

# NKS-B activity 'PardNor'

(ongoing activity)

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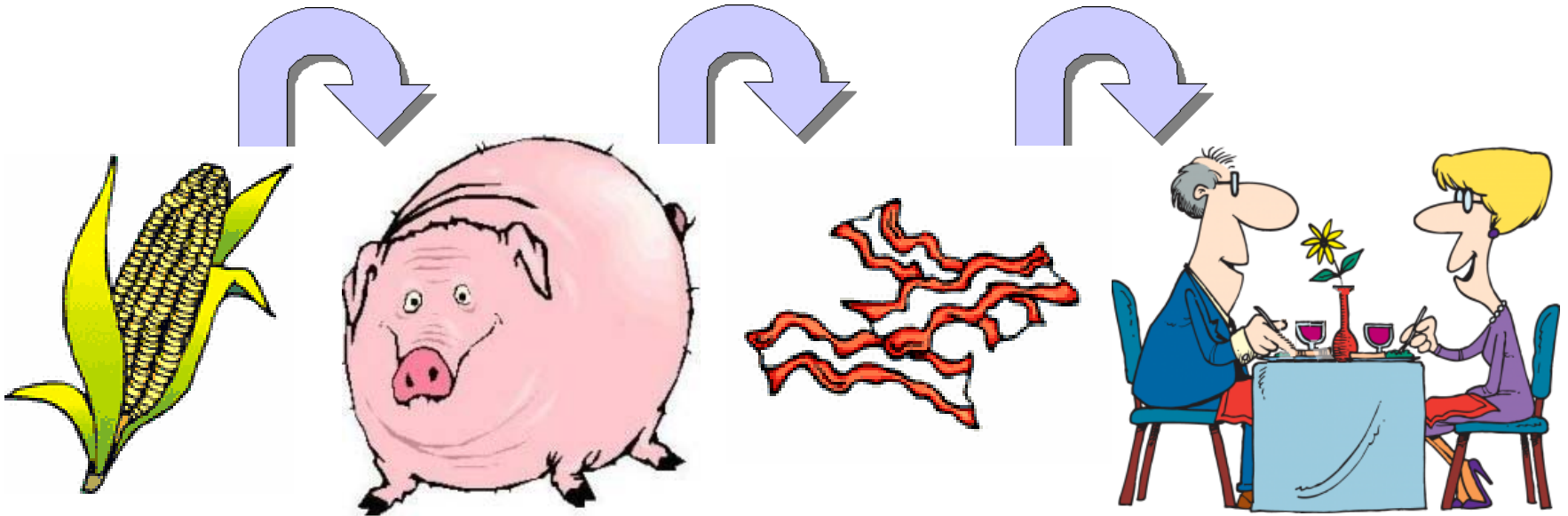
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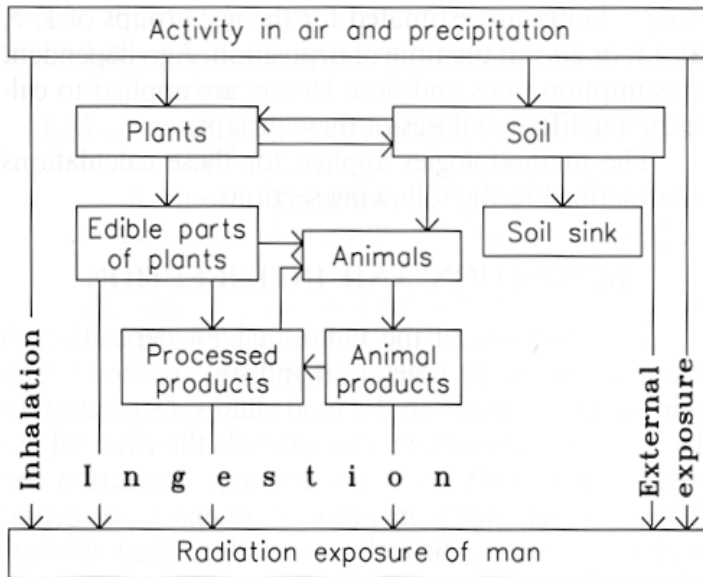
# NKS-B activity 'PardNor'

