Systool Web:
a new on-line application
for the French INRA "Systali" project

P. Chapoutot,
O. Martin, P. Nozière and D. Sauvant

patrick.chapoutot@agroparistech.fr

66th EAAP ANNUAL MEETING
31 AUGUST - 4 SEPTEMBER 2015
WARSAW, POLAND

Outline of the presentation

- The French INRA "Systali" project
- Organization of Systool Web
  - Objectives of Systool Web
  - Pedagogical aspects
  - Calculation aspects
- Some illustrations
- Conclusions

The Systali project

The INRA "Systali" project

- **To predict more precisely:**
  - ➢ The NE, PDI, AADI supplies & the flows of other nutrients (VFA + Gas + Glucose + Fatty acids …)

    Already published (2013 & 2014)
  - ➢ The animal requirements & their responses to NE, PDI & other nutrients

    Still in progress
- **To enlarge the fields of application of the INRA feed unit systems (→ hot countries, intensive diets…)**

The INRA "Systali" nutrient supply model

- **Prediction of the flows of diet nutrients**
- **More precise description of Digestive Interactions:**

$$Value(diet) = \sum_j p_j \times Table\_value(feed)_j \pm DI$$

- **Empirical modelling of DI:**

Major impact on OM digestibility

3 Causes: **Feeding level (DMI % BW)**

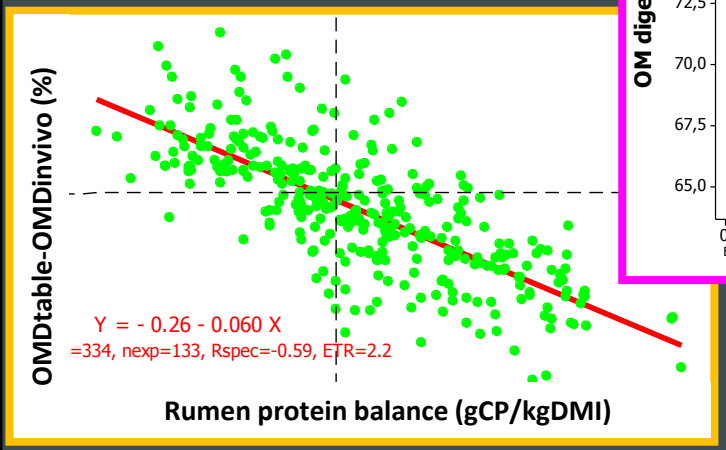
Prop^n of concentrate (0< <1)

Rumen Protein Balance (*=CP intake – CP duodenum)*

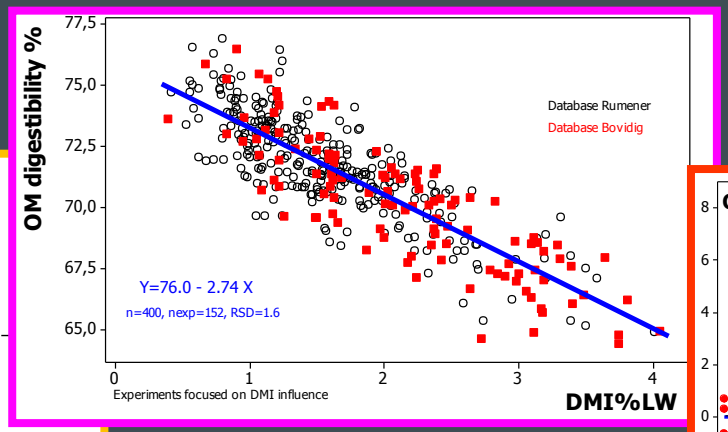
Major causes of Digestive Interactions modifying OM digestibility

Rumen Protein Balance *(RPB)*

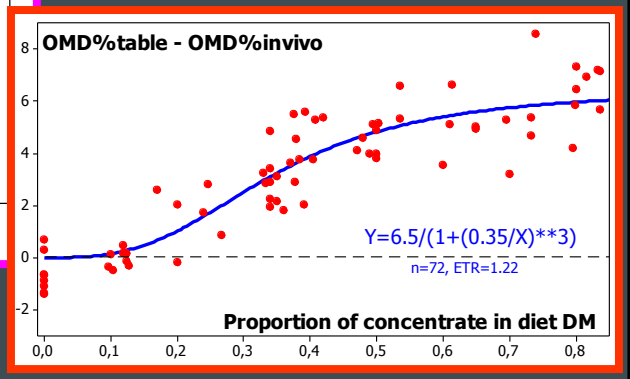
=CPintake – CPduodenum



Feeding Level *(DMI%LW)*



Proportion of Concentrate *(PCO)*



In addition…

- **Other processes impacted by the 3 factors of DI:**
  - NDF digestibility & Rumen Fermented OM (FOM)
  - Protein and Starch digestive partition *(through transit rate)*
  - CH4 production
  - Urinary E & N production

- **Rumen Protein Balance (ration)** { = Output data / = Input data (→DI)
  RPB = f(PDIME, PDIMN)

=> Iterative process of calculation

→ More and more complex calculations

→ Computer calculations needed

Organisation of Systool Web

Systool Web

Home | Feed Model | Ration Model | Calculations | Downloads | FAQ | Webmaster | Masterfile | Contact | Logout: PC

Objectives of Systool Web

Objectives of Systool Web

Due to strong demand from professionals

- ✓ To obtain further explanations about the new concepts
- ✓ To practice the use of the new calculation models
- ✓ To integrate all the new equations in their own tools

➔ **A simple & powerful tool, quickly implemented (3 months) & funded by AFZ, with 2 main objectives:**

