

Relation between economically optimal use of nitrogen and nitrogen leaching



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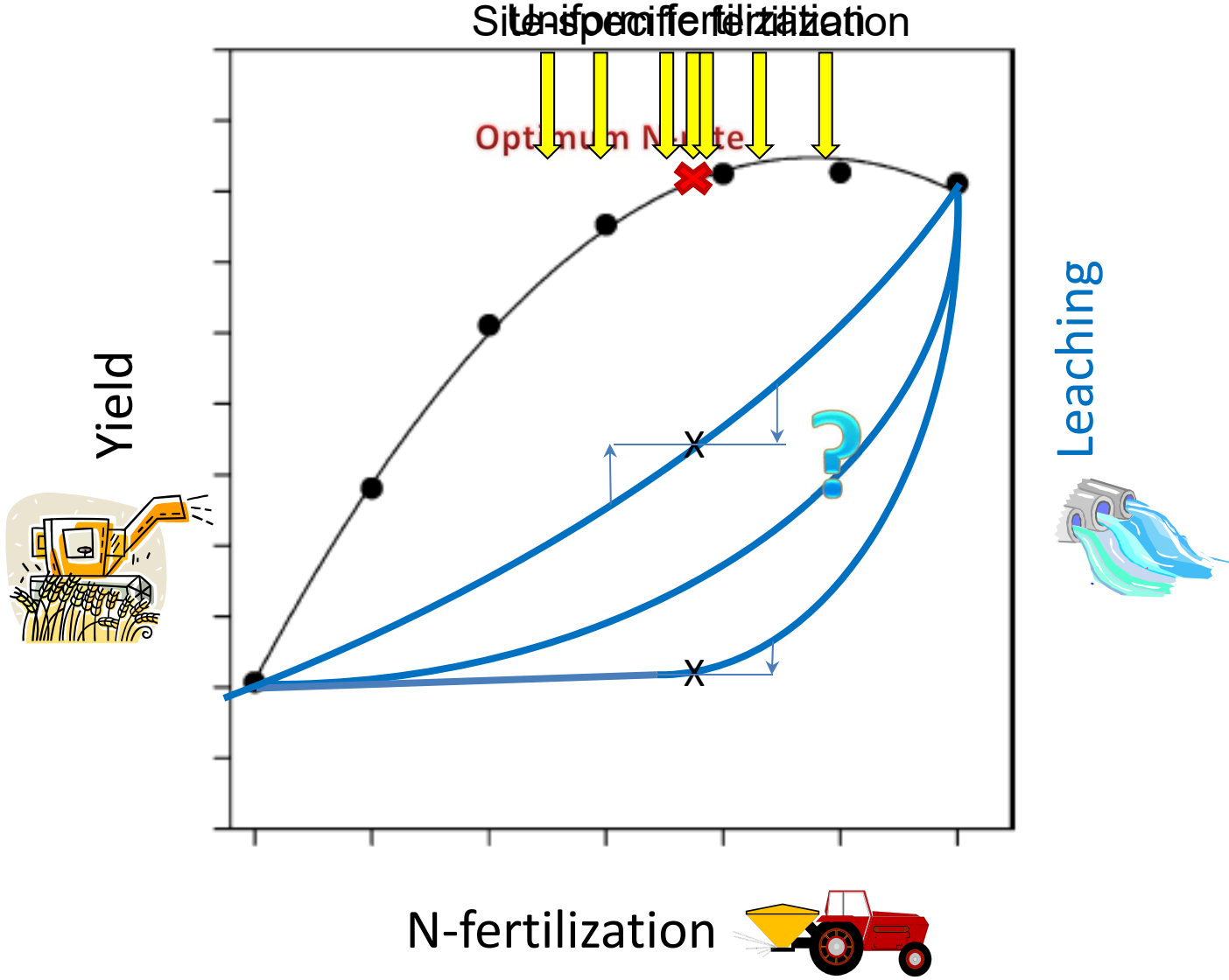
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Swedish Farmers' Foundation
for Agricultural Research

Background



Swedish clay soil, Lanna 1974-1983

(Bergström & Brink, 1986)

