



# Residue

Risk reduction of chemical residues in soils and crops:  
impact due to wastewater used for irrigation

## The RESIDUE project: reclaimed wastewater use in agriculture

Dr. Dieter Hennecke, Fraunhofer IME  
Online workshop April 26, 2022

# Framework



PRIMA programme is supported by Horizon 2020, the European Union's Framework Programme for Research and Innovation

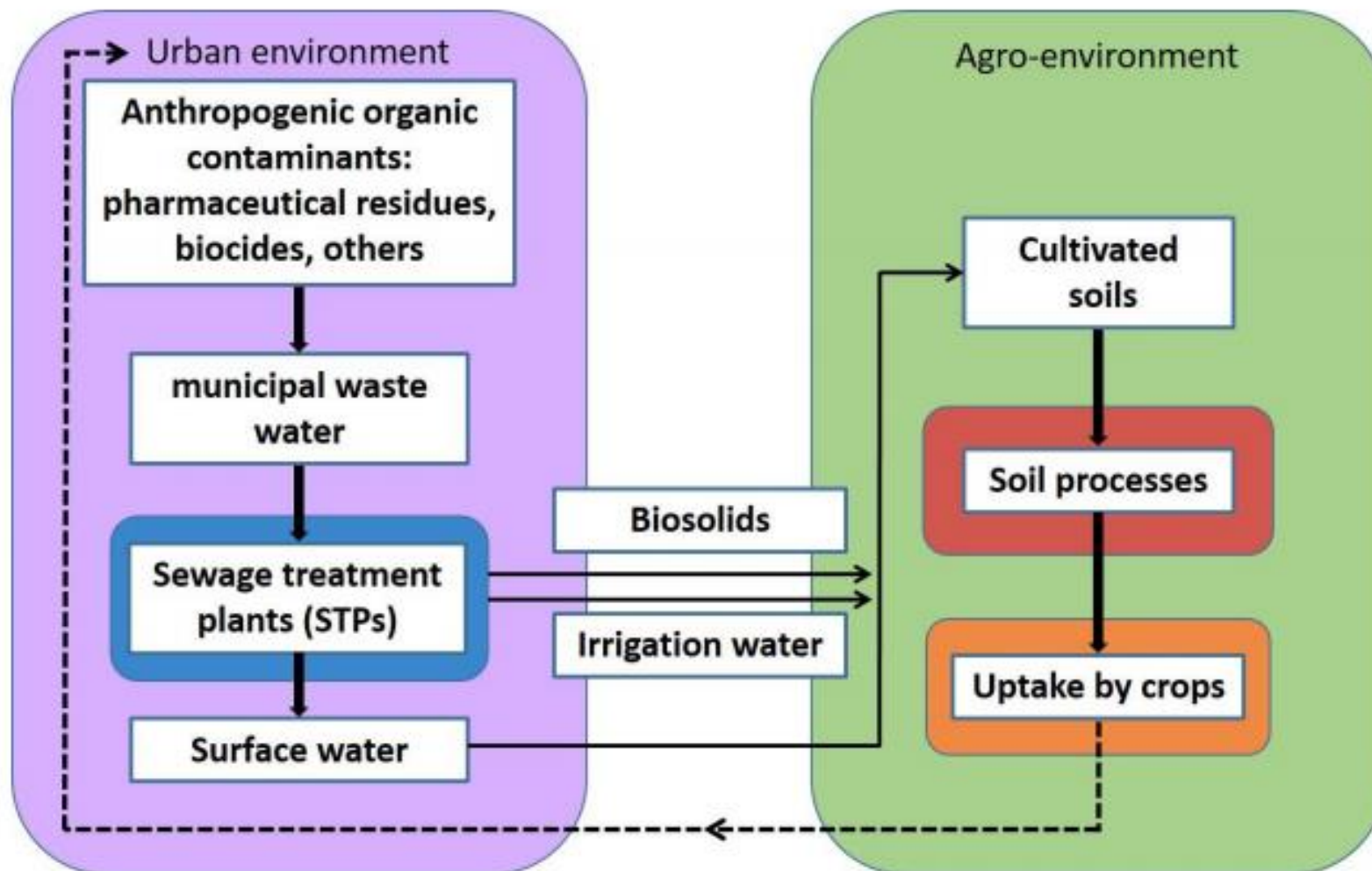
## About PRIMA

PRIMA –Partnership for Research and Innovation in the Mediterranean Area– is an ambitious **science** diplomacy **program** that aims to build R&I capacities and **develop innovative solutions** for agro-food systems and integrated **water provision and management in the Mediterranean area** competitive calls for funding. The partnership consists of 19 countries, including 11 EU Members States and eight non-EU Mediterranean Countries, on an equal footing basis (co-ownership, co-management and co-funding) supported by the European Commission.



