

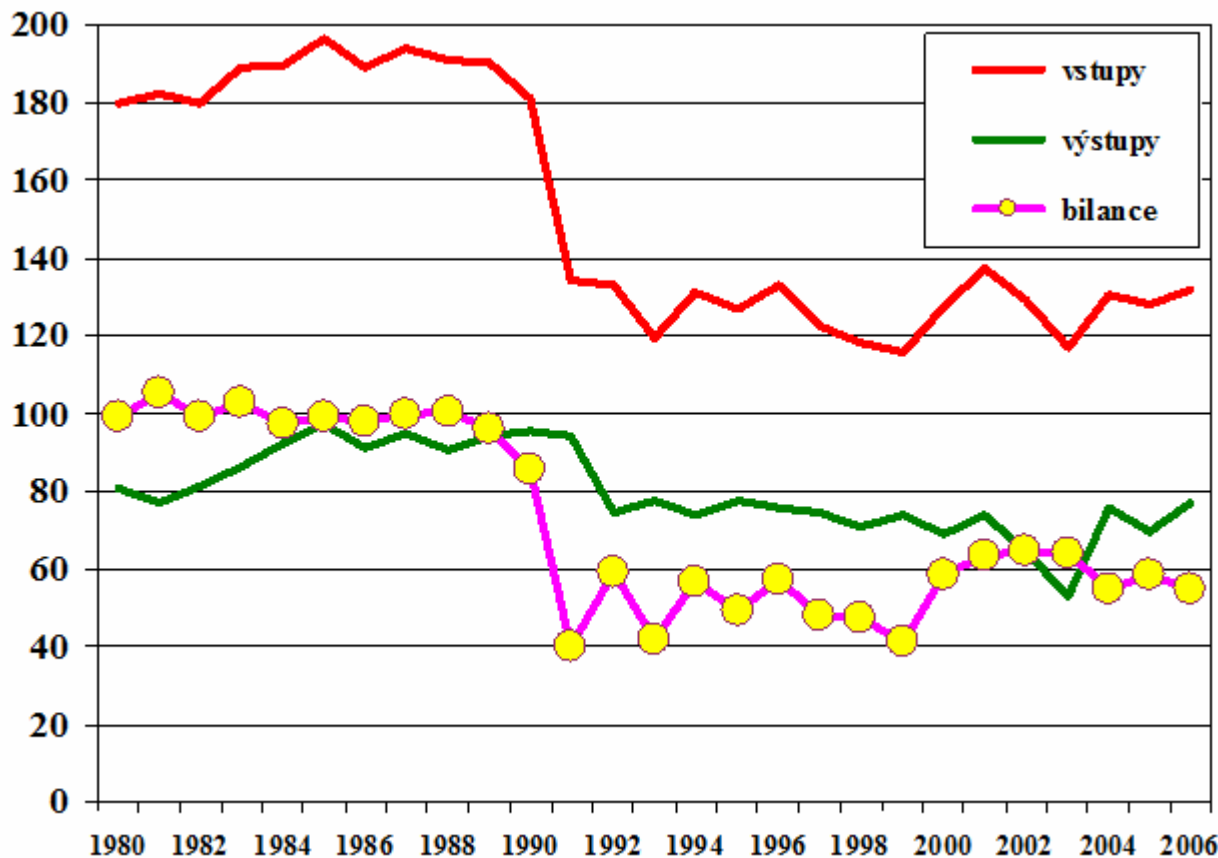
Nitrogen balance in the Czech Republic

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OECD Balance

N-Balance of the CR for agricultural fields in kg N/ha (OECD Methodology)



input
output

Mineral N use:

1992/93 only 45% of N
used 1988/89



Research fields

Research fields of the Central Institute for Supervising and Testing in Agricultural (CISTA)