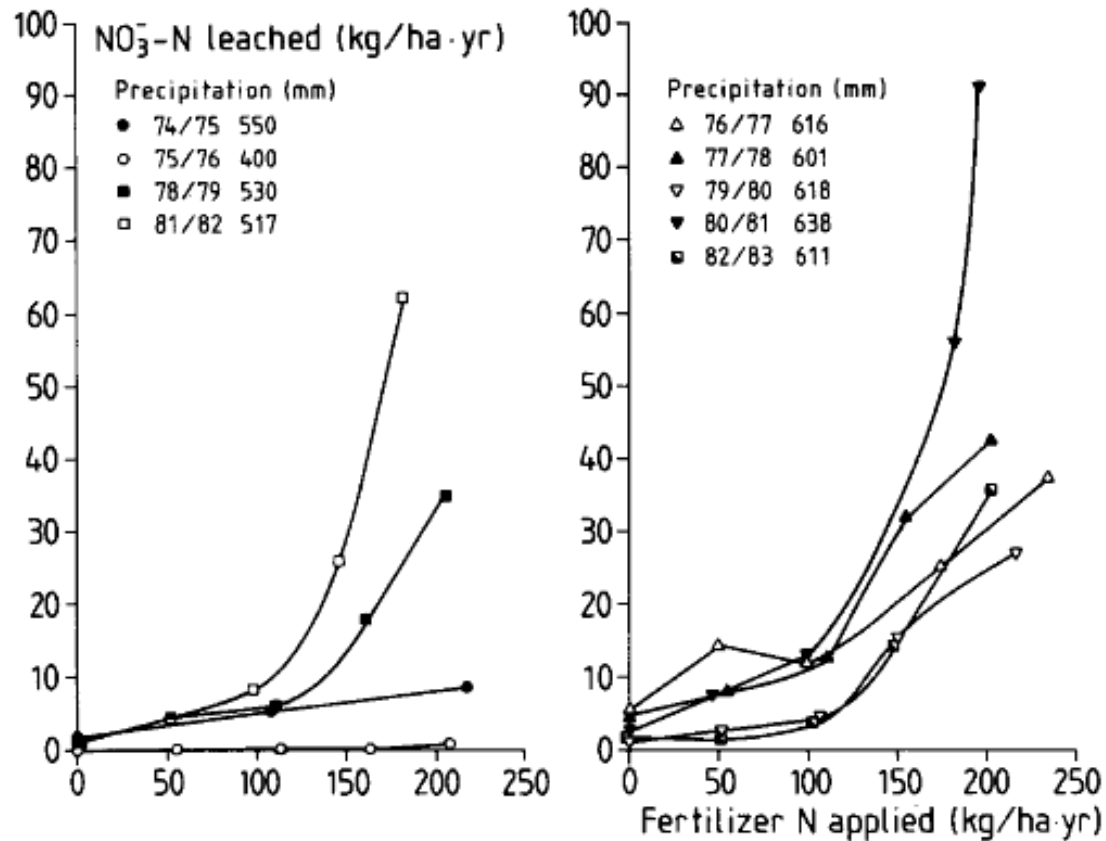
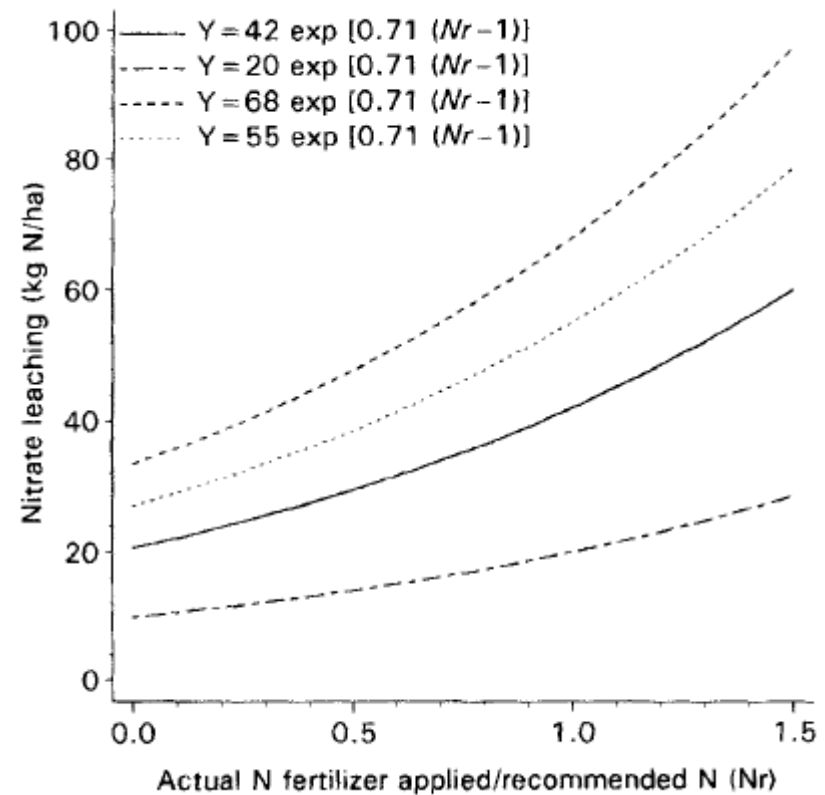
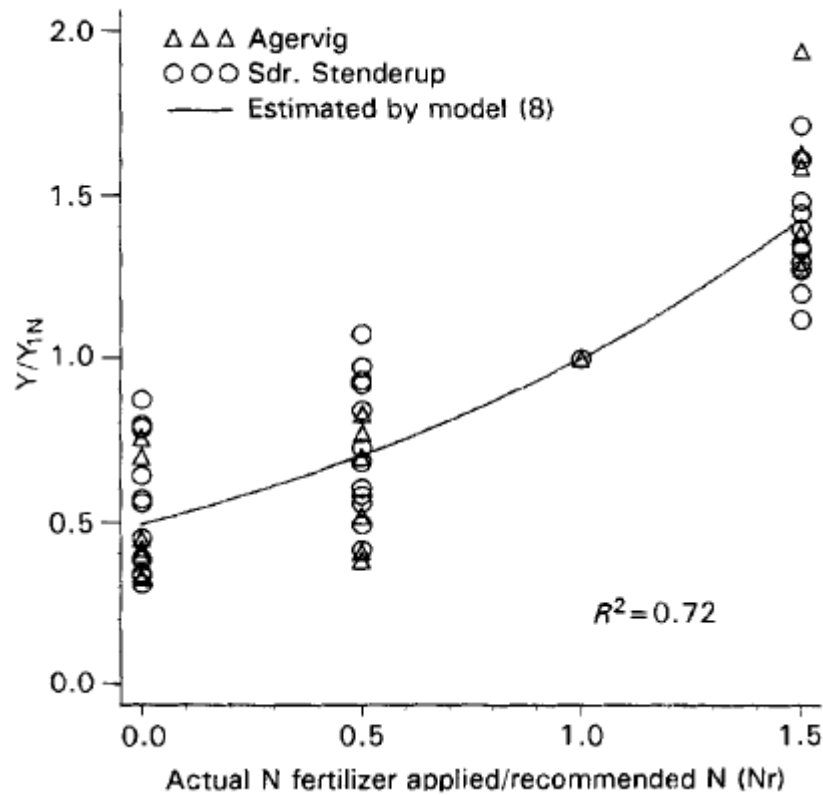


