

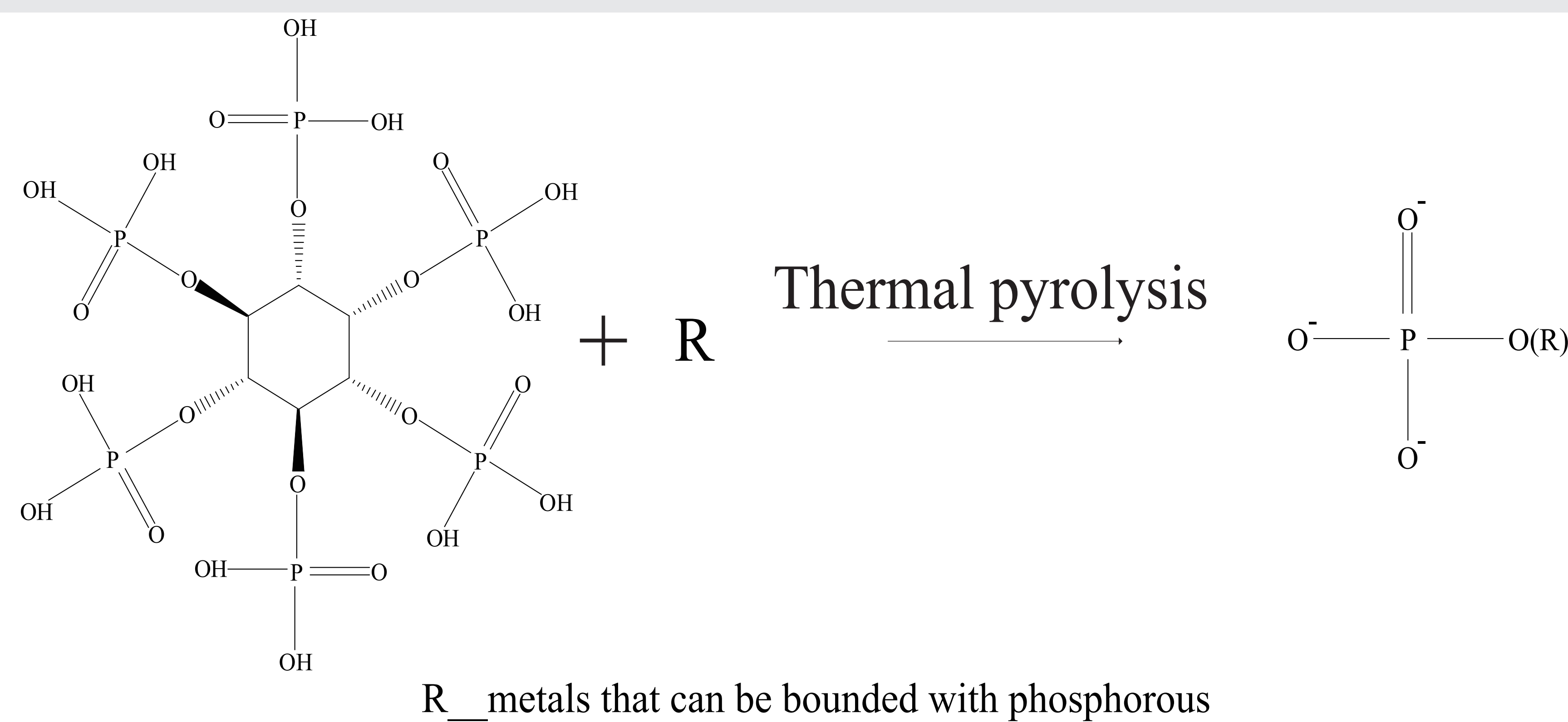
# Phosphorous recovery from key pyrolyzates

