Make sense out of Bernou’s SFA excel sheet

Objective:

* Link flows shown in SFA paper to calculations in the excel sheet
* say in which folder can be found which information
* highlight progress

Color code

* green: implemented and confident in how I did it
* yellow: implemented but not confident in how I did it, problems in the calculations
* red: no calculations found in excel file
* none: not implemented yet

**Flows related to animal system**

**Leaving the system:**

**manure as biogas substrate**

“biogas input”; calculated based on the total amount of fresh matter substrate, the percentage of animal manure (got numbers of LWK) and the N-content

**Manure**

It is a bit unclear how this number was derived. Neither in “animal\_manure\_prod” nor in “manure\_to\_crops” the number is really calculated; just taken from Nährstoffreport

In Nährstoffreport they also have the methodology to calculate these numbers for yourself, so maybe it is better to do the calculations instead of bactracing the elements (like to get the housing losses etc)

**N losses through storage and housing of animal production**

Difference of total manure and summed manure of animals (taken from Nährstoffreport, which apparently accounted already for housing losses)

**Manure export**

“export-import org fert”; you can find the number there but no real calculation

“manure to crops”; same number listed, still no calculation

**Slaughter animals**

“animal production output”; number of slaughtered animals \* life weight \* N content

**Local animal products produced**

“self sufficiency consumption”; eggs and dairy produced

“egg” Egg calculation is a bit dubious; the number of eggs laid is derived from the share of chicken in Kleve to total chicken in NRW and the same proportions of eggs is assumed for total eggs laid in NRW; but the numbers don’t add up. Either the number of chickens in Kleve is too low or the number of average eggs laid by chicken is too low. Right now the calculations is based on chicken share / egg share being proportional to each other; but number of chicken times the number of eggs laid per chicken lead to a drastically different result!!! Shouldn’t it be easier to use number of chickens and then multiply it with egg-laying rate?

“milk” Calculation of milk is not related to the number of cows but a number taken from BLE; shouldn’t we relate the milk quantity also with number of cows, so that we can adjust the milk in the second scenario if we e.g. decrease the number of cows (found in IT.NRW document with number of cows in Kleve ~56 794Milchkühe in Kleve)

**Entering the system**

**Straw**

“crop production output”; considers winter and summer wheat, rye, winter and summer barley, oat and triticale; 33% of produced straw is used for animal production (and the rest remains on the field); approximate share of straw to total yield and multiply with N content

**Feed crops**

Taken from another document; mentioned in “feed import”

**Grass-based feed**

“Grassland”; N removal from grassland by mowing and grazing (per ha) multiplied by the area of meadows and pastures

**Feed from processed crops**

Taken from another document; mentioned in “feed import”

**Processed import feed**

“import feed”; approximated based on the animal products (milk, egg, meat, manure, housing and storage losses) and the amount of locally produced feed (grass, feed crops, byproducts from crop processing, straw)

**Flows related to crop system**

**Leaving the system:**

**Straw** (🡪 animal)

“crop production output”; considers winter and summer wheat, rye, winter and summer barley, oat and triticale; 33% of produced straw is used for animal production (and the rest remains on the field); approximate share of straw to total yield and multiply with N content

**Feed crops** (🡪 animal)

Taken from another document; mentioned in “feed import”

**Grass-based feed** (🡪 animal)

“Grassland”; N removal from grassland by mowing and grazing (per ha) multiplied by the area of meadows and pastures

**Cultivation losses** (🡪 outside)

Bernou says it is the difference nutrients applied to the crop system and what was harvested

**Other organic fertilizer export** (🡪 outside)

Taken from Nährstoffreport. They mentioned total export and manure export. Other organic fertilizer export is the difference of the two

**Vegetal biogas substrate** (🡪 waste)

“biogas input”; total fresh matter substrate \* share of product \* N content for all vegetal inputs

**Fruits and vegetables** (🡪 processing)

“vegetal production (LWK)”; calculated based on cropping area, yield and N content

**Food and feed crops** (🡪 processing)

**Entering the system:**

**Digestate** (waste 🡪)

Biogas output: taken report of digestate staying in Kleve from Nährstoffreport per ha

**Manure** (animal 🡪)

It is a bit unclear how this number was derived. Neither in “animal\_manure\_prod” nor in “manure\_to\_crops” the number is really calculated; just taken from Nährstoffreport

In Nährstoffreport they also have the methodology to calculate these numbers for yourself, so maybe it is better to do the calculations instead of bactracing the elements (like to get the housing losses etc)

**Organic fertilizer import** (outside 🡪)

“Import organic fertilizer”; based on the sum of animal (slurry, manure) and non-animal (champost) fertilizer import from other districts / NL

**Inorganic fertilizers** (outside 🡪)

“Inorganic fertilizers”; don’t get the calculation, what is ha LF; ha LF \* average N content

**sewage sludge** (waste 🡪)

under “sewage output”, mass data taken from regionalstatistik and multiplied with N content

