“Réseau PRO” network

Analyzing the French context of field experiments assessing agronomic, environmental and sanitary impacts of organic residues recycled in agriculture

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What is the « Réseau PRO » network?

The "Réseau PRO" network (2011-2013)
Partnership of 23 professionals involved in the French organic residues (OR) recycling

Purpose = to develop a national field experiments network sharing:
→ similar methods devoted to the study of OR recycling
→ data acquired in most of the field experiments carried out in France.

In France: many existing field experiments testing OR effects were carried in various contexts, with different objectives and methods

First step = to have a better knowledge of the existing context of field experiments in France.
→ inventory all the existing trials devoted to the study of OR recycling in France.

Inventory methodology

In 2011 = a survey has been sent to all French organisms involved in the OR recycling (technical and research institutes, chambers of agriculture, etc.)

Targeted field experiments:

Trials with any experimental designs and durations, any type of OR tested, with or without treatment replicates, in organic or conventional agriculture.

Registered information:

Which OR are studied?

In which contexts (soil, crops, climate, region)?

What are the plot designs?

What are the studied OR effects and studied factors?

Which data are acquired?

General overview of the French field trials context

437 trials testing OR effects inventoried which were conducted between 1974 and 2012

Primary observations:

Heterogeneity:

Of the level of the describing data information

Of the OR denomination and description

Large diversity

Of the objectives and tested OR

Of the contexts (soils, climate) and experimental designs

Agricultural systems: **73%** of trials conducted in **conventional agriculture**
27% of trials conducted in **organic agriculture**

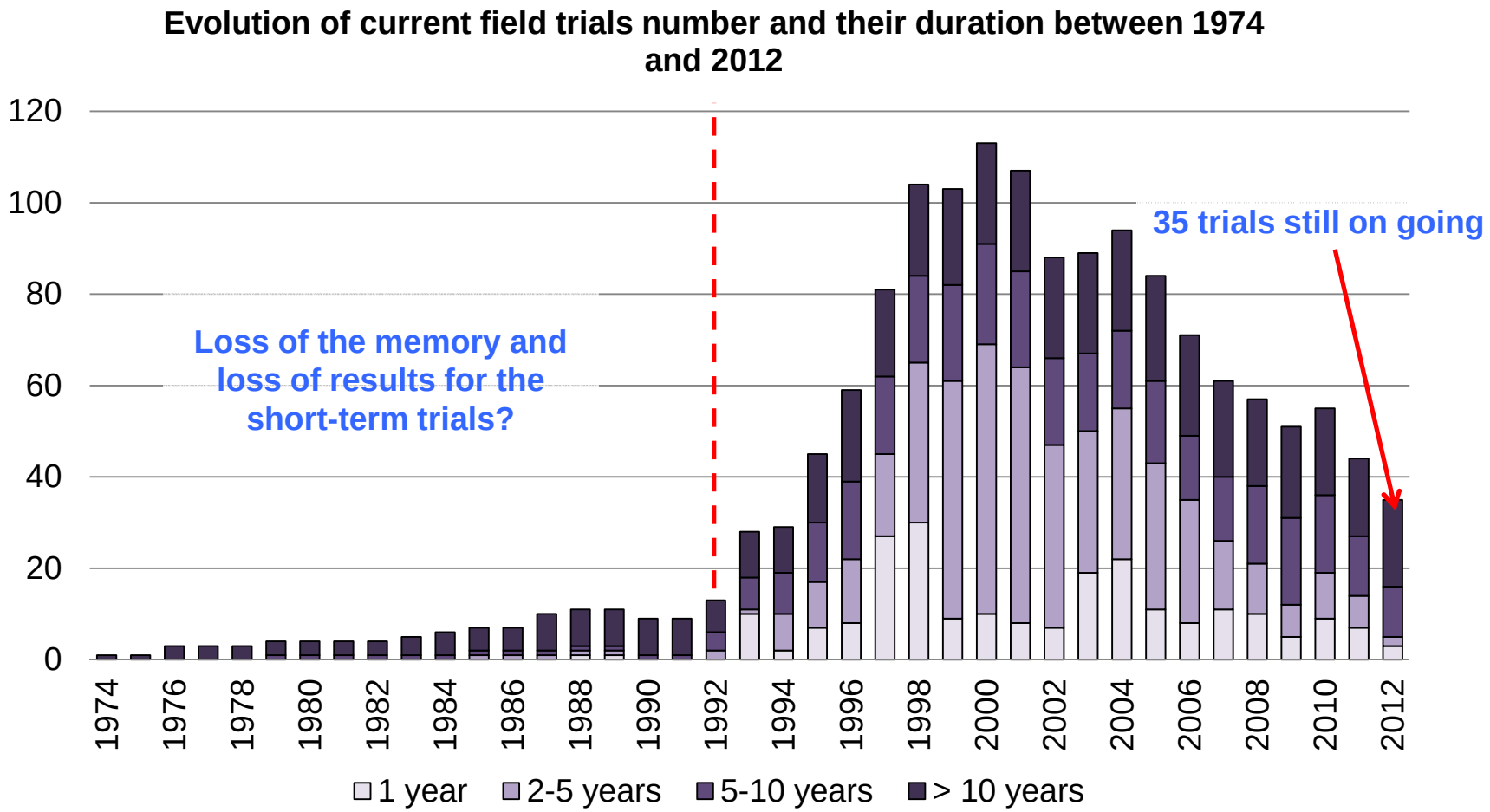
Plot designs: 70% were block designs with 2 to 8 treatment replicates
about 30% of trials without treatment replicate