- ➢ A pleasant e-learning tool for the nutrient supply model
- ➢ An efficient tool to compute feed & ration values

Systool Web

Home | Feed Model | Ration Model | Calculations | Downloads | FAQ | Webmaster | Masterfile | Contact | Logout: PC

Pedagogical aspects

Systool Web

Home | Feed Model | Ration Model | Calculations | Downloads | FAQ | Webmaster | Contacts | Logout: PC

Global view | Feed+Anim+Ration+Outflow | Digestive Interactions | Energy | Nitrogen | Starch | Cell wall | Fatty acids | Amino acids | Glossary

- Area
- Neighboring
- Predecessor
- Successor
- Equation
- Graphic

- RuProBalrefj
- Delta_OMd_Anij
- Delta_OMd_RPBj
- Delta_OMd_FLj
- Delta_OMd_PCOj
- OMdj
- FLrefj
- Intercept_RPB
- Intercept_FL
- Intercept_PCO
- Slope_RPB
- Slope_FL
- Slope_PCO
- Urea

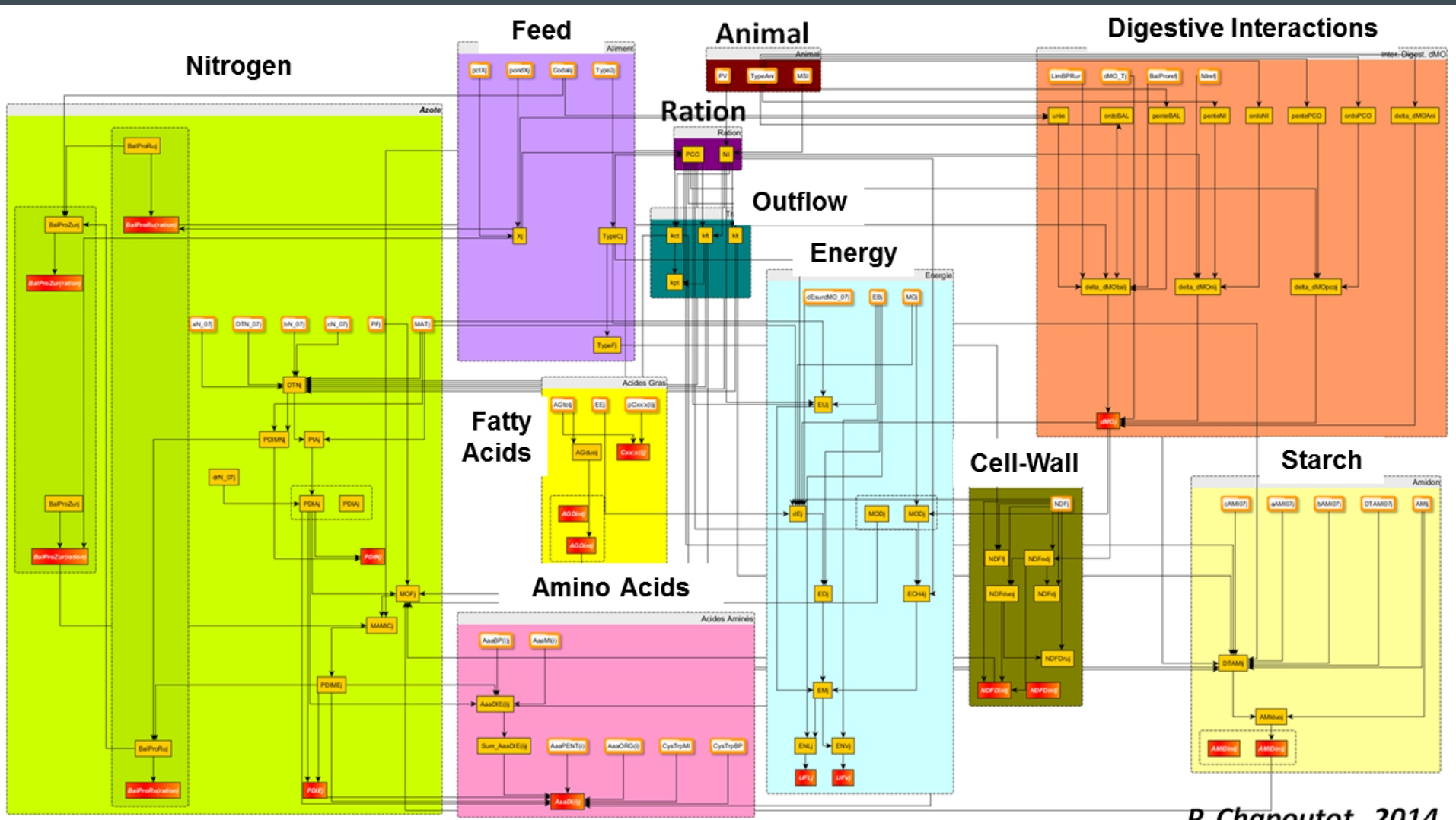
- 2 sub-models : the "Feed model" & the "Ration model"
- Variables gathered in different areas

  → energy, nitrogen, cell-wall, starch, fatty acids…
- Representation of the chaining variables according to the equations of the models:

  → Neighboring-, predecessor-, or successor-diagrams
- Detailed description of all the equations of the models
- Graphs of the main relationships between variables

Systool Web

Different variable areas of the "Feed model"



