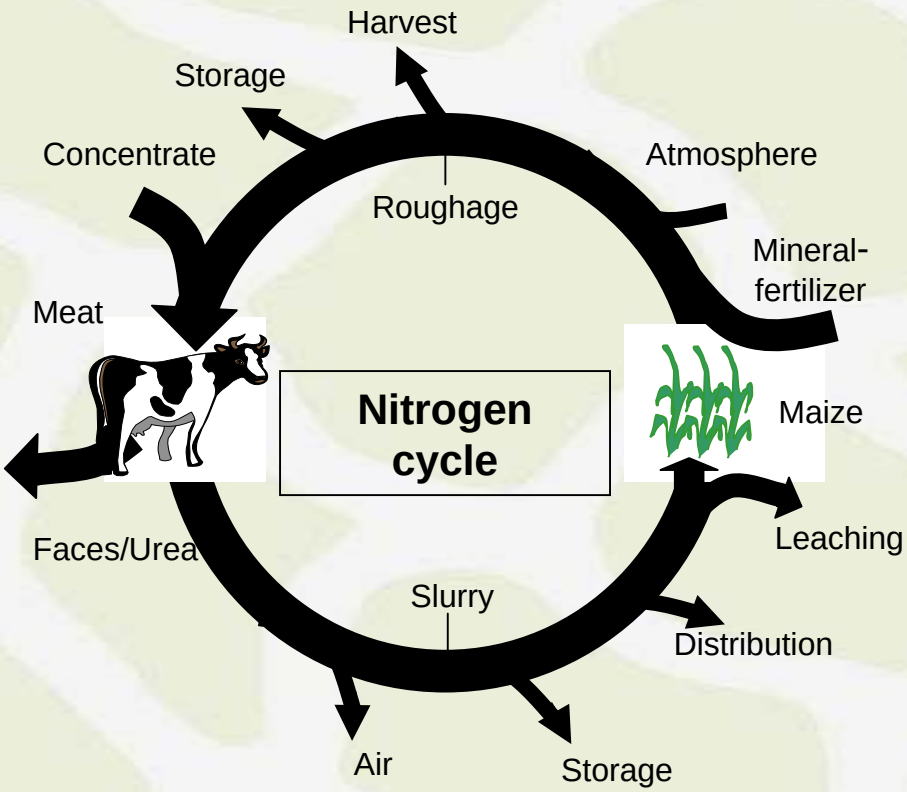


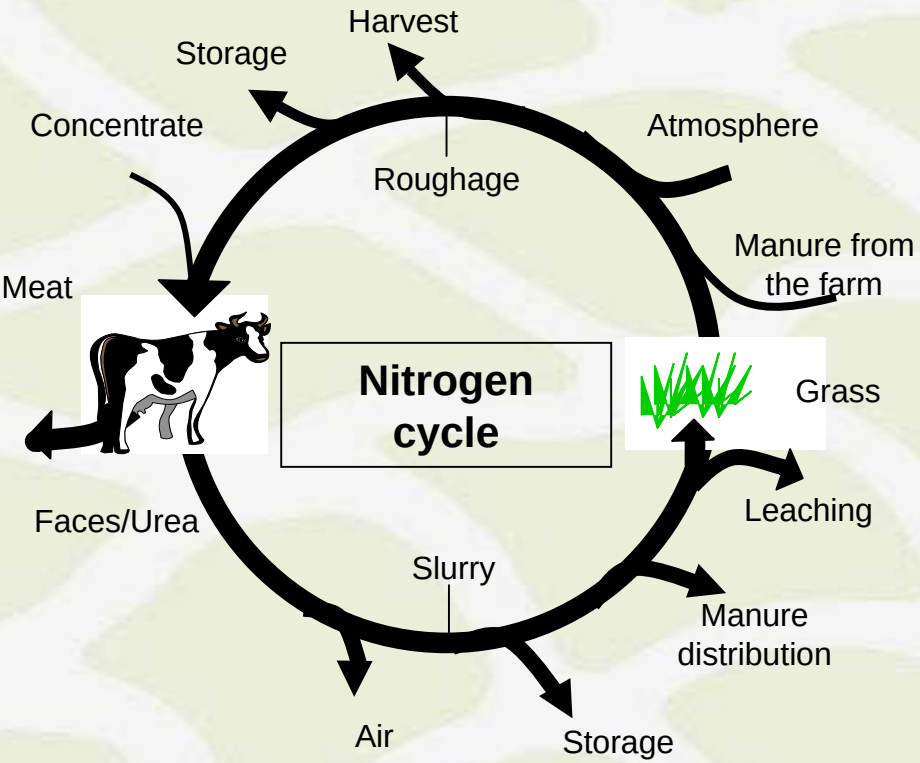
(n = 218 farms; Ø 1996 - 99)

