

Students' projects related to the Innovations for Healthy Soils & People

Botica, Ivan Niko
Horvatić, Vito
Powlison Belković, Hannah
O'Keeffe, Jamie



**International Master program Environment,
Agriculture and Resource Management**

InterEnAgro
University of Zagreb Faculty of Agriculture Croatia

Agrichar-based soil amendments for agriculture

- Biochar used for hundreds of years all around the world to increase soil fertility
- *Terra preta de indio soils* traditionally used by people of Amazon forest through slash and burn agriculture

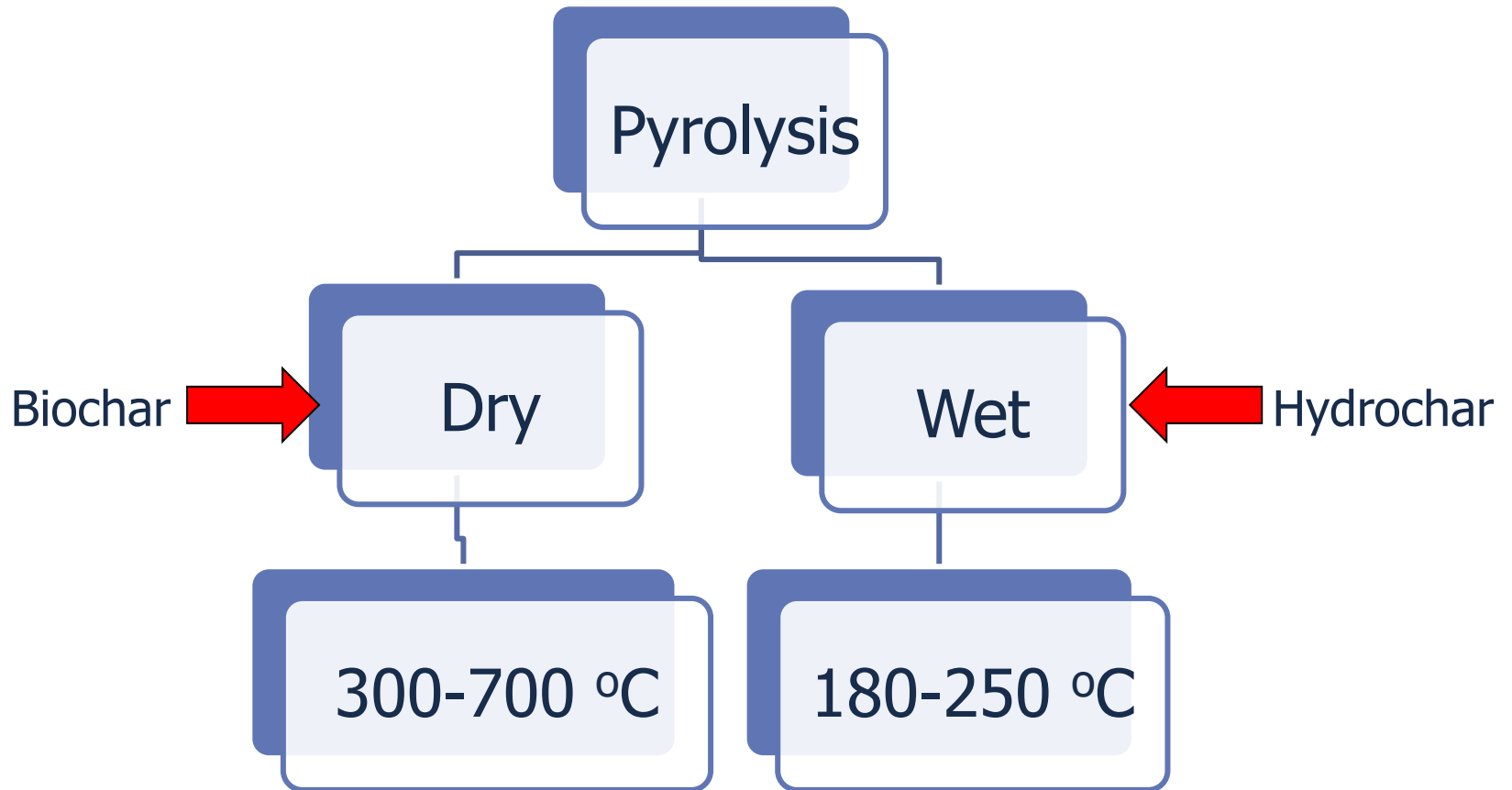


Typical profiles of Terra Preta soils (left) and unaltered tropical oxisols (right) (De Mena Pardo et al., 2016)