## PARameters for ingestion Dose models for NORdic areas



Food chain modelling

# Applied model



## ECOSYS model

Developed by H. Müller & G. Pröhl (ConRad/GSF)

Integrated in ARGOS and RODOS decision support systems (respectively modules FDM and FDMT)

# Overall objectives

- i) To update ECOSYS, which was developed in the 1980's, and thus includes very little of the host of data generated since Chernobyl. Current default data (e.g., for deposition, post-deposition migration and uptake) do not adequately reflect the knowledge of today.
  
- ii) To target ECOSYS for use in Nordic areas. It was parameterised for South German conditions. Its originators have always recommended revision of site-specific parameters before use in any other area. However, the model is still used in ARGOS and RODOS with defaults.

# PardNor work tasks

Analyses of typical diets in different Nordic countries

Analyses of Nordic import fractions of food products

Animal feeding regimes in the Nordic countries

Seasonal leaf area development in the Nordic countries

Better leaching rates, fixation rates, desorption rates, resusp. enrich. factor

Transfer factors in relation to soil classification

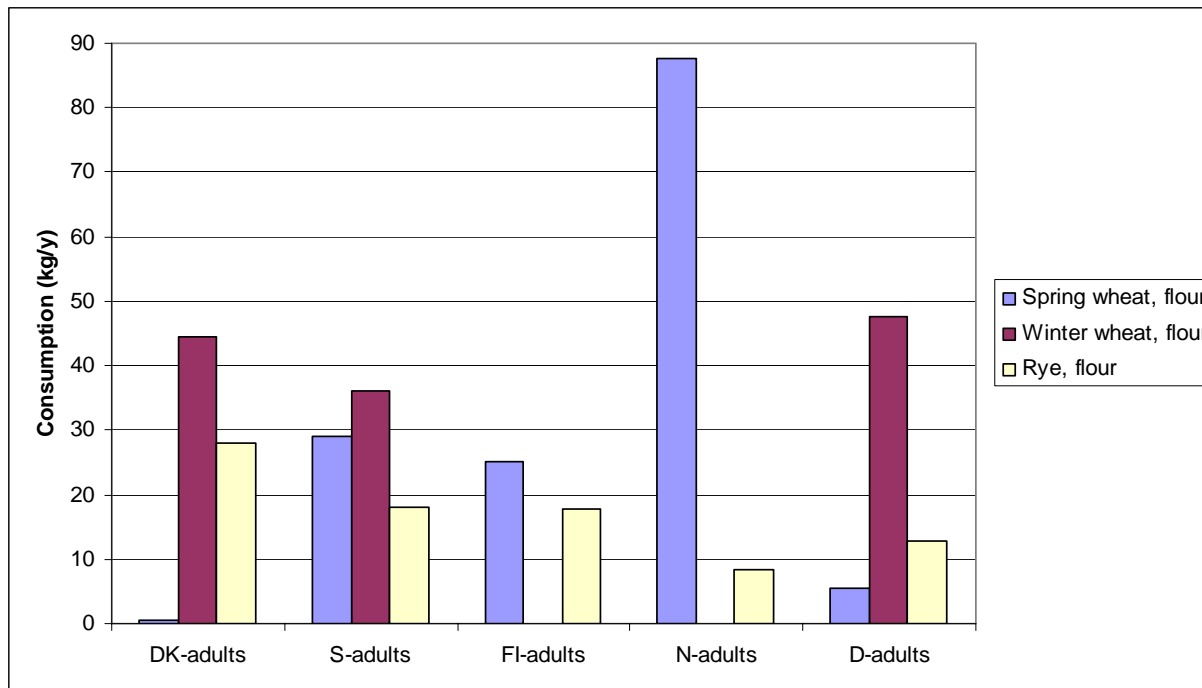
Improved animal metabolism parameters (transfer factors, biolog. half-lives)

