

## PARAMeters for ingestion Dose models for NORdic areas, PARDNOR (EXTENDED ABSTRACT)

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The two European standard decision support systems, ARGOS and RODOS, have in recent years become increasingly integrated in the Nordic preparedness against nuclear and radiological accidents and incidents. In the event of an emergency, decision making will rest heavily on the reliability of these tools. However, recent investigations have demonstrated that estimates made with the ECOSYS model, which is the ingestion dose module in both of the standard decision support systems, are highly sensitive to variation in a number of input parameters. The default values of these parameters, which are generally adopted uncritically in ARGOS and RODOS, are inadequate for the following two main reasons. Firstly, that the ECOSYS system was developed in the 1980's, and very little of the host of information obtained since the Chernobyl accident has been considered. Accordingly, default data values for 'generic' parameters (e.g., specifying deposition of contaminants and their post-deposition behaviour in the environment) do not reflect the best knowledge of today. Secondly, that the ECOSYS model was parameterised for Southern German conditions, and its originators have always recommended revision of site-specific parameters prior to use in any other area. However, the model is generally still used in RODOS and ARGOS with the default parameters.

The overall objective of the PARDNOR project is to redress these shortcomings specifically with a view to Nordic conditions, and thereby improve the platform for Nordic decision making. The project started in 2007, and has in its first phase focused on the following three items:

- *Typical diets* in the different Nordic countries have been analysed for different age groups and results described in a format facilitating integration into ECOSYS, as the annual average intake of some dietary constituents, which can have considerable influence on dose, varies much between Nordic countries as well as compared to the German default data.
- *Import fractions of consumed food products* are being investigated for the Nordic countries. In some Nordic regions, practically the entire consumption of certain important dietary constituents is imported. Naturally, this needs to be taken into account in dose models.
- *Animal feeding regimes* are being described for the Nordic countries. A comparison between the ECOSYS (German) standard feeding regime values and values for Nordic countries has revealed large differences, both in fodder types and in seasonal changes. This can have a considerable impact on dose.

Below, a few examples are given of the results of the investigations made in the PARDNOR project. As shown in Fig.1, practically all Norwegian (N) and Finnish (FI) wheat is spring wheat, whereas a very large fraction of the Danish (DK) and German (D) wheat is winter wheat. The differences in maturity of winter and spring wheat can in periods of the spring lead to great differences in contaminant deposition to the crops.

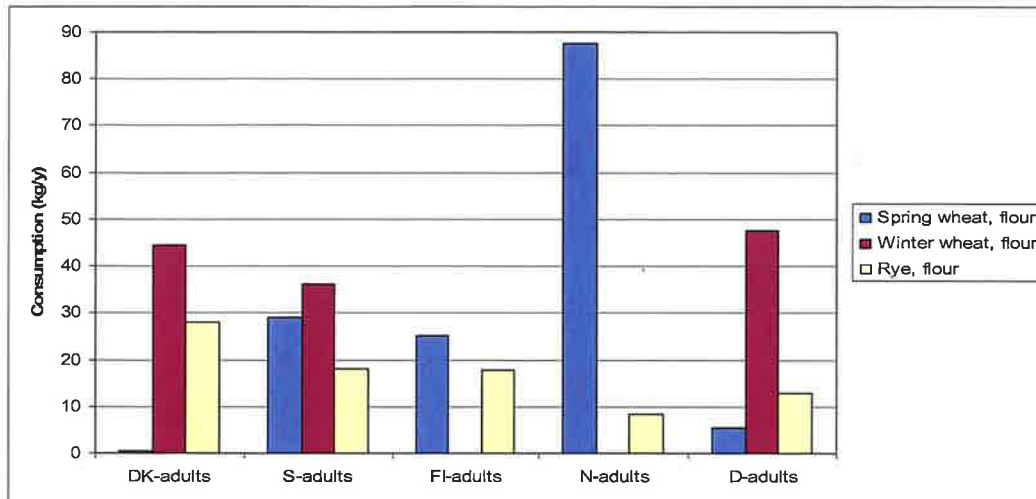


Fig.1. Annual average consumption of some grain products in the Nordic countries.

Table 1 shows the fractions of the consumption of some important dietary components, which are produced within different Nordic countries. Considerable variation is seen, and Icelandic (IS) values are generally low.

Table 1. Percentage of selected consumed foodstuffs produced within the country.

Food:	N	DK	FI	IS
Wheat	67	60	50	~0
Rye	40	86	15	~0
Potatoes	100	86	96	59
Leafy vegetables	55 <sup>□</sup>	75 <sup>*</sup>	77 <sup>#</sup>	33 <sup>£</sup>
Berries	6	10 <sup>□</sup>	69	~0
Milk	100	90	99	n
Butter	98	69	97	n
Cheese	93	63	66	n
beef	95 <sup>□</sup>	88	86	n
Pork	95 <sup>□</sup>	94	91	n
Lamb	95 <sup>□</sup>	20	30	n

\* Figure only valid for early June to mid-October; It is 0 the rest of the year.

□ Assumed values.

# Import of leafy vegetables is in Finland low in mid-June to September.

£ For Iceland, only the fraction for total vegetables has been identified.

n Not determined at this point.

Differences in feeding regimes can lead to substantial differences in dose. For instance some Nordic animal grazing seasons strongly differ from the ECOSYS default. If a <sup>137</sup>Cs dry deposition occurs on the 1<sup>st</sup> of May, where Southern German (ECOSYS default) lactating cattle is on grass, while Danish lactating cattle is fed with silage, contaminant concentrations in beef, butter and milk 6 months after can, according to ECOSYS simulations accommodating all feeding differences between the two countries, differ by several orders of magnitude.