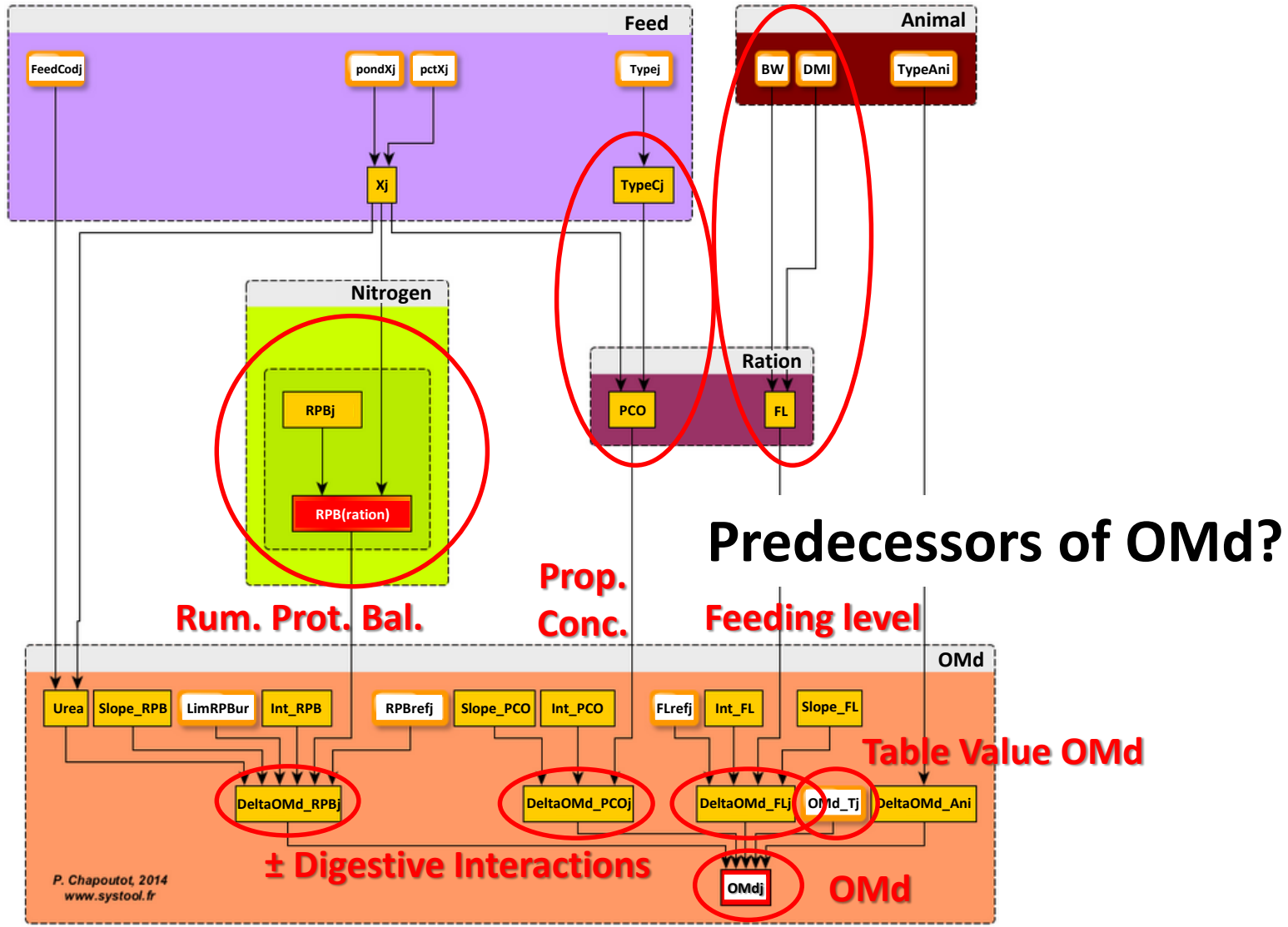
P. Chapoutot, 2014

www.systool.fr

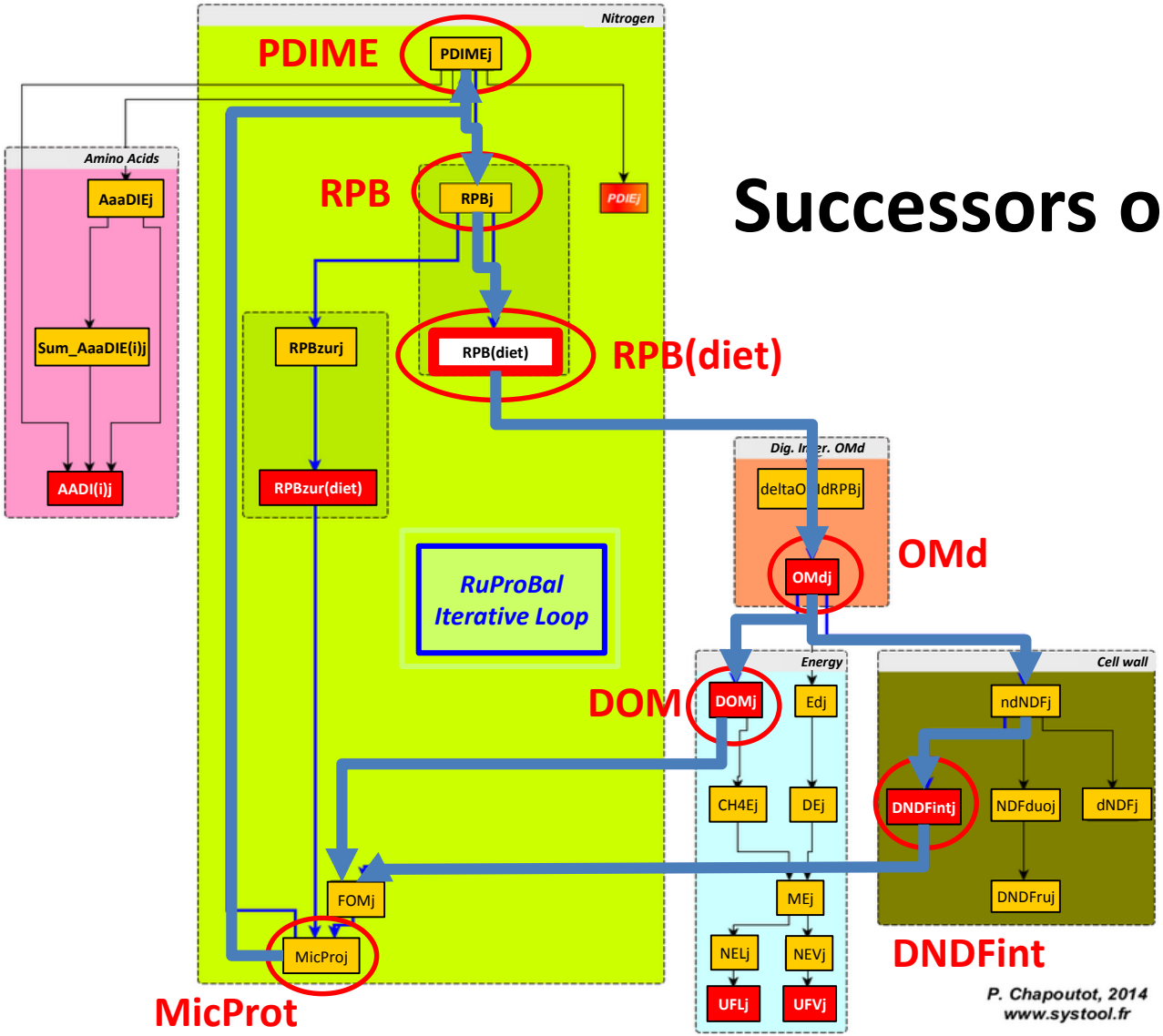
- Area
- Neighboring
- Predecessor
- Successor
- Equation
- Graphic

- RuProBalrefj
- Delta_OMd_Anij
- Delta_OMd_RPBj
- Delta_OMd_FLj
- Delta_OMd_PCOj
- OMdj
- FLrefj
- Intercept_RPB
- Intercept_FL
- Intercept_PCO