Soil context: information often not available. Variation in references used to name or describe soil → difficulty to cross and compare soil contexts

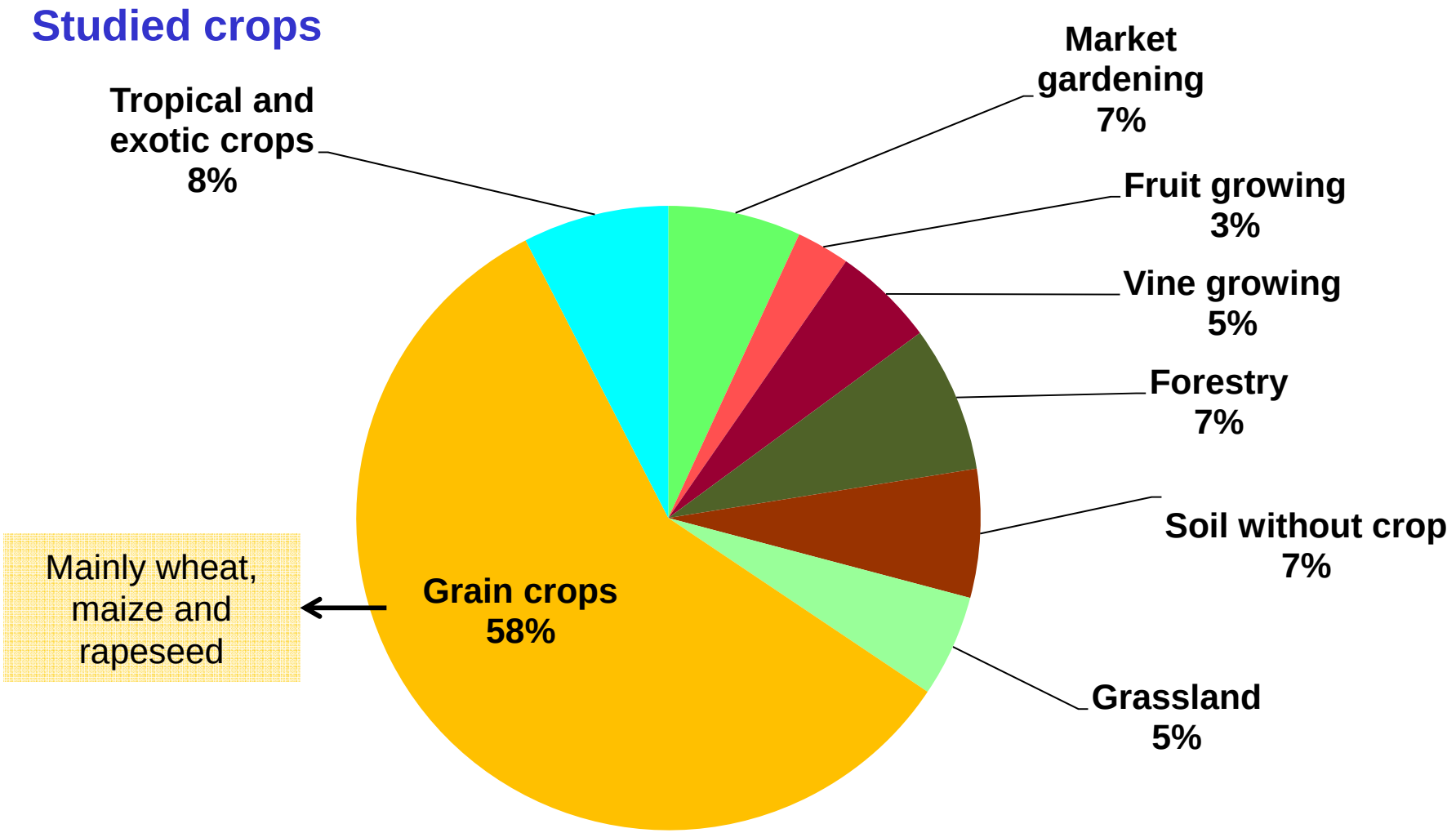
Duration of trials

Duration of registered trials:

About 51% of the registered trials were conducted for 1 year



Results: studied crops



→ fruit growing, agroforestry, wine growing, grassland and market gardening: studied on less than 7% of total trials

Studied organic residues

4 different origins of studied OR in inventoried field experiments:

Urban/industrial OR

Ex: Sewage sludge, dairy sludge, …

Studied in 60% of trials

Livestocks OR

Ex: Cattle manures, pig manures, etc.

Studied in 40% of trials

Other animal or vegetal OR

Ex: bone meal, seaweeds, …

Studied in 18% of trials

Mixed OR

Mix of components from the 3 other origins (mostly commercial OR)

Studied in 18% of trials

Studied organic residues

Studied OR classes:

