



67th Annual Meeting of the European Federation of Animal Science – Belfast, UK – 29/08/2016



ArchiMod: a metamodel of farming systems functioning to address future livestock challenges

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Introduction

Animal nutrition



Soil science



Diversity

Network

Flow

Crop science



Interactions

Cycle

Computer science



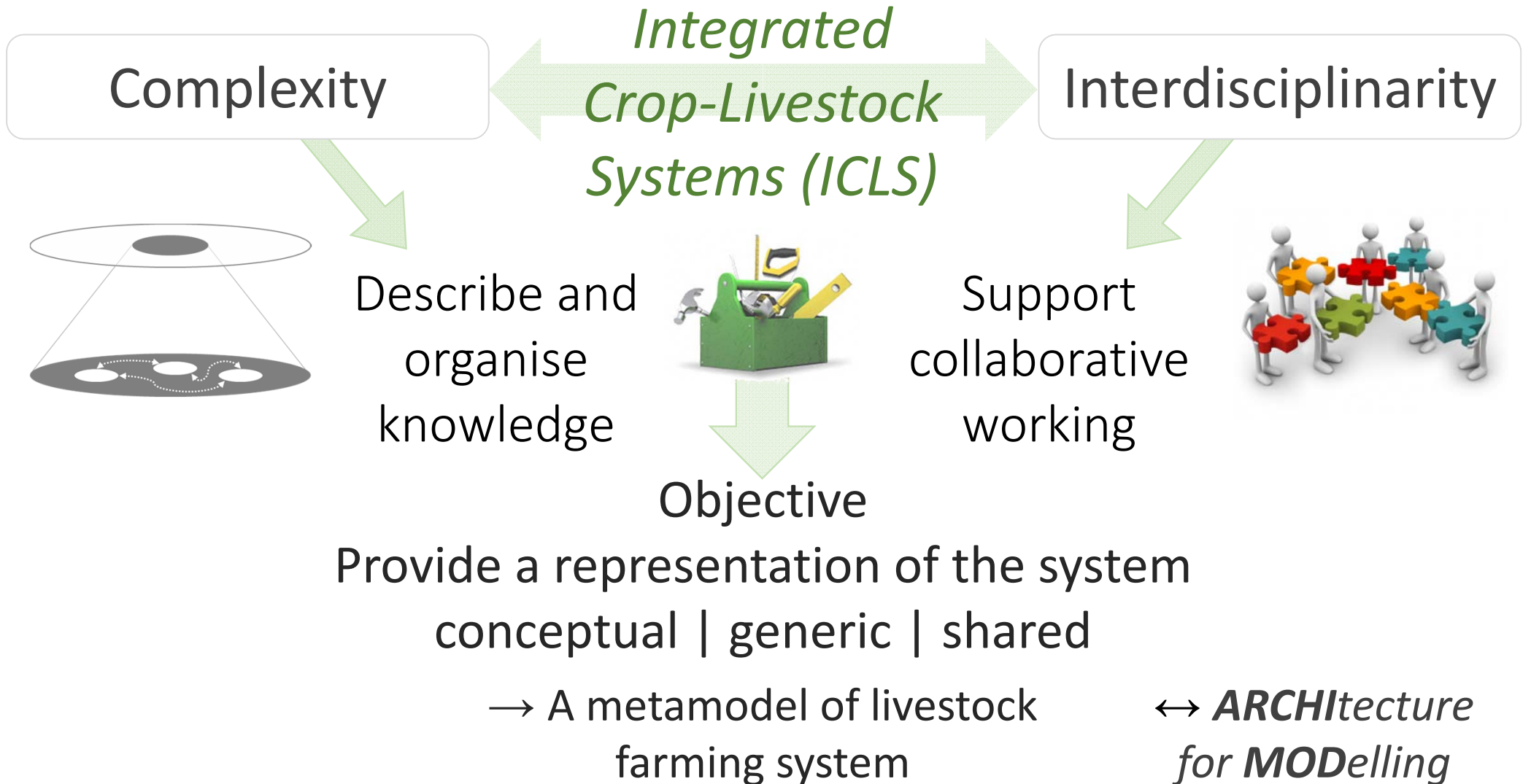
Organization levels

Social science



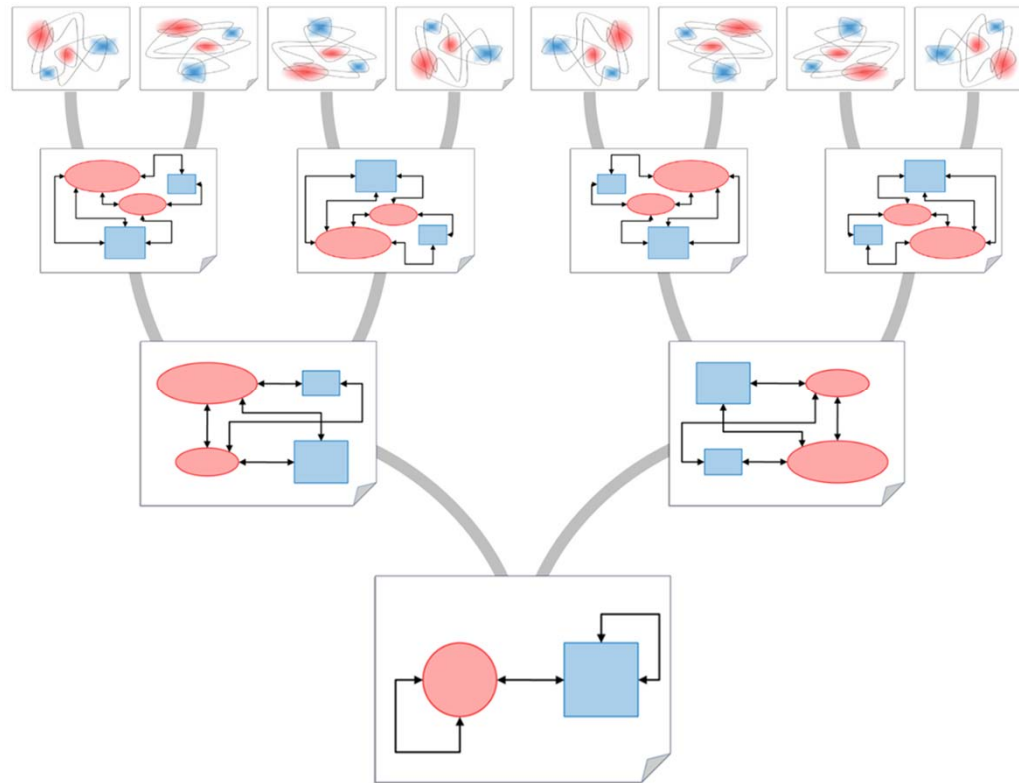
Management science

Introduction



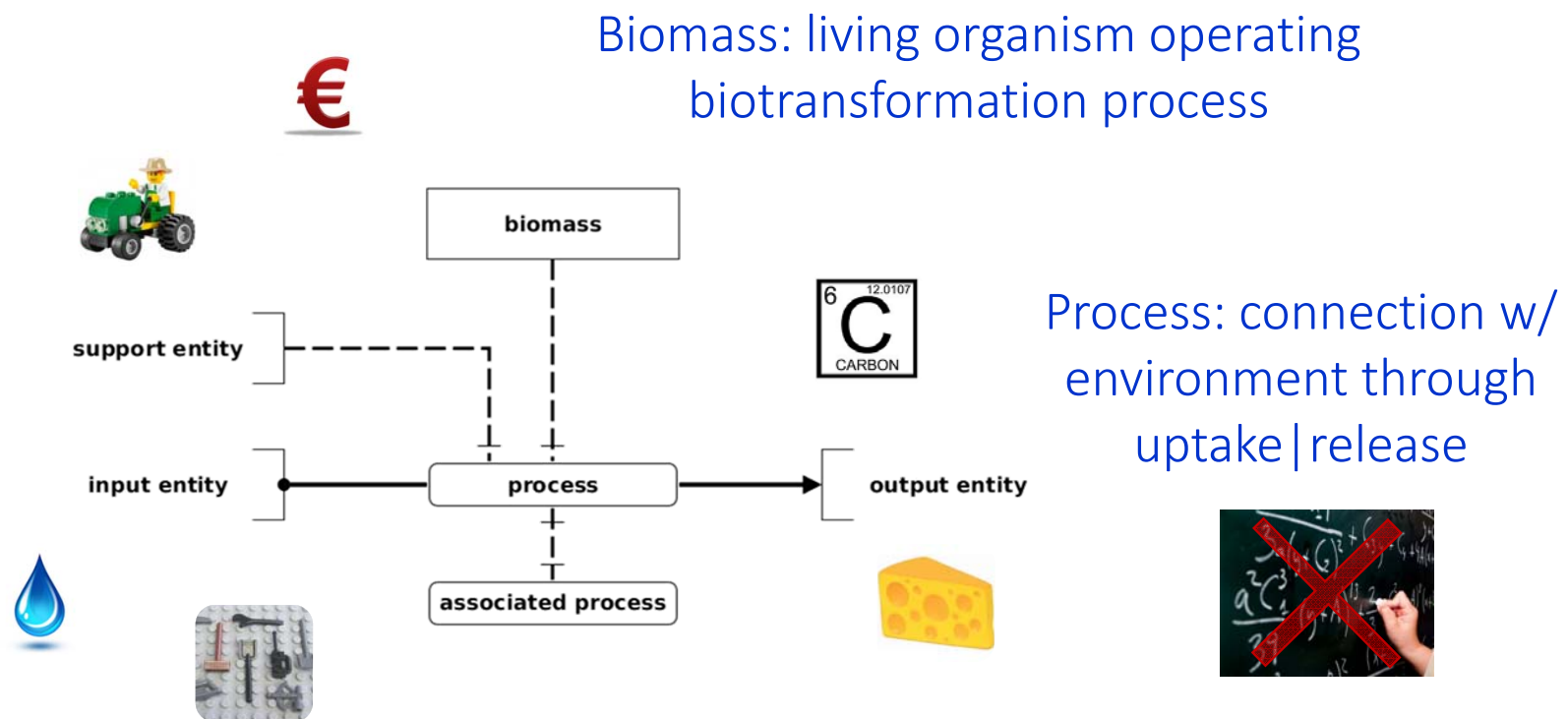
Methods

- 3-y collaborative project (PHASE funding) | \approx 40 INRA scientists, multi-sp
- Series of seminars \rightarrow Emergence of a shared representation



