Rolling out a collaborative citizen science approach on earthworms communities on a regional scale

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Introduction

To preserve soils and soil biodiversity

Society's stakeholders
need diagnosis tools

Scientists
need more data under different land uses and managements

The **EcoBioSoil Platform** (Univ Rennes) try to answer this needing

by using Earthworm's bioindicators, as a diagnosis tool[1] accessible to all

by using citizen sciences which are recognizing to increase the speed of data acquisition [2]

[1] Bispo et al., 2009 ; Pérès et al., 2011 ; Cluzeau et al., 2012 ; Griffits et al., 2016
[2] Amano and al.,2016 ; Chandler and al., 2017
[3] Cluzeau et al., 2012 ; Rutgers et al., 2016 ; Phillips et al., 2019
[4] Houllier.F, 2016 ; Dickinson and al., 2010

- **Available studies** on earthworm's communities **focus at the beginning on agricultural environments** [3]

  ➡ EcoBioSoil Platform collaborative approach involves a variety of land managers working on different land uses

- **Quality of the data** from citizen sciences is interrogated[4] and **maintaining participation** over time can be difficult.

  ➡ EcoBioSoil Platform collaborative approach ensure satisfactory data quality, encourage continued participation by sharing knowledge and by raising awareness of issues related to soil management for soil biodiversity preservation

This approach can be rolling out at different scales, the methodology for the regional scale is detailed below.

Methodology for regional roll-out

Experimentation on 2 regions (2015-2021 and 2016-2021)

Bretagne since 2015
(27 209 km², 123 inhab/km²)

Ile de France since 2016
(? 011 km², 1017 inhab/km²)

Funders

Earthworm's sampling

Earthworm Spade Test : sampling of 6 blocs of soil (20x20x25cm) and hand sorting
Simplified protocol of ISO 23611-1:2018

Human resources for one year

- Coordinator *(full time)*
- Biostatistician *(2 months)*
- Laboratory technician *(4 months)*
- Technical agent *(2 months)*

STEPS FOR EACH YEAR

① Territorial diagnosis

Search for available data *(Ecobiosoil database, previous research programs...)* to prioritize the least surveyed land uses

Identification of the networks of actors managing the concerned land uses *(farmers, local authorities, natural area managers, gardening associations...)*

② Training of participants

Provision of a step-by-step methodological guide

Accompaniment by an expert in the field for the first application of the protocol

