Informal note from the Task Force on Reactive Nitrogen

Overview of interacting factors affecting net costs and benefits of ammonia abatement

1. This note results from discussion at the TFRN-3 workshop 24-25 November 2009 in Amsterdam on the interaction of ammonia abatement measures with other developments/effects. More specifically it considerss whether:

- Taking a specific action is likely to be cheaper than the default cost estimate because of *x* and *y* interaction, and
- Taking a specific action will give *x* and *y* co-benefits for climate targets, etc.

2. The TFRN-3 agreed that there is a need to review and update the basic costs data for agriculture used in baseline and optimized scenario cost calculation. However, in addition, the Task Force agreed that other impacts, which may affect the actual costs of measures, should be also considered in the discussion. It is the second of these points which is addressed here.

3. For this purpose the following tables have been prepared by the Task Force in cooperation with the Centre for Integrated Assessment Modelling at IIASA. Detailed comments on an earlier version were received from experts in Macedonia, Netherlands, Romania, Russia, and UK. The tables represent work in progress and are open to comment from WGSR to encourage their further development.

4. Three tables are presented below; the whole set was split into groups of interactions by priority as viewed by TFRN.

- Table *A* groups interactions that has consistently scored *HIGH* priority in all comments,
- Table *B* includes those that scored only *LOW* priority.
- Table (*C*) reflects on mixed comments, i.e., there was no agreement among TFRN members who commented as to the importance of the interaction.

5. Some of the issues included in Table C received radically different score and it might be also linked to different understanding of the issue mentioned. For example, biogas production and organic farming are included in Table C, with responses varying from not relevant to high priority, especially when considering long term development and integrated approach; at the same time a measure connecting new (low emission housing) with animal welfare scored consistently *HIGH*.

6. The Task Force considers that a further discussion of these will bring more uniform prioritization as well as inclusion of further interactions.

Notes to Table A, B, C
[**1**] Title and nature of interaction
[**2**] Expected impacts of the interactions on emissions and costs.
[**3**] Whether in GAINS, explicit, implicit, not in, possibility for future costings (either in GAINS or in indicative calculation outside the model).
[**4**] Indication of priority level for future development.

Table A. Exploring interaction of ammonia abatement measures with other developments/effects; a priority discussion [**HIGH** priority]

Interaction [**1**]	Impact on: [**2**]		Cost calculation [**3**]		Priority [**4**]
	Emissions	Costs	GAINS	Other	
All who commented agree these are HIGH priority					
Potential value to farmer of N saved through reduced NH_3 emissions	YES (Potential further reduction of N_2O, NH_3)	YES (If mineral N fertilizer use reduced)	YES (Currently the benefit set to 0)	YES	HIGH
Reduced cost of implementing low NH_3 housing if the housing is already being rebuilt to satisfy new animal welfare legislation (Example of integrated approach)	YES (Secondary effect)	YES/NO (Cheaper compared to retrofit but more expensive than conventional system)	NO	YES	HIGH
Developing economies of scale and innovation (For example: contractor costs for low emission spreading, air scrubbers may decrease as new markets develop)	YES (Secondary effect)	YES	YES (Has to be updated)	YES	HIGH
Cost implications if certain changes are only to be applied to new buildings	NO	YES	YES (Currently only for new buildings, limiting the application by a set of region-specific constraints; other approach needed if retrofitting of old buildings is required)	YES	HIGH
Extending grazing (Leads to higher emissions of N_2O and NO_3^-)	YES (Not in GAINS; currently grazing period fixed – analysis possible via different scenario)	YES	NO	?	HIGH