Fig. 4. Nitrate leaching as a function of the N-fertilization intensity during years with precipitation over 600 mm/yr (right graph) and during years with precipitation less than 600 mm (left graph).

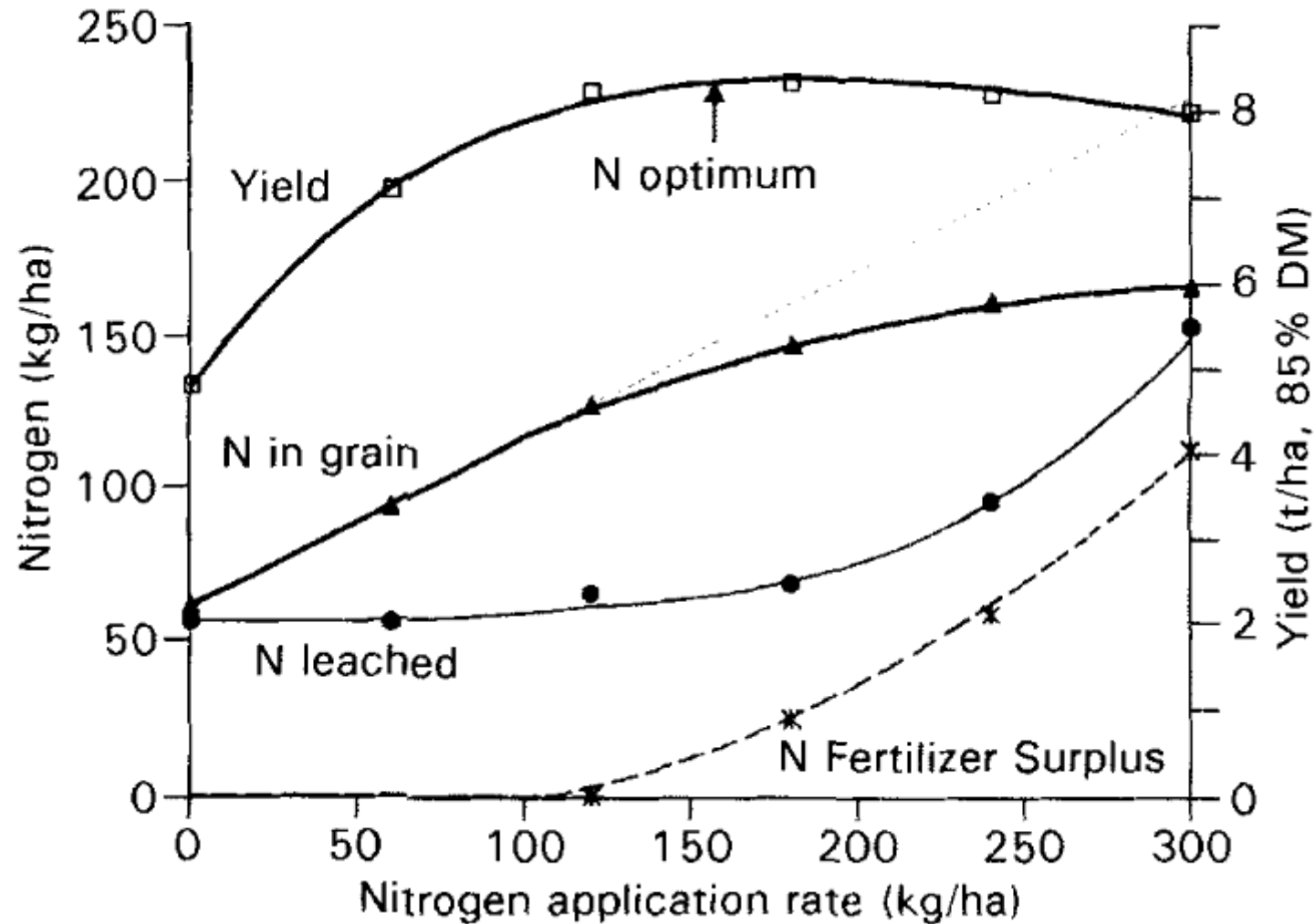
Danish experiments and modelling

(Simmelsgaard & Djurhuus, 1998)



Sandy soil in England (21 trials)