Supply of ethanol vials to collect earthworms

Experts available at all times to answer questions
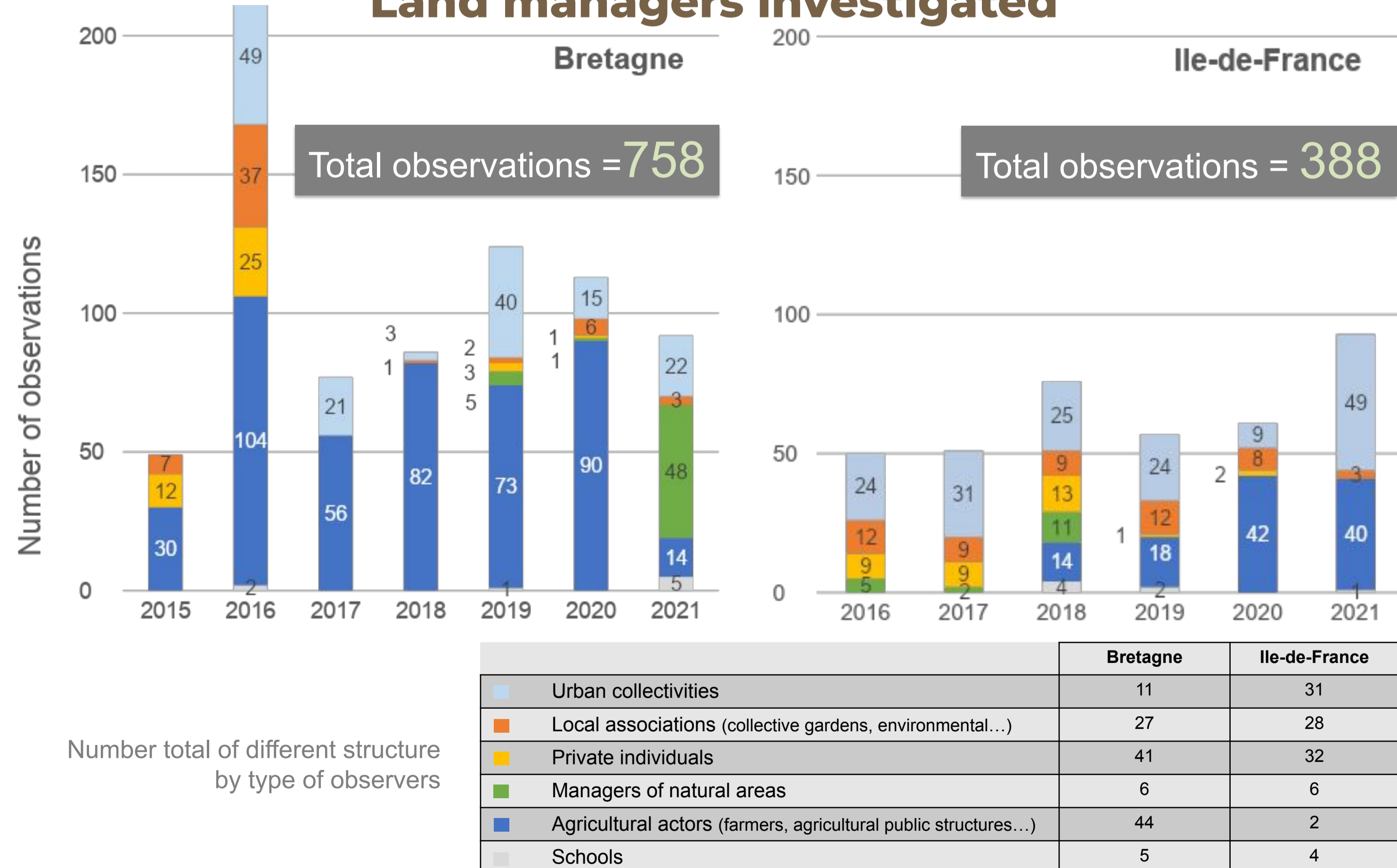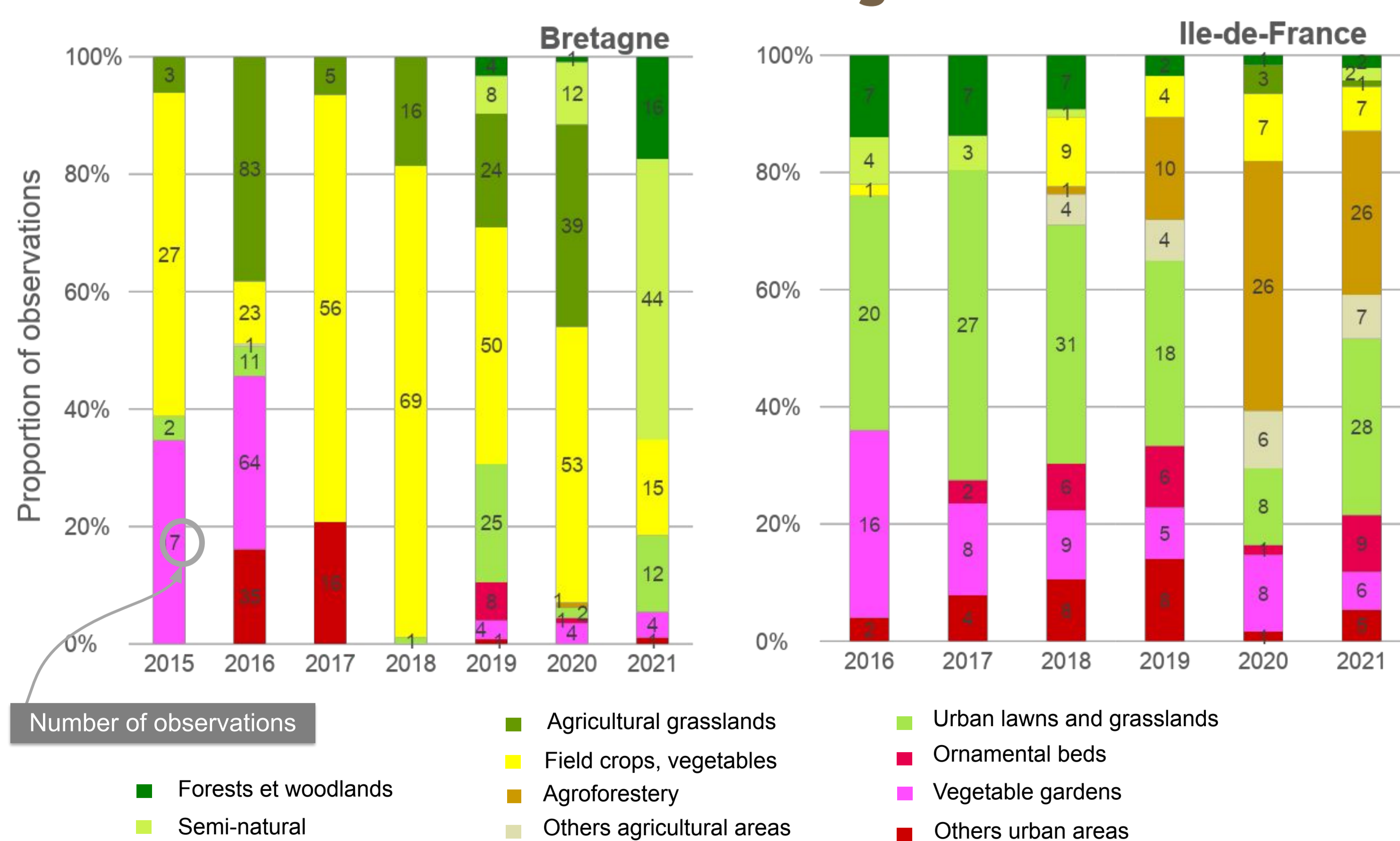
③ Collection of samples and metadata