- Slope_RPB
- Slope_FL
- Slope_PCO
- Urea

Feed Model / Digest. Inter. / Predecessor / OMdj



Feed Model / Nitrogen / Successor / RuProBal(diet)



Successors of RPB?

Systool Web

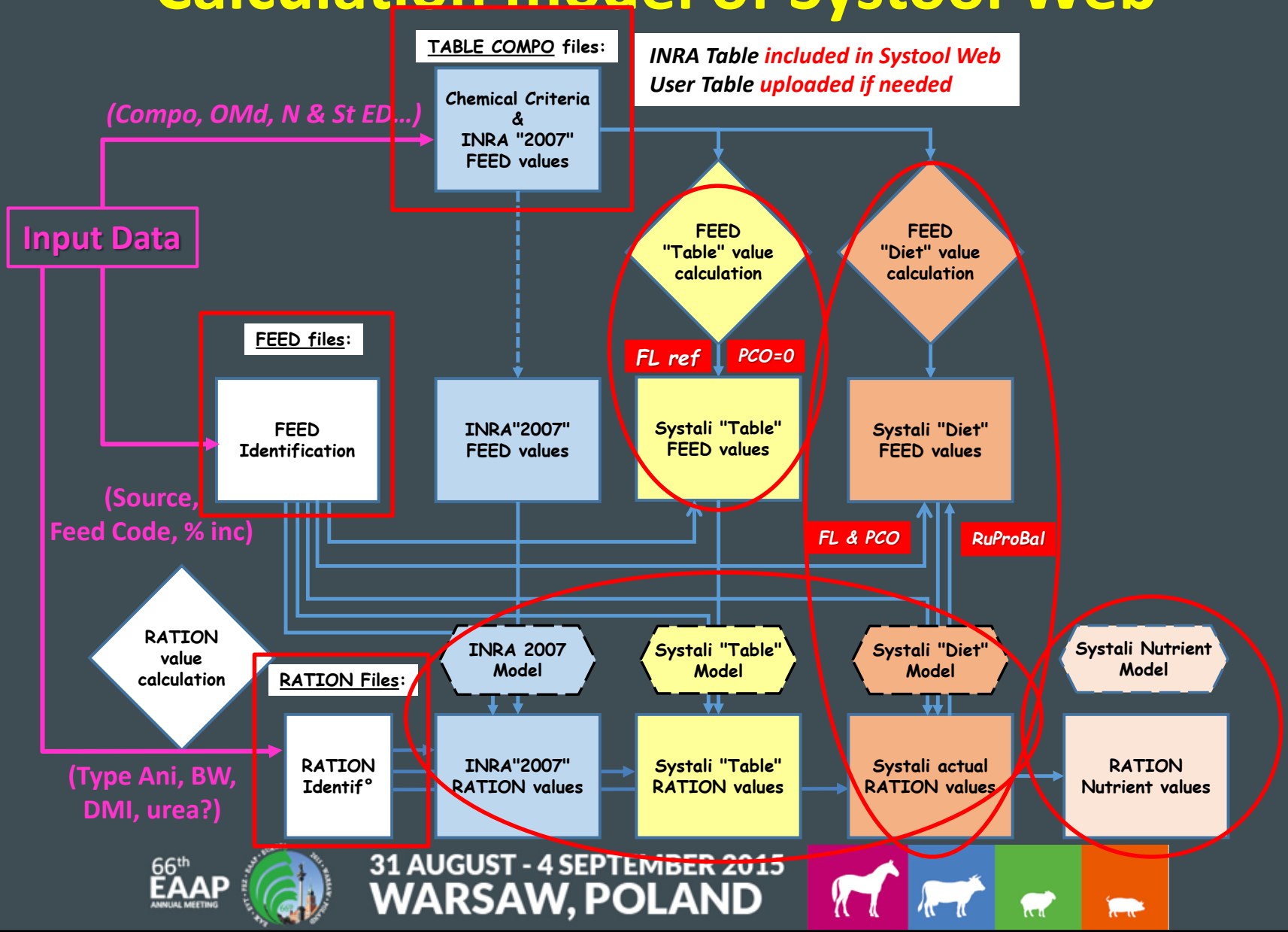
Home | Feed Model | Ration Model | Calculations | Downloads | FAQ | Webmaster | Masterfile | Contact | Logout: PC

