

# INTERCROP

EU shared cost project under the 5th Framework Programme of RTD, Key Action 5 - Sustainable Agriculture.

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## Intercropping cereals with grain legumes : N and S concentration and N:S ratios of cereals

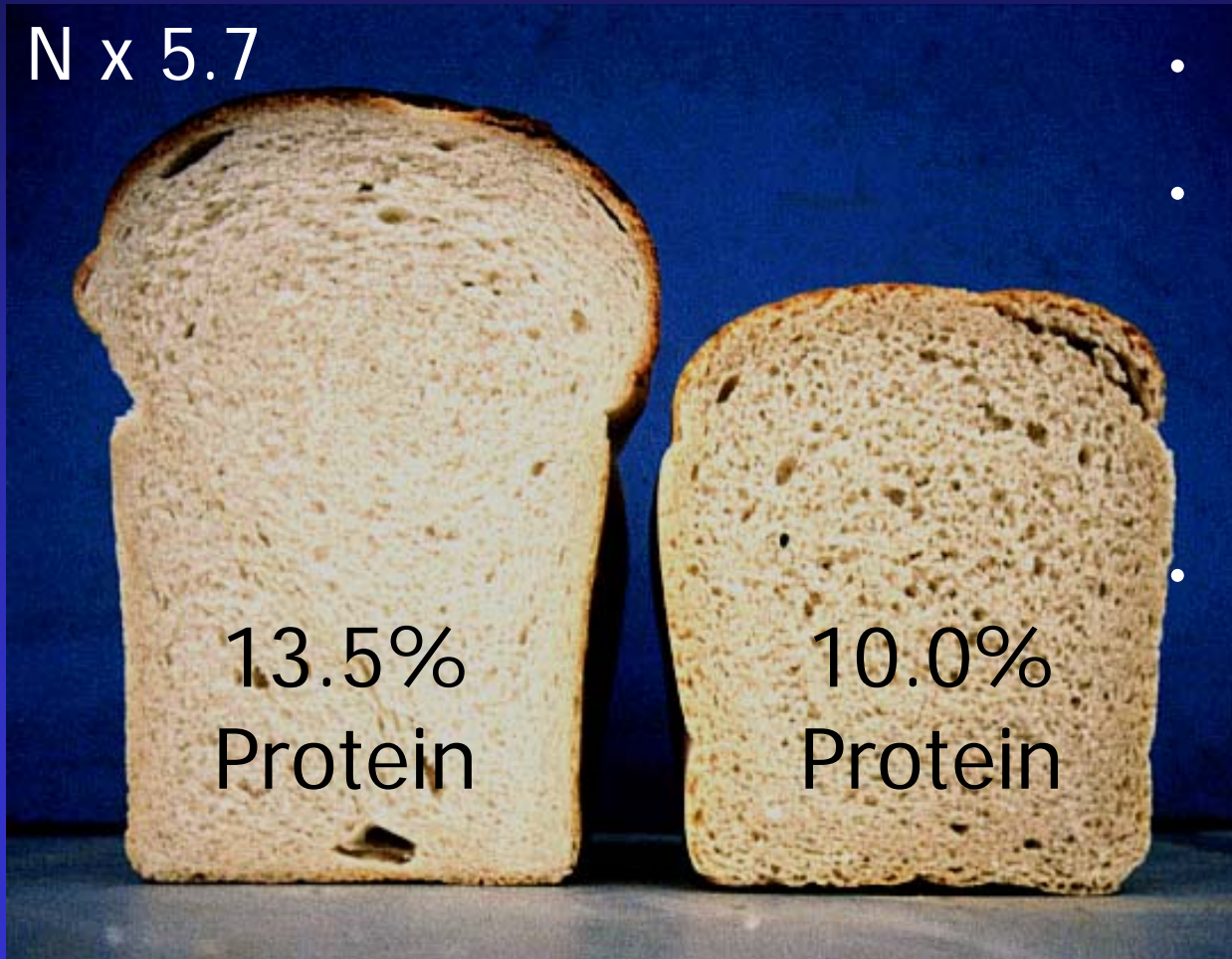
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E. Kasyanova, R. Ruske, M. J. Gooding, H. Hauggaard-Nielsen, A. Dibet, G. Corre-Hellou, Y. Crozat, C. Dahlmann, P. von Fragstein, M. Romeo and M. Monti

# Introduction:

Cereal grain nitrogen concentration an important quality criterion  
eg. Grain protein concentration of wheat

- linearly related to loaf volume



- Protein, major constituent of gluten
- Gluten imparts the strength to a dough which allows it to capture the gas produced during fermentation
- Sulphur?

