

# Meeting 22 Feb 2019

Present at the meeting Christophe Gouel, Jean-Christophe Bureau, Basak Bayramoglu, Cecilia Bellora, Paul Leadley, Devaraju Narayanappa, Anna Lungarska, David Makowski, Stéphane De Cara, Nathalie de Noblet, Thierry Brunelle.

## Raja makes an introduction to the program of the meeting:

9h30-9h45: introduction

9h45-10h: Presentation of the new database on diversification constructed by David Makowski

10h-10h30: Progress towards comparing potential yields of different crop models by Devaraju

Narayanappa

10h30-11h: News from STICS and AROPAj by Anna Lungarska

11h-11h30: Introduction of the dose-response functions of the nitrogen input in MIRAGE by Cécilia Bellora

11h30-12h30: discussion

- Look back on the meetings in 2018. Some meetings were between few members of the project. There were discussions with Dev on the comparison of yields. There was a meeting with BASC management. Some news on the budget: last expenses are until March 2020 and CDD are until December 2020.
- Overview of the evolution from the initial project. New economic model was included (CG), no link between AROPAj and NLU. PAJ is working on getting the data for EU27 on soils (with Christine Le Bas from InfoSol).
- A view on the outputs. **No deliverables for each task, but only a STIMUL paper : on halving nitrogen in Europe from multi-scale LU models.** Start of a common paper on the  $\frac{1}{2}$  N @ EU. Ideas for a journal:
  - Environmental Modeling & Assessment
  - Ecological Economics
  - Any suggestions?
- Preliminary version available on googledrive:

[https://docs.google.com/document/d/1aBi-FpSZNNr8cxi2zXJ\\_EAxYCF4wOb52ji00hY37vmY/edit?usp=sharing](https://docs.google.com/document/d/1aBi-FpSZNNr8cxi2zXJ_EAxYCF4wOb52ji00hY37vmY/edit?usp=sharing)

- Question from David: papers on the topic? There are maybe plenty of papers looking at the effects on yields of halving nitrogen. Paper title too generic. Maybe put “markets” in the title...
- Suggestion: submit this preliminary paper to the IATRC symposia (deadline for submission March 20<sup>th</sup>)  
<https://iatrc.umn.edu/2019-iatrc-eu-commission-summer-symposium/>
- STIMUL website with all information about meetings and output of the project

[https://www6.versailles-grignon.inra.fr/economie\\_publicue/Projets/STIMUL](https://www6.versailles-grignon.inra.fr/economie_publicue/Projets/STIMUL)

## Presentation by David Makowski:

Slides on a project on crop diversification. If diversifying: positive externalities. Many results in the literature.

The notion is a bit fuzzy: agroforestry, associated plant species, cultivar mixture, intercropping (two cash crops together), landscape heterogeneity, rotation.

Review of the literature, focused on meta-analysis, otherwise 10,000 papers. To synthesize meta-analyses (not individual papers): 100 meta-analyses.

Rotation is the most popular in EU. The same Northern America. Africa, central America, Southern Asia: Agroforestry.

A paper on data is under minor revision in Data in Brief. Externalities are related to biodiversity, soil quality (organic matter) and yield.

Dealing with redundancy in the data base, some papers are using the same papers.

Is the reduction in yield variability studied in the meta-analyses. Are primary papers interested?

Neither initial papers nor the meta-analyses look at this since they need long term observations.

Most meta-analyses are after 2000. Meta-analyses are studied following different criteria.

Pre-registration / Publication of the protocol before the actual study.

Weight the studies depending on the quality of the procedure.

The output here is the dataset.

Can we go back to the primary papers from the dataset: no. You have to look at the primary paper.

An example of effect size:  $Y_D$  – yield in diversification;  $Y_0$  – control value. The effect size is the

difference, the ratio. A big discussion on the topic of effect size in terms of the comparisons. If

control and treatment are conducted in the same context, it's OK. For biodiversity it's complicated since everyone has its own index of biodiversity.

