



NaturErhvervstyrelsen

Vedrørende notat om klimaaftryk for dansk kvægproduktion per produceret enhed

DCA - Nationalt Center for
Fødevarer og Jordbrug

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Side 1/3

NaturErhvervstyrelsen (NEST) har i mail af 1. november 2012 bedt DCA – Nationalt Center for Fødevarer og Jordbrug - om at vurdere, hvilken af to fremsendte artikler - der angiver meget forskellige oplysninger om drivhusgasudledning (herunder metan udledning per produceret enhed vedr. kvægproduktion) - der må betragtes som mest retvisende.

Nedenstående vurdering er udarbejdet af forskningsleder John E. Hermansen og seniorforsker Troels Kristensen, begge Institut for Agroøkologi.

Med venlig hilsen

Susanne Elmholt
Seniorforsker, koordinator for myndighedsrådgivning



Notat om klimaaftryk for dansk kvægproduktion per produceret enhed

John E. Hermansen og Troels Kristensen

NaturErhvervstyrelsen (NEST) har i mail af 1. november 2012 bedt DCA – Nationalt Center for Fødevarer og Jordbrug - om at vurdere, hvilken af to fremsendte artikler - der angiver meget forskellige oplysninger om drivhusgasudledning (herunder metan udledning per produceret enhed vedr. kvægproduktion) - der må betragtes som mest retvisende.

De to artikler er:

Lesschen JP, van den Berg M, Westhoek HJ, Witzke HP, Oenema O, 2011. Greenhouse gas emission profiles of European livestock sectors. Animal Feed Science and Technology 166-167, 16-28.

Weiss F, Leip A, 2012. Greenhouse gas emissions from the EU livestock sector: A life cycle assessment carried out with the CAPRI model. Agriculture, Ecosystems and Environment 149, 124-134.

Konklusion

Det er vores opfattelse, at dataene fra publikationen af Weiss og Leip (2012) ikke er velegnede til at vurdere udledning af drivhusgasser, herunder metan, fra de enkelte lande i Europa, herunder Danmark.

Publikationen af Lesschen et al. (2011) er mest retvisende.

Baggrund og vurdering

Begge publikationer bygger på analyser af registerdata, hvor det ikke er muligt ud af publikationerne at verificere de specifikke forudsætninger, der gælder for de enkelte lande.

Weiss og Leipp (2012) bygger på en mere omfattende rapport 'Evaluation of the livestock sector's contribution to the EU greenhouse gas emissions (GGELS) - Final report - Administrative Arrangements AGRI-2008-0245 and AGRI-2009-0296', som vi har studeret i nogen detalje dels på foranledning af henvendelse fra Landbrug og Fødevarer og dels af egen interesse, idet vi fandt, at resultaterne var meget afvigende fra vores egne data vedrørende Danmark. Rapporten kan findes på:

http://ec.europa.eu/agriculture/analysis/external/livestock-gas/full_text_en.pdf.

Vores vurdering er, at den teoretiske beregningsmetode af drivhusgasbelastningen per produceret enhed, som beskrevet i ovennævnte rapport, er solid og



rigtig, men at datagrundlaget for de enkelte lande er ukorrekt. Det er nævnt direkte i rapporten, at data fra Danmark afviger meget fra de nationale statistikker, og at i sådanne tilfælde foretager programmet en automatisk procedure til at sikre koherens i beregningerne. Det er tilsyneladende ikke muligt at verificere de dermed opnåede korrigerede data.

Korrespondance med JRC/forfatterne er vist i appendiks 1. Det fremgår heraf, at vi ikke har kunnet få verificeret de nøjagtige forudsætninger, der i rapporten er gældende for Danmark. Appendiks 1 viser a) spørgsmål fremsendt til JRC (disse er formuleret af undertegnede), b) svar fra JRC samt c) ny henvendelse, der påpeger meget store afvigelser i datagrundlag. Det har ikke været muligt at få yderligere oplysninger fra JRC om datagrundlaget.

På denne baggrund er det vores opfattelse, at datagrundlaget for de enkelte lande er behæftet med endog meget betydelige fejl, og at resultaterne per produceret enhed ikke er retvisende for de enkelte lande, herunder Danmark. Det gælder også metanemissionen.