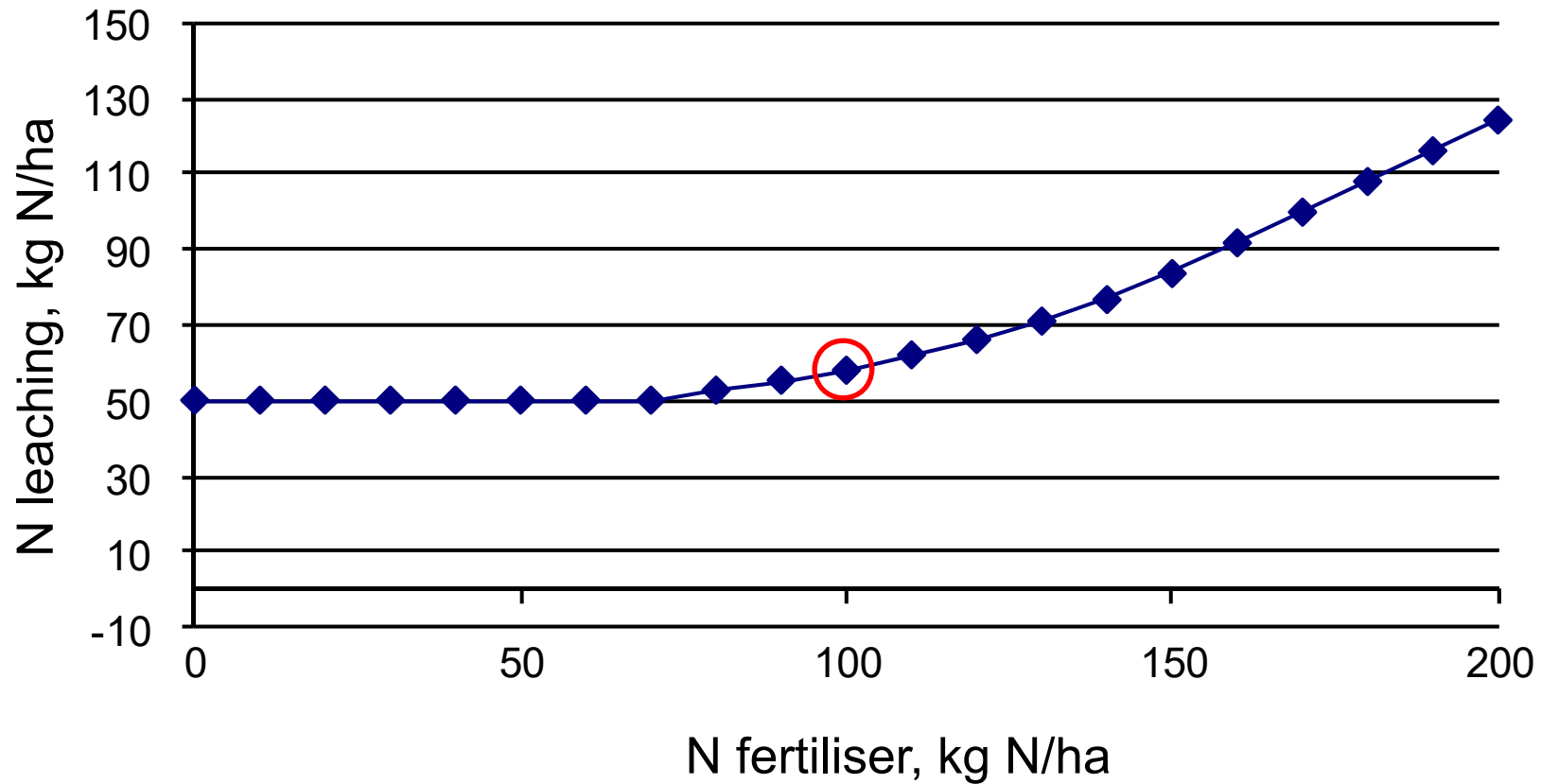
(Lord & Mitchell, 1998)



STANK IN MIND

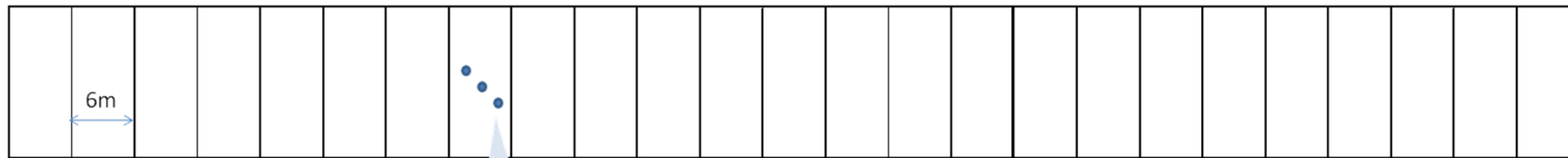
(Aronsson & Torstensson, 2004)