Improved natural weathering rates (e.g., precipitation, time dependent)

Improved deposition velocity estimates according to particle size

# PardNor work tasks

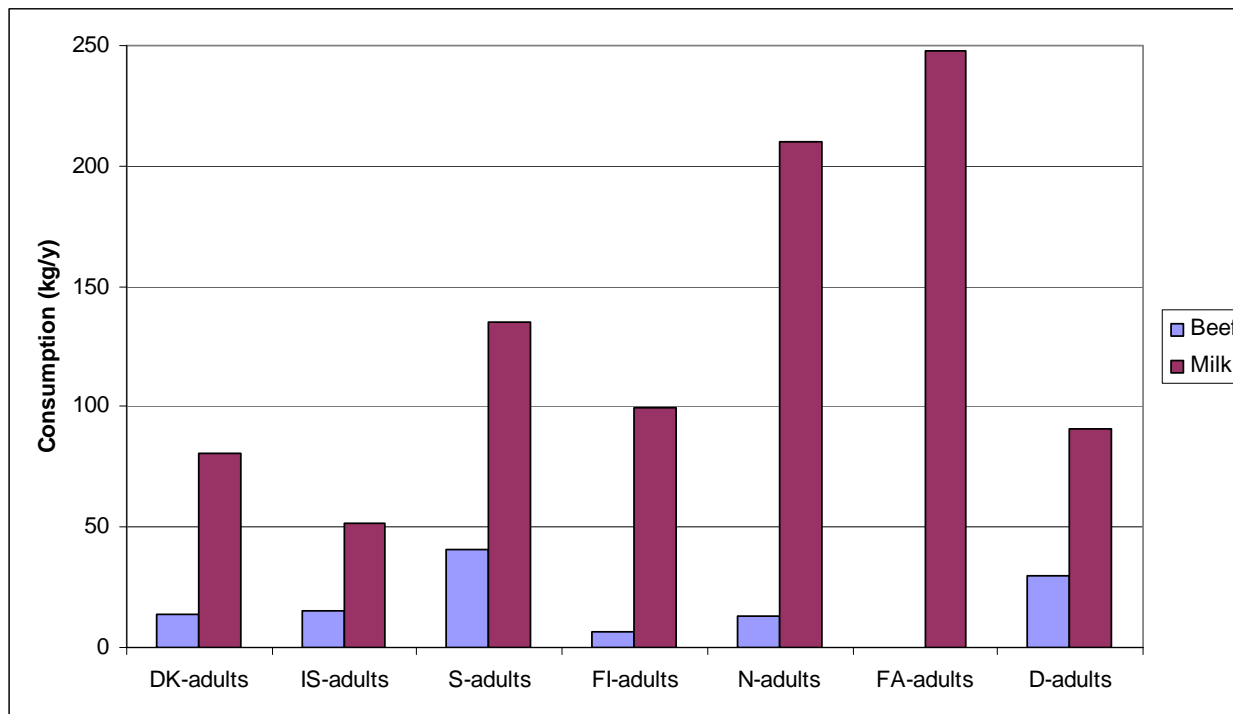
## Analyses of typical diets in different Nordic countries



Consumption of wheat and rye flour in the Nordic countries, compared with the German ECOSYS defaults (average figures for adults - ca. 30 y).

# PardNor work tasks

## Analyses of typical diets in different Nordic countries



Consumption of beef and milk in the Nordic countries, compared with the German ECOSYS defaults (average figures for adults - ca. 30 y).