Benefits with regard to an environmentally friendly production related to the organic production method

- Ban of pesticides and other synthetic risk factors incl. GMO
- Reduced use of fossil energy and non renewable resources
- Low nutrient losses due to low input of nutrients

Comparison of the nitrogen flow in organic and conventional agriculture





Conventional Agriculture
- Interrupted nutrient cycle
- High input- and output flow
  (e.g. concentrate, mineral fertilizer etc.)

Organic Agriculture
- Nearly complete nutrient cycle
- Low input- and output flow

Farm balance sheets of nitrogen and the use of external resources (N-fertilizer and N from purchased feed) in organic and conventional dairy production

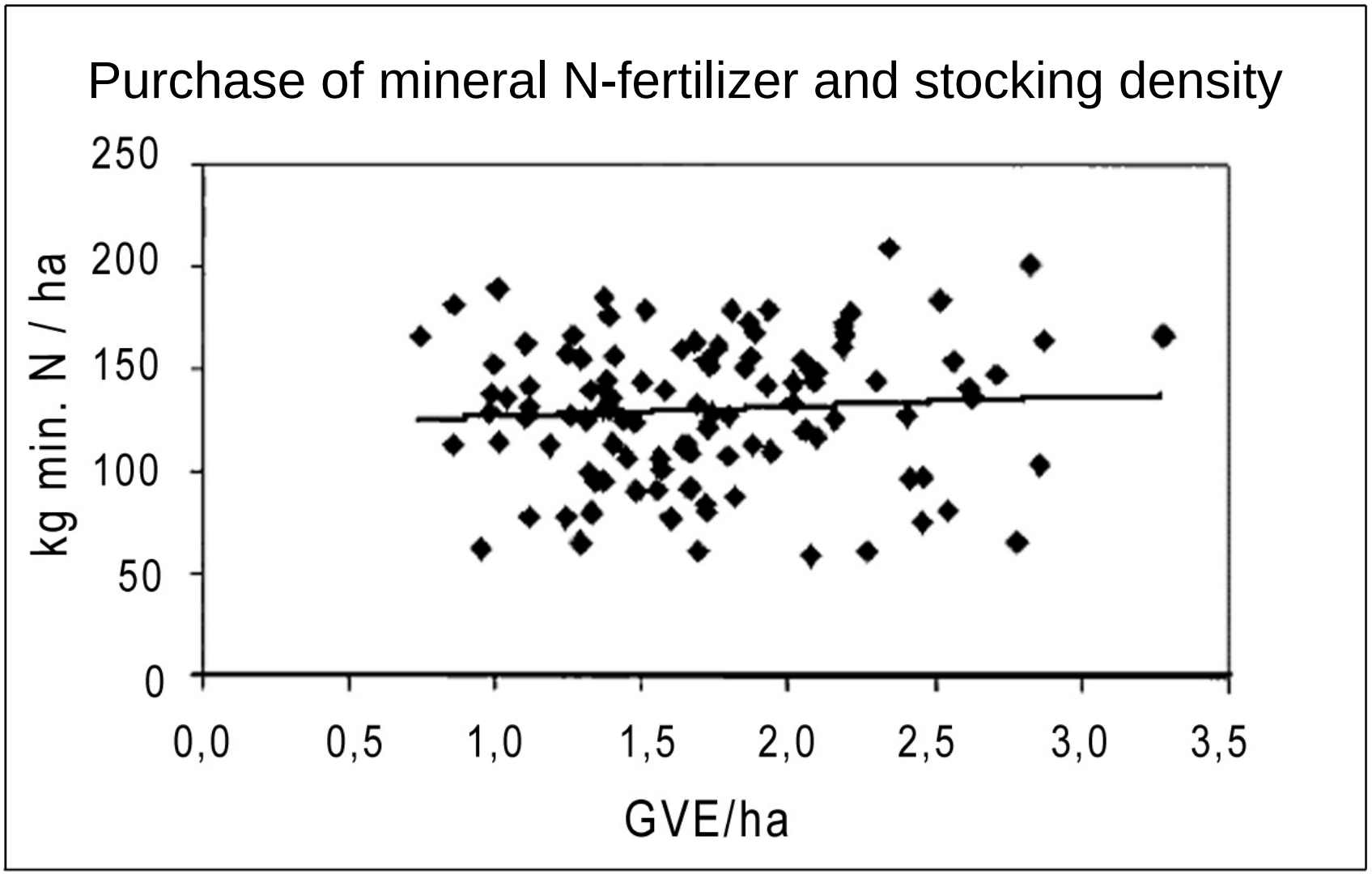
Farm balance sheet (kg N / ha)		Use of resources (kg ext. N / kg N Output)		
Organic	Conventional	Organic	Conventional	Authors
31 (n = 6)	**80** (n = 6)	**0,38** (n = 6)	**2,3** (n = 6)	Haas et al., 2001
56 (n = 7)	**146** (n = 39)	**0,77** (n = 7)	**1,5** (n = 39)	Scheringer, 2002
43 (n = 26)	-	**0,28** (n = 26)	-	Haas & Deittert, 2004
119 (n = 149)	**183** (n = 350)	**1,5** (n = 149)	**3,3** (n = 350)	Knudsen et al., 2006