Leaching response with fertilization optimum at 100 kg N/ha



Field trials on sandy loam 2007-2009

Spring oat



Sampling centrals for suction cups

ceramic suction cups (80 cm depth), 3/plot

Nitrate concentration i suction cups

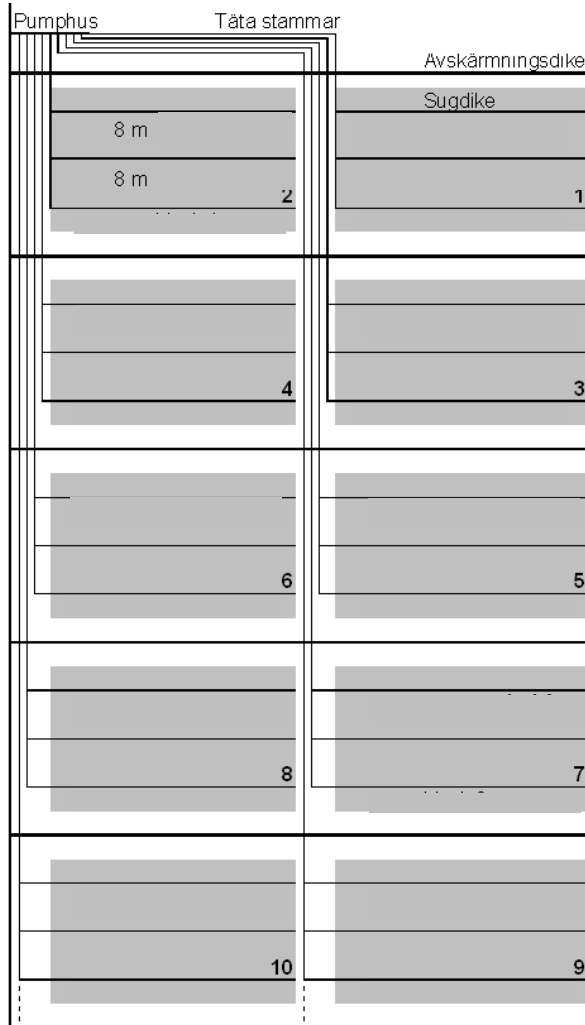
Experimental setup

Percentage of expected economical optimum fertilization level	Actual fertilization rate kg N ha ⁻¹
0 %	0
50 %	45
75 %	70
100 %	90
125 %	110
150 %	135
100 % (adjusted after crop emergence)	60 + (30, 0 and 40 in 2007, 2008 and 2009 respectively)



Experiments on clay soil 2009-2011

Spring oat



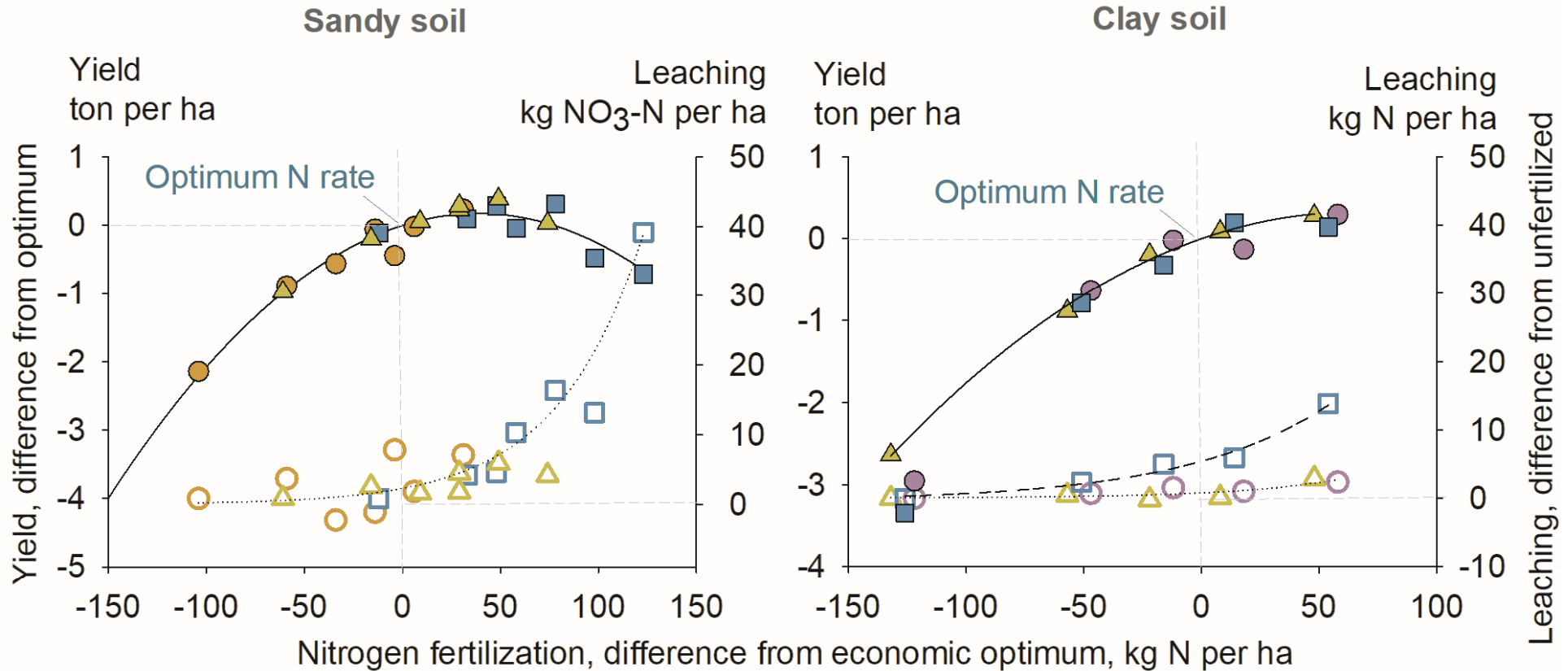
Treatment

A.	0 kg N/ha	0 kg N/ha
B.	70 % of normal rate	75 kg N/ha
C.	100 % of normal rate	110 kg N/ha
D.	130 % of normal rate	140 kg N/ha
E.	160 % of normal rate	180 kg N/ha



Leaching and yield response

Six experiments with spring oat in south-west Sweden



Yield:
 ● 2007
 ■ 2008
 ▲ 2009

Leaching:
 ○ 2007
 □ 2008
 △ 2009

Yield:
 ▲ 2009
 ● 2010
 ■ 2011

Leaching:
 △ 2009
 ○ 2010
 □ 2011



Yes! 

