Linking N flows in 3B*, 3D** and 5.B.2***: emissions of N gasses (NH₃, NO)

* Animal husbandry and manure management
** Crop production and agricultural soils
*** Anaerobic digestion for biogas production
Interaction between chapter methodologies

- Manure is increasingly used as a feedstock in biogas production
  - Mainly a measure to reduce greenhouse gas emissions from manure management
- Biogas production from energy crops is increasing
Changes to chapter methodologies

- Emissions from field-applied manure are calculated in 3B but reported in 3D
- Need to include interaction with 5.B.2
  - Emissions from manure used for biogas production
- Changes made to 3B:
  - Account for manure used for biogas production (removed from 3B)
  - Account for emissions from biogas digestate applied to soil
- Changes made to 5B2:
  - Account for manure used for biogas production (imported from 3B)
  - Account for biogas digestate applied to soil (exported to 3B)
- Changes are for clarification only
  - No changes to the underlying methodology
New Excel spreadsheet

- Excel spreadsheet was associated with chapter 3B
  - Did not have the resources to update this spreadsheet to account for interaction with 5.B.2.
- Excel spreadsheet substantially modified
  - Now uses Visual Basic routine
  - Produces tab-separated (i.e. Excel readable) output files
### Parameters

- Cells that need to be edited when changing livestock category
- Cells that should not be altered
- Cells into which activity data should be input
- Cells that are calculated by the spreadsheet
- Equation numbers, as in 3B

### Calculations

- Old Excel spreadsheet

#### Standards worksheet
- Contains constants (e.g., Emission factors)

#### Example worksheets
- Contain examples for livestock categories

#### Summary worksheets
- Contain the summary data from the relevant livestock category

#### Grand total worksheet
- Contains the total emissions (sum from all livestock categories)

### Total emissions

#### Summary for category

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<table>
<thead>
<tr>
<th>Guide</th>
<th>Standards</th>
<th>Dairy example</th>
<th>Dairy summary</th>
<th>Finishing pig example</th>
<th>Finishing pig summary</th>
<th>Grand total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Control box for different regions

#### Parameters

- **Control tab**: Input the path and name for the results files. The location name must refer to the name of a tab in this spreadsheet. The results files will be written to a subfolder called Results, within the folder named as the output directory. The results will be written to one file for each location tab, with the name `<Results filename>_<Location name>`. E.g. Emissions_Europa.xlsx.

- **Location tabs**: The location tabs contain the parameters for the emission calculations for a particular region. There can be a (nearly) unlimited number of location tabs.

  - Each livestock category is parameterised separately.

- **Biogas tab**: Performs the calculations for §B.2

- **Standards tab**: The parameters for each livestock category in each location are written to this tab in turn. At the end of the processing, the results are in a file.

- **Calculations tab**: Calculates each livestock category at each location in turn. At the end of the processing, the numbers will be for the last livestock category.

- **Results tab**: The results are stored here, prior to them being written to file. At the end of the processing, the numbers will be for the last livestock category.

#### Calculations for each category

- **New Excel spreadsheet**

  - B22: Input the path and name for the results files.
  - The location name must refer to the name of a tab in the spreadsheet.
  - The results files will be written to a subfolder called Results, within the folder named as the output directory.
  - The results will be written to one file for each location tab, with the name `<Results filename>_<Location name>`. E.g. Emissions_Europa.xlsx.
  - The Run model button initiates the calculations. On completion, the results files will have been written (unless an error has occurred).

- **Location tabs**: The location tabs contain the parameters for the emission calculations for a particular region. There can be a (nearly) unlimited number of location tabs.

  - Each livestock category is parameterised separately.

- **Biogas tab**: Performs the calculations for §B.2

- **Standards tab**: The parameters for each livestock category in each location are written to this tab in turn. At the end of the processing, the results are in a file.

- **Calculations tab**: Calculates each livestock category at each location in turn. At the end of the processing, the numbers will be for the last livestock category.

- **Results tab**: The results are stored here, prior to them being written to file. At the end of the processing, the numbers will be for the last livestock category.
<table>
<thead>
<tr>
<th>Livestock class</th>
<th>Number of livestock</th>
<th>Dry matter intake (kg/head/day)</th>
<th>Protein concentration (% of dry matter)</th>
<th>Apparent protein digestibility</th>
<th>Milk or egg protein concentration (g/kg)</th>
<th>Milk or egg protein concentration (g/kg)</th>
<th>Live weight gain (g/day)</th>
<th>Protein concentration of live weight gain (g/kg)</th>
<th>Protein concentration (g/kg)</th>
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</thead>
<tbody>
<tr>
<td>Dairy cows</td>
<td>564799</td>
<td>21.5</td>
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<td>160</td>
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<td>Bulls 0-6</td>
<td>117091</td>
<td>3.8</td>
<td>16.1</td>
<td>0.75</td>
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<td>160</td>
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<td>Bulls 6-</td>
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<td>6.5</td>
<td>13.8</td>
<td>0.72</td>
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<td>160</td>
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<tr>
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<td>0.30</td>
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<td></td>
<td>0</td>
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<td>163</td>
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</tbody>
</table>
EEA Guidebook maintenance project

- Continue to use Excel?
  - Other technical solutions may be available

- Need volunteers to test any new/revised tool
  - Spend time testing
  - Get free advice