Results: the graphical language

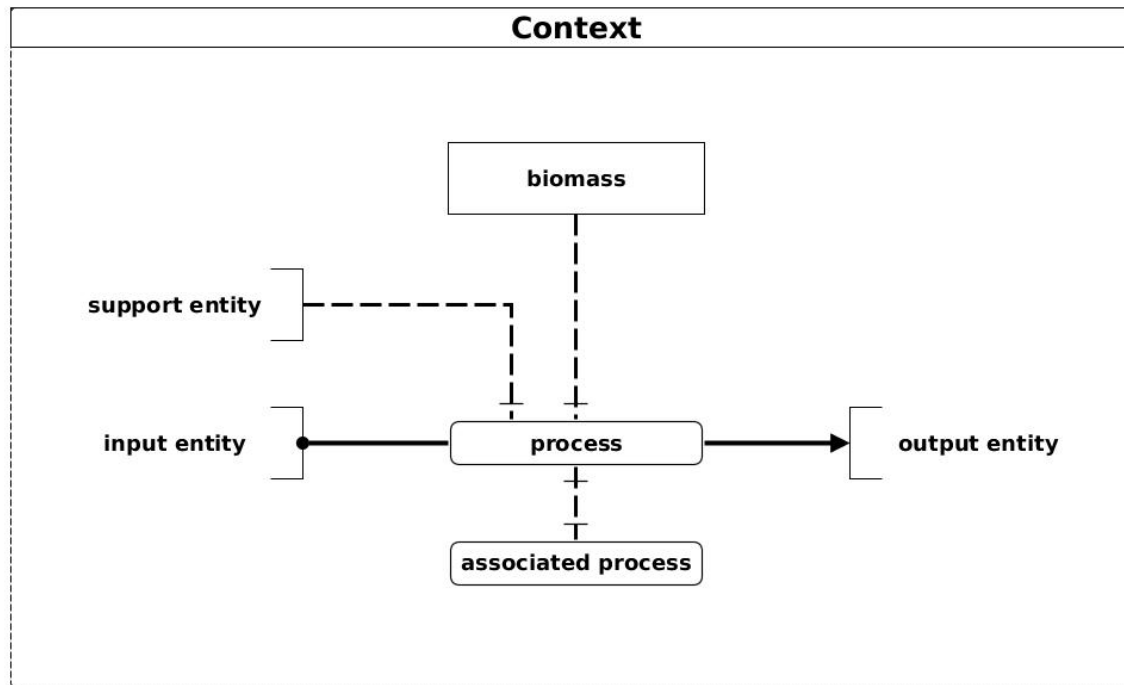
- Process → building block



Entities: material | immaterial,
living | inert, organic | inorganic

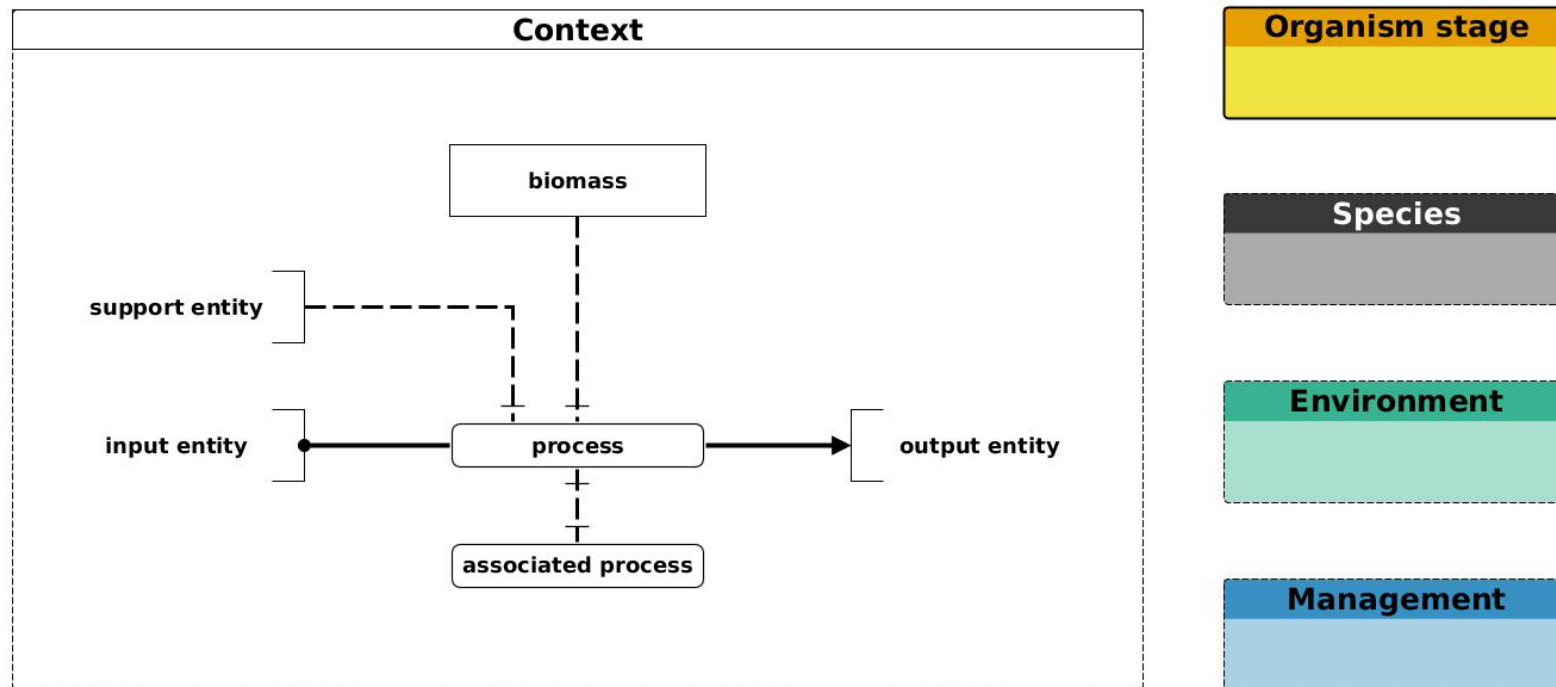
Results: the graphical language

- System's functioning → putting building blocks in contexts



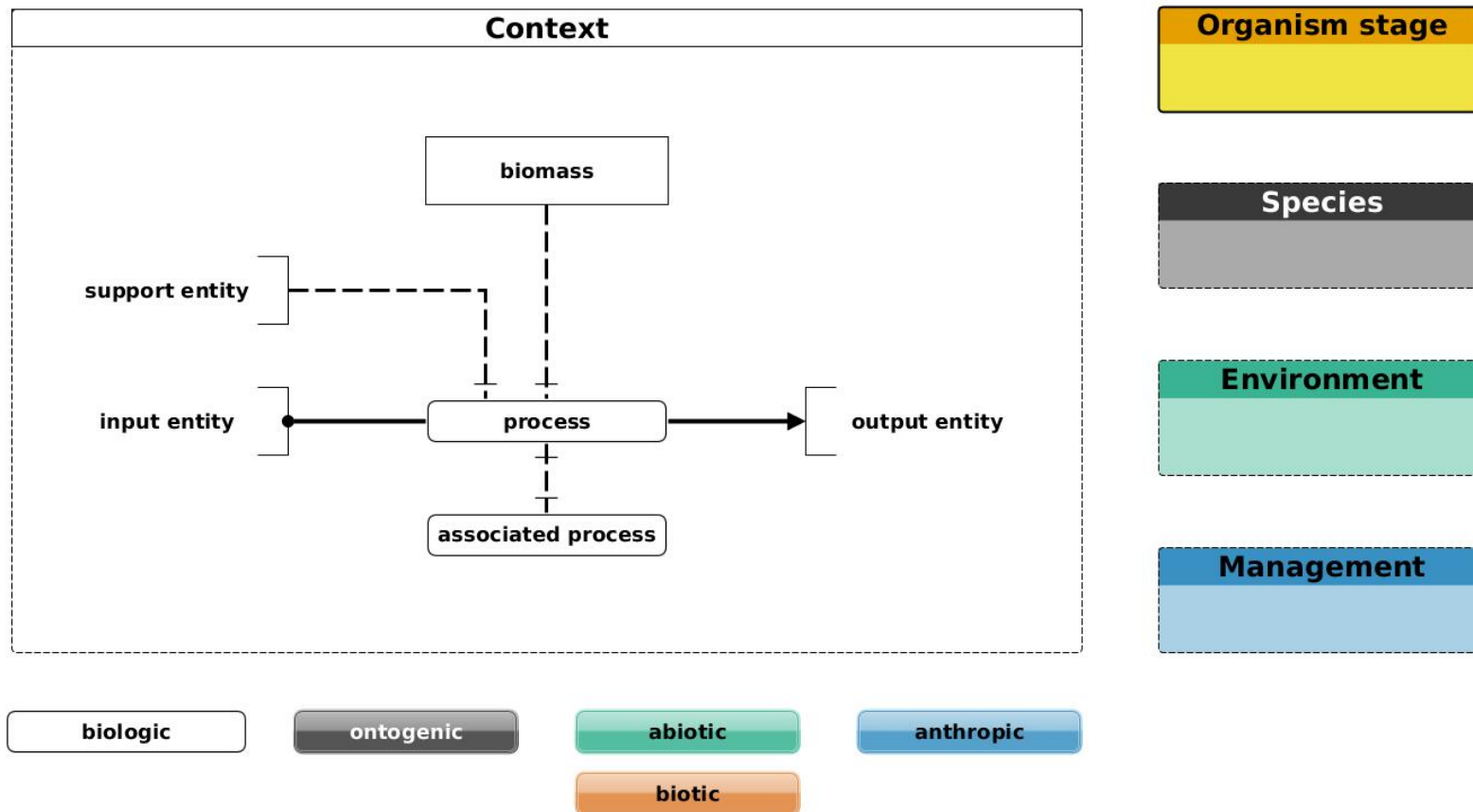
Results: the graphical language

- System's functioning → putting building blocks in contexts