Receipt of samples at the laboratory for analysis *(abundance, biomass, communities structure, taxonomic richness, diversity index, ecological assurance and functional redundancy)*

Return of completed survey about land management by email or via the website EcoBioSoil

④ Restitution of the results to the participants

Delivery of individual diagnostic sheets presenting the biological parameters and their evaluation in relation to the standard
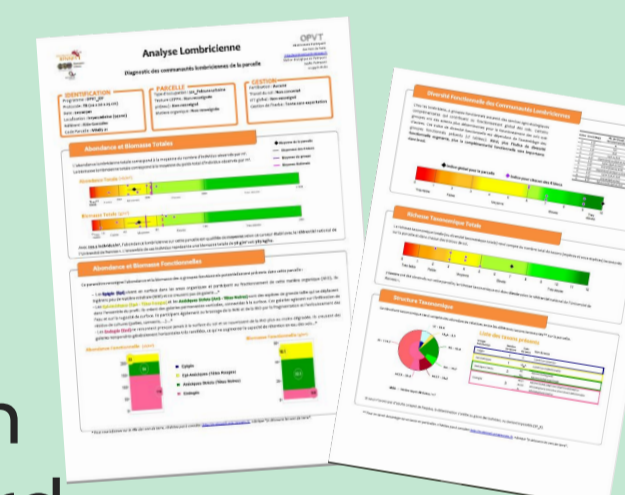
Oral presentation to groups of participants and discussion on their results

⑤ Contacting participants or new partners for the next season

Results

Land managers investigated

Bretagne — Total observations = 758
Ile-de-France — Total observations = 388

Number total of different structure by type of observers	Bretagne	Ile-de-France
Urban collectivities	11	31
Local associations (collective gardens, environmental…)	27	28
Private individuals	41	32
Managers of natural areas	6	6
Agricultural actors (farmers, agricultural public structures…)	44	2
Schools	5	4

Land uses investigated

Legend:
- Agricultural grasslands
- Forests et woodlands
- Field crops, vegetables
- Semi-natural
- Agroforestery
- Others agricultural areas
- Urban lawns and grasslands
- Ornamental beds
- Vegetable gardens
- Others urban areas

Conclusions

- 1146 observations on two regions in 7 years (50 to 120 observations per year)
- The diversity of the participants makes it possible to explore a variety of land uses
- Training and laboratory analysis allows to collect reference values to make progress on different research topics and to refine diagnoses
- This collaborative approach allowed, for example, to improve knowledge on earthworm biodiversity in Bretagne from 27 taxa in 2000 to 42 taxa in 2020

Maintenance of participation

Legend:
- New participant
- Previous participant