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## Background

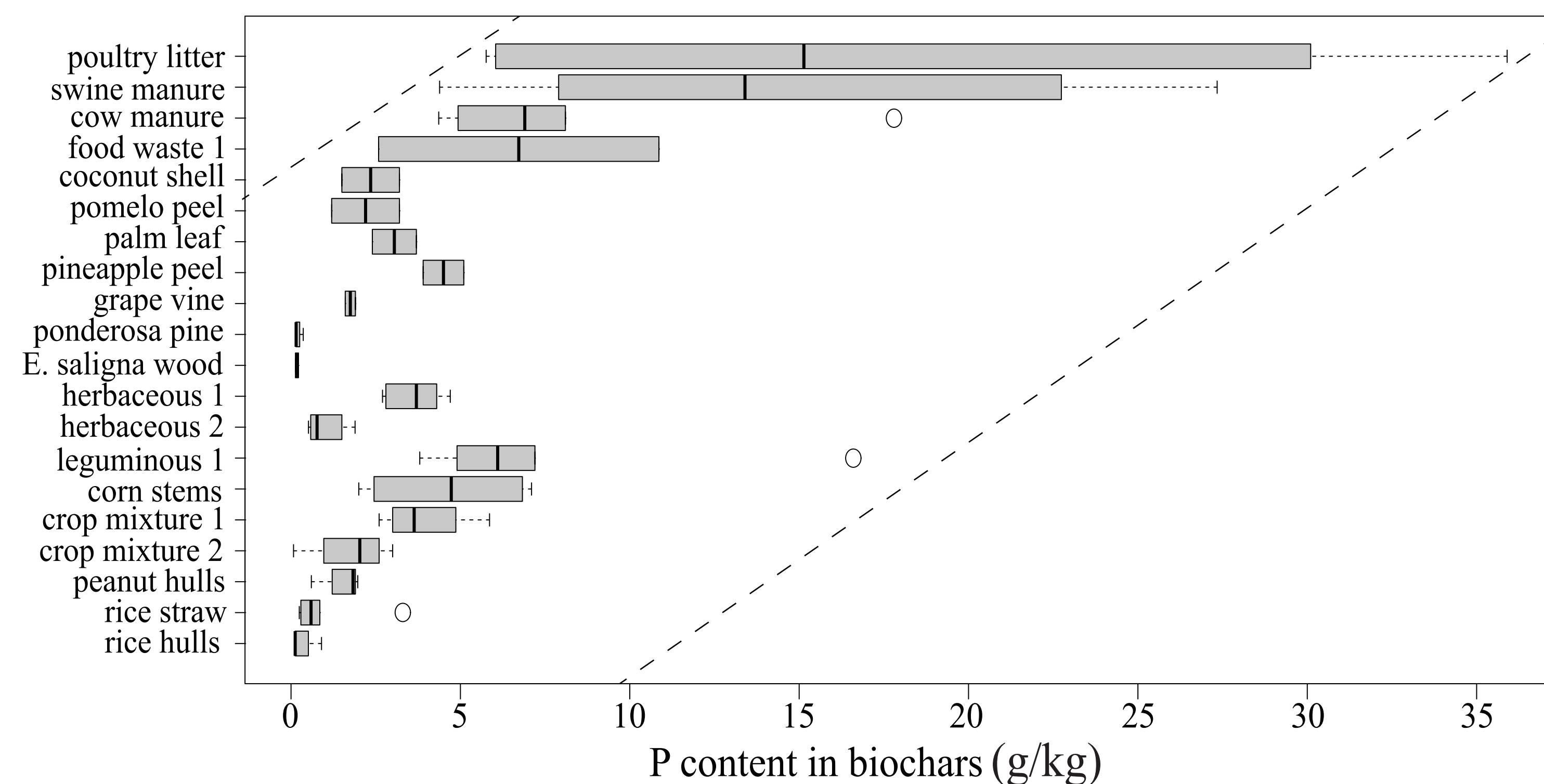
- The accessible deposit of phosphate ore is expected to be exhausted for current agricultural use in the next 50-100 yrs.
- Advent of reduced production and low-grade of phosphorous fertilizers are assumed to arrive even earlier.
- Biochar technology (pyrolysis (< 700 °C) with reduced oxygen) delivers multiple environmental functions, such as carbon sequestration and soil modification, but being ignored as an alternative for P recovery.

## P thermal transformation



- P does not volatilize but subjects to compositional transformations:
  - 1) break down of phytate (phytic acid bound to a mineral);
  - 2) reoccurrence of inorganic metal-P consortiums;