Results: the graphical language

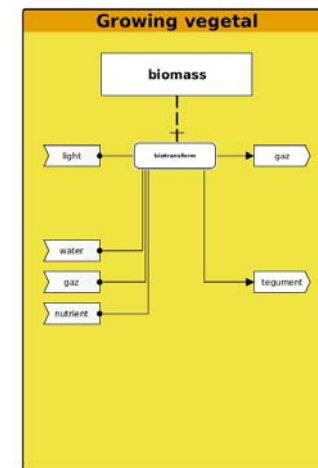
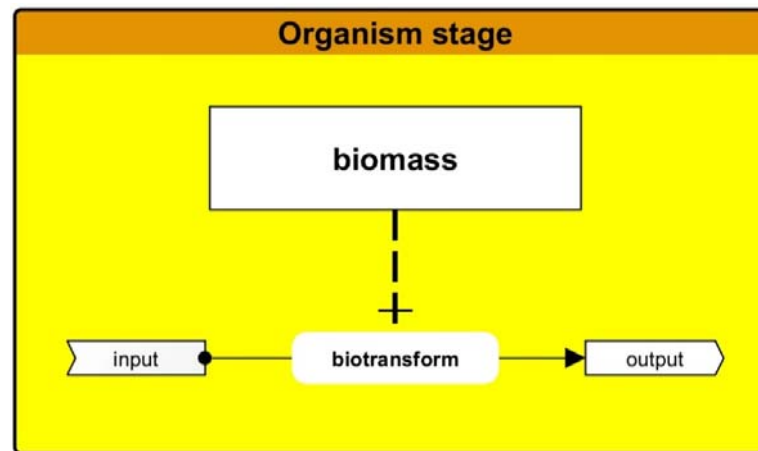
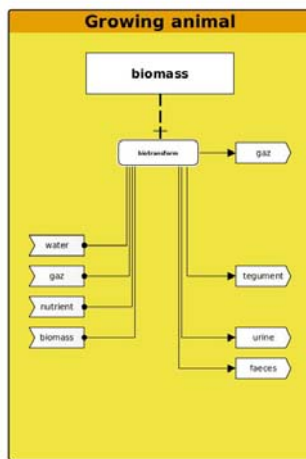
- System's functioning → putting building blocks in contexts



Results: the graphical language

- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment

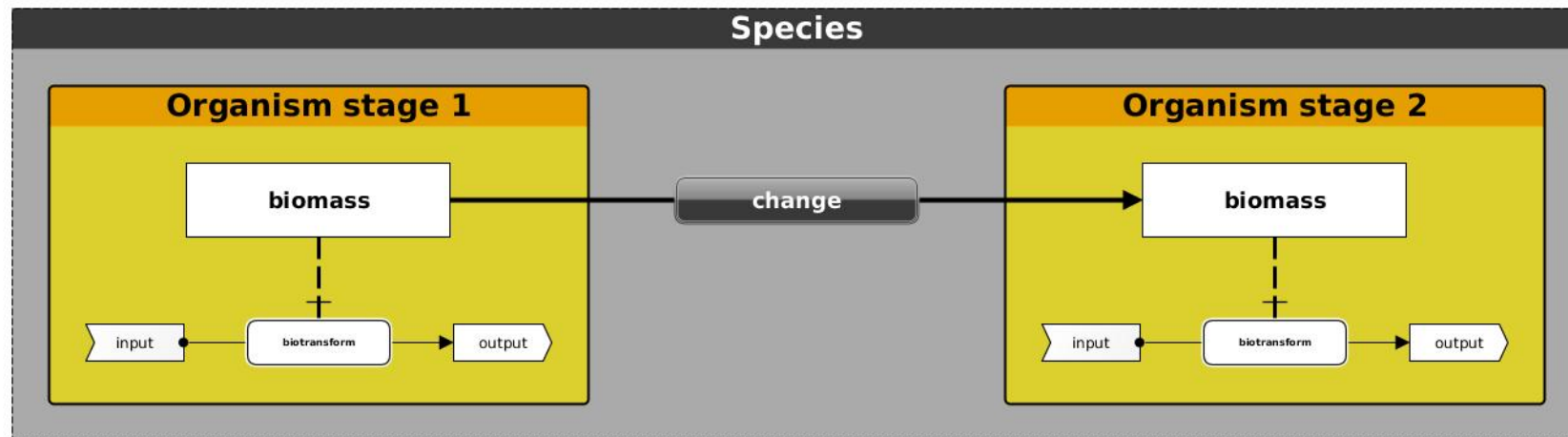
Biotransformation process: a synthetic view of all processes within the organism
↔ exchange of entities