# Introduction: Problem.....

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Achieving adequate protein or nitrogen concentration in organic cereals in NW Europe is a significant challenge

Because

- high yield potential,
- long grain filling period,
- and often low nitrogen availability during grain filling

Modifying seed rate, sowing date, previous crop, grazing cereal with sheep before stem extension, and cultivar can have small to moderate effects

But at the expense of yield

Intercropping may increase grain nitrogen concentration

- The legume competes poorly with the cereal for nitrogen,
- but still significantly for light, and therefore in dry matter production

But what about sulphur?

# Methods

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Grain taken from replicated field experiments within INTERCROP

Denmark (Tåstrup)

France (Thorigné d'Anjou)

Germany (Kassel)

Italy (San Marco Argentino)

UK (Sonning, Reading)

See Monti *et al.* pg 310, and  
Pisteri *et al.* pg 294 for further  
details

Experiments included:

Replacement v Additive Designs

Spring sown v Autumn sown

Wheat : faba bean

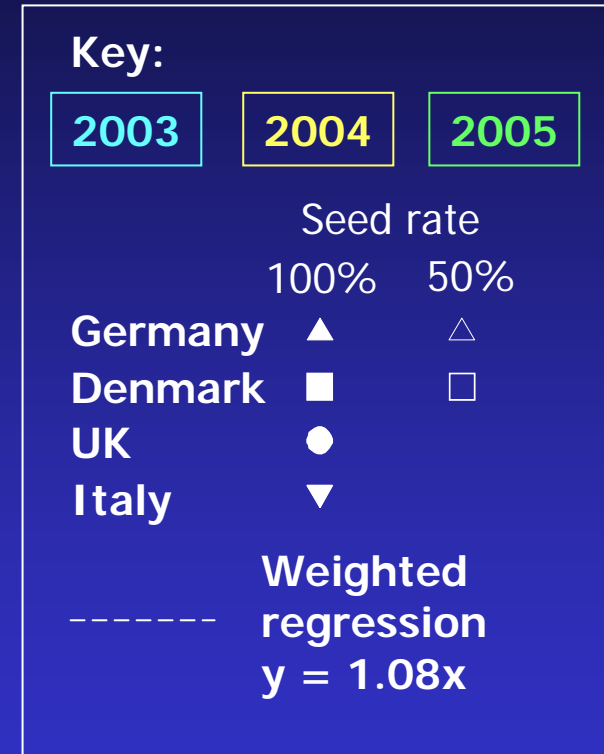
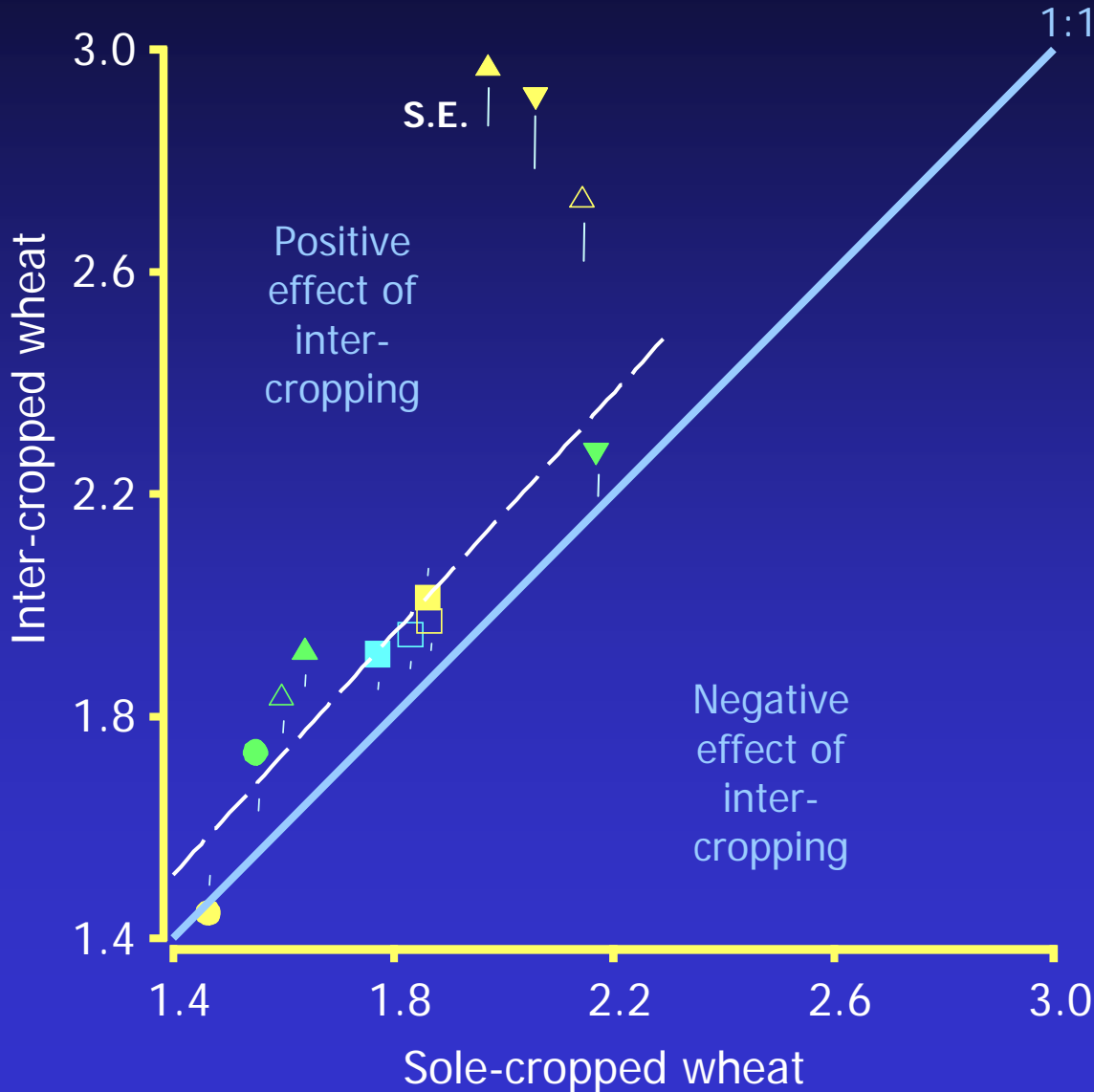
Wheat : pea

