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To cite this version:

H. Saint Marcary, Sabine Houot, Philippe Cambier, Christine Aubry, Jean-Marie Paillat, et al.. Ecological intensification of agricultural production systems through waste recycling: the ISARD project. 11. ESA Congress, Aug 2010, Montpellier, France. ESA European Society for Agronomy, 2010, Proceedings of the XIth ESA Congress Agro 2010. hal-01192291

HAL Id: hal-01192291

https://hal.science/hal-01192291v1

Submitted on 3 Jun 2020

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ISARD

http://isard.cirad.fr

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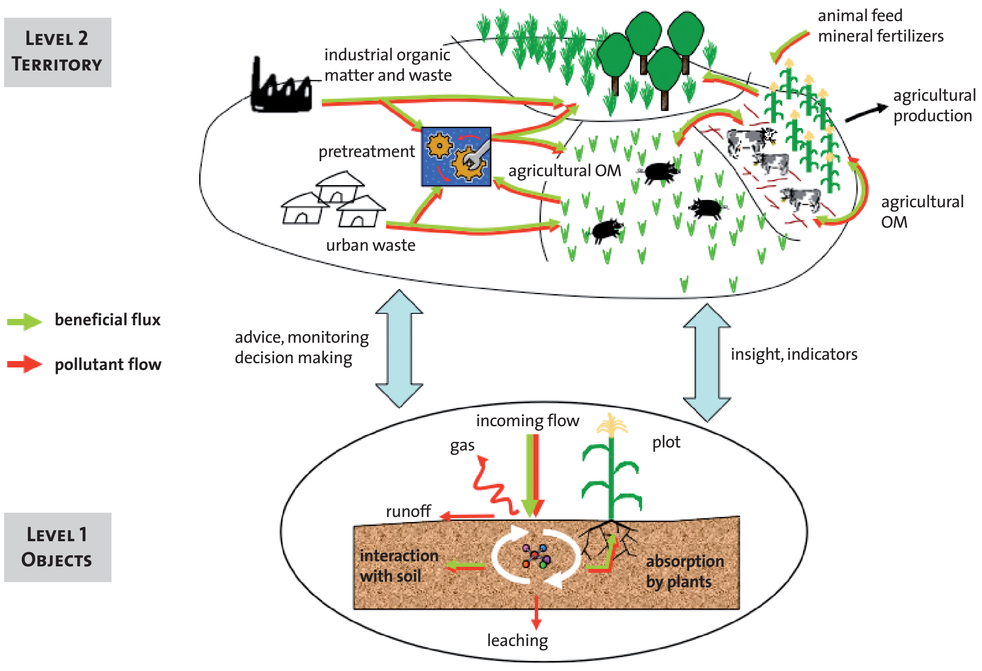
Ecological Intensification of Agricultural Production Systems through Waste Recycling: the ISARD Project

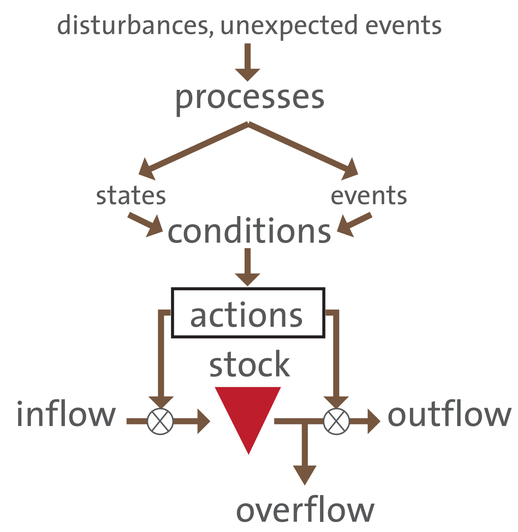


Organic waste (OW) *generated by human activity is continuously increasing worldwide. OW are sources of organic matter that may increase soil fertility and reduce the need for chemical fertilizers, thus enhancing sustainable agricultural production.*

The ISARD project *aims to develop a global approach for integrating knowledge concerning OW recycling in agriculture. Innovation in this project is related to the territorial approach and the diverse range of situations considered, with organic matter stemming from either agriculture or households, and mainly in suburban areas.*