Calculation aspects

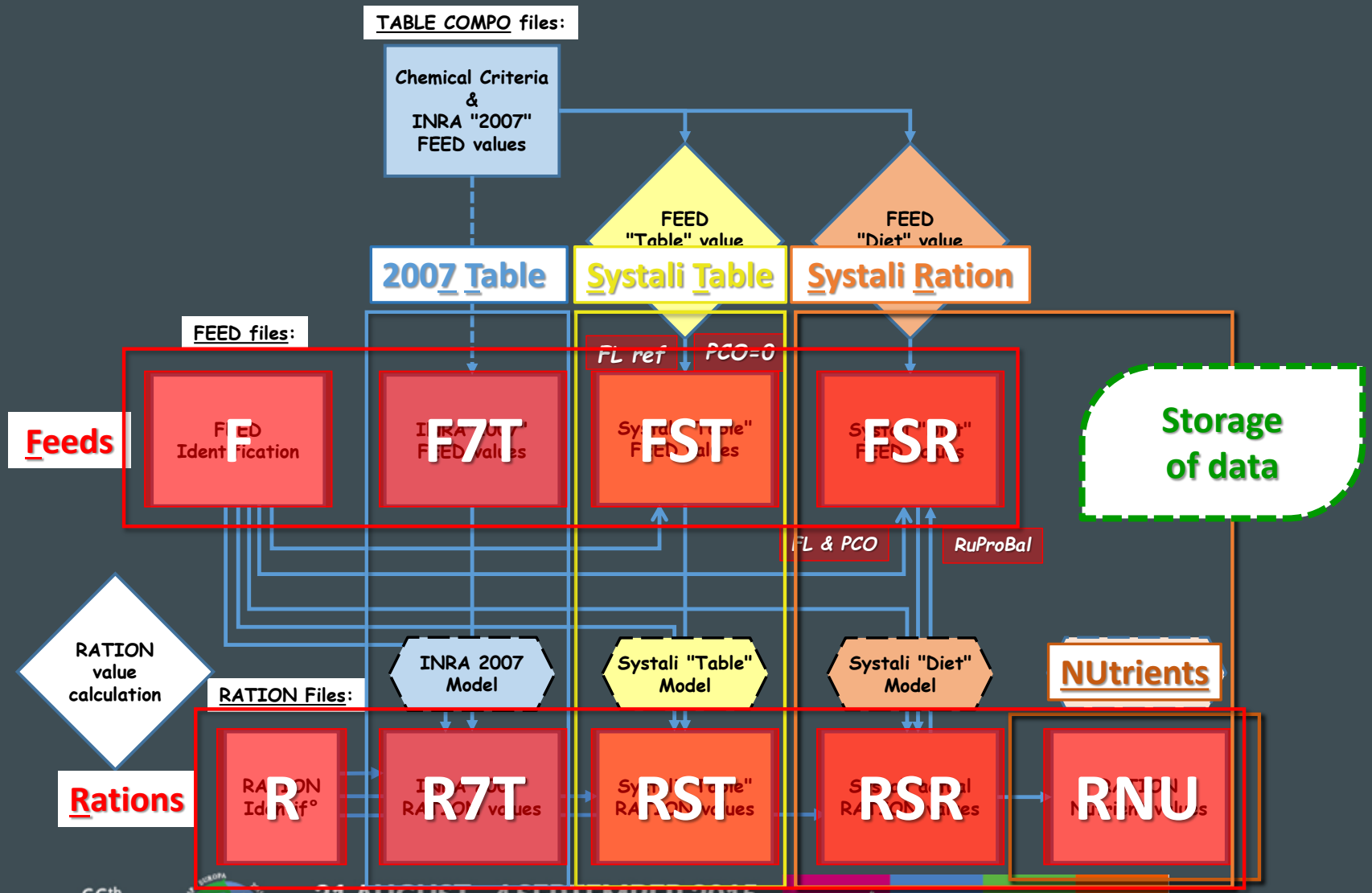
Approach & Organisation of calculations

- Equations are used to estimate Feed values:
  - → Feed "Table" values (with FL=ref, PCO=0, without RuProBal)
  - → Feed "Diet" values (with FL, PCO & RuProBal of the actual ration)
- Additivity calculation used to obtain Ration values:
  - → "Systali" values of the diets
- Calculation of the Nutrient flows from the ration values
- Deliberately light structure of data:
  - → Simple organization of the Input variables (Rations, Feeds, User Table)
  - → No interpretation/transformation of the output variables (self-interpretation by users)