Urban/industrial OR

Sludge **28%**

Agroindustrial by-products

Composts

Digested OR

Livestocks OR

Non treated livestock OR **36%**

Composted livestock OR

Digested livestock OR

Other animal or vegetal OR

Animal OR

Vegetal OR

Composted A/V OR

Mixed OR

Mixed OR

Composted mixed OR

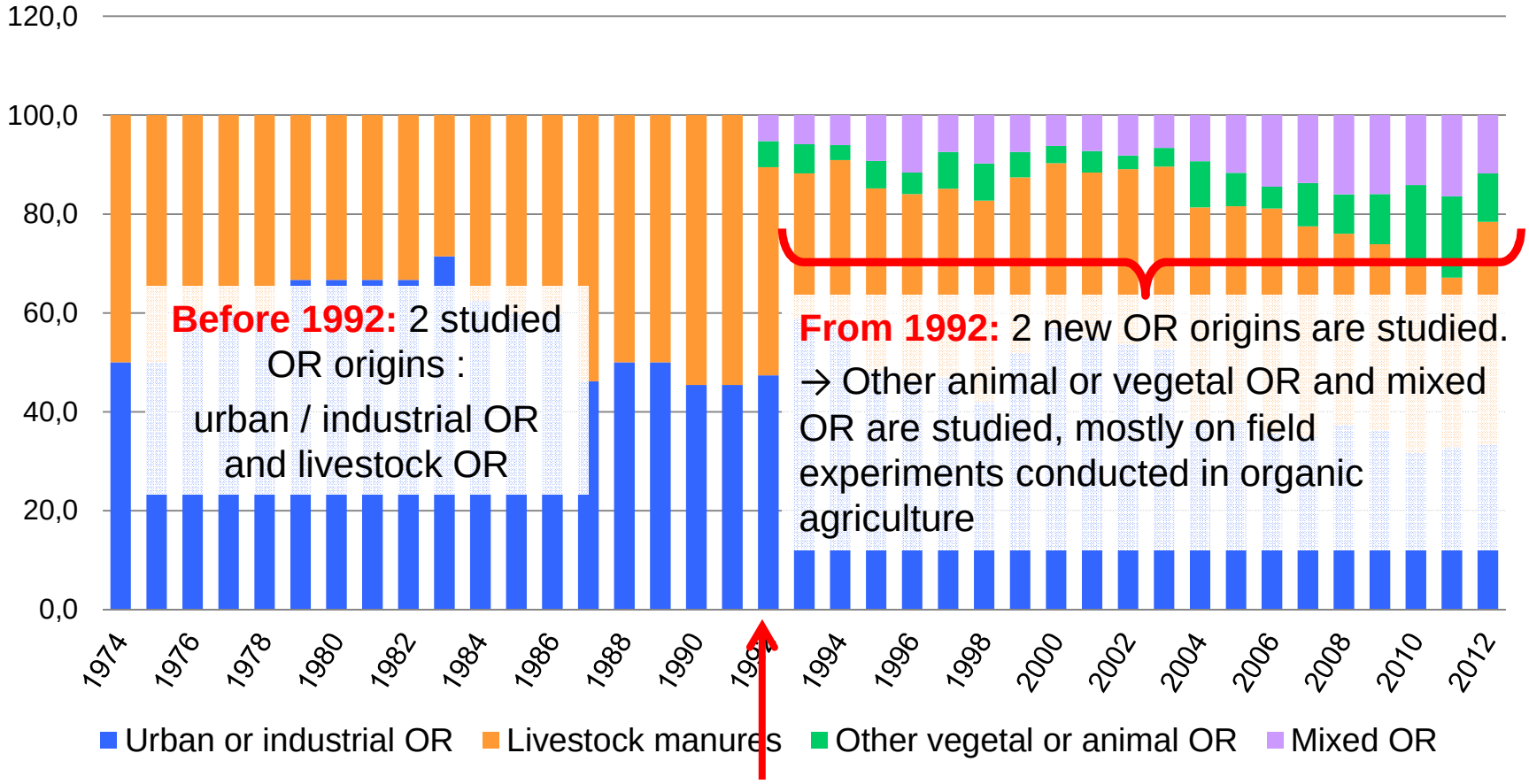
Digested mixed OR

→ Urban / industrial sludge and non treated livestock manures are the most studied OR type

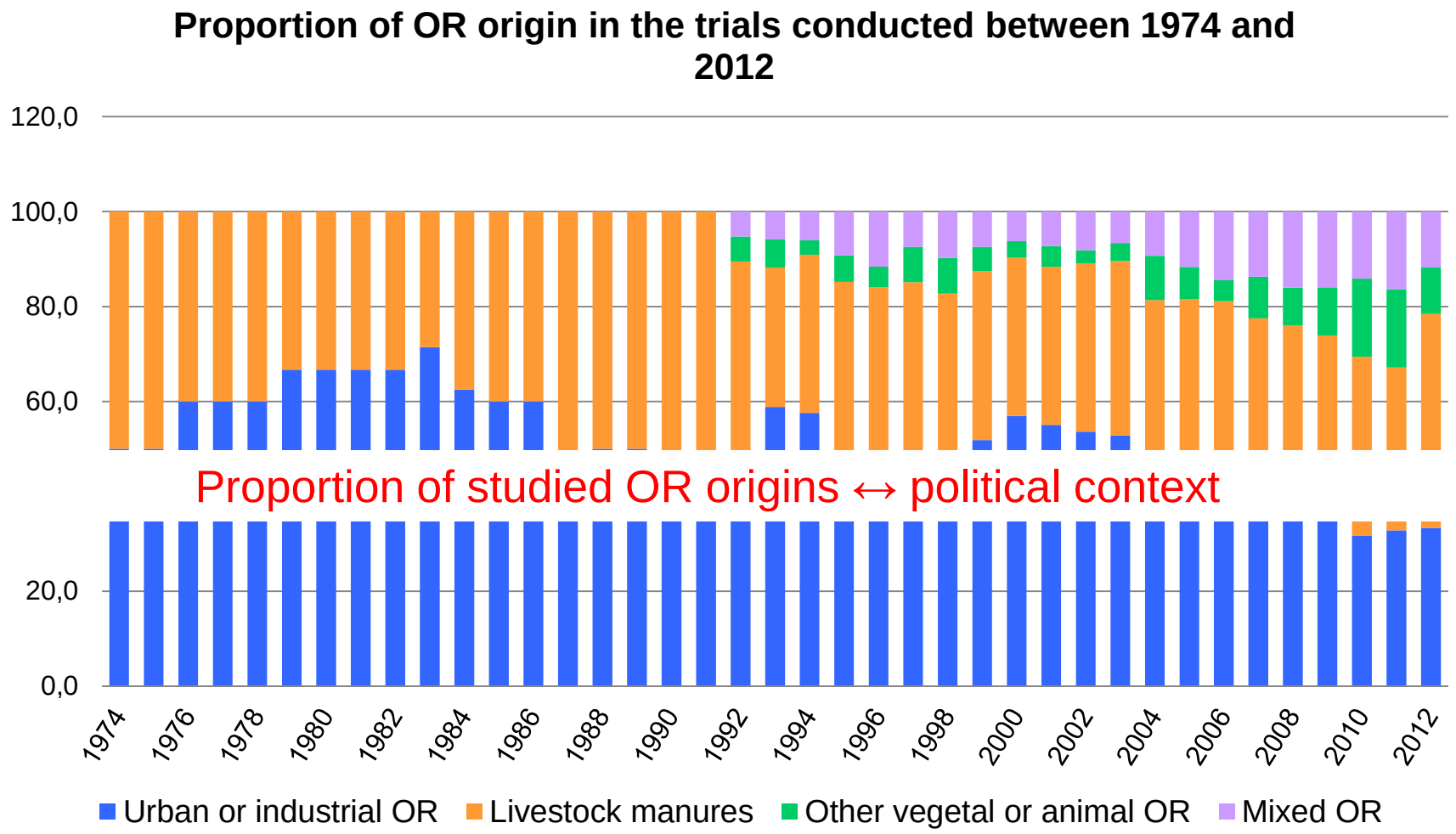
→ All origins together, **anaerobic digested OR** were studied in **less than 2%** of the total trials