Barley : pea

N and S concentrations were  
determined with oxidative  
combustion methods (LECO FP-528  
and LECO SC-144DR; Leco  
Instruments (UK) Ltd., Stockport).

# Additive intercropping wheat with faba bean

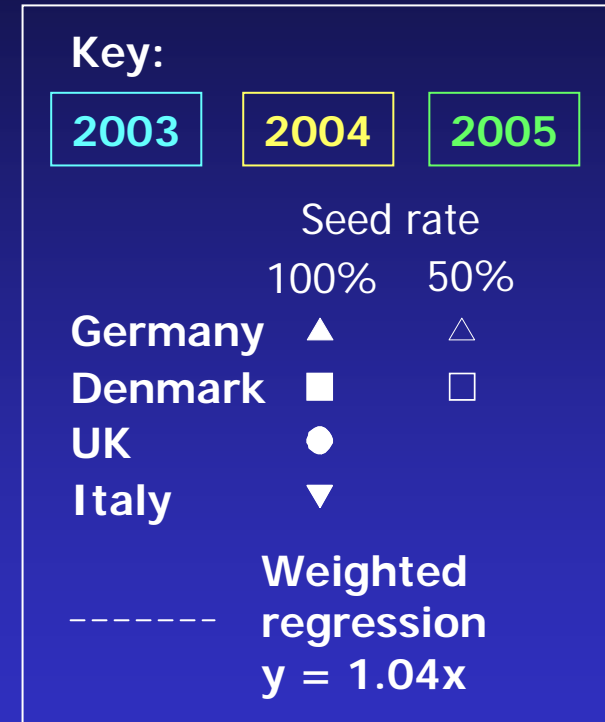
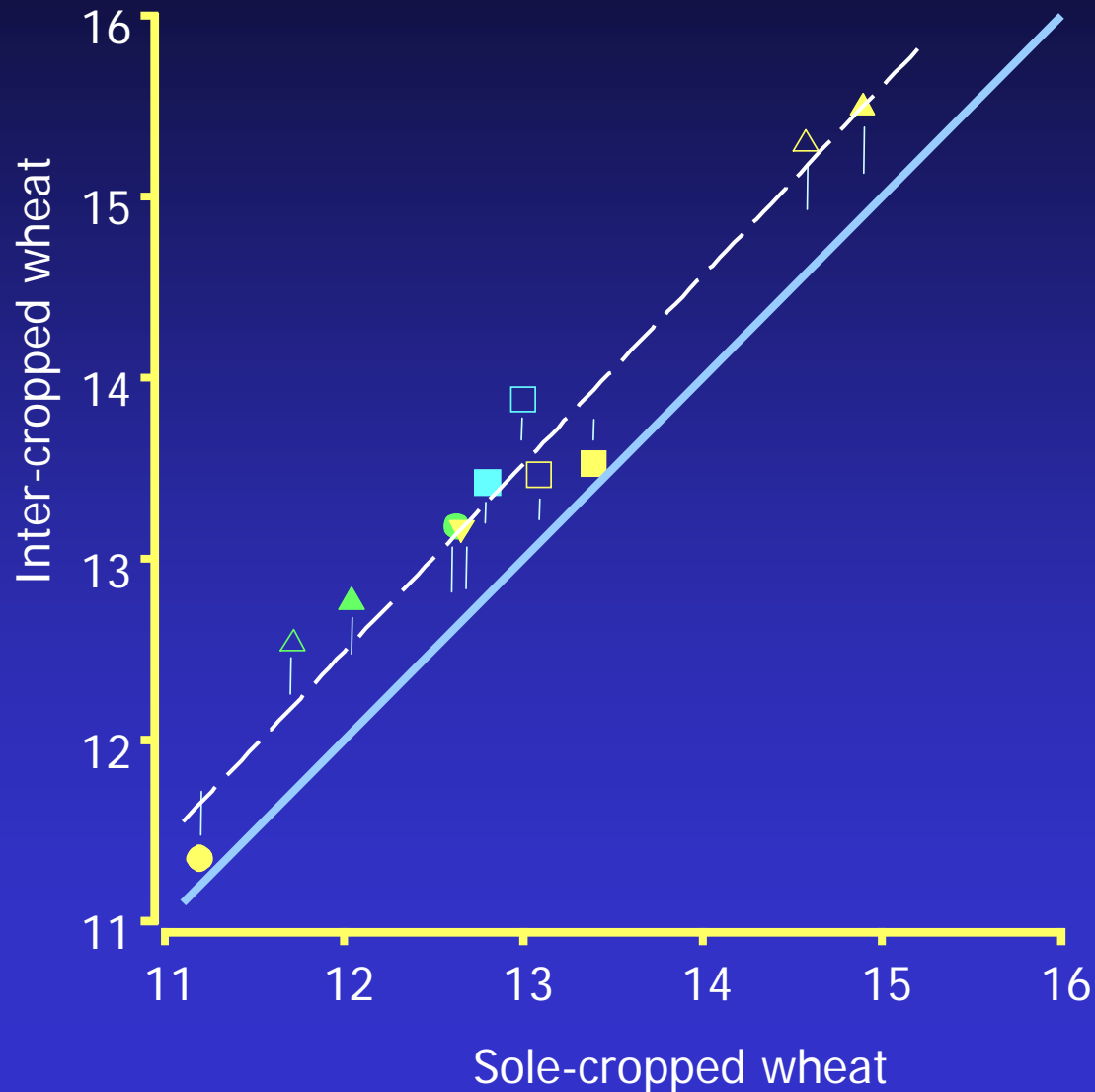
## 1. Nitrogen concentration (% DM)