SOIL TYPES: brawn, black soil, cambisol, podzol

SOIL TEXTURE: loam, clay-loam, sandy-loam, loamy-sand

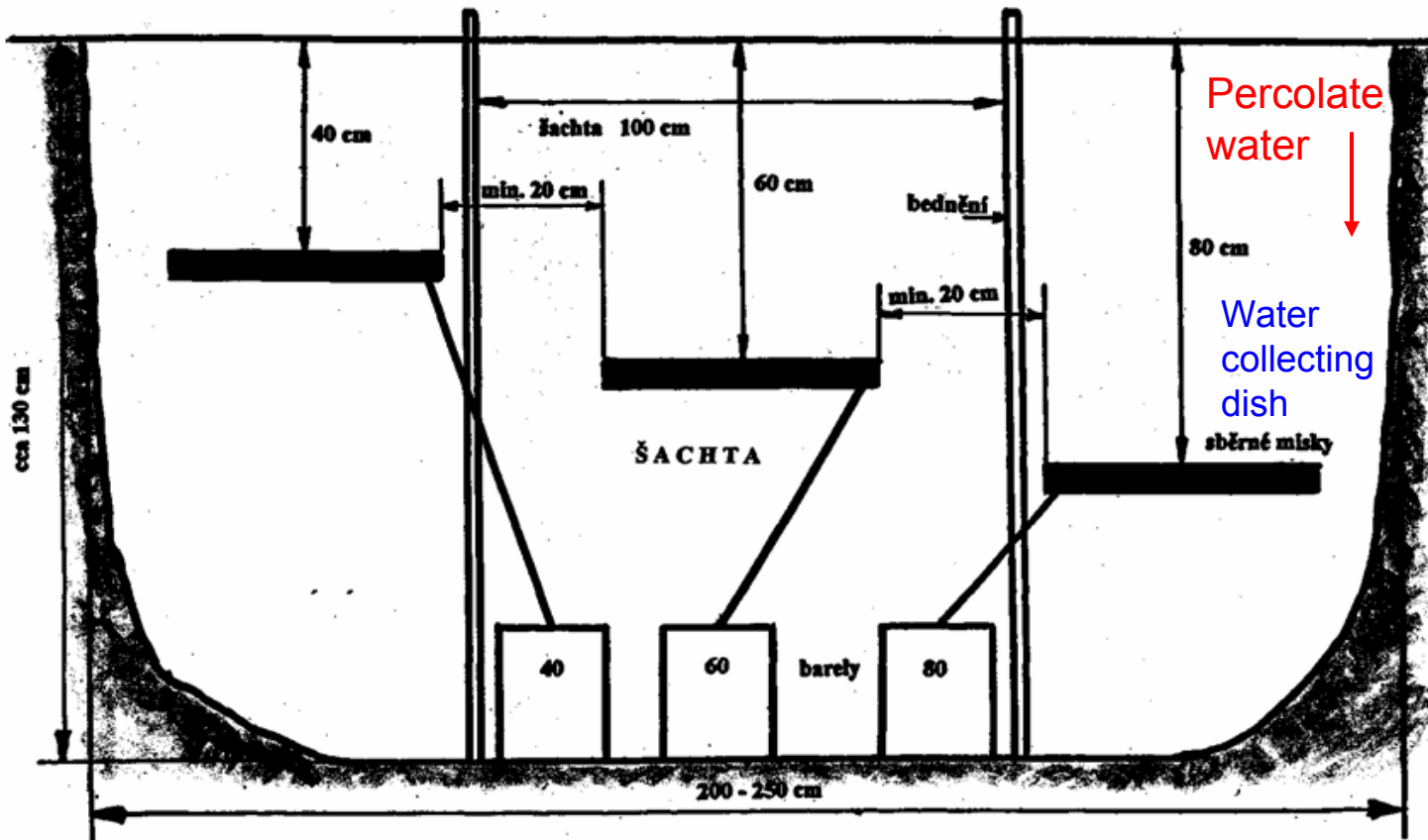
Legend:

- řepařská výrobní oblast - sugar-beet growing area
- bramborářská výrobní oblast - potato growing area
- dlouhodobý pokus pod závlahou - irrigated long-term experiment



N leaching

Lysimeter: N leaching below the root zone (80 cm)



Front view



Lysimeter site



Results

INPUT	-	OUTPUT
N fertilizer, manure		Crop N
N deposition		N leaching below 80 cm
Soil N _{min} (0-80cm)		
Biologically fixed N		