Calculation model of Systool Web



File structure of Systool Web

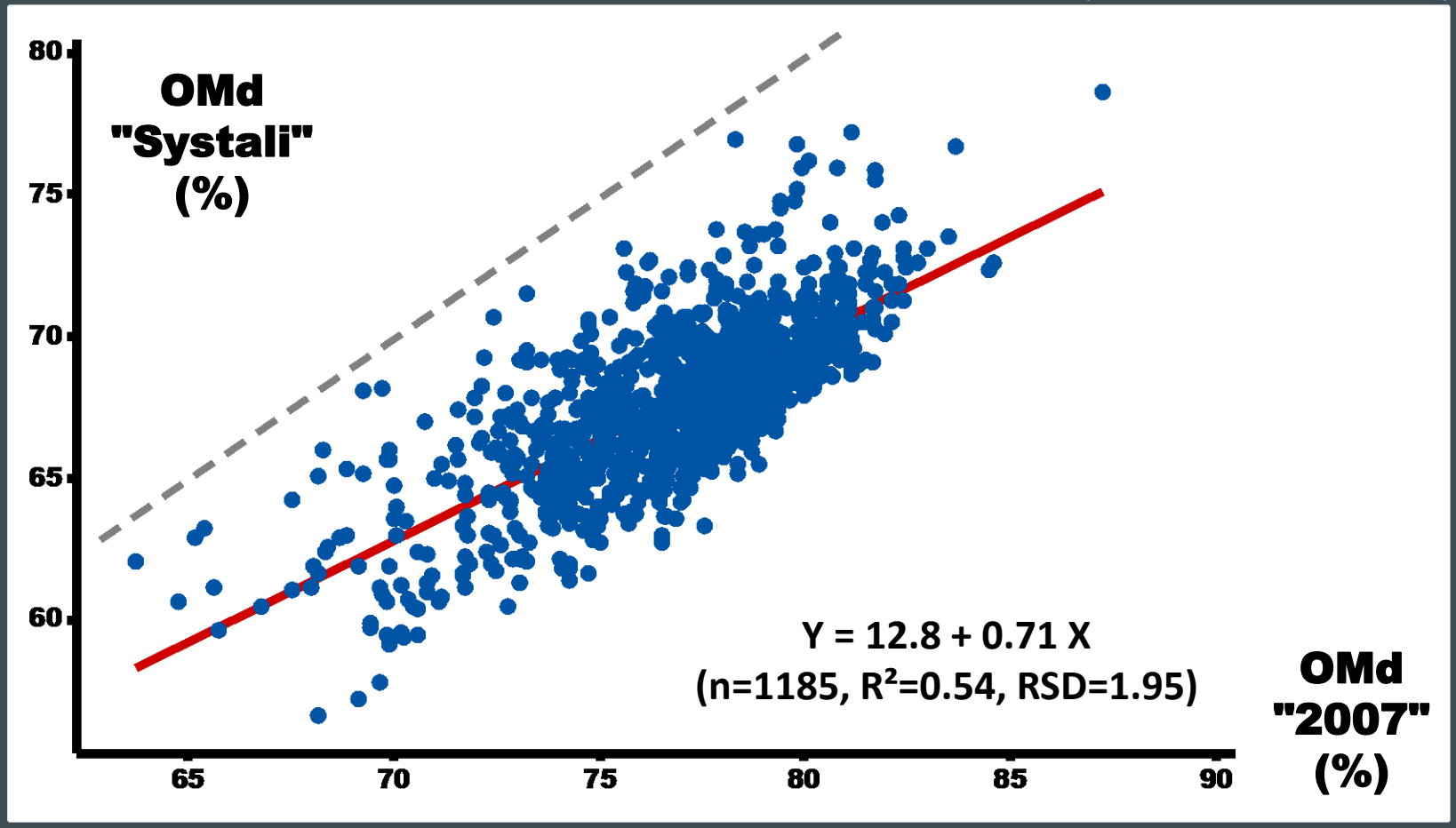


What can you do with all these data?

Just use your brain…
…and add your own touch!

Comparison of OM digestibility of rations "Systali" *vs* "2007"