N fertilisation for optimised
yield can minimise leaching....

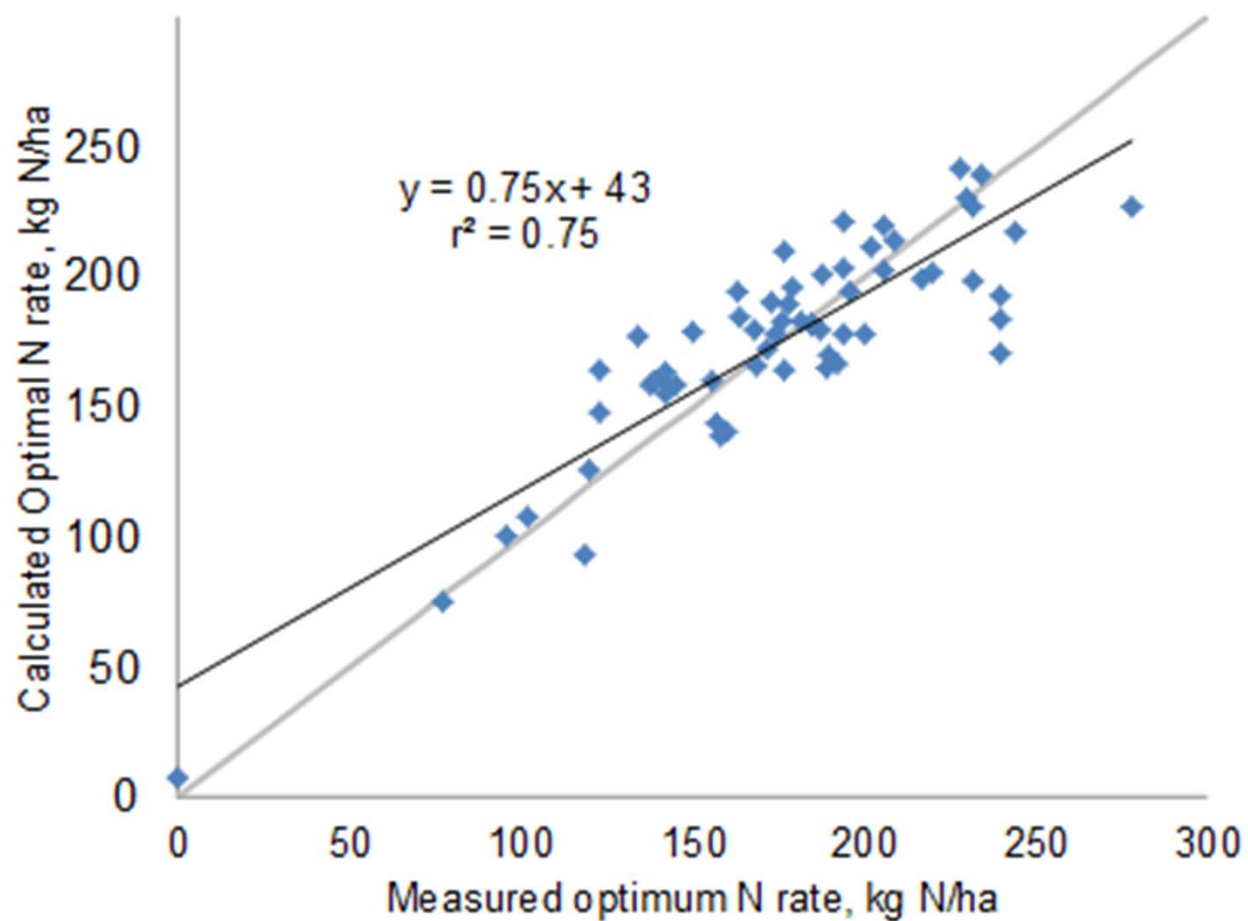
.....if the optimum N rate can be
predicted!?