Results: the graphical language

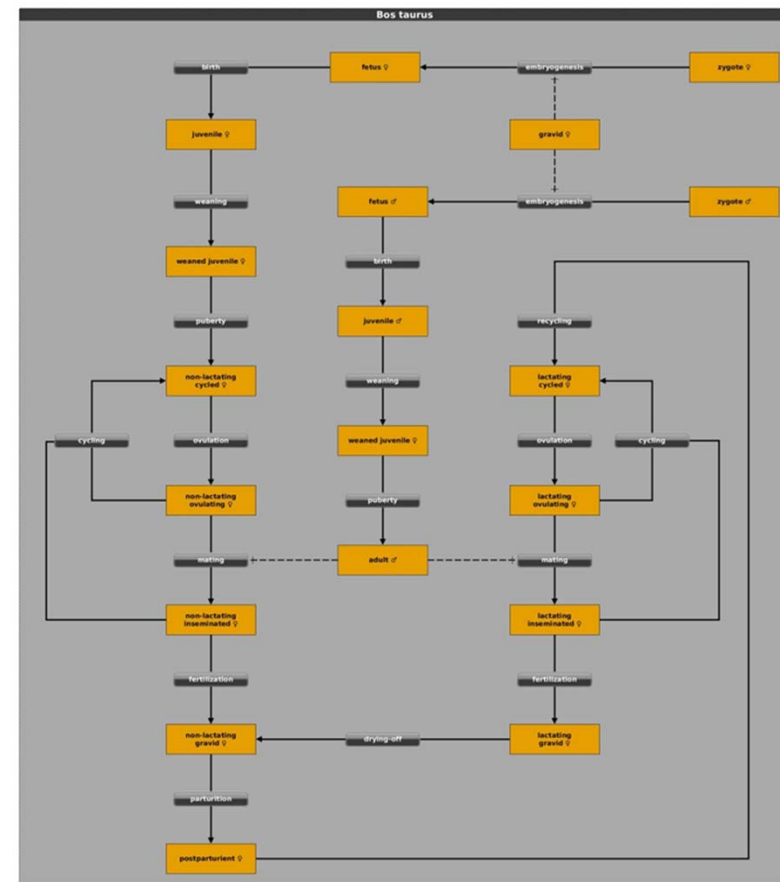
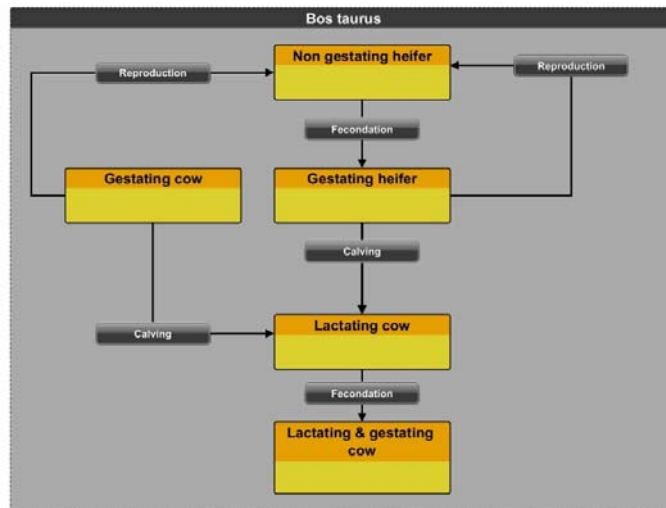
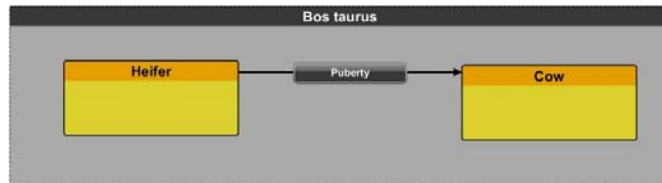
- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
- Species pathways: transitions through time

Transition among stages ↔ ontogenic process



Results: the graphical language

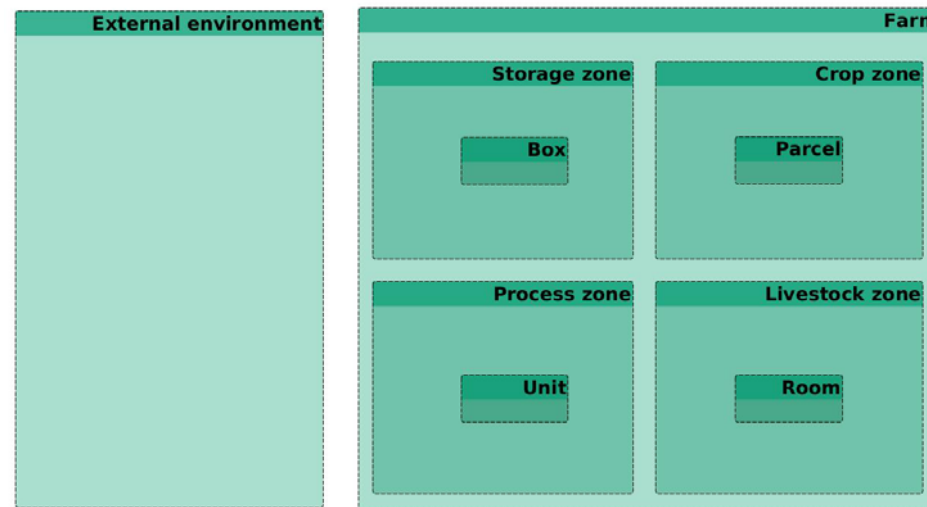
- ± complex pathways



Results: the graphical language

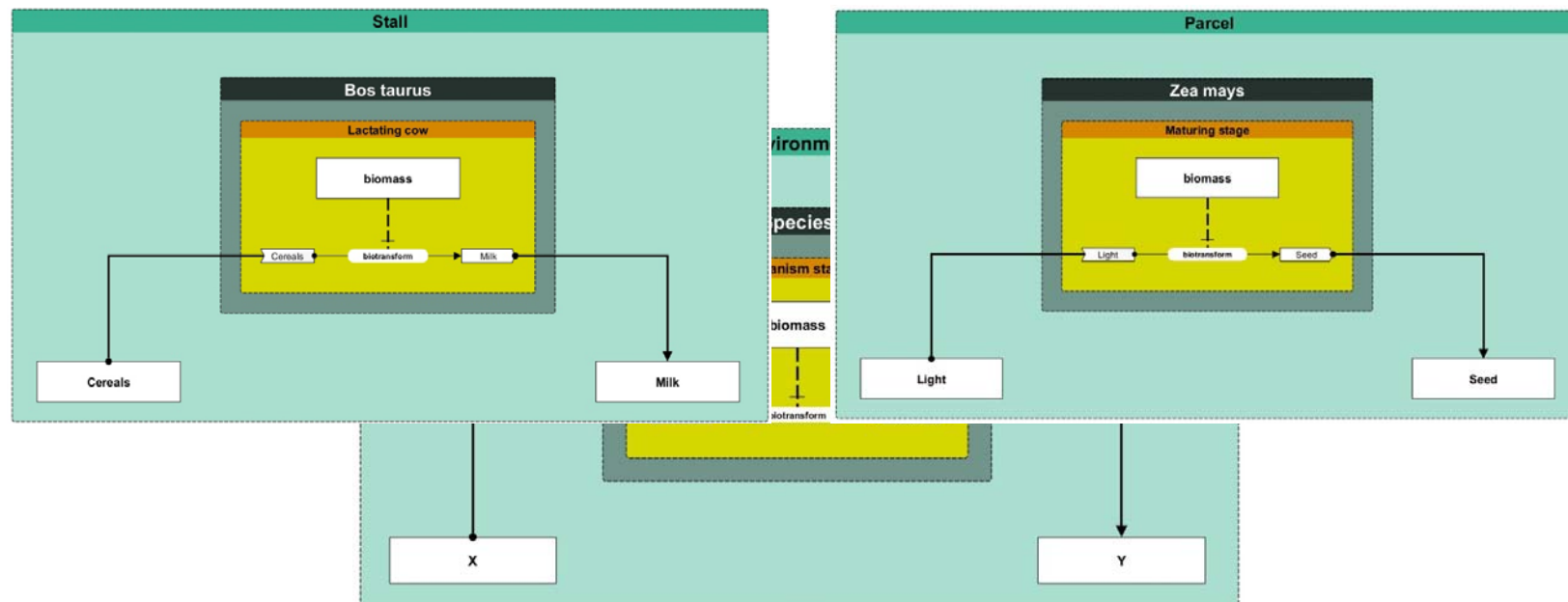
- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
- Environmental interactions: spatial cut