(n = number of farms)

Benefits with regard to an environmentally friendly production related to the organic production method

- Ban of pesticides and other synthetic risk factors incl. GMO
- Reduced use of fossil energy and non renewable resources
- Low nutrient losses due to low input of nutrients
- Limited availability of resources as an incentive to increase the efficiency in the use of home-grown feedstuffs and manure
- System-immanent stimulus to reduce emissions of nutrients due to their relevance for increasing yield in plant cultivation

Relationship between the purchase of mineral N-fertilizer and the stocking density (mean values of the years 1996-1999)



(Source: Stoll, 2001)

Conflicting areas when trying to implement a high level of self-sufficiency

High level of self-sufficiency ⇔ animal health and welfare

High level of self-sufficiency ⇔ lower productivity/ higher production costs

High level of self-sufficiency ⇔ fair competition

High level of self-sufficiency ⇔ lower level of efficiency in utilization of nutrients and energy

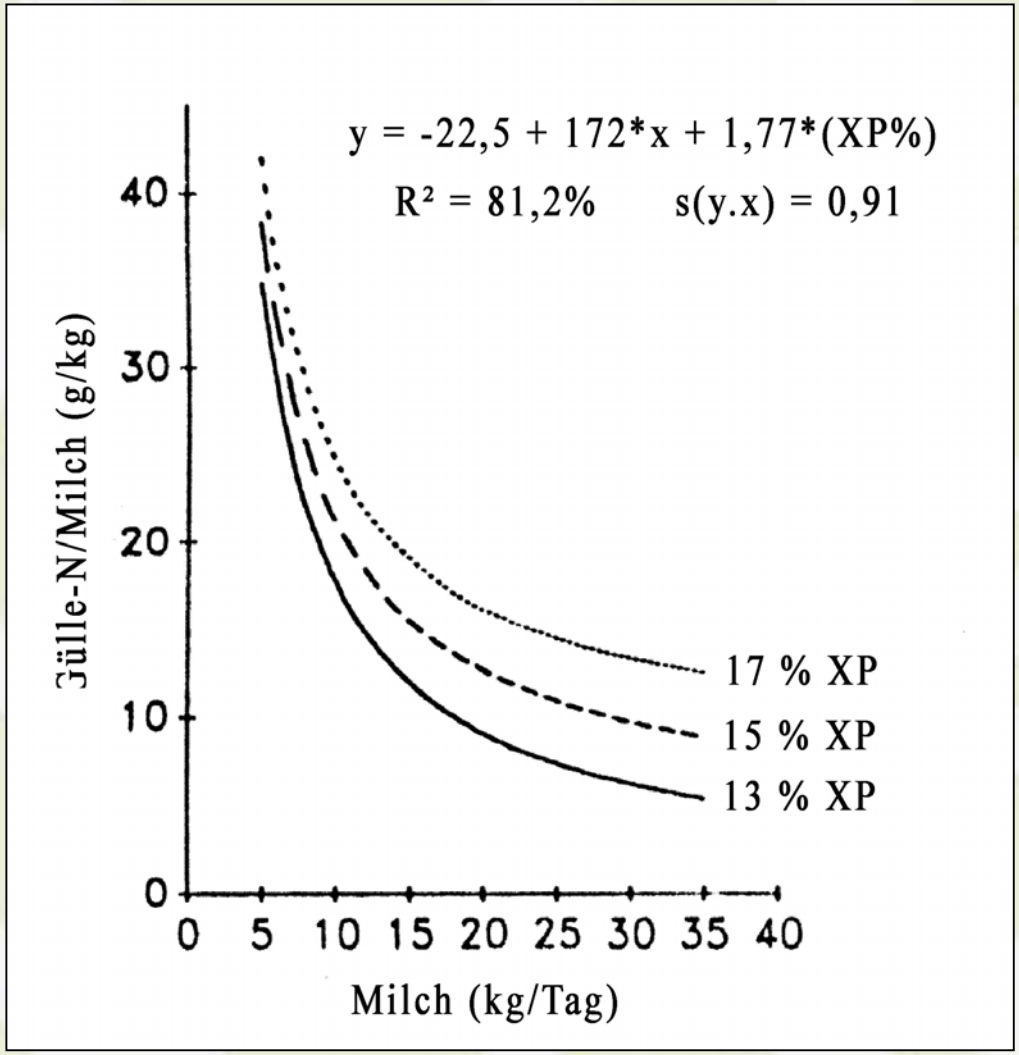
Different reference points to evaluate the environmental impacts of livestock production

Output of nitrogen (NH_4, NO_3, N_2O), phosphorus, potassium, methane or CO_2 and use of energy in relation to:

- Single animal
- Kg of milk, meat or eggs produced
- Quota of milk
- Land area (ha)
- Farm system
- Total amount of resources used within the production chain

The choice of the reference point is most important in relation to the meaningfulness and the interpretation of assessments

Amount of nitrogen in the slurry per kg produced milk (g/kg) in relation to the milk yield (kg/day) and the crude protein content of the diet



