# Risk assessment scheme for Birds and mammals

Robert Luttik

# Food Intake Rate

**Food intake rate (FIR)**

The estimates of food intake are based on means of daily energy expenditure for free-ranging animals, energy and moisture content and assimilation efficiencies. The FIR can be calculated as follows:

$$FIR = \left( \frac{DEE}{FE * \left(1 - \frac{MC}{100}\right) * \left(\frac{AE}{100}\right)} \right) \quad \text{[g fresh weight/d]}$$

In which:

DEE = Daily energy expenditure of the indicator species [kJ/d]
FE = Food energy [kJ/dry g]
MC = Moisture content [%]
AE = Assimilation efficiency [%]

# Estimated Theoretical Exposure

**Estimated dietary intake**

The estimated daily exposure, i.e. the uptake of a compound via a single food item is given by the following equation:

$$\mathrm{ETE} = \frac{\mathrm{FIR}}{\mathrm{bw}} \times \mathrm{C} \times \mathrm{PT} \quad [\mathrm{mg/kg\ bw/d}]$$

In which:

ETE = Estimated theoretical exposure
FIR = Food intake rate of indicator species [g fresh weight /d]
bw = Body weight [g]
C = Concentration of compound in fresh diet [mg/kg]
PT = Fraction of diet obtained in treated area (number between 0 and 1)

# ETE (Mixed Diet)

$$\mathrm{ETE} = \frac{1}{\mathrm{bw}} \times \sum_i \left(\mathrm{FIR}_{i,fresh} \times \mathrm{C}_i \times \mathrm{PT}\right) \quad [\mathrm{mg/kg\ bw/d}]$$

In which:

$\mathrm{FIR}_{i,fresh}$ = Food intake rate of food item [$i$] in mixed diet [g fresh weight/d]
$\mathrm{C}_i$ = Concentration of compound in food item [$i$] in fresh diet [mg/kg]

# Daily Energy Expenditure

**Daily energy expenditure (DEE)**

Data for the DEE are derived from a research project carried out for DEFRA[1] (Anonymous, 2007). Relationship between body weight (bw in g) and daily energy expenditure (DEE in kJ) can be described by the equation:

$$\log DEE = \log a + b \times \log bw$$

To obtain the specific equation for the relevant species group the respective log a and b from Table 2 have to be inserted.

**Table 2.** Species groups, log a and b, the standard errors for a and b (SE), the number of species in each group (N), and the proportion of variation explained by each equation ($r^2$).

| Species group | log a | SE log a | b | SE b | N | $r^2$ |
|---|---|---|---|---|---|---|
| Non passerines | 0.839 | 0.161 | 0.669 | 0.063 | 18 | 0.87 |
| Passerines(*) | 1.032 | 0.058 | 0.676 | 0.045 | 44 | 0.84 |
| Mammals(*) | 0.814 | 0.046 | 0.715 | 0.019 | 46 | 0.97 |

(*) = excluding desert passerines or desert and marine eutherians.

# Caloric contnent and Moisture %

| Food items | kJ/g dry | Moisture [%] |
|---|---|---|
| Grasses and cereal shoots | 17.6 | 76.4 |
| Non-grass herbs | 17.8 | 88.1 |
| Cereal seeds | 18.4 | 14.7 |
| Weed seeds | 21.7 | 9.9 |
| Fruit | 14.8 | 83.9 |
| Arthropods (including caterpillars) | 22.7 | 68.8 |
| Soil invertebrates | 19.4 | 84.3 |
| Fish | 21.0 | 73.7 |
| Aquatic invertebrates | 20.9 | 76.3 |
| Aquatic vegetation | 15.0 | 81.4 |

# Assimilation Efficiency

| Assimilation efficiency of different food items | Mammal | Passerine | Duck & geese | Pigeon | Fowl |
|---|---|---|---|---|---|
| Grasses and cereal shoots | 0.47 | 0.76 | 0.41 | n.a. | 0.42 |
| Non-grass herbs | 0.76 | 0.76 | 0.41 | 0.53[b] | 0.42 |
| Cereal seeds | 0.84 | 0.80 | 0.83 | n.a. | 0.65 |
| Weed seeds | 0.84 | 0.80 | 0.83 | 0.76[a] | 0.65 |
| Fruit | 0.74 | 0.67 | n.a. | n.a. | 0.57 |
| Arthropods (including caterpillars) | 0.87 | 0.76 | 0.87 | n.a. | 0.70 |
| Soil invertebrates | 0.87 | 0.76 | 0.87 | n.a. | 0.70 |
| Fish | 0.87 | 0.76 | 0.87 | n.a. | 0.70 |
| Aquatic invertebrates | 0.87 | 0.76 | 0.87 | n.a. | 0.70 |
| Aquatic vegetation | 0.76 | 0.76 | 0.41 | n.a. | 0.42 |

# Residue Unit Dose

| Crop/category of insects | Crop stage | mean | Standard deviation | 90th percentile[7] | n | Source |
|---|---|---|---|---|---|---|
| Grass+cereals | BBCH 10-30 | 54.2 | 55 | 102.3 | 132 | ECPA database[6] |
| Non-grass weeds | Whole season | 28.7 | 27.5 | 70.3 | 230 | ECPA database[6] |
| Small fruits from orchards[1] | Fruiting period | 3.3 | 2.6 | 6.5 | 33 | Baril *et al.* (2005) |
| Large fruit from orchards[2] | Fruiting period | 19.5 | 16.8 | 41.1 | 33 | Baril *et al.* (2005) |
| Berries[3] | Fruiting period | 8.3 | 7.2 | 16.7 | 9 | Baril *et al.* (2005) |
| Tomato | Fruiting period | 12.8 | 14.6 | 30.6 | 86 | Baril *et al.* (2005) |
| Gourds | Fruiting period | 34.3 | 54.7 | 61.5 | 19 | Baril *et al.* (2005) |
| Grains/ear | Fruiting period | 15 | 25.4 | 13.0 | 21 | Baril *et al.* (2005) |
| Seeds | Fruiting period | 40.2 | 50.6 | 87.0 | 108 | EC (2002) |
| Ground dwelling invertebrates without interception[4] | ground directed applications | 7.5 | 12.0 | 13.8 | 21 | ECPA |
| Ground dwelling invertebrates with interception[5] | applications directed to crop canopies | 3.5 | 3.8 | 9.7 | 28 | ECPA & CSL |
| Insects (foliar dwelling invertebrates[8]) | Whole season | 21.0 | 21.6 | 54.1 | 35 | ECPA & CSL (aphids) |