# PardNor work tasks

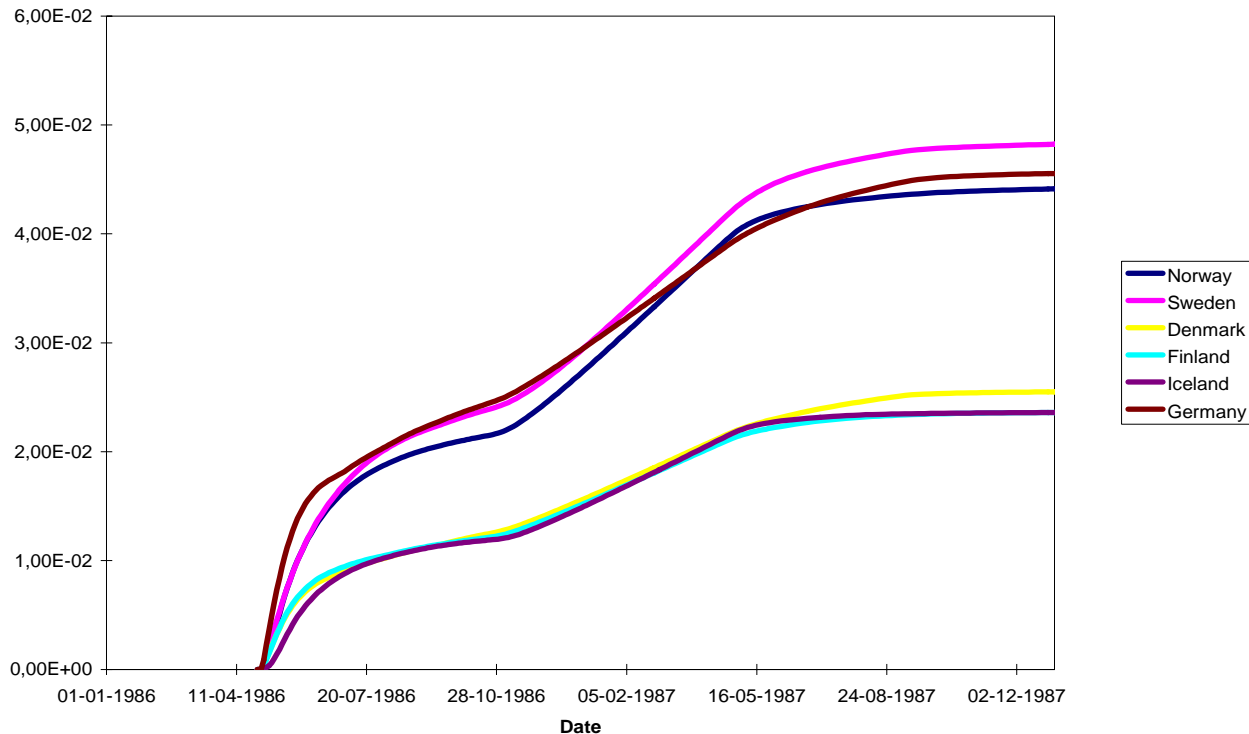
Percentage of selected consumed foods produced within the country

Food item:	S	FA	N	DK	FI	IS
Wheat	98	~0	67	60	50	~0
Rye	99	~0	40	86	15	~0
Potatoes	91	~10	100	86	96	59
Leafy vegetables	42	~0	55	75	77	33
Berries	29	~0	6	10	69	~0
Milk	98	97	100	90	99	100
Butter	66	n	98	69	97	99
Cheese	60	~0	93	63	66	99
Beef	68	~10	95	88	86	98
Pork	80	~0	95	94	91	96
Lamb	33	~65	95	20	30	100



# PardNor work tasks

## Location specific consumption/import: ECOSYS dose calculation

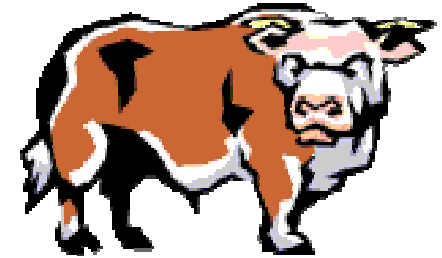


ECOSYS example based on the  $^{137}\text{Cs}$  air concentrations, rainfall and only dry deposition recorded at Tranvik (Sweden) in the first month after the Chernobyl accident (adults - ca. 30 y). Accumulated individual doses.