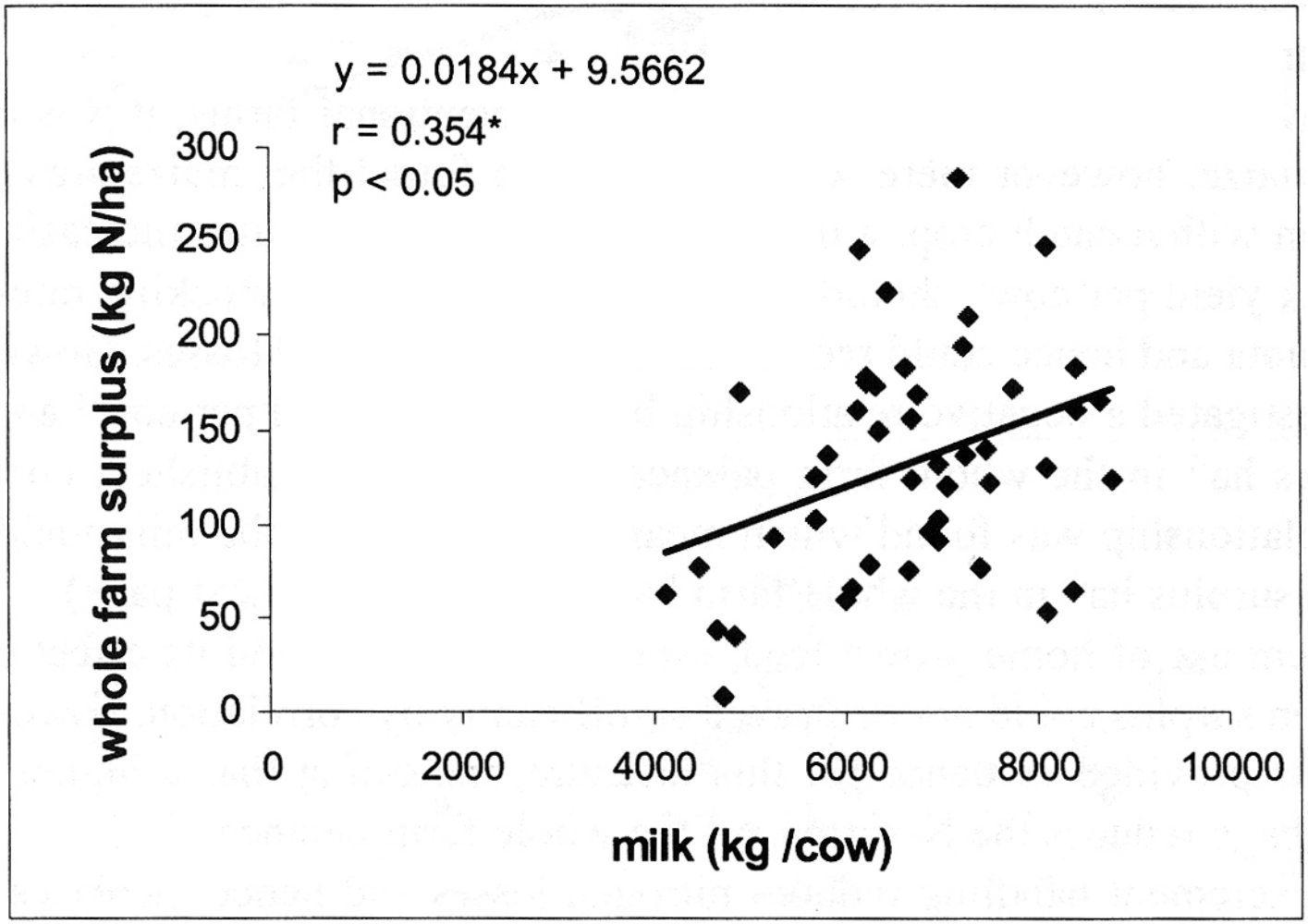
(Source: Kirchgessner et al., 1993)

Traditional perspective:

Assessment of nitrogen output per kg milk on the level of the farm animal, often leading to general conclusions about the benefits of a high milk yield for an environ-mentally friendly production, therewith ignoring how the feed was produced and what happens with the manure