“Krasne udoli” balance

Year Rok	Site Stanoviště Potato growing area	Input			Output		Difference	N _{min} po sklizni After harvest	Crop type Plodina Spring cereals
		N _{min} jaro Spring	Fertilization hnojení	srážky Deposition	Crop odběr sklizni	ztráty pod 80 cm Leaching	rozdíl A - B		
1998	Krásné Údolí	142,0	114,0	10,0	119,0	0,0	147,0	111,0	obilnina jarní Winter c.
1999	Krásné Údolí	84,2	80,0	6,4	86,5	0,0	84,0	118,9	obilnina ozim
2000	Krásné Údolí	50,9	70,0	2,1	27,3	0,3	95,4	117,1	obilnina jarní
2001	Krásné Údolí	72,3	70,0	5,6	161,3	0,3	-13,8	204,6	luskovina Legume
2002	Krásné Údolí	80,1	92,0	3,5	102,0	0,0	73,6	71,3	obilnina ozim
2003	Krásné Údolí	98,0	141,0	5,0	60,0	0,0	184,0	195,1	okopanina Root-crops
2004	Krásné Údolí	274,0	50,0	11,0	119,0	0,0	216,0	96,7	obilnina jarní
2005	Krásné Údolí	68,2	0,0	3,3	30,7	0,1	40,7	123,6	jetelovina Clover
2006	Krásné Údolí	148,3	90,0	8,3	114,0	0,0	132,6	241,1	jetelovina
2007	Krásné Údolí	36,4	83,0	6,6	112,8	0,0	13,2	76,7	obilnina ozim
	Medián	82,1	81,5	6,0	107,4	0,0	89,7	118,0	
	Průměr Average	105,4	79,0	6,2	93,3	0,1	97,3	135,6	
	Minimum	36,4	0,0	2,1	27,3	0,0	-13,8	71,3	
	Maximum	274,0	141,0	11,0	161,3	0,3	216,0	241,1	
	Směr. odchylka	65,5	35,5	2,8	40,3	0,1	69,8	54,7	

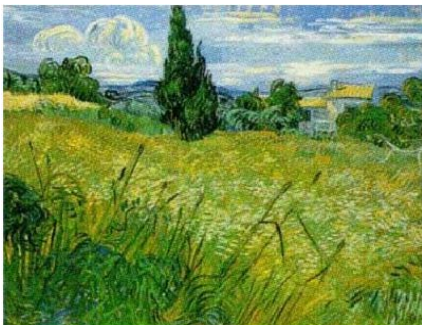
Std. dev.



Influence of crop types

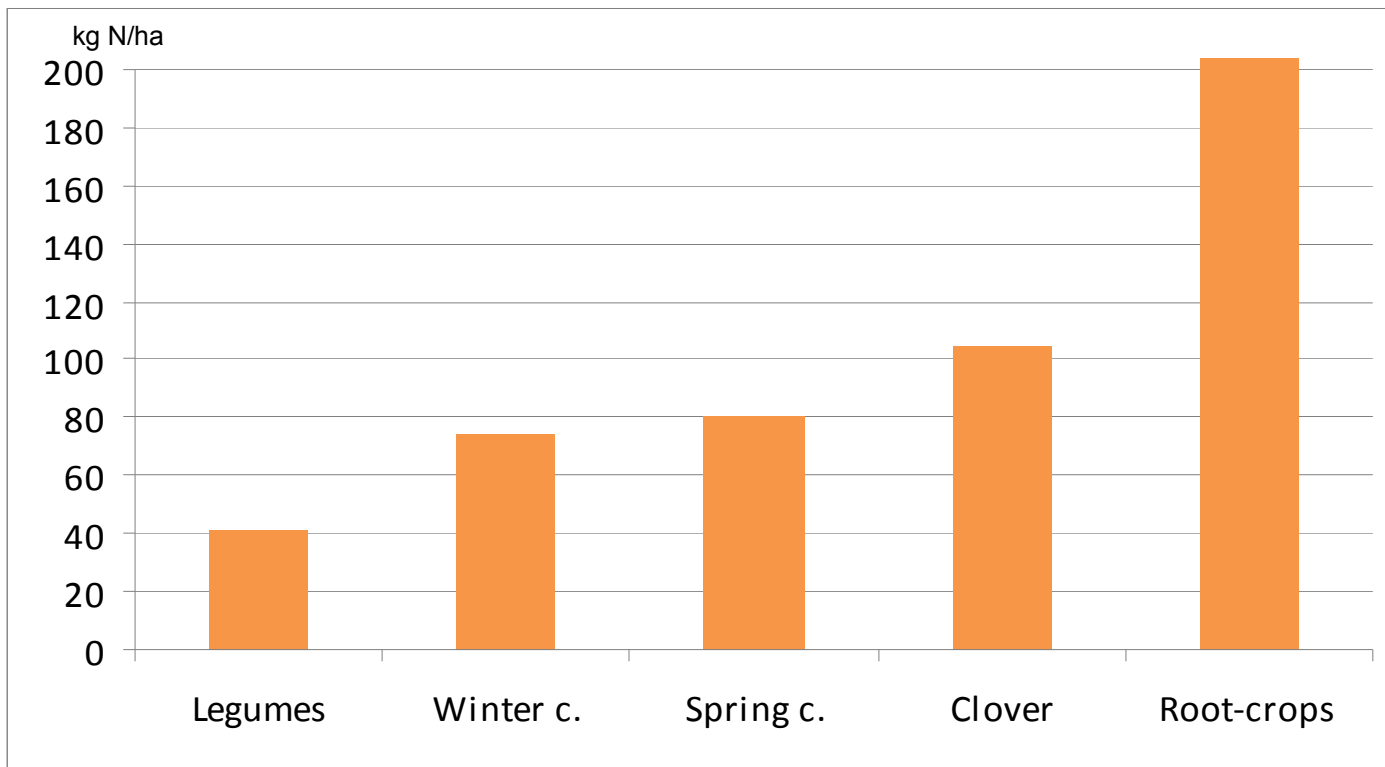
Average balance (1998-2007) for various crop types (kg N/ha/yr)