# PardNor work tasks



## Animal feeding regimes



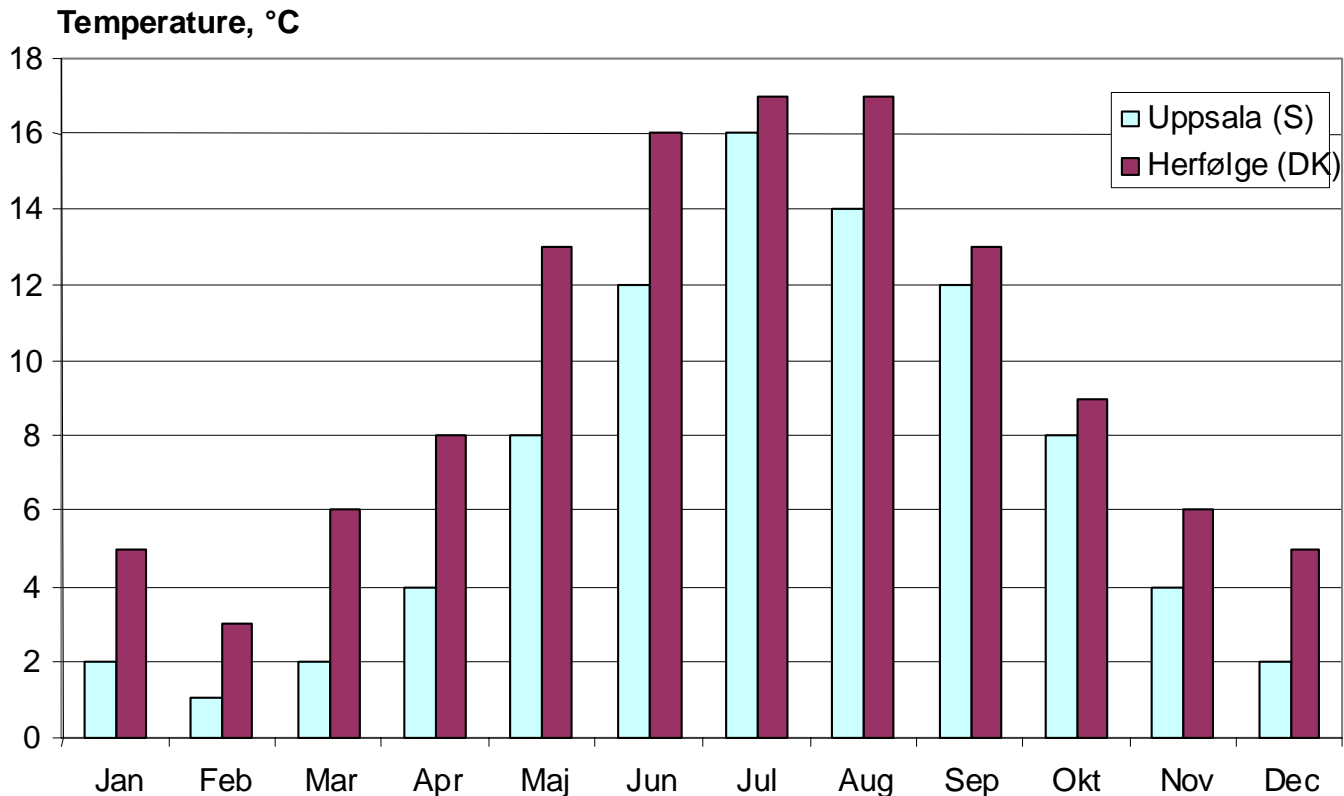
For instance, Danish lactating cattle is generally kept in stables all year round, and fed with stored products (maize and grass silage), whereas Norwegian lactating cattle is grazing between the 1st of June and the 15th of September. ECOSYS calculations show that if an accident occurs in the beginning of June, the caesium concentrations in Norwegian milk, cream, butter and beef would even after six months all be one or two orders of magnitude higher than the corresponding in Danish products (from same deposition).