# Problem definition

Details by Dr. Y. Maor



- Use of waste water in agriculture inevitable due to water scarcity
- Potential exposure of crops with anthropogenic organic chemicals
- Risk of food contamination

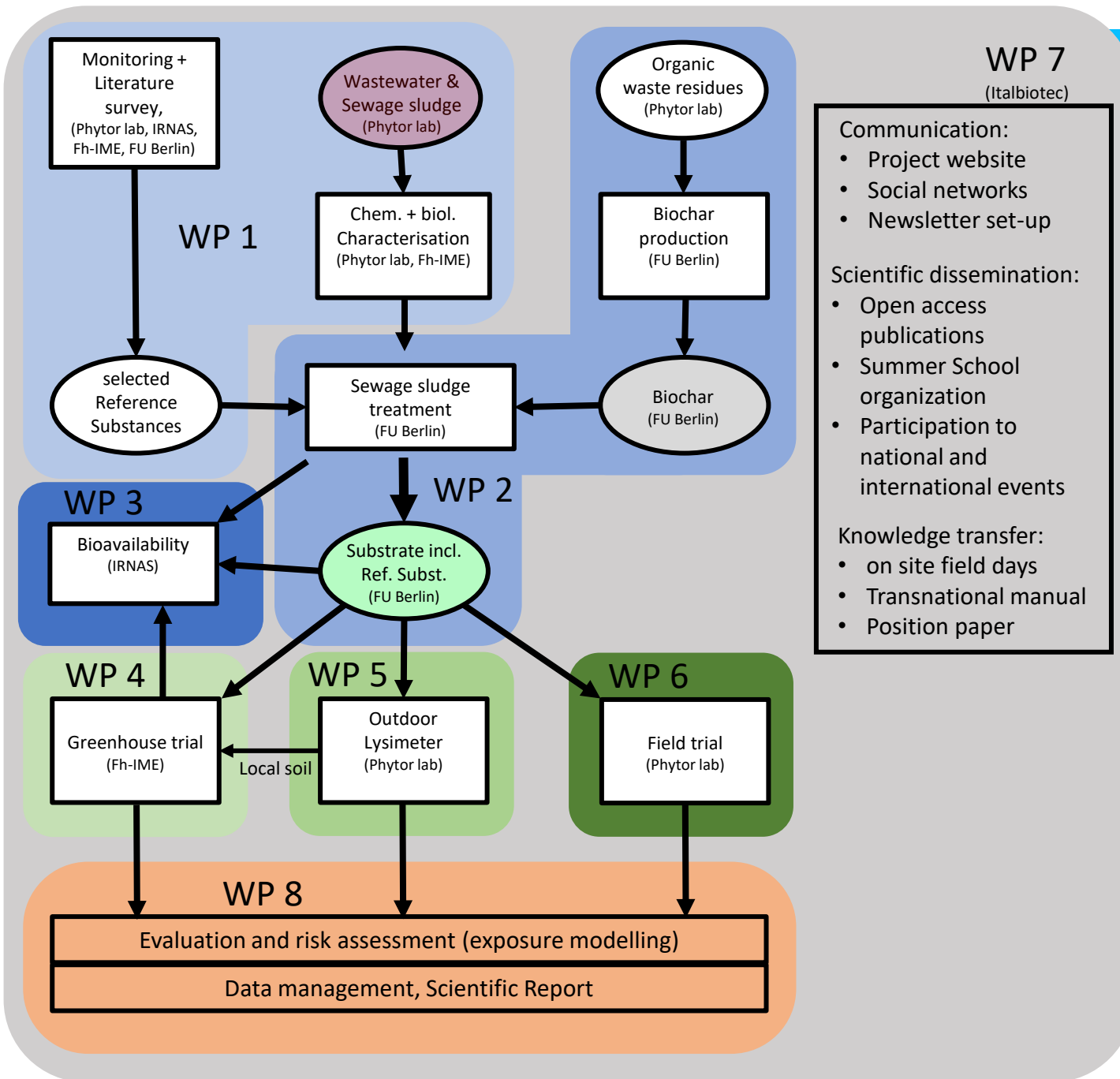
# Project goal

- improve the safety of agricultural products grown in countries, which are obliged to use waste materials for irrigation and fertilization in agriculture
- no setting of new limits but develop a technology with significantly reduced risks of transfer of organic contaminants into the agricultural products
- to enhance the in situ removal and detoxification of introduced organic pollutants by the improvement of soil functions
- new production methods for safe soil amendments using local waste streams