Interaction [**1**]	Impact on: [**2**]		Cost calculation [**3**]		Priority [**4**]
	Emissions	Costs	GAINS	Other	
Reduced farm leaching and secondary N_2O from less atmospheric NH_x deposition. (No benefits of this effect to the farmer)	YES (included in GAINS with some limitations-fixed N deposition)	NO	NO (Avoiding double-counting)	?	HIGH
Implementation of commitments with different time perspective, e.g., 5, 10, 15 years from now (Longer lead time could/should lead to lower costs for the same measures. How to deal with the fact that obligations would enter into force in 2015/2017?)	NO	YES	NO (Fixed base year - currently 2005 - constant prices calculation)	YES	HIGH
Animal feeding strategies and their impact on crop production and consequently fertilization (This might become more and more important in the future, also in conjunction with other topics like low protein feed and biofuel production)	YES	YES	NO	?	HIGH
Low protein feeding and link to crop production and in turn fertilizer use (See comment above)	YES	YES	NO	YES	HIGH
Air quality in barns (From bedding, additives, – manure management systems, efficient ventilation systems - human and animal welfare (esp, interaction with PM) and performance.	YES	YES	NO	YES	HIGH
Outwintering options for cattle – including grazing of forage crops, e.g. rape, kale, fodder beet; also wintering on woodchip pads. OWPs may reduce emissions of N_2O and NO_3^-	YES [Some evidence of reduced NH_3 emissions]	YES			HIGH

Table B. Exploring interaction of ammonia abatement measures with other developments/effects; a priority discussion [**LOW** priority]

Interaction [**1**]	Impact on: [**2**]		Cost calculation [**3**]		Priority [**4**]
	Emissions	Costs	GAINS	Other	
All who commented agree these are LOW priority					
Sewage sludge field-application (Mostly banned, if allowed then strictly regulated)	YES	YES	NO	?	LOW
Biomass for fuel production strategies (The important might increase in the future)	YES	YES	NO	YES	LOW

Table C. Exploring interaction of ammonia abatement measures with other developments/effects; a priority discussion [**VARIED** priority]

Interaction [**1**]	Impact on: [**2**]		Cost calculation [**3**]		Priority [**4**]
	Emissions	Costs	GAINS	Other	
Assessment of priority varied from LOW to HIGH					
Value of increased agronomic flexibility (Specifically important for low emission spreading, reduced fouling of grass; and improved timing flexibility)	YES (Secondary effect)	YES/NO (divided views)	NO	?	LOW to HIGH
Final cost of implementation is usually lower than used in discussion (Linked to economy of scales. How to take that into account?)	NO	YES	NO (Current data or forecasts is used)	YES	LOW to HIGH
Smaller setbacks for housing and storages (odour) and for low emission-banding/ injection- land spreading (odour and water contamination). Less risk of drift onto food crops and water.	YES (Not included in GAINS)	YES	NO	?	LOW to HIGH
Biogas production (Not directly related to the Gothenburg Protocol, but linked to energy and climate policies)	YES (Need to consider interactions for CH_4, NH_3, N_2O; not only direct but also indirect due to need for closed storage for digested manure and proper land application? The overall effect on NH_3 might be small)	YES	YES	YES	MEDIUM to HIGH
Reduced N fertilizer demand resulting from lower NH_3 losses could descrease exposure of farmers to fluctuations in (oil and) fertilizer prices	NO/YES (Secondary effect)	NO	NO	?	LOW to MEDIUM

Interaction [**1**]	Impact on: [**2**]		Cost calculation [**3**]		Priority [**4**]
	Emissions	Costs	GAINS	Other	
Greenhouse gas value of the reduced CO_2 emissions from using less mineral fertilizer	YES (Potential savings on the production side comparable to the N_2O emissions from application) [not included in GAINS]	YES	NO	YES	LOW to HIGH
Development (increase) in organic farming	YES	YES	NO (scoping study on a long term impact on emissions and abatement potential performed)	?	LOW to MEDIUM
Improved N management may foster reductions in phophorus losses.	YES (on phosphorus losses)	YES	NO		LOW to HIGH
Reduction in odour emissions	YES (Odour emissions are a key concern in certain countries)	YES (The financial benefit of odour reduction is currently uncertain)	NO		LOW to HIGH
Reduction in VOC emissions and O_3 formation (VOCs emitted livestock waste may make a small but significant contribution to regional ozone formation)	YES (Many low emission techniques reduce both NH_3 and VOC emissions;)	YES	NO		LOW to MEDIUM