Optimum N rate depending on both yield and soil N supply

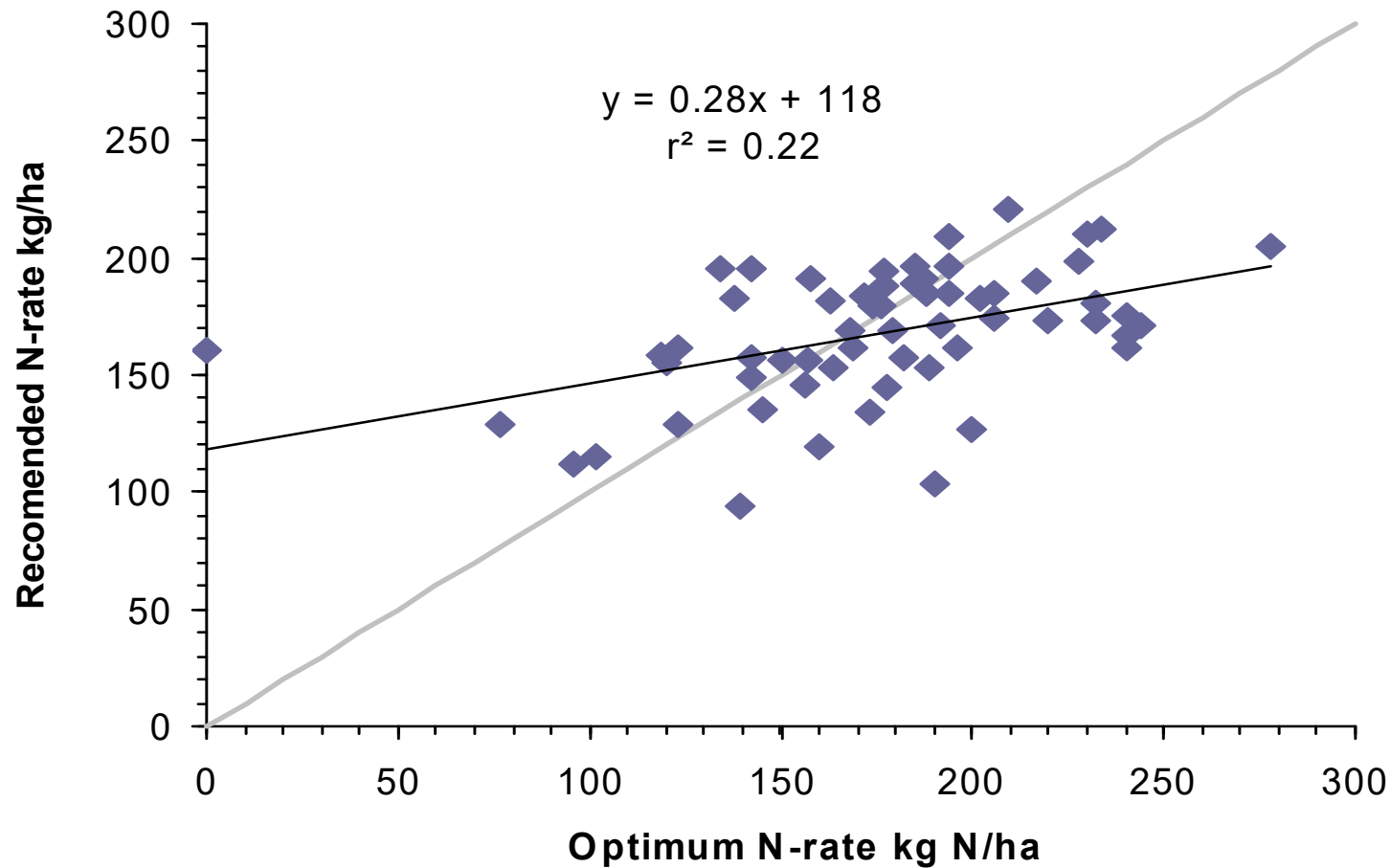
(61 Swedish winter wheat experiments 2007-2012)