Vi har ikke en tilsvarende baggrundsrapport for Lesschen et al. (2011). I følge artiklen bygger den mere på data og statistikker fra de enkelte lande uden automatiske modelkorrektioner. Til forskel fra Weiss og Leip (2012) inddrages ikke evt. effekter af ændret arealanvendelse som en konsekvens af foderproduktionen. Det påvirker ikke metan estimeringerne, men der kan argumenteres for, at det ville være mere korrekt at gøre sådan. Men når det ikke er gjort kan drivhusgasudledningen per produceret enhed sammenlignes med det arbejde, vi har lavet ved AU. Estimerterne for den samlede drivhusgasudledning for bl.a. mælk og svinekød i Lesschen et al. (2011) for Danmark er i fin overensstemmelse med vores resultater (Kristensen et al., 2011; Nguyen et al., 2011). Derfor er det opfattelsen, at Lesschen et al. (2011) giver det mest retvisende billede.

Referencer

Kristensen, T., Mogensen, L., Knudsen, M.T. & Hermansen, J.E. (2011). Effect of production system and farming strategy on green house gas emission from commercial dairy farms in a life cycle approach. *Livestock Science* 140, 136-148.

Lesschen, J.P., van den Berg, M., Westhoek, H.J., Witzke, H.P. & Oenema, O. (2011). Greenhouse gas emission profiles of European livestock sectors. *Animal Feed Science and Technology* 166-167, 16-28.

Nguyen, T.L.T., Hermansen, J.E. & Mogensen, L. (2011). Environmental assessment of Danish Pork. Internal Report, Aarhus University, Faculty of Agricultural Sciences, 34 pp.

Weiss, F. & Leip, A. (2012). Greenhouse gas emissions from the EU livestock sector: A life cycle assessment carried out with the CAPRI model. *Agriculture, Ecosystems and Environment* 149, 124-134.

Appendix 1

a)

From: Sune Jin Christensen [<mailto:sjc@agridan.be>]

Sent: Friday, April 08, 2011 12:22 PM

To: adrian.leip@jrc.ec.europa.eu

Cc: Trine Vig Tamstorf; Anette Englund Friis; John Erik Hermansen; Troels Kristensen; Nicolaj Christoffersen; Richard de Mooij

Subject: Questions about the JRC report concerning the livestock sector's contribution to the EU greenhouse gas emissions

Dear Mr Leip,

My name is Sune Jin Christensen and I work for DANSKE SLAGTERIER, SA. (the Danish pig meat sector). My colleagues and I have with the greatest interests read JRC's report regarding the livestock sector's contribution to the EU greenhouse gas emissions. However, the report has left us with some questions that we thought you and your colleagues may be in a position to help us with.

Questions

Looking at GHG emissions per kg pork and per kg milk (figure ES 10), the numbers for Denmark are considerable larger than the results of recent in detail investigations on that issue. It is not clear from the report exactly how the GHG emission per kg product was estimated. However, looking at Figure ES 5, it is clear that there is a huge deviation in N excretion ab animal compared to the national inventory as also discussed in the report. This in turn impacts on N2O emission and thus on GHG. We tried to identify some reasons for that deviation and notice the following for the pork

1. Numbers of pork (heads) is assumed to be 7.7 mill in the CAPRI while NI (National data) says 13 mill (page 141). How can a deviation occur here of that magnitude?
2. Produced meat per head is given to 133 kg (p 5 in Annex). Multiplying with number of heads this amounts to 1.0 mill t, whereas the stated national production is 1.7 mill t (p 4 in Annex)
3. Feed use per kg pork as given in Annex p 56 is closely in agreement with our own inventory. Based on these numbers it is difficult to understand why GHG per kg pork in the CAPRI model is almost double than our estimates.
4. It is stated that the CAPRI model adjust to national statistics – in that light it is difficult to understand that N excretion per head differs that much from NI.
5. Will it be possible to get information on exactly what background information that were used to calculate the N excretion per head
6. Will it be possible also to get the information used to calculate CO2

Further for cattle

1. Numbers are in line with NI, but again N excretion pr head is far from NI level, both for dairy cows and other cattle. As this is also the case for methane it seems like feed intake is estimated too high – how was feed intake estimated?
2. In order to understand the difference between CAPRI and NI it would be useful to have figures adding the different livestock sectors compared to sum of DK

Conclusion

Having in mind that production efficiency (amounts of product produced per kg of Dry matter used) is acknowledged as having high correlation to GHG emission per kg product, and at EU level DK livestock is known to have a high efficiency for DMI as well as net energy and N, there is a need for further explanation of the high product GHG figures by CAPRI.