## Presentation by Devaraju Narayanappa

Work at LSCE on task 2 and 5.

-To compare yields of different crop models

-STICS, LPJmL, ORCHIDEE

-3 different climate forcing scenarios lead to 3 simulations with different results: ERAI; CRU-NCEP; GSWP3

-Irrigation effects test: absence, local irrigation, full irrigation for maize/wheat

-N-fertilizer effect test: Crop yield = fn (Nitrogen fertilization) for different yields: wheat, maize, rice

The flow chart in STIMUL. The idea is to get at the same page between models.

The comparison of yields.

Some test on sensitivity of models.

Looking at the climate forcing and the differences between them. The variability in wheat and maize yields.

ERA Interim has the least variability which is strange.

Different forcing leads to difference in results.

Test on irrigation: three levels of irrigation, 1) no irrigation, 2) calculation with needs and supply (by rivers accounting for water competition), 3) no water stress.

Nitrogen sensitivity: no interaction between C and N cycles.

No nitrogen cycle, the tool is photosynthesis parameter.

Looking for a coefficient to calibrate ORCHIDEE for the sensitivity on N. Maybe on STICS results used in AROPAj.

Some trials for France are available and meta-analyses.

Description of hypothesis behind each model concerning yields.

CG: what's important is the variability between pixels and not figures their self.

DM: compare with the actual yields. Do we need variability of the sensitivity or only of yields.

SDC: look if it's maize forage or maize grain that are compared.

Next steps: calibrate ORCHIDEE, understand the low variability, look maybe also on planting dates.

PL: the paper Dev cites, is not on pesticides.

TB: Look at yield gaps from the models.

Gets some more information on the simulations.

### **Presentation by Anna Lungarska**

-STICS: generic crop model at the plot level (parcel); daily simulation, variables: soil, climate, agri practices, inputs nitrogen and water

-AROPAJ: supply side model, no market adjustments, prices are given; output: production, and profits, farm scale (group of farmers); crop land use choice and inputs decisions (thanks to STICS) also climate data (thanks to STICS and also other data)

-Objective is to use STICS for MIRAGE as was done for AROPAj

-V5 version of AROPAj: year 2008, present climate functions for UE15; soil data UE 27 (difficulties obtaining it).

### **Presentation Cecilia Bellora**

Back to economics. Some explications on MIRAGE and its hypotheses. Interesting for studying leakages related to policies (carbon, land use). MIRAGE-e focused on energy and not agriculture. Limitations: no substitution between land and input (N). Fertilizers are aggregated in the chemistry sector. For now, the hypothesis for  $\frac{1}{2}$  N is to reduce by 25% the chemistry sector. Currently, no differentiation between land use switching wheat vs maize, wheat vs pasture (not the same way).

Also, a problem with expansion, no limitation in cropland/pasture expansion. No forestry. No heterogeneity in land within a country. Everything is in \$\$, no physical units and no consistency.

Look back on the results with the 25% chemistry sector hypothesis.

PL: Why are we not liking the mechanisms ?

Because no substitution between land and input. No crop switching.

Solutions: introducing dose-response functions.

Needs for data on fertilizer use: quantities and values.

Substitution between land: some data already available from previous versions of MIRAGE.

Expansion: done already.

Data on rents: GTAP.

### **N data for MIRAGE-e (Anna)**

-Mineral N fertilizer application rate per crop per ha; N from animal manure applied on field per crop per ha; Atmospheric deposition per crop per ha; N present in soils per crop per ha (own calculations)

All that is done for MIRAGE can be done for the Christophe's model. The latter is more flexible and has a better level of detail.

Check for nitrogen deposition if there are some small scale AEZ where it can be important.

**Remi from CIRED:** could make predictions on the impacts of N on biodiversity (from PREDICT model)

On the JRC Symposium: strategic and good idea. Even very preliminary results would be interesting.