Crop type	A - Input				B - Output		Difference		Nmin (After harvest)
	Nmin (Spring)	Min. fertilizer	Org. f.	Dep.	Crop uptake	N leaching (bellow 80 cm)	A - B	+ Biol. fixation	
Clover	102	30	0	16	277	5	- 135	105	80
Legumine	73	12	0	22	116	30	- 40	40	130
Spring cer.	113	52	22	19	110	17	80		85
Winter c.	107	89	21	15	135	23	74		97
Root-crops	111	122	75	16	108	11	204		117



Influence of crop types

N balance (average: 1998-2007, biol. fixed N included)



Different fertilizer levels

Average balance (1998-2007) in kg/ha/yr (potato growing area)

Fertilizer combination	Fertilizer N	+	Dep.	+	Nmin	+	Nfix	-	Crop N	-	N leach.	=	Balance
Without f.	0		16		107		0 (50)		96		17		10 (60)
Organic f.	30		16		107		0 (50)		104		17		30 (80)
Org. + Min. f. (low)	73		16		107		0 (50)		136		17		40 (90)
Org. + Min. f. (medium)	95		16		107		0 (50)		146		17		50 (100)
Org. + Min. f. (high)	116		16		107		0 (50)		157		17		60 (110)

Org. fertilizer: approximately 30 kg/ha/yr



Comparison with DNDC

N flows in kg/ha

NUTS 2: CZ 03, Jihozapad	Horazdovice 10	H 11	Libejovice	Average 1998-07	DNDC 2002
Fertilization	94	137	80	104	88
Deposition	8	8	33	16	10
Crop uptake	172	200	67	<u>146</u>	87
Leaching	5	1	26	11	31



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DNDC: DeNitrification DeComposition Model (CAPRI data)



Comparison with DNDC

NUTS 2: CZ 04, Severozapad	Zatec	Krasne Udoli	Average 1998-07	DNDC 2002
Fertilization	100	80	90	71
Deposition	9	6	8	10
Crop uptake	134	93	<u>114</u>	71
Leaching	4	0	2	22
NUTS 2: CZ 06, Jihovychod	Jaromerice	Uhersky Ostroh	Average 1998-07	DNDC
Fertilization	86	87	87	107
Deposition	19	18	19	10
Crop uptake	144	187	<u>166</u>	104
Leaching	5	3	4	27



Conclusion

- Positive balances were estimated in both areas (potato and sugar-beet growing area)
- N fertilization should be below 100 (potato g. a.) and 90 kg/ha (sugar b. g. a.)
- Root crops show the highest N balance
- High N excess (>150 kg N/ha) by 9% of all balances and by 50% of root-crops
- N leaching strongly underestimated
- Differences to DNDC



Thank you ...