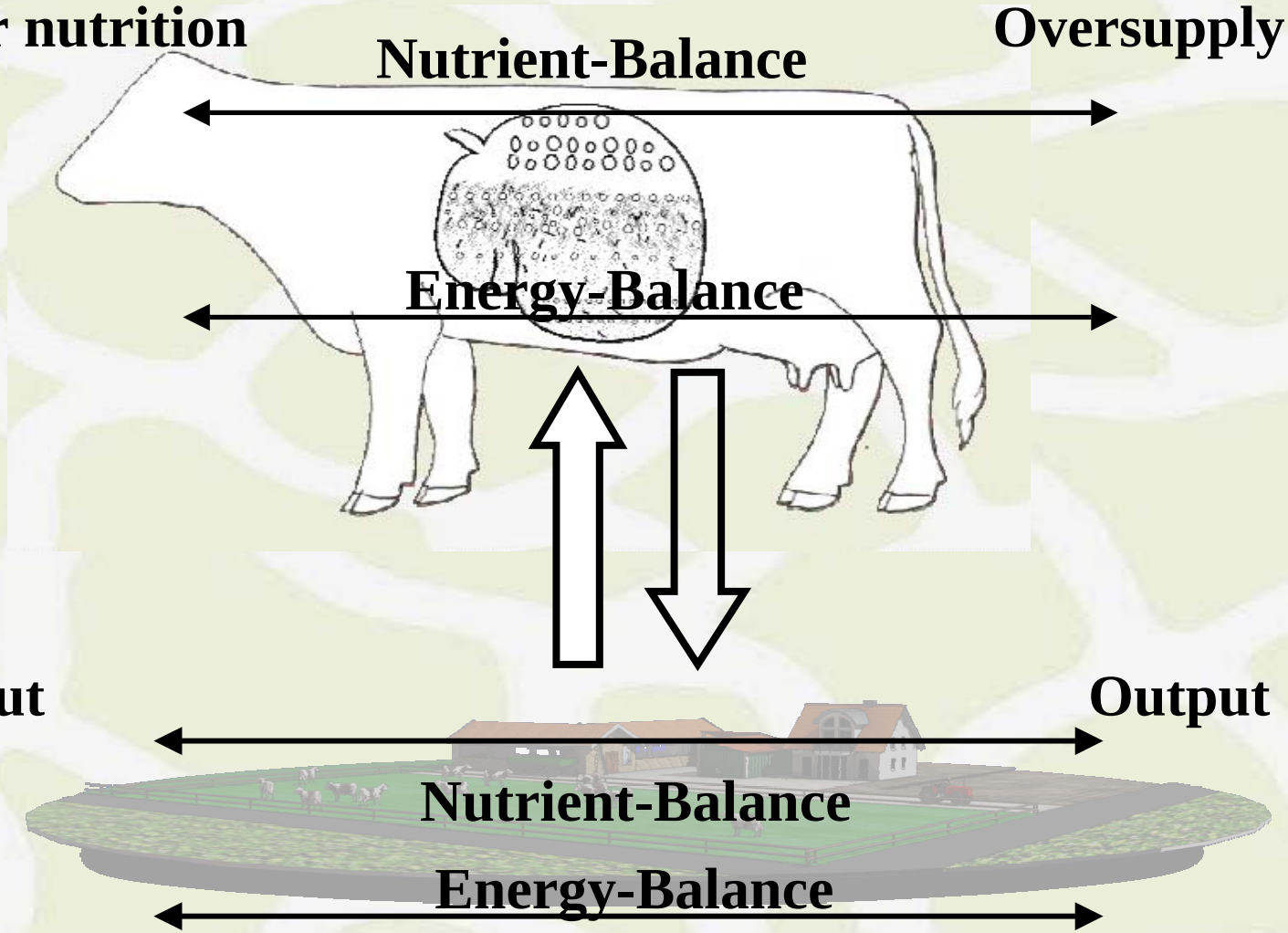
Milk yield per cow and N-surplus of farm balance sheets

(n = 46)



(Quelle: Scheringer, 2002)

Challenge to find a balance between requirement and nutrient & energy supply of farm animals and within the farm system

