# Minutes DairyCap modelers teleconference – April 18, 2016

**Attendees:** Al Rotz, Larry Chase, Curtis Jones, Pete Ingraham, Pete Vadas, Richard Gaillard, Greg Thoma, Nick Stoddart, Ying Wang, Sarah Collier, Carolyn Betz, Matt Ruark, Quirine Ketterings, Joyce Cooper, Kristina, Katerina Stylianou, Karin Veltman, Olivier Jolliet

**Next teleconference: Friday, April 29th, 11am – 1pm (EDT) (10am-noon, Central)**

**Action points:**

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| **Persons** | **Action** | **Date** |
| Al Rotz, Larry Chase | Define and agree upon feed rations for 150 cow herd and 1500 cow herd | *asap* |
| Nick/Greg | Assist Al Rotz in extracting crop-specific emissions and crop yield for each scenario |  |

## Agenda

1. **In terms of farm characteristics, what should be kept constant in the various scenarios to best integrate the feed BMPs with the field BMPs?**

**Proposals:**a) cultivated area and milk production or b) cultivated area fixed, with varying number of animals and milk production to best use the field production (since the original idea of adapting area to maintain identical milk production is too complex). In both cases, we will need to get the emissions per kg of crop produced for each of the produced crops separately to correct for imports and exports.

1. **How to ensure model comparability and a meaningful integration (i.e. emission ranges) of model outputs?**Two main points here: a) For each scenario, DAYCENT and APEX need the amount of manure/N/P applied on each crop (this was taken from IFSM in our previous study, including the subtraction of the amount of NH3-N volatilized at manure application for DAYCENT) and b) We would like to maximize the usefulness of our outputs to other team members, particularly the LCA team, which will use IFSM for a first estimate with a potential uncertainty range defined by the other models for specific farm components.

**Proposal:**Once all scenarios are harmonized with respect to challenge 1 (as described above) and with Larry's rations, we propose to take the input data and results from IFSM, that is manure application, defined crop rotations, crop acres, and feed rations, as the basis for the other models, at least for APEX, DAYCENT and CNCPS.For DNDC it would be of interest to a) run DNDC on the same input data as IFSM (feed ration, crop rotation etc.) and b) also harmonize the internal farm flows with IFSM (amount excreted and/or amount applied on the field) and re-run the scenarios - at least the main scenarios identified under point 4.

1. **How to integrate the individual, farm-component specific BMPs into a small set of whole-farm scenarios?**   
   Joyce will propose us a strategy to get the maximum information from a minimum number of scenarios.
2. **Which historic-current climate scenarios to run in order to ensure consistency with study and paper II on climatic influence?**

Shall we directly use the scenarios from past years from the climate team?

## Main points from the teleconference

No points added to agenda.

1. **In terms of farm characteristics what should be kept constant to integrate feed and field BMPs?**

*Farm characteristics*

* It is decided that (per farm type):
* Total cultivated area will be fixed (areas of individual crops can vary per scenario);
* Number of animals will be fixed;
* Milk production is allowed to float, however, only if the production increases (no decrease in milk production);
* As far as possible, purchases of crops and protein mixes will be kept at a minimum level.
* Manure export will be fixed, that is the same amount of manure export will be used for all scenarios.

Regarding the milk production: Al Rotz’ BMP scenarios for the New York farm are developed by letting the milk production float, as feed intake and milk production increases with increased digestibility of feed (higher NDF) and/or added fat to the diet (BMP feed scenarios). (For the Wisconsin farm, Al has tried to keep the milk production constant). Larry mentions that a dairy farmer will not let the production vary too much. Rather the farmer would buy additional feed so that he/she can keep the milk production constant, therewith ensuring a constant cash flow. Al: What if you can get more milk? The farmer will do that. Larry agrees. Greg mentions that we cannot meet Larry’s scenario without purchasing feed when crop yield is low, e.g. in a bad weather year. It is decided that the milk production is allowed to float, however, only if the production increases. There should be no big decrease in milk production. We will try to minimize purchases of additional feed (as far as possible).

*Feed rations and Wisconsin farm*

* Al and Larry will decide (and agree) upon feed rations for the New York farm and the Wisconsin farm.
* For simplicity, only two protein mixes will be used: 1. degradable protein, i.e. plain soybean meal and 2. undegradable protein, i.e. expeller soybean meal.
* In the next runs, Al will provide the breakdown of ‘purchased feed’ into type purchased (crop-specific, and protein-mix specific, if relevant).
* For the Wisconsin farm, 3 groups of milking cows will be run (early, mid and late lactating cows), next to the replacement heifers and other animals. (This because IFSM needs to have 3 groups of milking cows to let the milk production float).

*Environmental impacts associated with purchased feed*

* To quantify environmental impacts associated with purchased feed crops on a farm, we will use the estimated crop-specific emissions for that farm. This assumes that feed crops are purchased from a farm with exactly the same characteristics (in terms of land area, soil characteristics, animal number, crop rotation schedule etc.)
* Nick Stoddart (and Greg Thoma) will assist Al Rotz in extracting crop-specific emissions from IFSM for each scenario. (Currently, crop-specific emissions are not automatically provided as output by IFSM and can only be obtained by going into the IFSM program code. Nick develops a program to extract crop yield and crop specific emissions automatically from IFSM. These will be added to Simapro and made available for the team. Nick/Greg will contact the DNDC team to discuss developing a similar ‘automatic data extraction’ program for DNDC).
* Greg Thoma will assist in quantifying carbon footprints for the protein mixes (At present, Al Rotz has quantified C footprints based on the dominant protein types in his mix using Greg’s C footprint spreadsheet).

*Other*

* Quirine Ketterings is interested in running the scenarios through the NMB, once the scenarios are fixed.

1. **How to ensure model comparability and a meaningful integration (i.e. emission ranges) of model outputs?**

* All agree on the proposed methodology (see above, agenda point 2).

1. **How to integrate the individual, farm-component specific BMPs into a small set of whole-farm scenarios?**

* Joyce presents the factorial design approach (Design of Experiments) that she developed to select a subset of BMPs that would be of most interest to model in a whole-farm scenario. The method executes the full set of model runs over all combinations of factors (controllable and not controllable) and can provide information on the best combination of BMPs given a specific output parameter of interest (in this case global warming impact). Joyce mentions that it would be much better (in terms of potential combinations) to get the BMPs down to 2 instead of 6. At present, the method does not take interactions between farm components into account. Joyce will look into the possibility to account for interactions.
* Olivier suggests to run the BMPs individually, and afterwards discuss how we will select a subset that can be combined into a small set of whole-farm scenarios. A challenge in combining the individual BMPs is that there are interactions between the different farm components, which have to be taken into account in combining the BMPs.

1. **Which historic-current climate scenarios to run in order to ensure consistency with study and paper II on climatic influence?**

* It is decided that the current climate scenario will be used for the NY location rather than Rob&Chris historic-current climate scenario. (Thus, we will use the climate scenario for the Twin Birch farm that was used previously in the model comparison study and developed by Curtis).