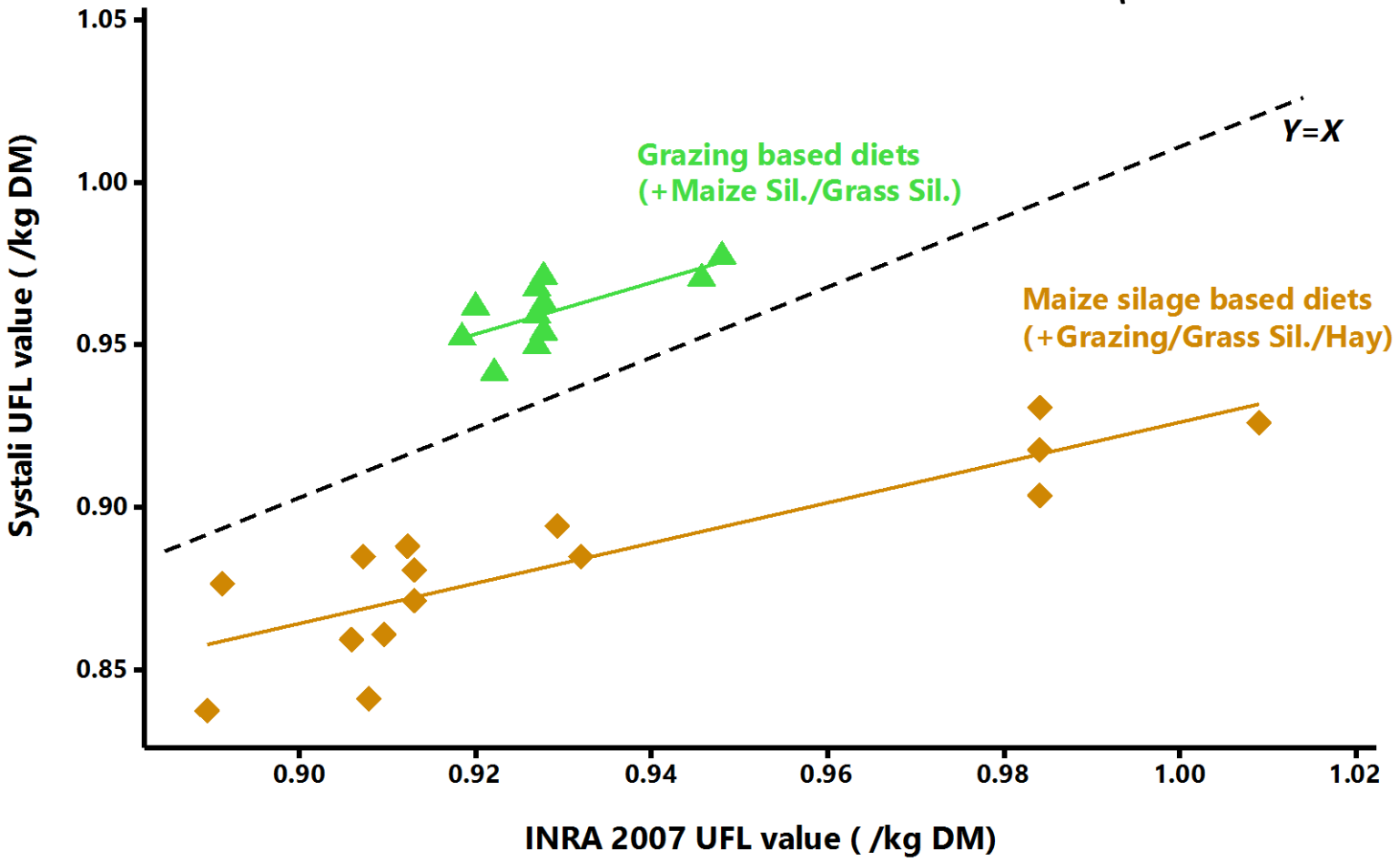
Source: J-B. Daniel (MosarCo Data base)



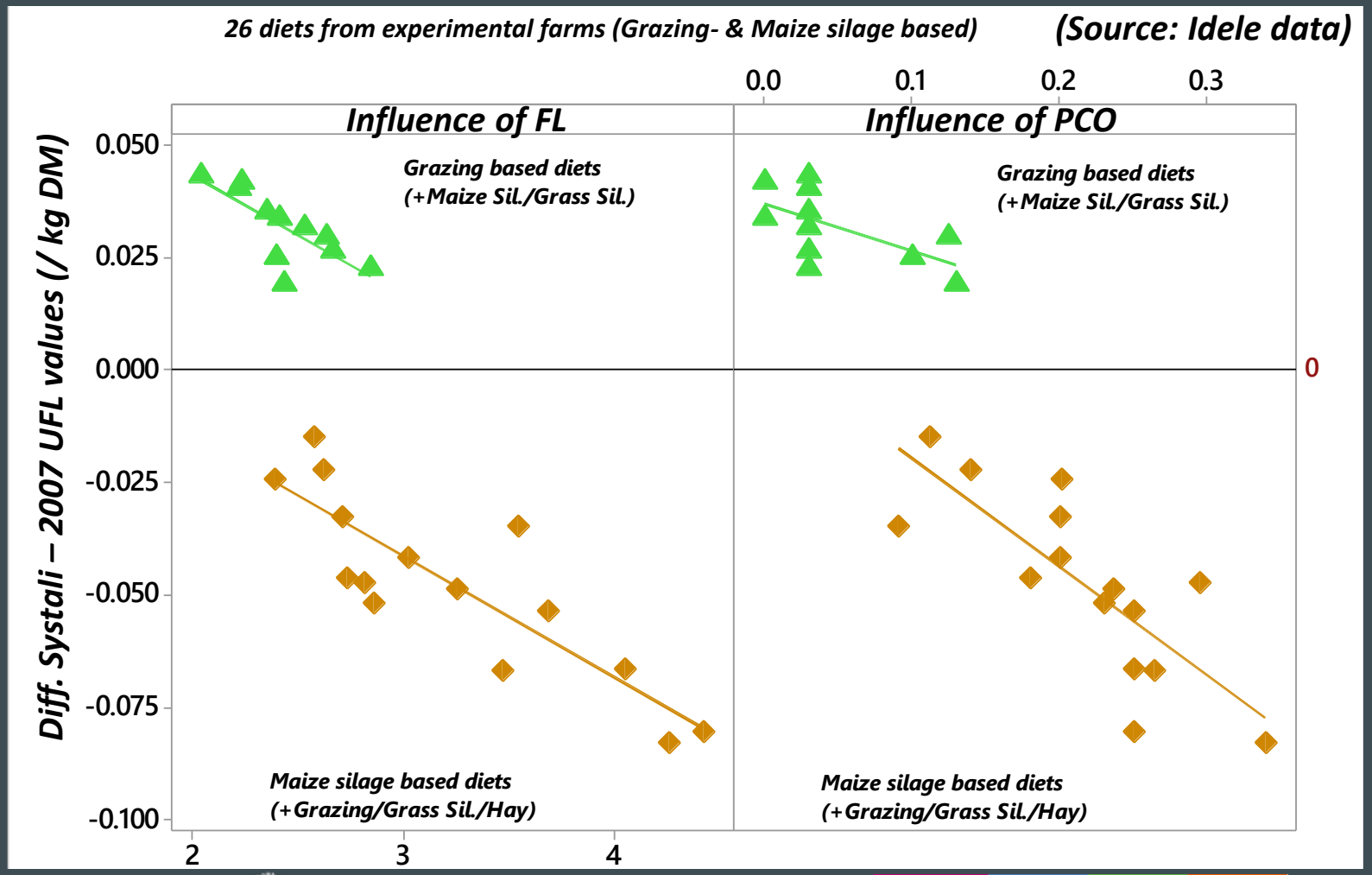
Comparison of the UFL values of rations "Systali" *vs* "2007"