-o-

I have been told that there will be a conference at Wageningen University on feed stuff in May in which you probably will participate in. If possible, we (and probably also our Dutch counterparts) would be more than willing to meet in the margin of the conference.

Yours sincerely,

Sune Jin Christensen
Consultant EU-affairs

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b)

-----Original Message-----

From: Franz Weiss [<mailto:franz.weiss@jrc.ec.europa.eu>]

Sent: 11 April 2011 17:38

To: Sune Jin Christensen

Cc: Adrian Leip

Subject: Re: Fwd: Questions about the JRC report concerning the livestock sector's contribution to the EU greenhouse gas emissions

Dear Mr.Christensen,

Thank you for your interest in our study. I'll try to answer your questions:

> _Questions_

>

> Looking at GHG emissions per kg pork and per kg milk (figure ES 10),
> the numbers for Denmark are considerable larger than the results of
> recent in detail investigations on that issue. It is not clear from
> the report exactly how the GHG emission per kg product was estimated.
> However, looking at Figure ES 5, it is clear that there is a huge
> deviation in N excretion ab animal compared to the national inventory
> as also discussed in the report. This in turn impacts on N2O emission
> and thus on GHG.

>

You are right that in case of Denmark the CAPRI values for N excretion are significantly higher than in the inventories. The reason is, that CAPRI derives the N excretion from the difference of feed intake and retention, which has the advantage that feeding and excretion values are consistent. Moreover, CAPRI uses a variety of data sets coming from EUROSTAT and checks them for consistency among themselves. If inconsistencies are discovered then a automatic procedure changes those values considering their reliability. This procedure, of course is not perfect and we cannot exclude that it creates errors. However, since we don't know the real numbers and also inventories have frequently proven to be full of errors we decided to consistently use the CAPRI data base which has been used and approved many times for policy assessment in the EU commission. Sweden and Denmark seem to be problematic and we would like to find out whether the error is mainly in CAPRI or in the inventories.

We tried to identify some reasons for that deviation and notice the following for the pork

>

> 1. Numbers of pork (heads) is assumed to be 7.7 mill in the CAPRI
> while NI (National data) says 13 mill (page 141). How can a deviation
> occur here of that magnitude?

>

For fattening the CAPRI data base does not contain stock numbers like the inventories but only slaughtered heads corrected by live imports and exports. We derive average stock numbers by multiplying the number of slaughtered heads with the relation of fattening days to 365. For Denmark the CAPRI number of slaughtered heads (corrected by live imports and exports) for a three year average is 24331870 fattening pigs with an average fattening period of 95 days. Moreover there are 1387860 sows. This adds to the 7720812 heads ($24331870 * 95/365 + 1387860$) as the average stock mentioned in the report.

>

> 2. Produced meat per head is given to 133 kg (p 5 in Annex).
> Multiplying with number of heads this amounts to 1.0 mill t, whereas
> the stated national production is 1.7 mill t (p 4 in Annex)

>

Those numbers are taken from the chapter "Overview of the EU livestock sector" and are not the numbers used in the CAPRI model. I agree that it is not helpful to use different numbers in a report, but the chapters have been written by different people in different times. We tried to sort those things out but apparently we were not successful for each number. In CAPRI the average danish meat output per fattening pig is 73 kg.

>

> 3. Feed use per kg pork as given in Annex p 56 is closely in agreement
> with our own inventory. Based on these numbers it is difficult to
> understand why GHG per kg pork in the CAPRI model is almost double
> than our estimates.

>

In the inventories and the studies you mentioned, is there a connection between feed intake and N excretion or are the numbers coming from independent sources?

>

> 4. It is stated that the CAPRI model adjust to national statistics -

> in that light it is difficult to understand that N excretion per head
> differs that much from NI.