**Fresh compost** (waste 🡪)

**Flows related to consumption system**

**Leaving the system:**

**Sewage** ( 🡪 waste)

Calculated based on the incoming wastewater and the average N content in tab “wastewater”

**OFMSW** (🡪 waste)

Municipal solid waste”; organic and green waste from district \* DM content \* N content

**OFSMW in residual waste** (🡪 waste)

“municipal solid waste”; food and garden waste in grey bin \* DM content \* N content

**Entering the system:**

**Finished compost to hobby gardeners** (waste 🡪)

“Schönmackers out”; Mass \* DM content \* N content

**Local vegetal products consumed** (processing 🡪)

“self sufficiency consumption”; “household input” based on the average consumption of products and their N content

**Import vegetal products** (processing 🡪)

“self sufficiency consumption”; calculated based on the consumption of products where local production is not feasible, based on consumption data in “households input”; if production would not be feasible, then also the difference of local consumption and production of vegetal products

**Local animal products consumed** (processing 🡪 )

Main assumption: all the locally produced animal products are consumed and only after that products are imported

Mainly driven by “households input”. There they calculate the average consumption of households based on numbers of the Statistisches Bundesamt. Then multiply it with the N content and the residents in Kleve

Numbers of animal products in “households input” roughly add to the flow

**Imported animal products consumed** (processing 🡪 )

**Flows related to waste system**

**Leaving the system:**

**Finished compost to hobby gardeners** (🡪 consumption)

“Schönmackers out”; Mass \* DM content \* N content

**Digestate** (🡪 crop)

Expected it to be under “biogas output” but the number there (1,621) is larger than in the report (1,385)

**sewage sludge** (🡪 crop)

under “sewage output”, mass data taken from regionalstatistik and multiplied with N content

**Fresh compost** (🡪 crop)

**sewage sludge export** (🡪 outside)

under “sewage output”, mass data taken from regionalstatistik and multiplied with N content

**Effluent, gaseous losses during WWT** (🡪 outside)

“wastewater”; sewage – sewage sludge

**Fresh compost export** (🡪 outside)

“Schönmackers out”; data of Schönmackers of compost leaving Kleve \* DM content \* N content

**Waste water direct charge / remains in the canalisation** (🡪 outside)

“wastewater not processed”, took numbers of wastewater remaining in canals and direct discharge to ground and surface water from destatis and nutrient content of wastewater tested from 4 stations in 2016

**Entering the system:**

**Sewage** ( consumption 🡪)

Calculated based on the incoming wastewater and the average N content in tab “wastewater”

**OFMSW** (consumption 🡪)

Municipal solid waste”; organic and green waste from district \* DM content \* N content

**OFSMW in residual waste** (consumption 🡪)

“municipal solid waste”; food and garden waste in grey bin \* DM content \* N content

**Vegetal biogas substrate** (crop 🡪)

“biogas input”; total fresh matter substrate \* share of product \* N content for all vegetal inputs

**OFSMW import**

Municipal solid waste”; organic and green waste from outside district \* DM content \* N content

**Flows related to processing system**

**Leaving the system:**

**Local animal products consumed** (🡪 consumption)

Main assumption: all the locally produced animal products are consumed and only after that products are imported

Mainly driven by “households input”. There they calculate the average consumption of households based on numbers of the Statistisches Bundesamt. Then multiply it with the N content and the residents in Kleve

Numbers of animal products in “households input” roughly add to the flow

**Meat export** (🡪 outside)

“animal production output”; calculates the total amount of locally produced meat

‘households input”; calculates the total amount of meat consumed

Difference of the two is the meat export

**Vegetal products export** (🡪 outside)

“self sufficiency consumption”; kg N available – kg N produced – kg N in biogas = export of vegetal products

**Local vegetal products consumed** (🡪 consumption)

“self sufficiency consumption”; “household input” based on the average consumption of products and their N content

**Milk export** (🡪 outside)

“Milk”; total dairy available for Kleve – local milk consumption without further processing; numbers tken from BLE and multiplied with N content

**Slaughter waste** (🡪 outside)

“animal production output”; total life weight for food processing \* (1-edible fraction) \* N content

**Imported animal products consumed** (🡪 consumption )

**Import vegetal products** (🡪 consumption)

“self sufficiency consumption”; calculated based on the consumption of products where local production is not feasible, based on consumption data in “households input”; if production would not be feasible, then also the difference of local consumption and production of vegetal products

**Entering the system:**

**Net food import** (outside 🡪)

“self sufficiency consumption”; import vegetal + import animal products

**Fruits and vegetables** (crop 🡪)

“vegetal production (LWK)”; calculated based on cropping area, yield and N content

**Food and feed crops** (crop 🡪)

**Feed from processed crops**

Taken from another document; mentioned in “feed import”

**Net feed import** (outside 🡪)

“import feed”; approximated based on the animal products (milk, egg, meat, manure, housing and storage losses) and the amount of locally produced feed (grass, feed crops, byproducts from crop processing, straw)

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“animal production output”; number of slaughtered animals \* life weight \* N content

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