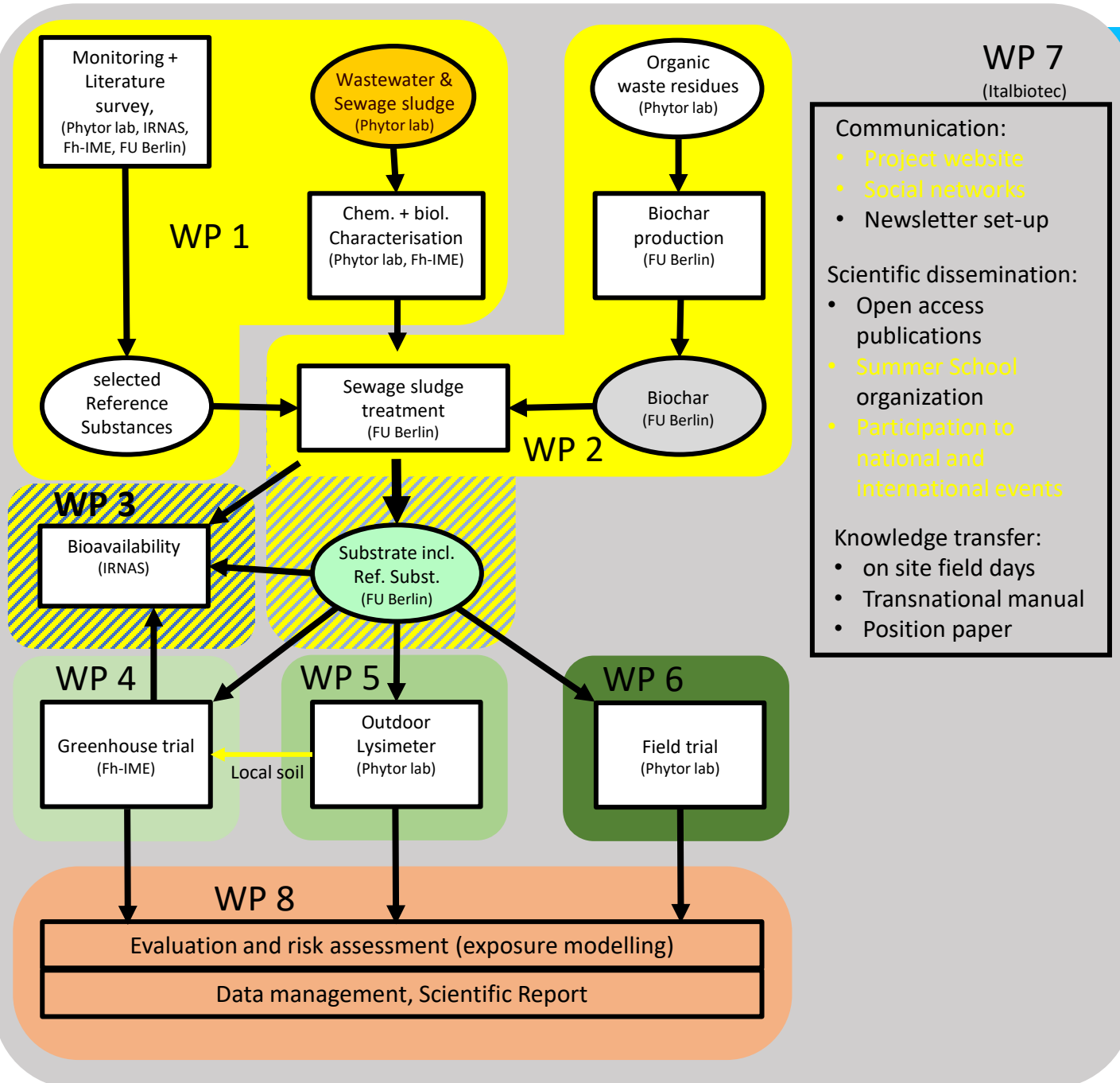
# Project Partner

- ❖ Fraunhofer IME, Schmallenberg, Germany (Project coordination)
- ❖ PHYTOR Ltd. LAB Jerusalem, Israel,
- ❖ Institute of Natural Resources and Agrobiology of Sevilla (IRNAS)-CSIC, Seville, Spain
- ❖ Working Group Geoecology Free University, Berlin, Germany
- ❖ Consorzio Italbiotec, Milan, Italy
- ❖ Faculty of Agriculture, Hebrew University, Jerusalem, Israel