Studied organic residues

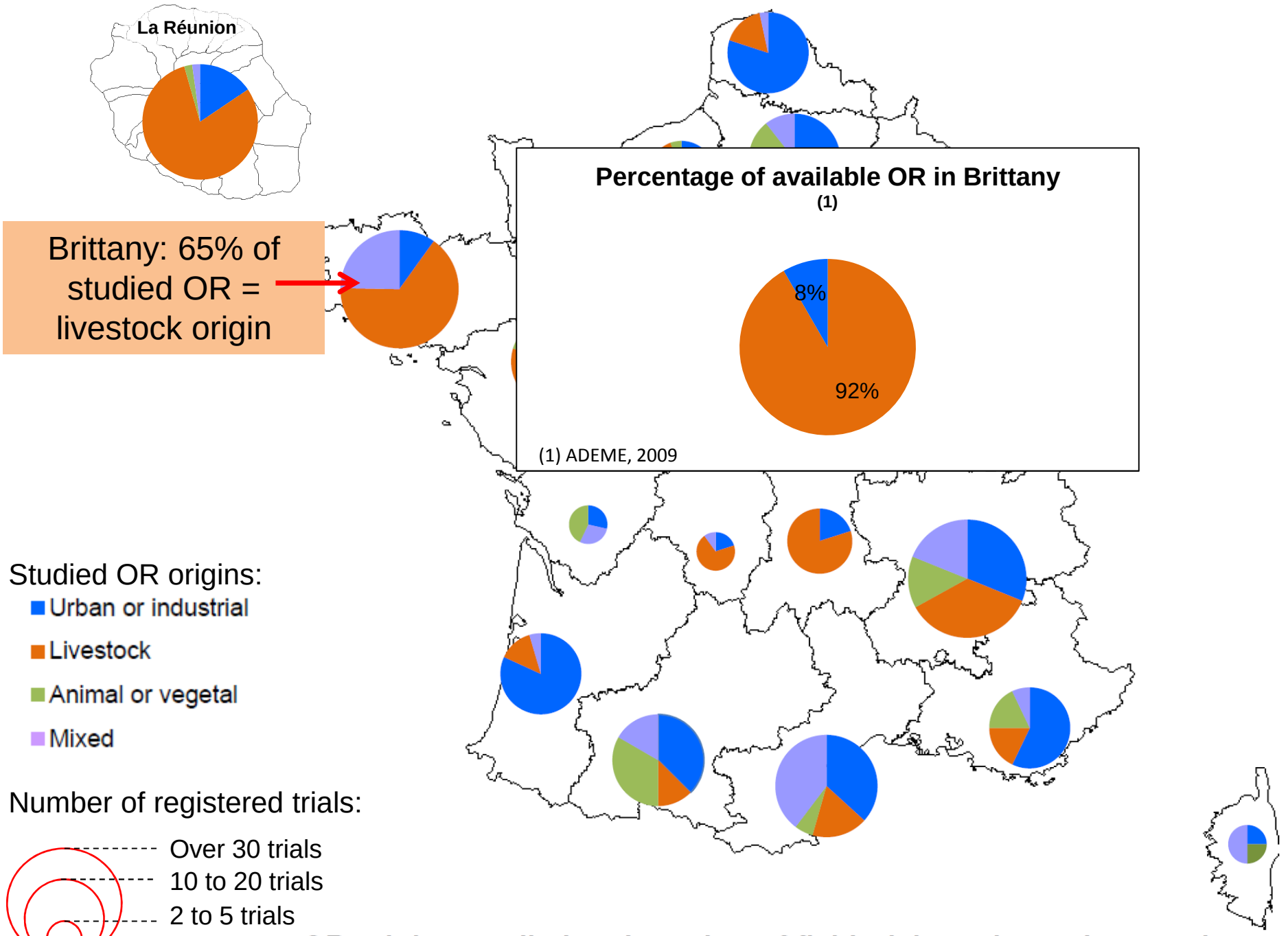
Proportion of OR origin in the trials conducted between 1974 and 2012