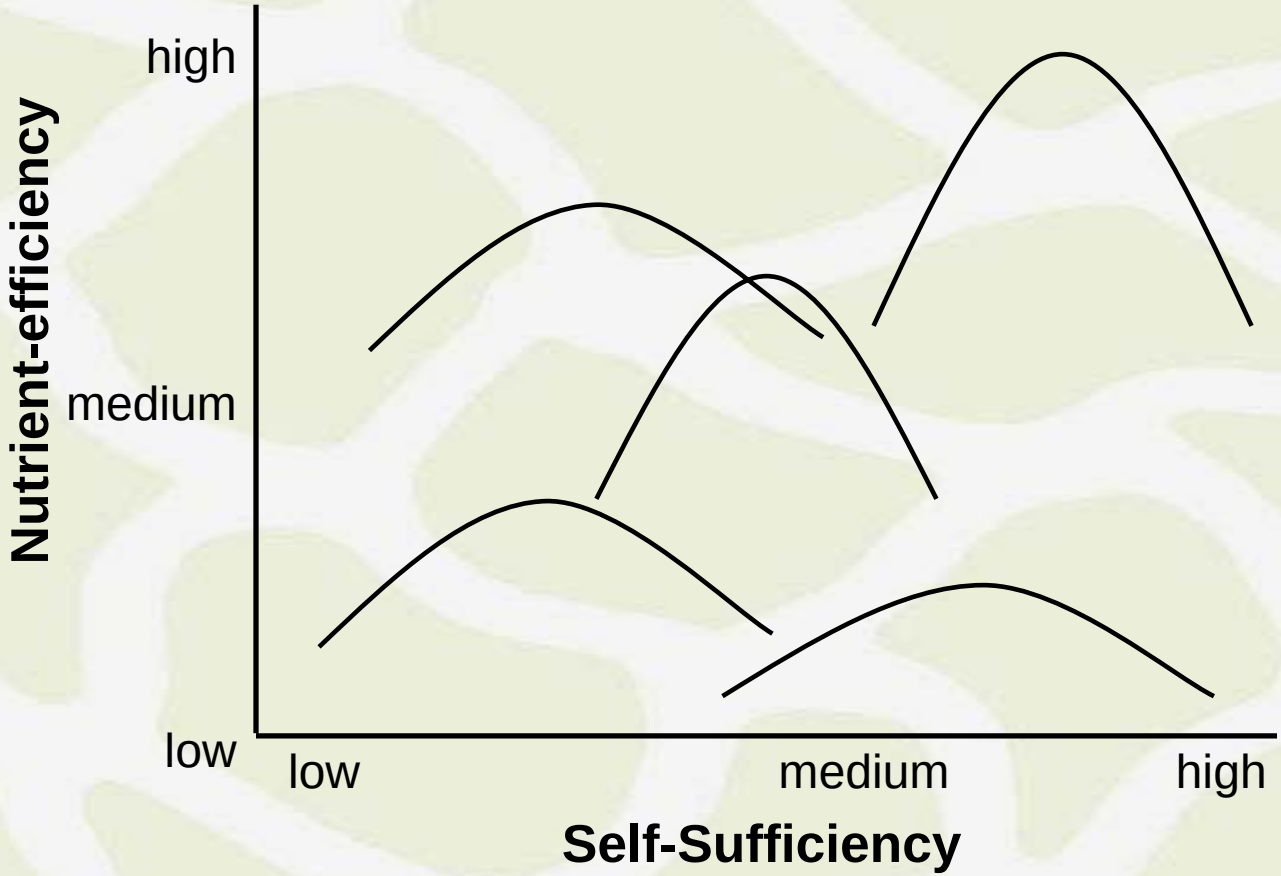


Herd performance and efficiency of feed utilization in two different organic systems within one farm (average of 3 years)

	SS-System	IP-System
Stocking density, incl. young stock (livestock unit/ha)	**1,27**	**1,65**
Stocking density, incl. off-farm land area for concentrate		**0,93**
Bought-in concentrate per cow and year (t)	**0,39**	**1,43**
Portion of roughage in the annual feed ration (%)	**92,4**	**72,5**
Efficiency of feed utilization (MJ Milk / MJ feed energy)	**0,36**	**0,37**
Milk yield per cow and year	**5498**	**6438**
Total milk output (1 ha^{-1})	**6961**	**10601** **6197**
% of milk produced from forage	**83,9**	**47,3**
Farm balance sheet of nitrogen (kg ha^{-1})	**+ 99**	**+ 151**