## Identify P enriched pyrolyzates

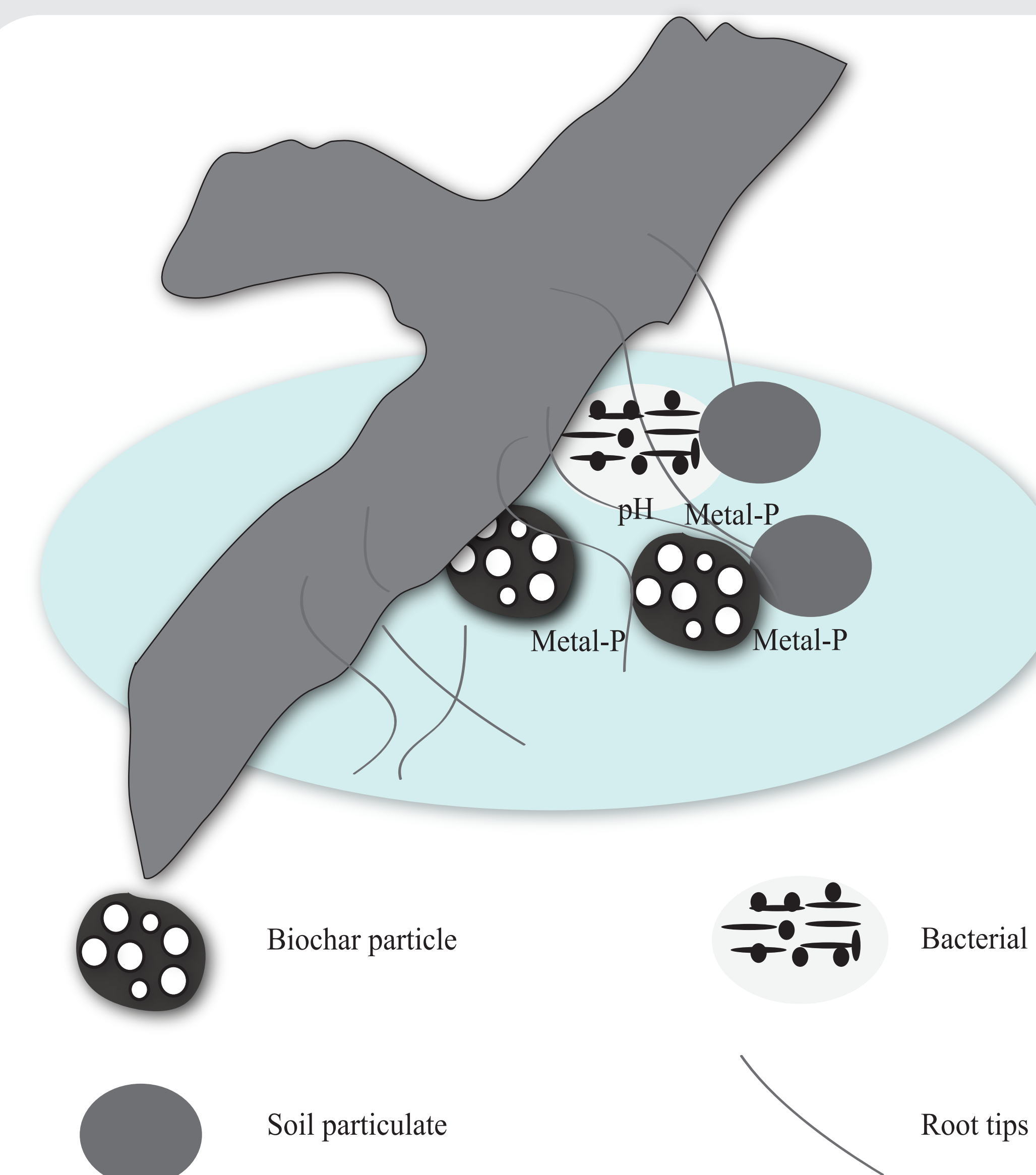


- The P content in the final thermal product will increase once the combustion degree is enhanced (e.g. prolonged pyrolysis time and increased thermal temperature).
- More P is enriched in animal faeces than from other feedstocks such as plant tissues.

## Chemical recovery

- Acidic or alkaline extractants can be used on P recovery from pyrolyzates.
- Heavy metal content in raw materials or the final biochar products should be considered.
- After chemical washing, pyrolyzates can act as agent with higher sorption capacities.

## Soil amendments



- Release of P from biochar to soils
- Rhizosphere effect
- Phosphorous soluble bacteria
- Arbuscular mycorrhizal fungi
- Sorption of P by biochar

## Academia to industry

- Identification of high P captured biomass in 'point' and 'non-point' sources.
- Application of pyro-, or hydro-thermal reaction for specific biomass.
- Small to large-scale thermal reaction equipments under specific circumstances.
- A sound marketing cycle.

## Acknowledgement



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