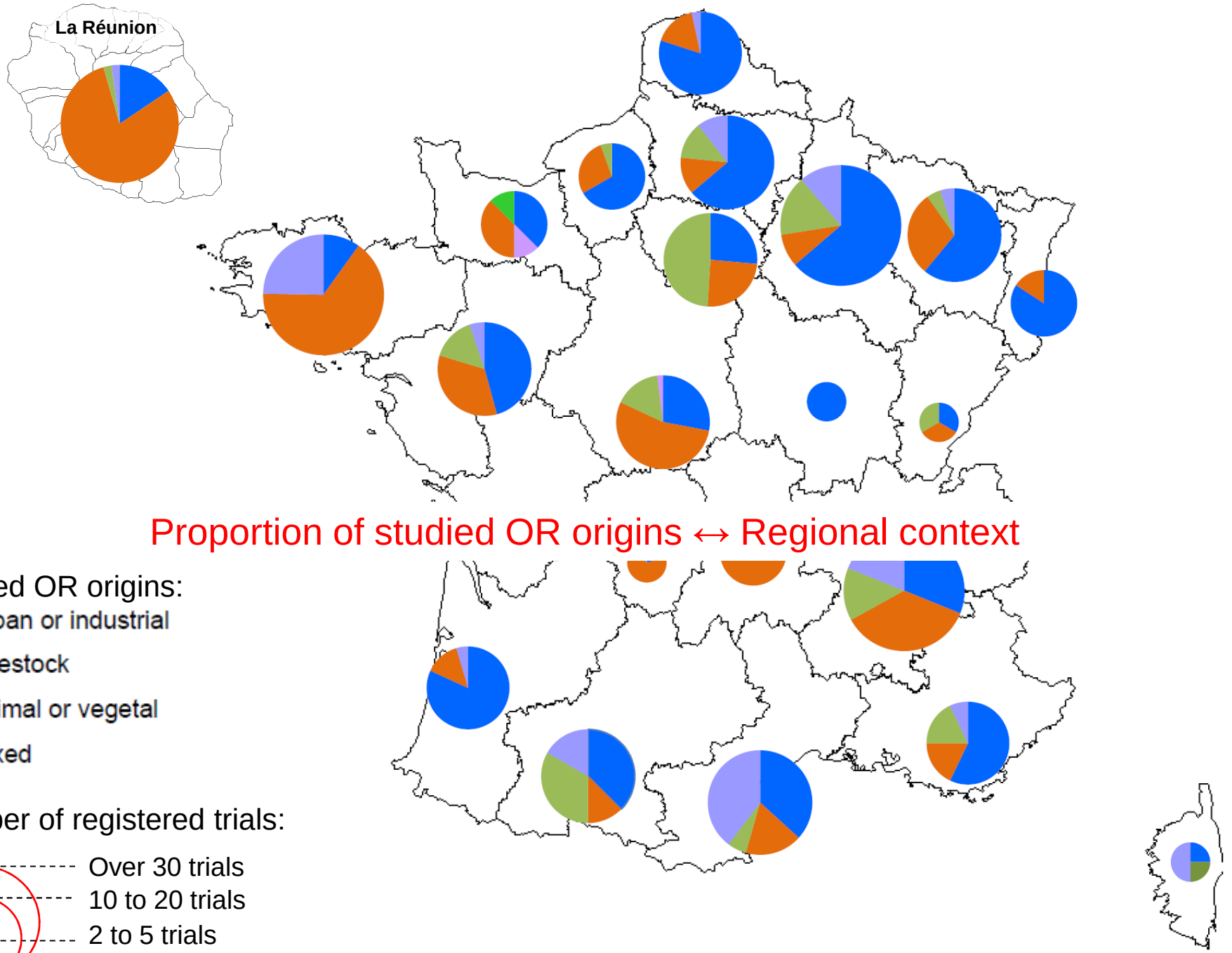
Studied organic residues



Proportion of studied OR origins ↔ political context



OR origins studied and number of field trials registered per region



OR origins studied and number of field trials registered per region

Studied topics

11 different studied topics identified:

Studied topics	Percentage of trials
Agronomical effects of OR recycling:	
Nitrogen fertilizing effects	
short term N effects (≤ one year)	
middle term N effects (1 to 3 years)	
long term N effects (≥ 3 years)	
P-K-Mg-S	
Soil OM	
Soil pH	
Soil physical effects	
Environmental and sanitary putative impacts:	
Trace element (TE)	
Organic trace contaminant (OTC)	
Pathogens fates	
Economical and societal aspects:	
Crop quality	
Ecosystem services	
Economic impacts	

Studied topics

11 different studied topics identified:

Studied topics	Percentage of trials
Agronomical effects of OR recycling:	
Nitrogen fertilizing effects	90%
short term N effects (≤ one year)	54 %
middle term N effects (1 to 3 years)	14%
long term N effects (≥ 3 years)	17%
P-K-Mg-S	35%
Soil OM	19%
Soil pH	13%
Soil physical effects	10%
Environmental and sanitary putative impacts:	
Trace element (TE)	21%
Organic trace contaminant (OTC)	6%
Pathogens fates	2%
Economical and societal aspects:	
Crop quality	27%
Ecosystem services	5%
Economic impacts	9%

Contaminants mentioned in the French regulation

Conclusions

Existing trials: large diversity of contexts and heterogeneity of available information (studied OR, experimental designs, analytic methods etc.)

Regional context and national regulation could influence the studied OR

Most available references concern:

→ OR Nitrogen fertilizing effects, mostly short terms ones

→ Effects on grain crops,

→ Livestock manures and Urban / Industrial OR

Identified needs of references:

→ digested OR, Industrial OR (paper mill OR, milk industry OR…)

→ contaminants fates: ET, OCT, pathogens, what about the emergent contaminants?

→ ecosystem services

→ crops such as grassland, fruit growing, etc.

Perspectives

“Réseau PRO” network objectives =
to store and share data acquired on the registered trials in a national database
to point out needs of references and to encourage future experimentations to study new topics

How to:
→ study the subject properly?
→ produce homogeneous and reliable references on those topics?

Réseau PRO guide book (2014): aiming at any field experimenter and including protocol for each identifed topic and procedures for the management of field experiments

Implementation of a coherent national field experiments network that will permit to collect and share homogenised data.

ACTA
Le réseau des instituts des filières animales et végétales

INRA

Thank you

A concrete example: milk industry effluents in Lorraine

Many milk industries → milk industry effluents recycled on grassland (8400 m^3/year)

Milk industry effluents = very rich in P (70% available), enriched with iron chloride to trap P