>

It is based on national statistics, but corrected in case of inconsistencies. See comment above.

>

> 5. Will it be possible to get information on exactly what background
> information that were used to calculate the N excretion per head

>

> 6. Will it be possible also to get the information used to calculate
> CO2

>

To 5 and 6: Yes it would be extremely useful to find out where the differences come from, because we have already been aware of the problem. However, since many numbers are given in the report, maybe you could just give us a hint which numbers you feel that are missing. Maybe you could also provide us with the details of input data for studies you mentioned so that we could start to compare.

>

> Further for cattle

>

> 1. Numbers are in line with NI, but again N excretion pr head is far
> from NI level, both for dairy cows and other cattle. As this is also
> the case for methane it seems like feed intake is estimated too high -
> how was feed intake estimated?

>

Yes that could be the case. It would go to far now to explain how it was estimated. It's based on protein and energy requirement which are derived from the milk yields, daily weight increases etc. Do you feel uncomfortable with the feed intake of cattle shown in the annex? I could also provide you with the feed rations on animal level...my suspect is that there is something wrong with the yields of the crop category "other fodder on arable land" summarizing legumes etc.. I have announced this to the people in Bonn who are responsible for the feed estimation, but so far they could not find the time to look closer into the problem.

>

> 2. In order to understand the difference between CAPRI and NI it would
> be useful to have figures adding the different livestock sectors
> compared to sum of DK

>

I think I do not understand what you mean by livestock sectors...do you mean beef, pork etc.?

>

> Conclusion

>

> Having in mind that production efficiency (amounts of product produced
> per kg of Dry matter used) is acknowledged as having high correlation
> to GHG emission per kg product, and at EU level DK livestock is known
> to have a high efficiency for DMI as well as net energy and N, there
> is a need for further explanation of the high product GHG figures by
> CAPRI.

>

I agree. We would find it very helpful to go through the numbers together and find out where the large discrepancies come from.

Best regards,
Franz Weiss.

c)

-----Original Message-----

From: Sune Jin Christensen [<mailto:sjc@agridan.be>]

Sent: Friday, May 13, 2011 9:43 AM

To: Franz Weiss

Cc: Adrian Leip

Subject: RE: Fwd: Questions about the JRC report concerning the livestock sector's contribution to the EU greenhouse gas emissions

Dear Mr. Weiss,

Sorry for getting back to you this late and thank you for the response to our questions.

Enclosed please find our report on GHG emission related to Danish pork.

We used a bottom up process so obviously some deviations may occur. Our main concern is the huge deviation in N excretion per head from National Inventories given in Figure ES 5 both regarding dairy cows and pork (which may in turn impact on N₂O emissions). So we have tried to look closer at this point.

Basically, given your explanation of how # of pork were calculated, we find good coherence with our understanding of the total pork production in kg, although the # of pigs is calculated differently in our national inventory

In Annex 4.4a (p56) your calculated feed consumption per kg pork is given. We assume that this is per kg carcass weight. In that case the numbers are very close to our findings (table 1 in the enclosed report).

Here we find a total feed consumption of 2.8 kg per kg live weight with more or less the same composition of feed stuffs as your data.

Evaluation per kg carcass weight this corresponds to 3.7 kg feed per kg carcass, which is very close to your numbers in Table 4.4a.

In principle we calculate the N excretion the same manner as you do - input minus retention in the carcass.

We tried to recalculate our numbers using your way of calculation one head.

One head is 365/95 times 73 kg equals 280 kg carcass) or 280/0.76 equals 368 kg live weight.

According to our estimation 368 kg live weight (one head in your nomenclature) excretes $45.3/1000 \times 368$ equals 16.7 kg N. In Figure ES 5 is given a number of 23 kg N which is almost 40% higher. This is difficult to understand.

The data from the national inventory shows a total N excretion of 104 mill kg N from the pig production which is in close agreement with our bottom up calculation, whereas your data shows an excretion of about 177 mill kg N (7.7 x 23)

We hope you can help in identifying where in the assumptions these deviations occur.

Another matter is that huge numbers of piglets (30kg) are transported to Germany - maybe assumptions of weight etc related to that number also influence the results - just a hint?.

Best regards,
Sune