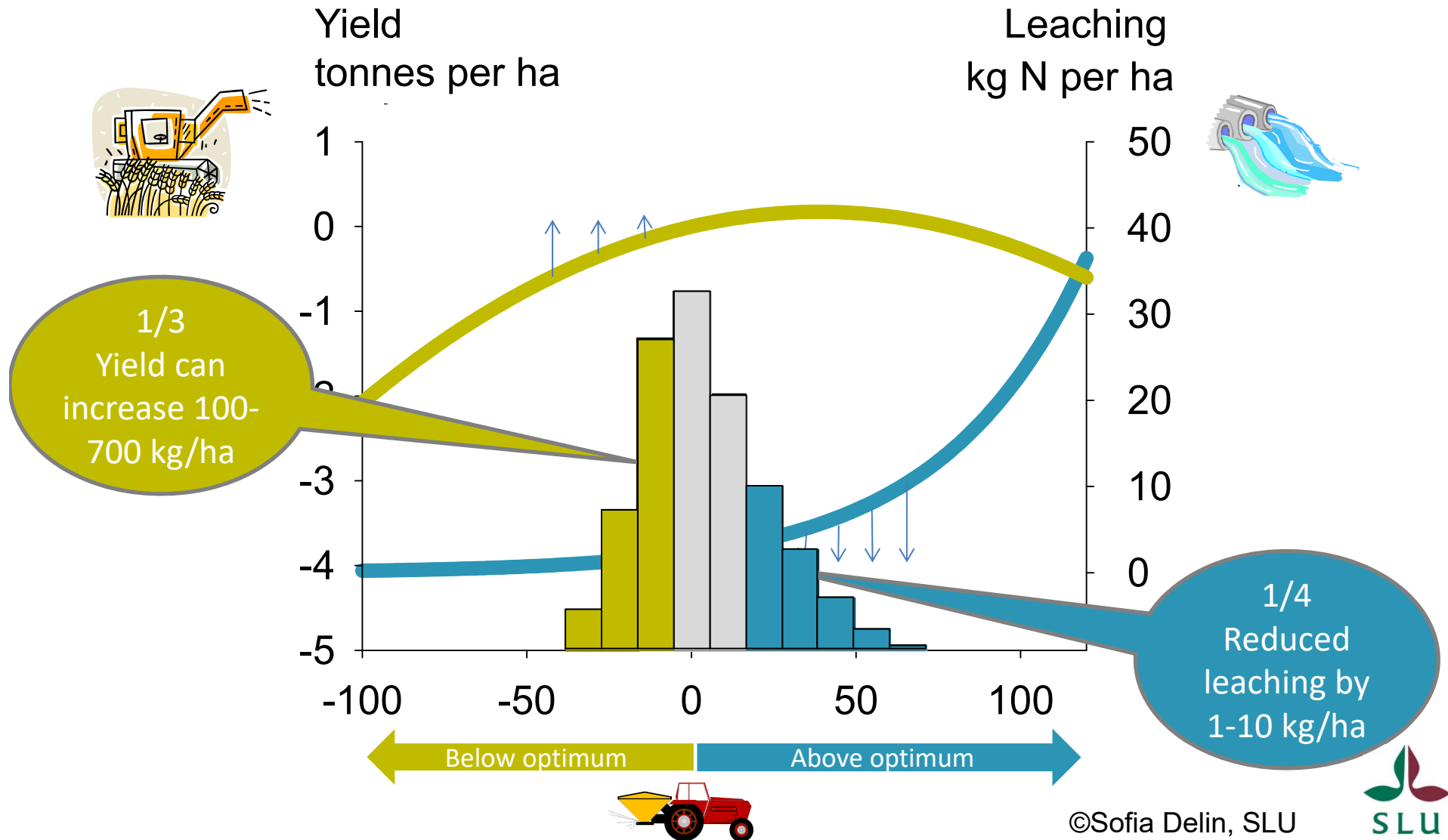


General recommendations vs actual optimum N rates

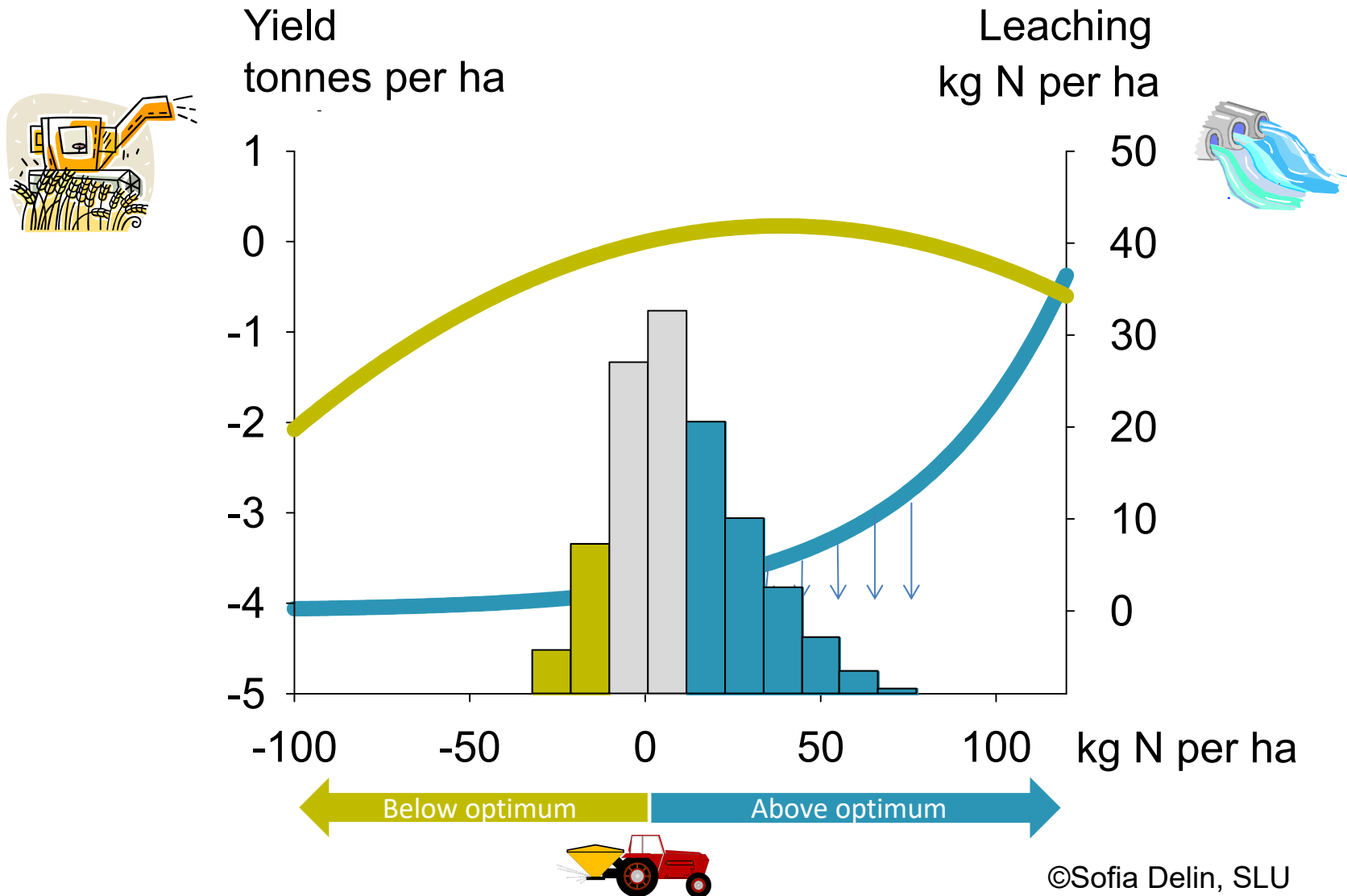
(61 Swedish winter wheat experiments 2007-2012)



Reduced leaching with precision fertilization?



Reduced leaching with precision fertilization?



Reduced leaching with precision fertilization?