# Project Structure



# Project Status



## WP 7 (Italbiotec)

- Communication:**
- Project website
  - Social networks
  - Newsletter set-up
- Scientific dissemination:**
- Open access publications
  - Summer School organization
  - Participation to national and international events
- Knowledge transfer:**
- on site field days
  - Transnational manual
  - Position paper



# Project status

WP 1 finished: selection and shipment of input material for Biochar production

Input material: **composted sewage sludge**

regional residual materials from Israel

60% green waste and 40% sewage sludge

originate from wooden residues from garden pruning and sewage treatment plants from all over the country (collected in the largest production plant of Israel)

Composting process:

2 months (8 weeks) for the maturation phase & 3-4 months for the curing phase

max. temperatures up to 70°C

Pre-treatment (drying, autoclaving) and shipment of 40 kg composted sewage sludge for a test carbonization from Israel to Berlin, Germany

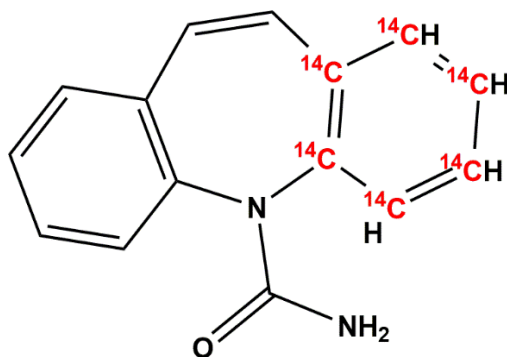




# Project status

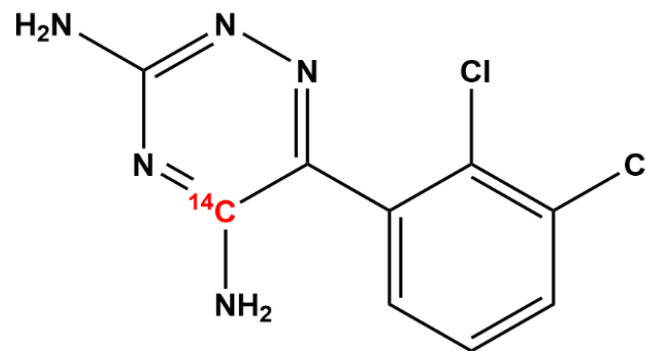
WP 1 finished: selection and purchase of  $^{14}\text{C}$ -radiolabelled test substances

Carbamazepin  
(antiepileptic)



$^{14}\text{C}$ -phenyl-label,  
specific radioactivity: 11,67 MBq/mg

Lamotrigine  
(anticonvulsant)



$^{14}\text{C}$ -triazinyl-label  
7,77 MBq/mg

$^{14}\text{C}$ -label enables

- Mass balance
- To follow unknown pathways
- Detect metabolites in any matrix

# Project status

## WP 2 finished: Biochar production

### Carbonization

- Pyrolysis plant with continuous mass flow
- Three temperatures (500/600/700°C) were applied to determine an optimal carbonization process
- Mass balance determination and characterization of resulting biochar



### Challenge

Composting of fresh sewage sludge with biochar amendment:

- no import of fresh sewage sludge possible
- composting process affected by biochar

=>Details see Dr. D. Drabkin, R. Schatten



# Project status

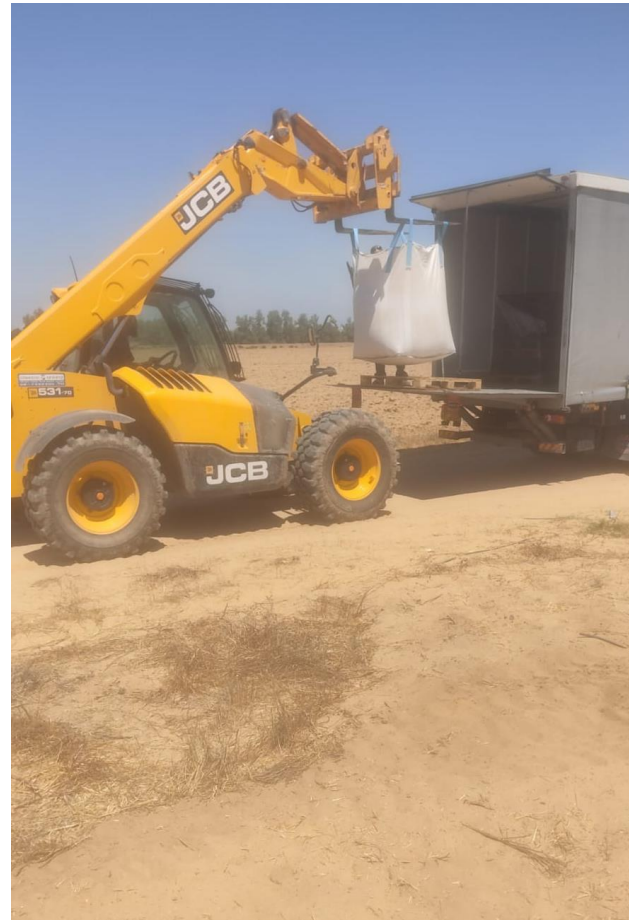
WP 3 status: bioavailability testing with pre-substrates and  $^{14}\text{C}$ -labelled test substances. Details see Dr. J. J. Ortega-Calvo