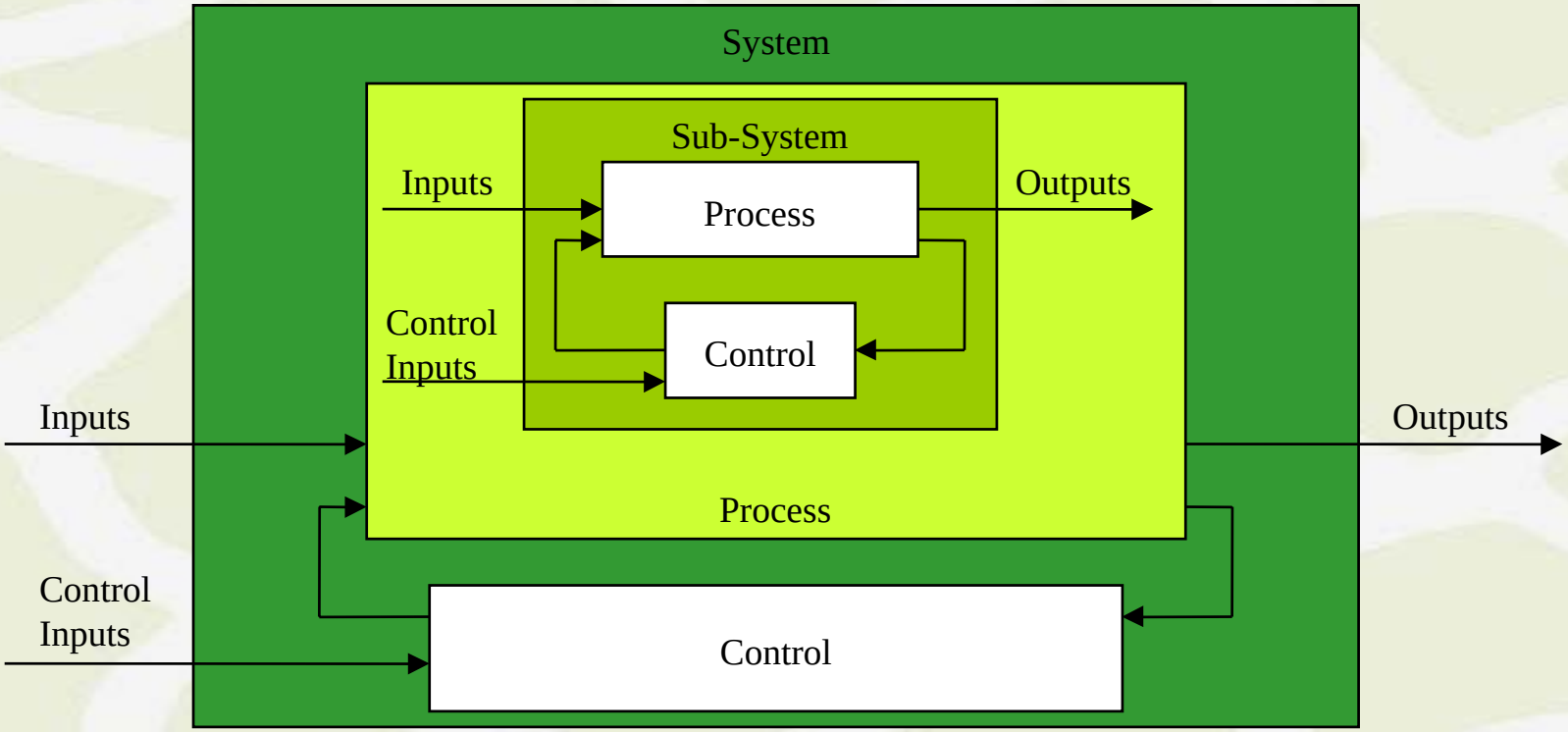
SS= Self-sufficient, IP = Increased productivity (Source: Weller & Bowling, 2004)

Hypothetical model to describe the relationship between self-sufficiency and nutrient efficiency (including all resources used within the production chain) in different organic farms



There is reason to assume that each organic farm has its own optimum concerning the balance between nutrient-efficiency and self-sufficiency

Feedback as a main principle of open systems



Hierarchy of Systems (Hodson, 2002)

Improvement of nutrient efficiency requires the implementation of feedback mechanism. To do without, as is the case on most of the farms, is against a main principle of ecological systems.

Résumé and conclusion

- Compared to conventional production organic farming provides clear benefits in relation to the use of fossil energy and environmental pollution.
- Organic farming includes various conflict of aims which have to be solved within the farm system and can not be externalised like in conventional.
- The farmer is challenged to strive for balances in the various areas, which requires specific skills, incentives and tools.
- To balance the various demands on the animal and farm level requires the development and implementation of control and feed back mechanism.
- Main objective should be to increase efficiency in utilization of nutrients and energy based on the total amount of resources used in the production chain.
- The specific performance of organic livestock production in relation to the environmentally friendly production should be assessed and labelled in order to be used as a specific production goal and a criterion for the market.

Thank you very much for your attention !