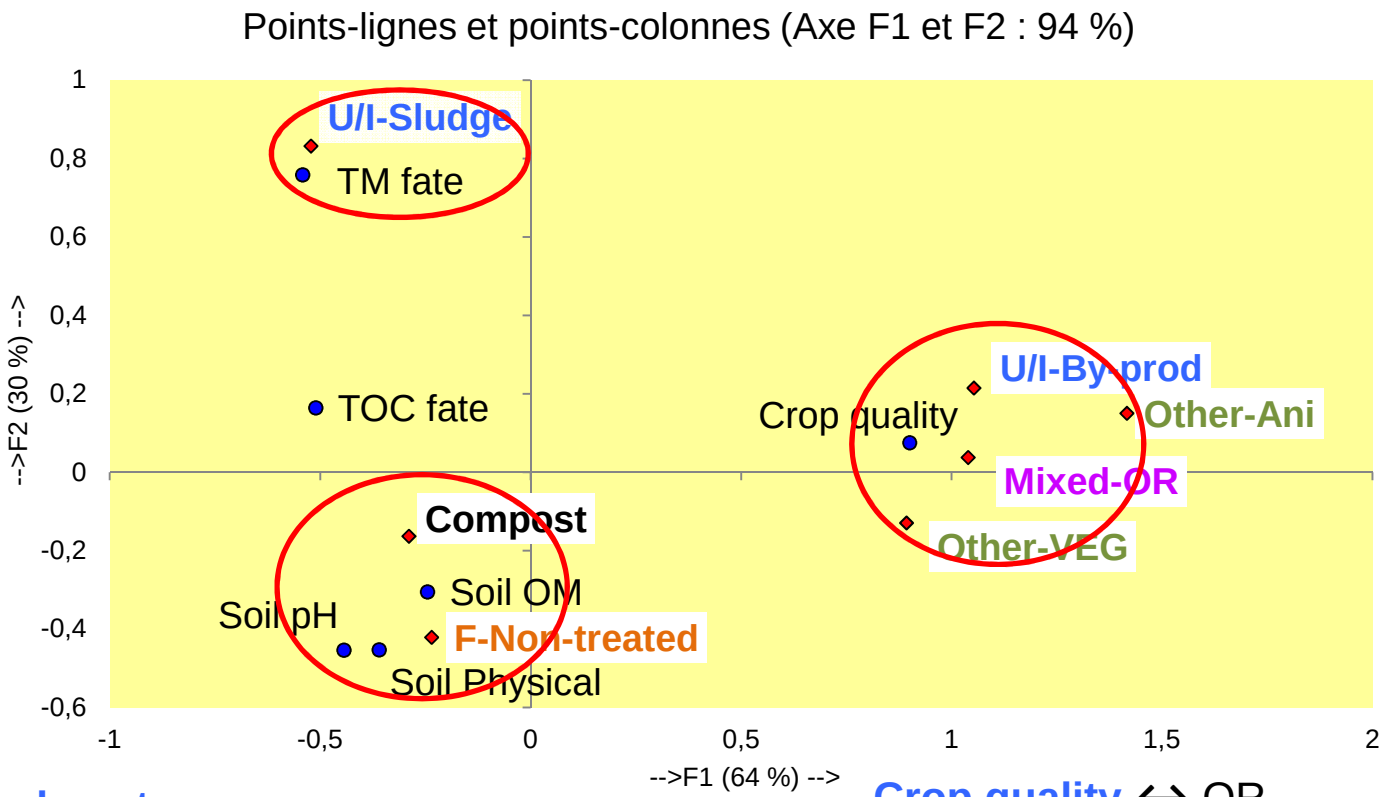
Inventory results show that few references are available:

→ on this type of OR effects, on iron input effects on the agrosystem, on phosphorus supply, on grassland

Study of OR : topics

Correlation between studied topics and OR:

TM fate ↔ Urban / Industrial OR effects



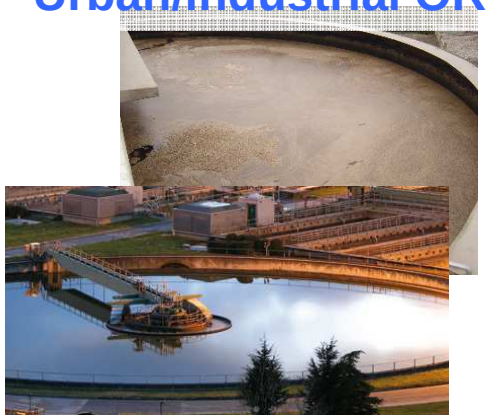
Soil organic amendment effects + physical effects on soil ↔ composts and non treated livestock manures effects

Crop quality ↔ OR recycled mainly in organic agriculture : mixed OR, U/I by-products, Animal and vegetal OR

Studied organic residues

Large diversity of raw materials: 80 different types

Urban/industrial OR



Sewage sludge
Paper mill sludge
Raisins marc
Green waste
Sugar refinery effluents
…

Livestocks OR

Cattle manure
Poultry manure
Horse manure
Goat manure
…

Other animal or vegetal OR

Bones meal
Feather flour
Seaweed
Dehydrated lucerne
…

Mixed OR

Bones meal
Feather flour
Cattle manure
Poultry manure
Raisins marc
Green waste
…

Study of OR : factors

Factors compared on the registered trials:

Main studied factors	Percentage of trials	Main related studied topics
OR nature	73%	Nitrogen and P-K-Mg-K inputs
OR dose	35%	
Mineral fertilization	20%	
OR period of application	15%	

Other encountered studied factors:

OR application localisation (wine and fruit growing)
Soil management
Crop rotation
Sowing density
…