26 diets from experimental farms (Grazing- & Maize silage based)

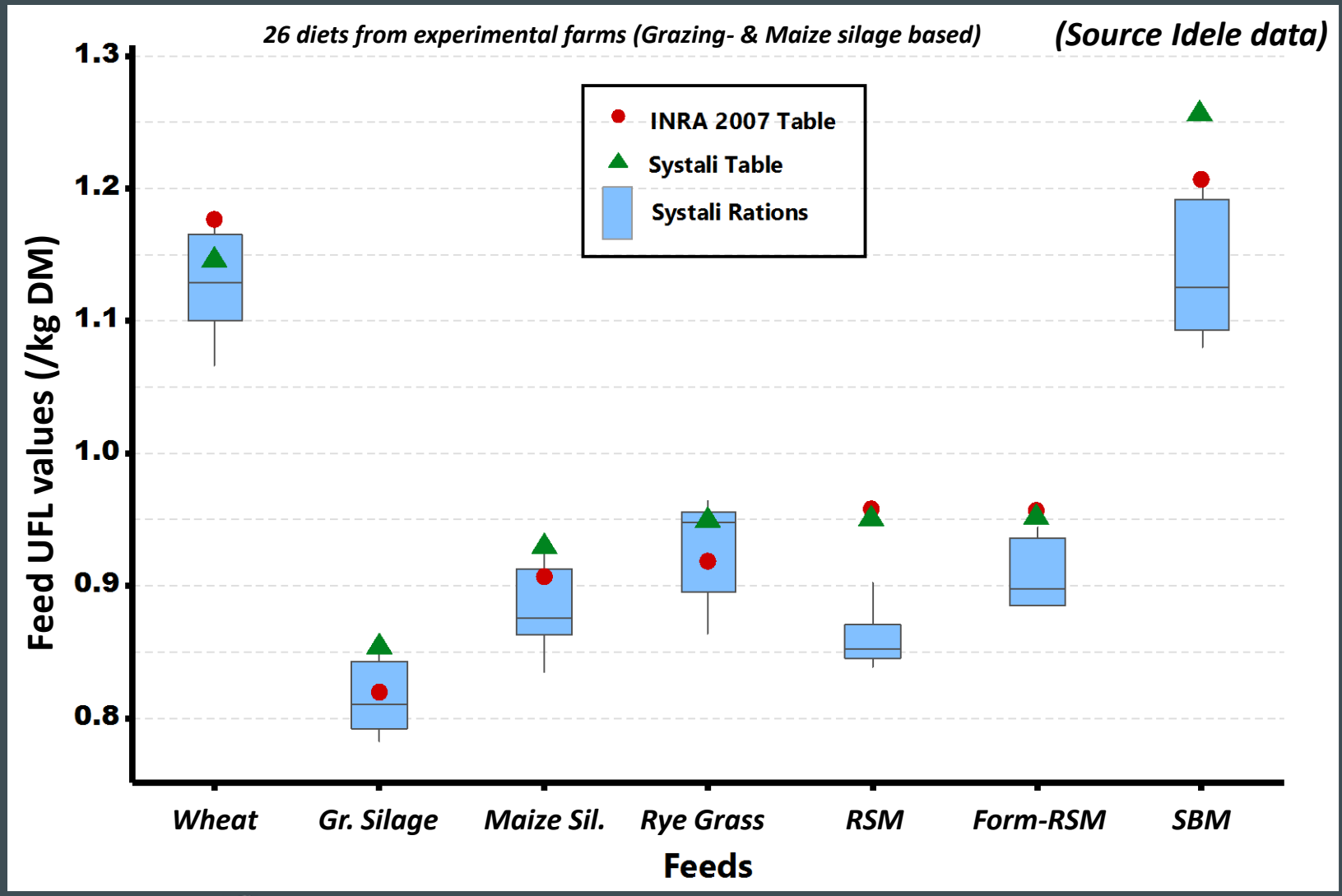
(Source: Idele data)



Influence of FL & PCO on the differences Systali - 2007 of UFL ration values



Comparison of "Table" & "Diet" UFL values of feeds



Conclusion

A user-friendly & powerful app

- A synthesis of all the equations of the Systali supply model
- A simple & illustrative representation of the chaining variables
- A very efficient tool → light-speed calculations:
  only 15-20 sec. for 600 rations including 6000 feeds!
- Systool web currently in French…
  …but an English version available very soon!
- Future evolutions:
  - Short-term: Update the evolutions of the Systali models
  - Later: Compare INRA Systali to other international systems…

Systool Web

Thank you for your attention!