Locating entities and organisms



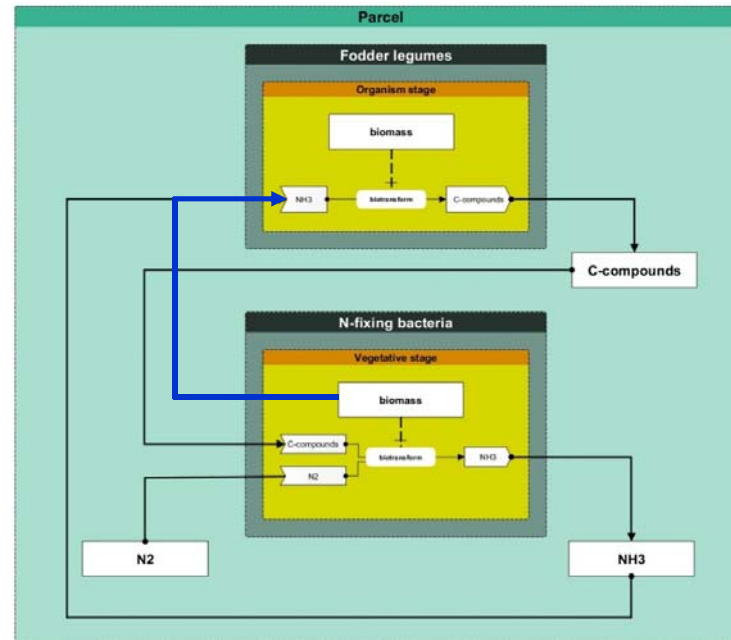
Results: the graphical language

- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
- Environmental interactions: living organism transforming entities



Results: the graphical language

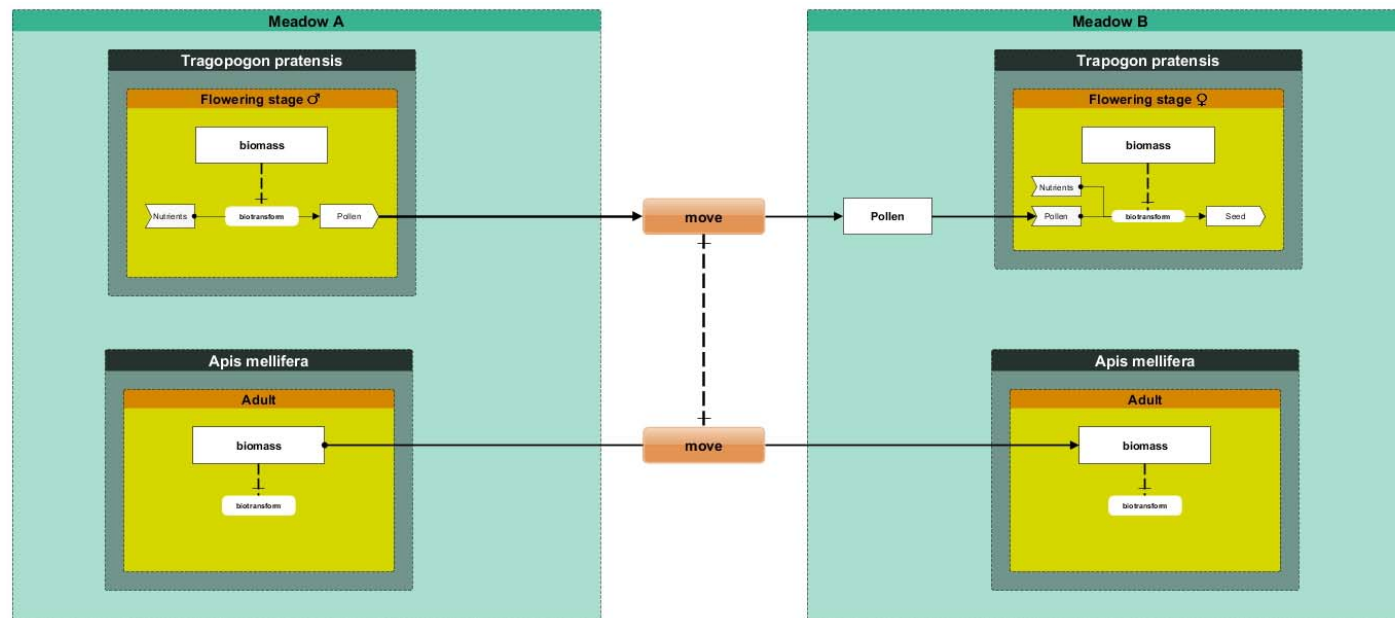
- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
- Environmental interactions: among species → biotic processes



Food web
↓
i/o connection
Harvest | Predation

Results: the graphical language

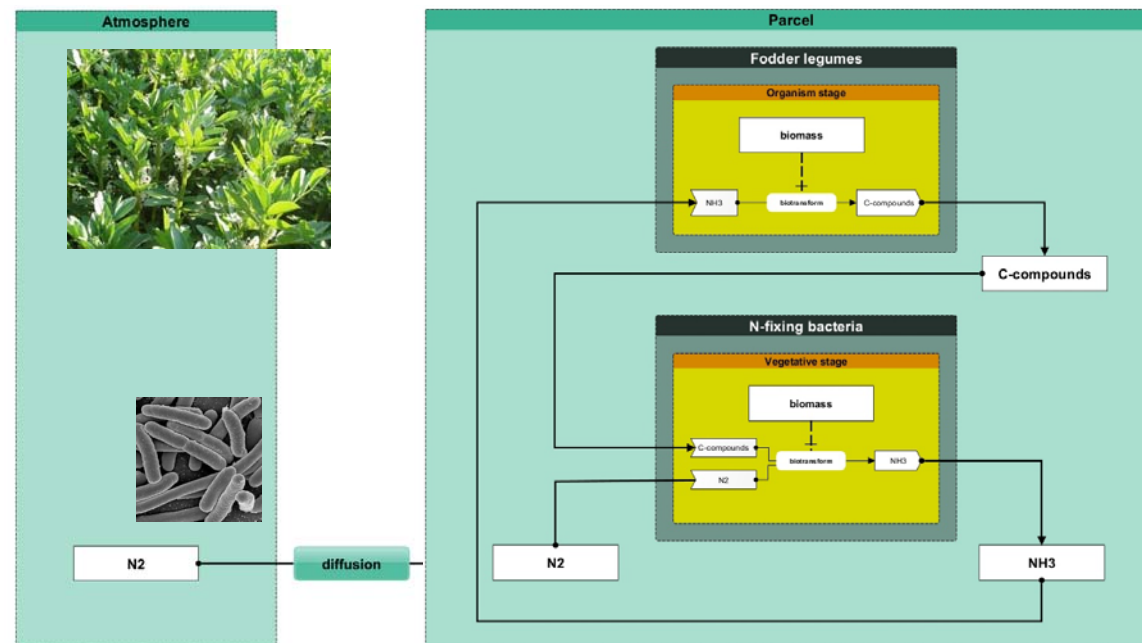
- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
- Environmental interactions: among species → biotic processes