Norwegian lactating cattle begin their grazing season nearly a month later than assumed in the Bavarian ECOSYS defaults, and end it nearly two months earlier.

# PardNor work tasks

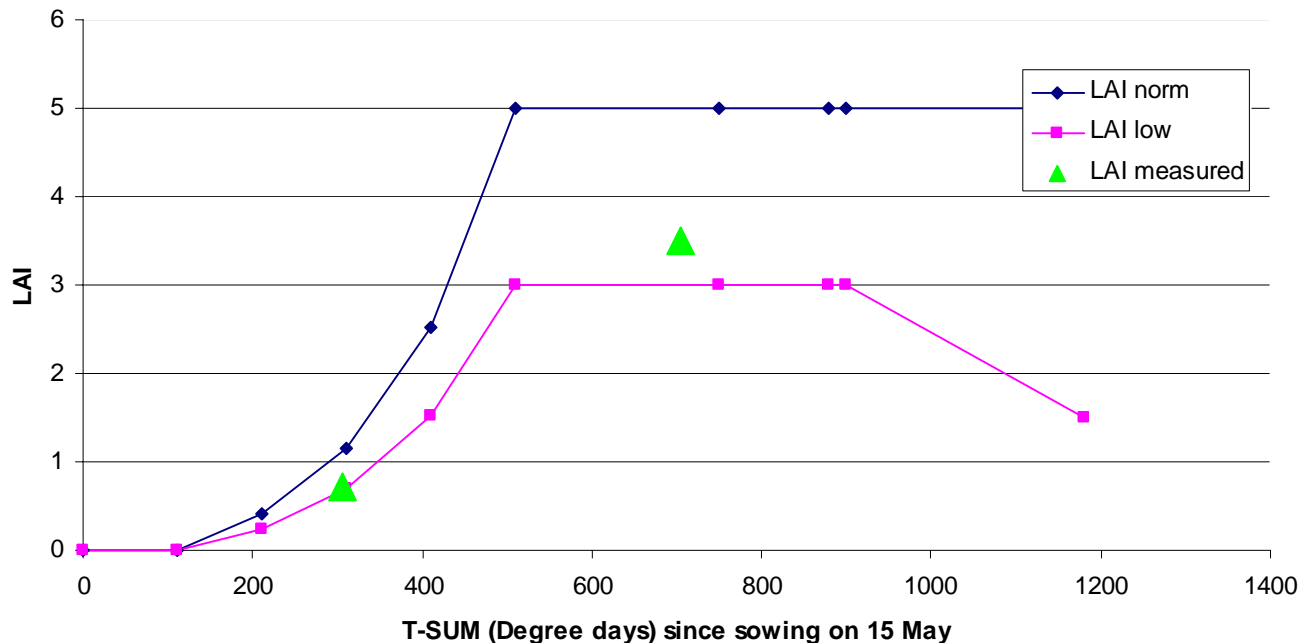
## Seasonal leaf area index development

$$V_d = V_{d, \max} \text{LAI} / \text{LAI}_{\max}$$



# PardNor work tasks

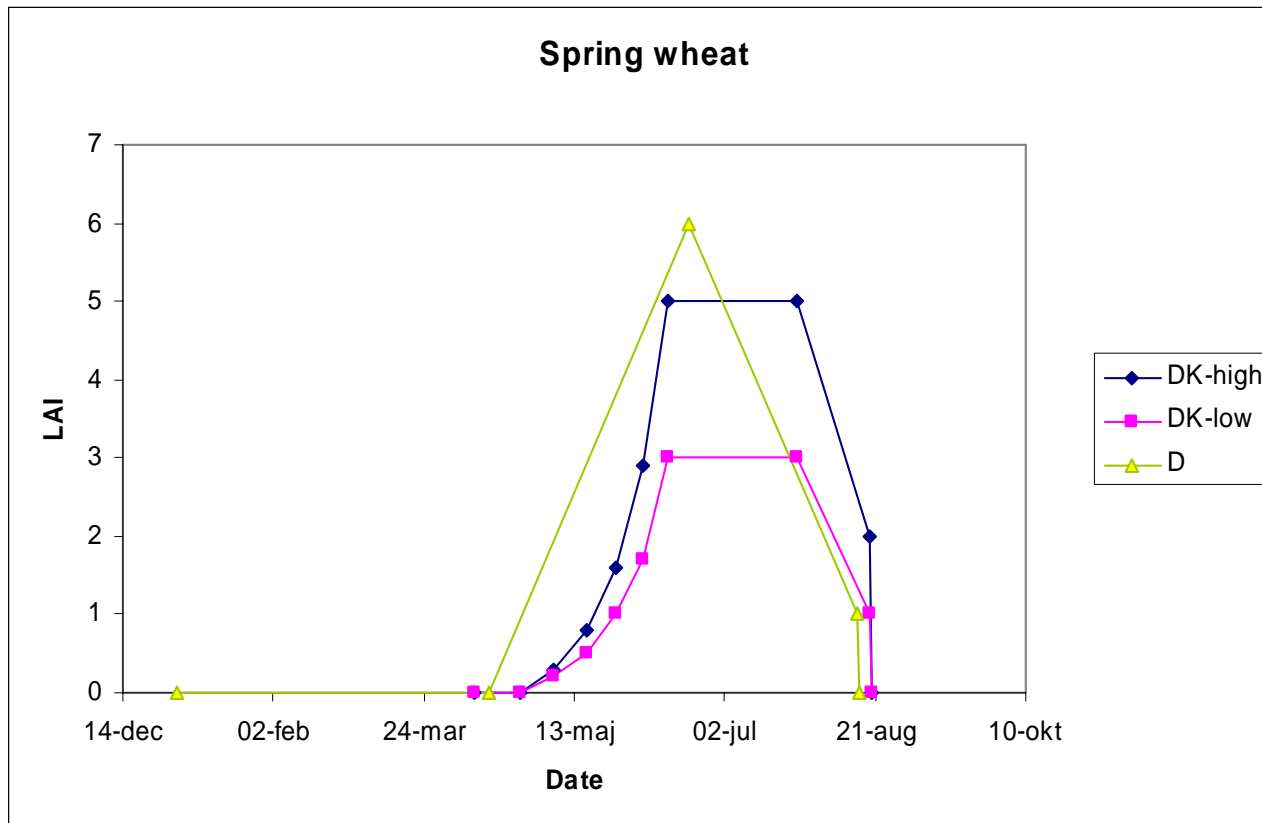
## Seasonal leaf area index development - Uppsala



Simple empirical Danish model - parameters:  
sowing time, soil temperature, harvest time, fertilisation status.

# PardNor work tasks

## Seasonal leaf area index development



Differences between German (ECOSYS default) and Danish LAI

# PardNor work tasks

## Improvement of fixation half-life estimate for caesium cations

Percentage change in ingestion dose contributions to adults integrated over resp. 2 and 50 years, by changing the  $^{137}\text{Cs}$  fixation half-life to from ECOSYS default (8.7 y) to 2 years (scenario example).

	Winter wheat flour	Fruits	Cow's milk	Beef (cow)	Total
2 years	18.5 %	23.7 %	0.5 %	0.5 %	0.5 %
50 years	67.6 %	69.9 %	7.7 %	8.0 %	9.5 %

Changes the estimate of the total ingestion dose received over the period from 10 to 20 years after the deposition by a factor of about 200.

# PardNor activity

## Conclusions

The PardNor activity improves parameter values applied in ECOSYS – specifically for Nordic areas

Important changes have so far been introduced to the parameterisation of

- dietary habits
- food import fractions
- animal feeding regimes
- seasonal leaf area development
- contaminant fixation rates in soil