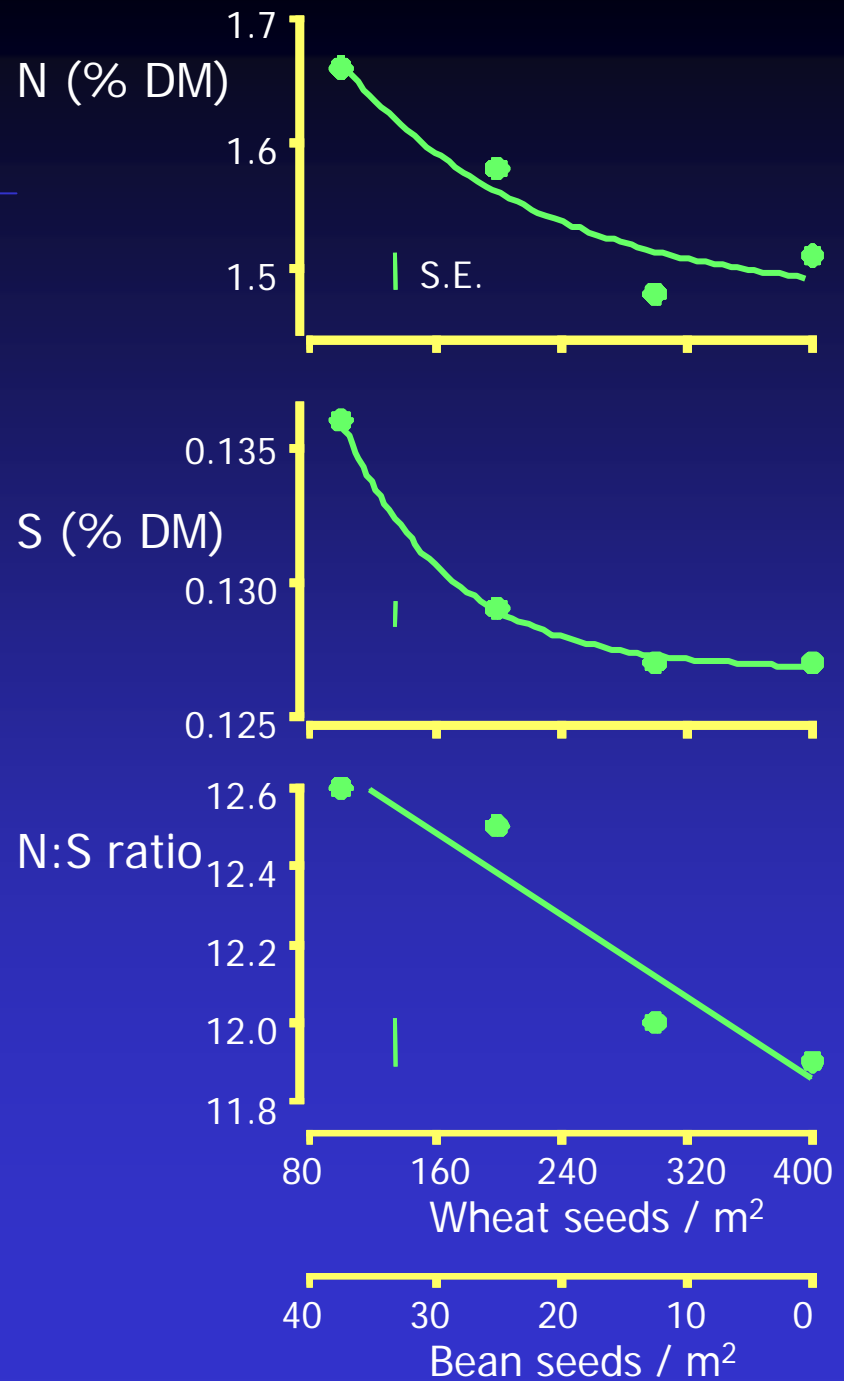
# Additive intercropping wheat with faba bean