Insect
pollination

Results: the graphical language

- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
- Environmental interactions: among entities → abiotic processes

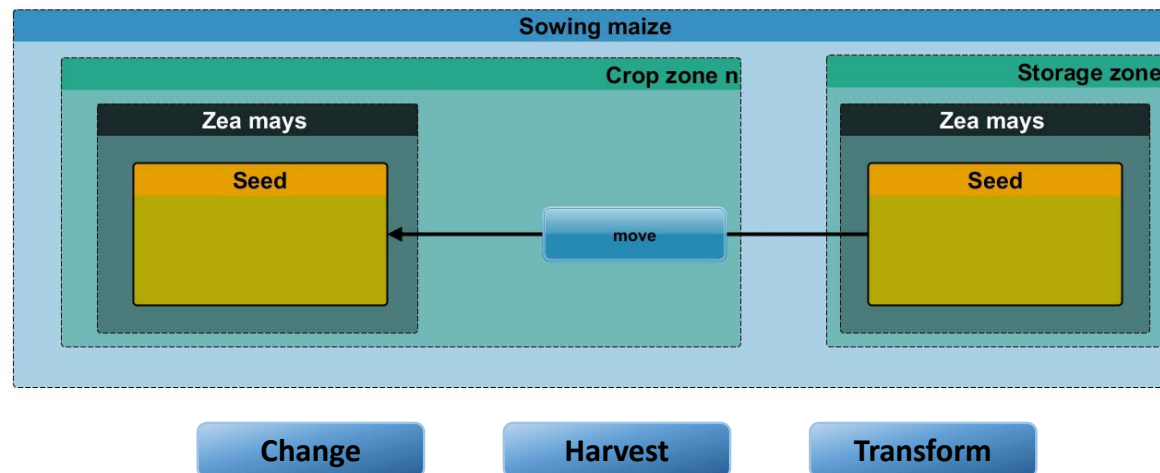


Gas diffusion

Results: the graphical language

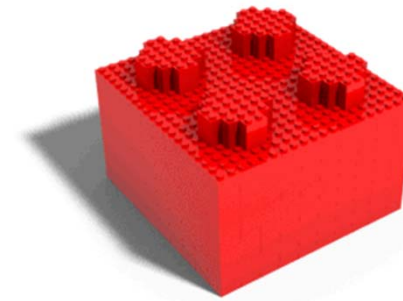
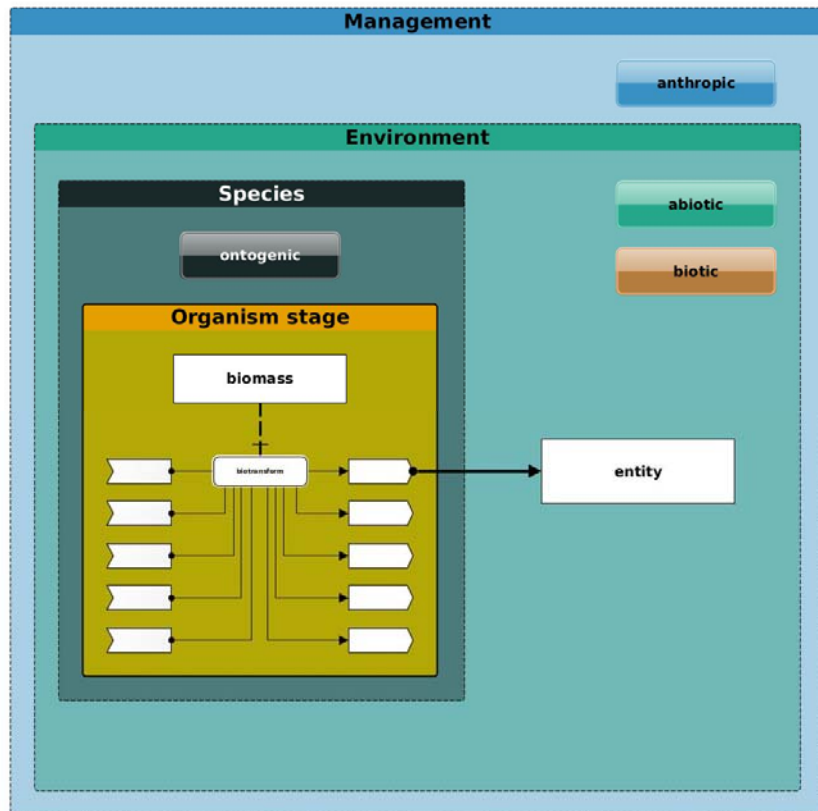
- Organizing diversity of processes → description through hierarchy of contexts
 - Organism stage: a living organism that uptakes and releases entities in the environment
 - Species pathways: transitions through time
 - Environmental interactions: biotic and abiotic processes
- Management operations: anthropic processes

Ontogenic, biotic and abiotic processes implemented by human



Results: the graphical language

- ArchiMod as a game box



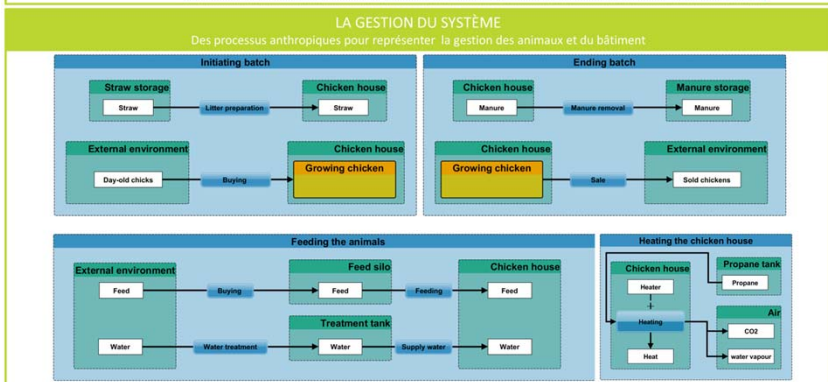
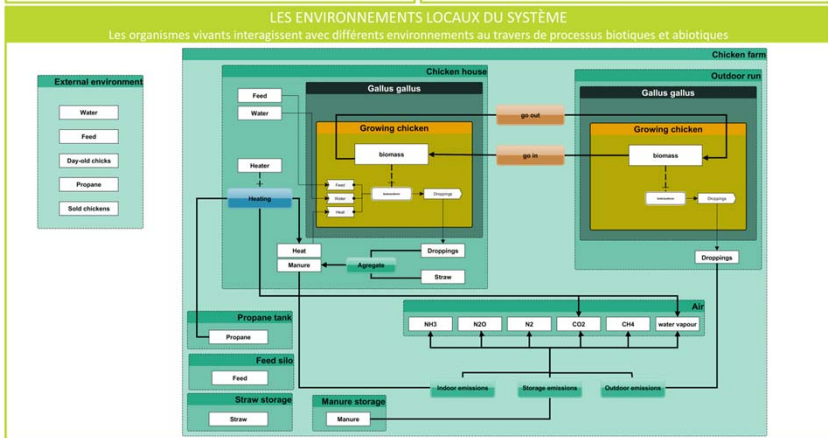
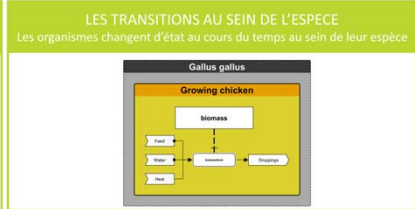
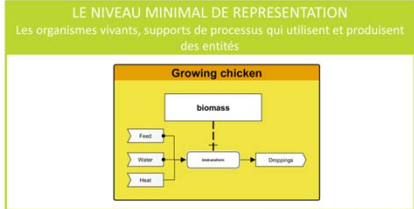
sheepfilms.co.uk