WP 4 status: sampling and import of 8 tons of soil from Israel to Germany for greenhouse trial. Soil sampling and shipment organised by Phytor Lab and University Jerusalem on behalf of Fraunhofer IME

development of analytical methods of reference substances from relevant matrices

# Project status

## Soil sampling at Nir Oz (Southern Israel)



# Project status

Soil arrival at Fraunhofer IME



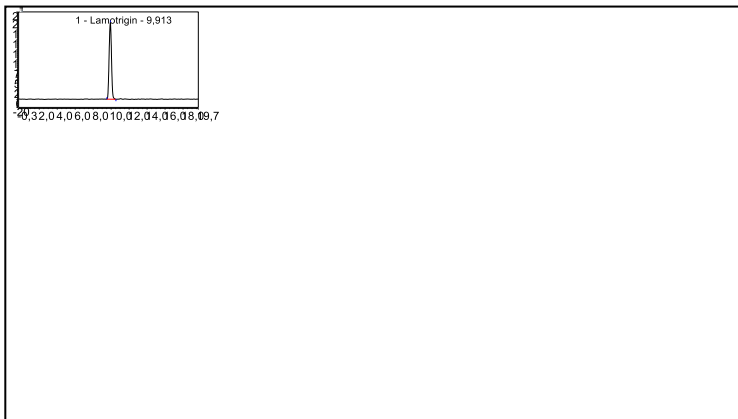
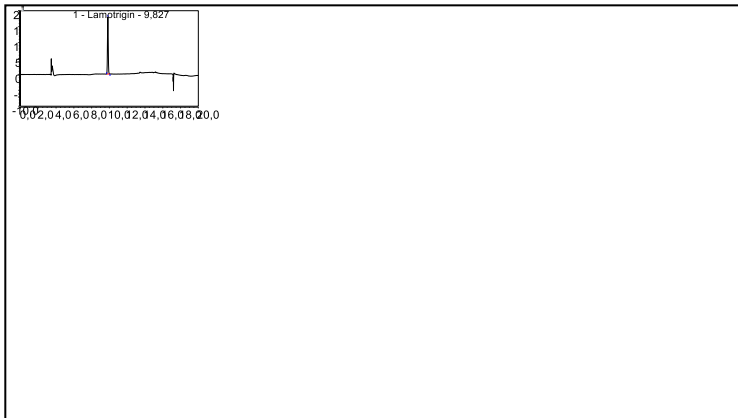
Preparation of plots  
at IME-greenhouse, 0.5 m<sup>2</sup> per plot



# Project status

## Development of analytical methods, radio HPLC, radio TLC

Lamotrigine by HPLC



### Preparation for greenhouse trial

- Extraction and recovery from soil
- Extraction and recovery from plant material (Alfalfa)



Waiting for the biochar substrate

# Time Schedule

Workpackage	Project period in quarter years											
	4/20	1/21	2/21	3/21	4/21	1/22	2/22	3/22	4/22	1/23	2/23	3/23
WP1: Collection and characterisation of the source material	■	■										
WP2: Composting and characterisation of resulting substrates		■	■	■	■							
WP3: Bioavailability of organic contaminants			■	■	■	■	■	■				
WP4: Greenhouse trial				■	■	■	■	■	■			
WP5: Long term plant uptake and remobilization				■	■	■	■	■	■			
WP6: Field trial				■	■	■	■	■	■			
WP7: Communication, training and policy legislation support	■	■	■	■	■	■	■	■	■	■	■	■
WP 8: Project management, DMP, Reporting	K	DM P	M SR		M SR			M SR				W FR

Project now almost exactly half time.

Delay because of unexpected findings, but should still fit in original schedule

Project Meetings so far only virtually possible.

with: K kick-off Meeting  
M Project Meeting  
W Workshop with international experts  
SR Status Report  
FR Final Report + Publication  
DMP Data Management Plan

# Many thanks for your attention

Contact

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