## 3. N:S ratio



# Replacement intercropping spring wheat with faba bean

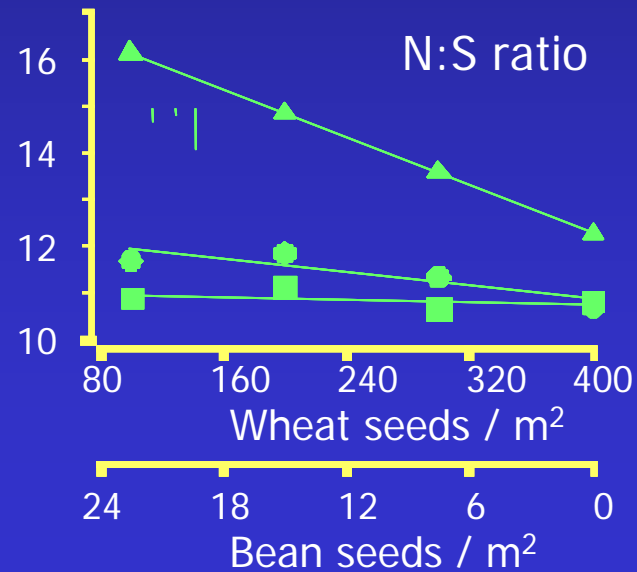
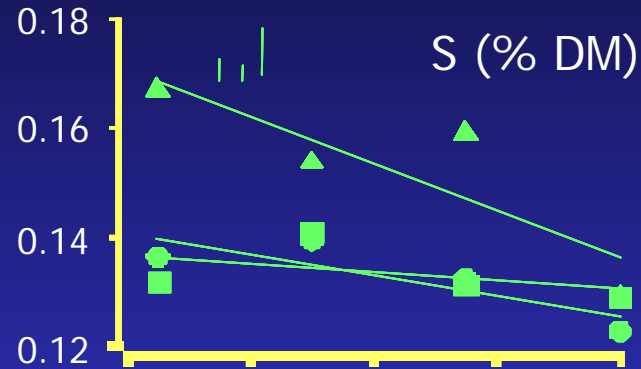
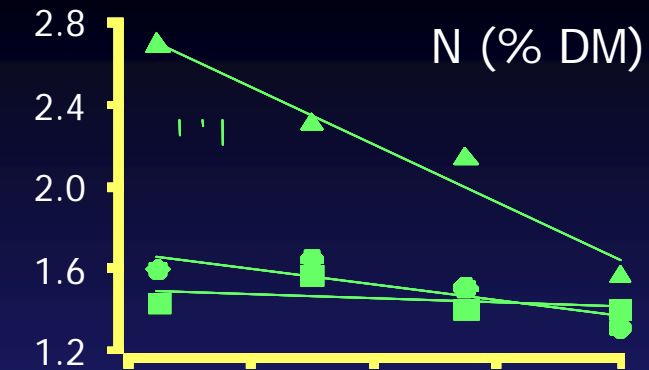
Average of three years in UK



# Replacement intercropping winter wheat with faba bean

UK

- 2003
- 2004
- ▲ 2005



# Intercropping winter wheat with pea

France, Average of 2004 and 2005

A. Dibet, G. Corre-Hellou, Y. Crozat

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Seeds / m <sup>2</sup>		N (% DM)	S (% DM)	N:S ratio
Wheat	Pea			
330	0	1.76	0.128	13.7
115	45	2.06	0.147	14.0
100	63	2.27	0.160	14.1
115	90	2.14	0.151	14.2
s.e. (21 df)		0.060	0.0044	0.19
<b><i>P</i></b>		<0.001	<0.001	0.195

# Intercropping spring barley with pea

## Average of five experiments

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Seeds / m <sup>2</sup>		N (% DM)	S (%DM)	N:S
Barley	Pea			
400	0	1.53	0.128	12.3
200	110	1.66	0.129	13.2
200	55	1.68	0.134	12.5
s.e.		0.024	0.0025	0.26
<i>P</i>		<0.001	0.127	0.044

# Conclusions

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1. Intercropping cereals with grain legumes in organic systems increases the nitrogen concentration of the cereal in a range environments

See also

Dahlmann *et al.* pg 256

Hauggaard-Nielsen *et al.* pg 268

Prins and de Wit pg 292

Value/t ?

2. Sulphur concentration in cereals can also be increased by intercropping with grain legumes (Why?)

but the effect is less in size and consistency compared with N

So...

3. N:S ratio is increased by intercropping (Implications?)