ARCHIMOD 2013|2015 METAMODELE DES SYSTEMES D'ÉLEVAGE SYSTÈME POULET DE CHAIR



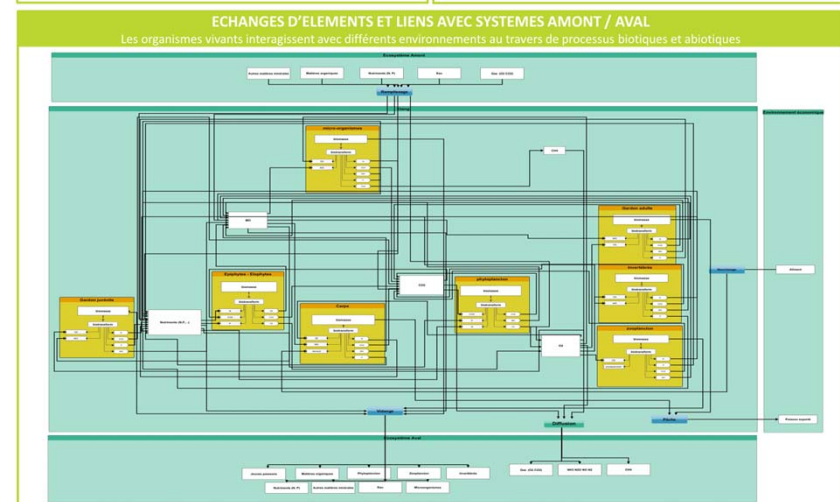
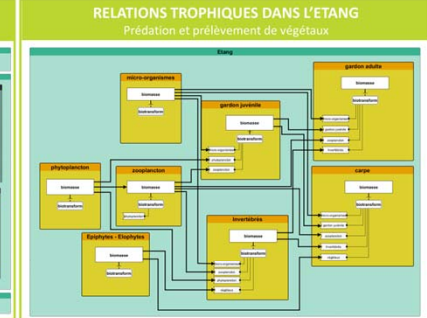
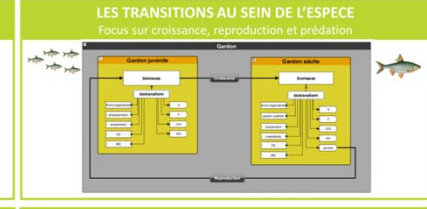
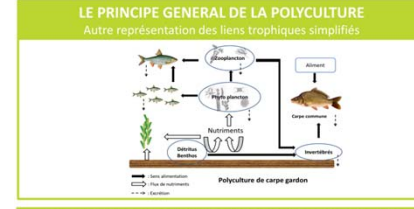
MODELE DE FONCTIONNEMENT D'UN ELEVAGE DE POULET AVEC PARCOURS :
FOCUS SUR LES EMISSIONS GAZEUSES



ARCHIMOD 2013|2015 METAMODELE DES SYSTEMES D'ÉLEVAGE ÉTANG DE POLY-CULTURE CARPE - GARDON



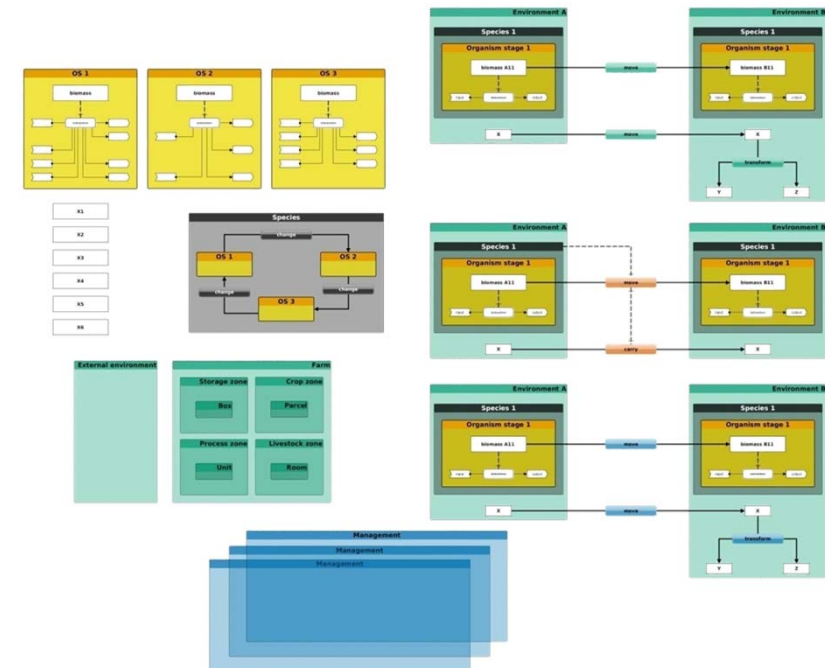
MODELE D'UNE POLY-CULTURE EN ÉTANG
ORIENTATION ENVIRONNEMENT ET RELATIONS TROPHIQUES



Conclusion

What happens when you're drawing your ArchiMod scheme?

- ArchiMod as a game box, to play with complexity
 - **Pedagogical approach**
 - From knowledge → model
 - **Multiple views** of the system
 - 1 view ↔ 1 feature
 - **Comprehensive listing** of system's functioning
 - Facilitating concept → code





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Session 6: Mixed Farming systems - does diversity bring any benefits and at what scale?

Not answering the question...

But providing a tool to do so!

Thanks for your attention

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