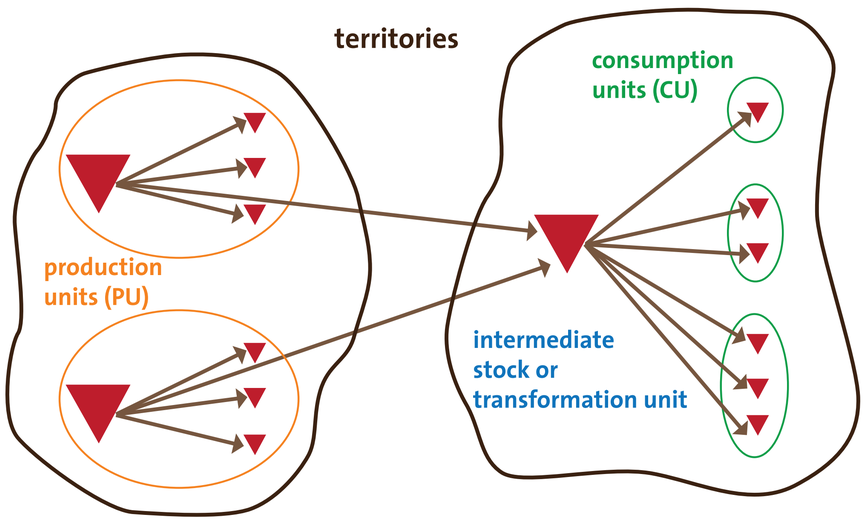
Methodology

A generic model...



Action – Flow – Stock representation of an Elementary Production Unit

... allowing to represent recycling systems



Mixed distribution/supply configuration of material flows connecting two territories

Results

In four locations, common methodologies are used to gather analytical and socioeconomic data:

Task 1

- biological and chemical characterization of available OW and potential soil receptors
- assessment of the interaction between OW, crops and soils

Task 2

- inventories of the various OW sources and sinks on a territory level
- simulation of OW transformations during the treatment process
- representation and simulation of OW management by farmers
- definition of social and economic constraints to the use of OW

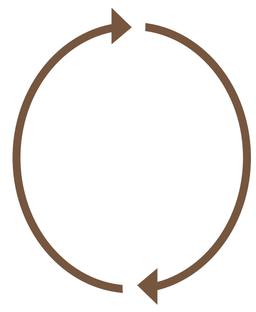
Task 3

- creation of a dataset of constraints to OW transfers, based on results from tasks 1 and 2:

Constraints due to	Examples
the product	fertilizing values presence of dangerous products
the receiver	better use by a specific crop specific use
time	seasonal availability of OW seasonal possibility for application
logistics	maximal distances investments transportation methods
environment	maximal slopes
social matters	religious bans odours
economy	breakeven point compared to fertilizers
legal issues	environmental regulations

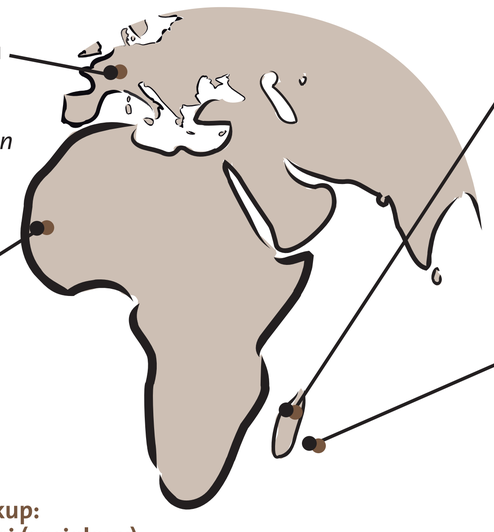
dataset used to address two questions

Spatial configuration
Making relations between PU and CU compatible with the constraints



Synchronization
Adjustment between supply and demand

Locations, partners, major stakes



- **Plaine de Versailles and Plateau des Alluets (France)**
  INRA (UMR EGC, SADAPT)
  Organic status of soils, substitution of fertilizers
- **Mahajanga Town (Madagascar)**
  Antananarivo University – LRI
  Large municipal compost unit, creation of organic matter commodity channels
- **Dakar Region (Senegal)**
  ISRA – IRD
  Interaction with water uptake, sanitary constraints
- **Reunion Island (France)**
  CIRAD
  Increase of urban wastes (sewage sludge), legal regulations
- **Partners involved in global backup:**
  UMR SAS Rennes, Université d'Albi (sociology), CEREGE (analytics), Université Catholique de l'Ouest (anthropology)

Key references of the team

Aubry C., Paillat J.M., Guerrin F. 2006. A conceptual representation of animal waste management at the farm scale: The case of the Reunion Island. *Agricultural systems,* 88 (2-3): 294-315.

Guerrin F. 2009. Dynamic simulation of action at operations level. *Autonomous agents and multi-agents systems,* 18 (1): 156-185.

Lashermes G., Nicolardot B., Parnaudeau V., Thuriès L., Chaussod R., Guillotin M.L., Lineres M., Mary B., Metzger L., Morvan T., Tricaud A., Villette C., Houot S. 2010. Typology of exogenous organic matters based on chemical and biochemical composition to predict potential nitrogen mineralization. *Bioresource technology,* 101 (1): 157-164.

AGENCE NATIONALE DE LA RECHERCHE ANR

Project funded by ANR
Decision ANR-08-STRA-15-01