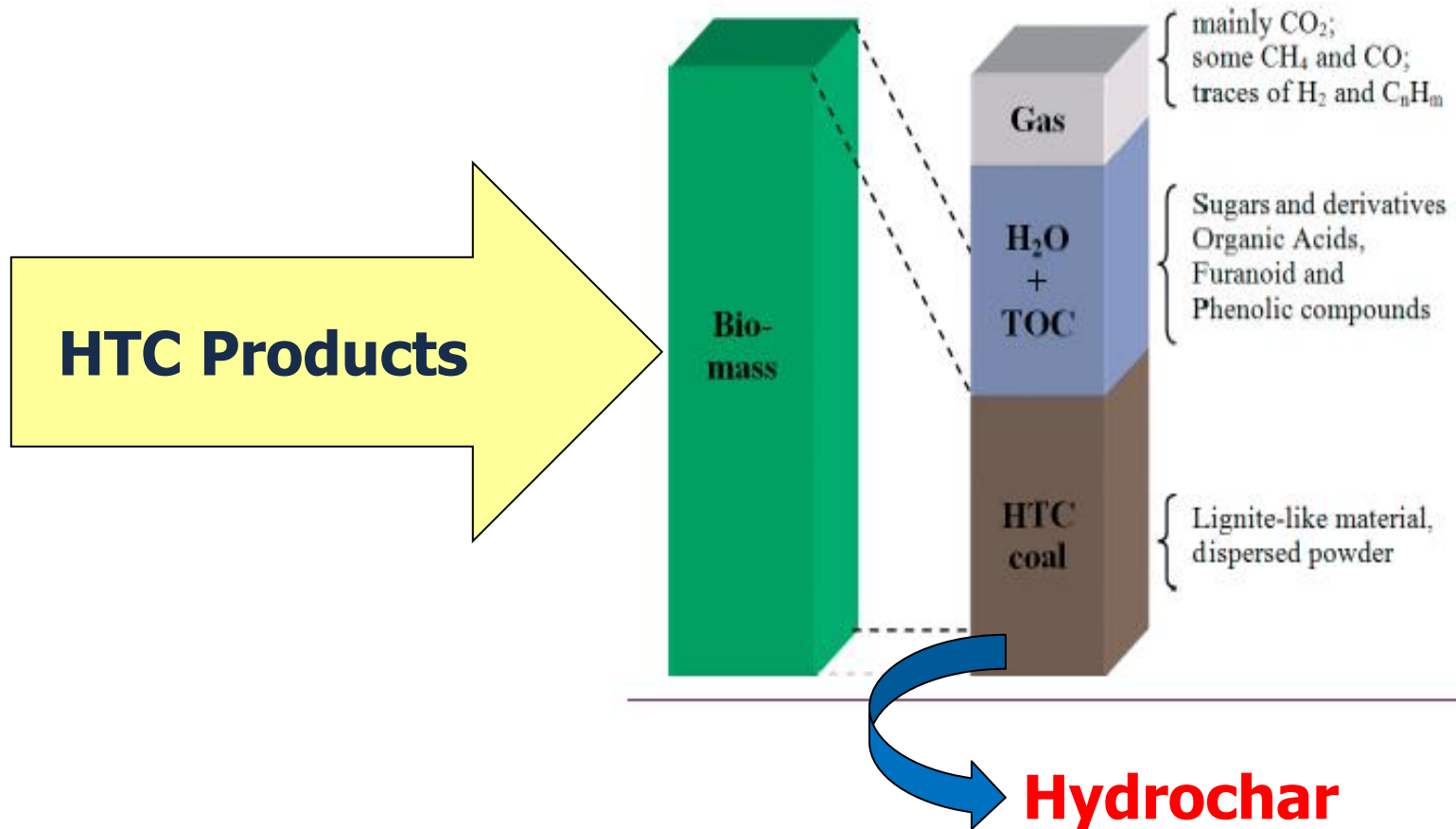
Chars as soil amendments

- Have large surface areas and complex surface structure
- Nutrient, water storage capacities and pH are also increased
- Improved micro-habitat for soil microbial activity
- Prevention of groundwater pollution, mitigation of GHG emissions and reduction of soil acidity

Comparison of dry and wet pyrolysis

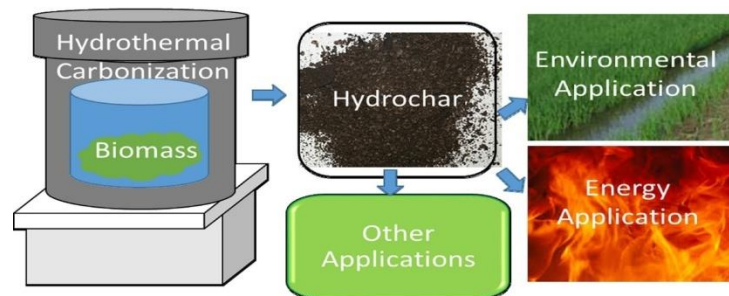


Hydrothermal carbonization (HTC)



Hydrochar as soil amendment

- Its application and effects as soil amendment are still not researched enough
- Prospective in areas of plant biomass growth, water and nutrient storage capacities
- Effective for retention of toxic substances in the soil
- Its porosity and C content increase soil microorganism activity thus increasing the soil fertility



June Fang et al., Minireview of potential applications of hydrochar derived from hydrothermal carbonization of biomass

Case study

POTENTIAL OF SEWAGE SLUDGE APPLICATION IN MEDITERRANEAN AGRICULTURAL SOILS

- Šibensko-kninska county – great natural potential
 - Production of wastewater → large quantities of sewage sludge
 - Highest amount of coastal cities, 1.846 tons/month (dry matter)
 - Pose great risk for environment if not treated, stored or disposed properly
 - Application to agricultural land – best practical environmental option – careful examination

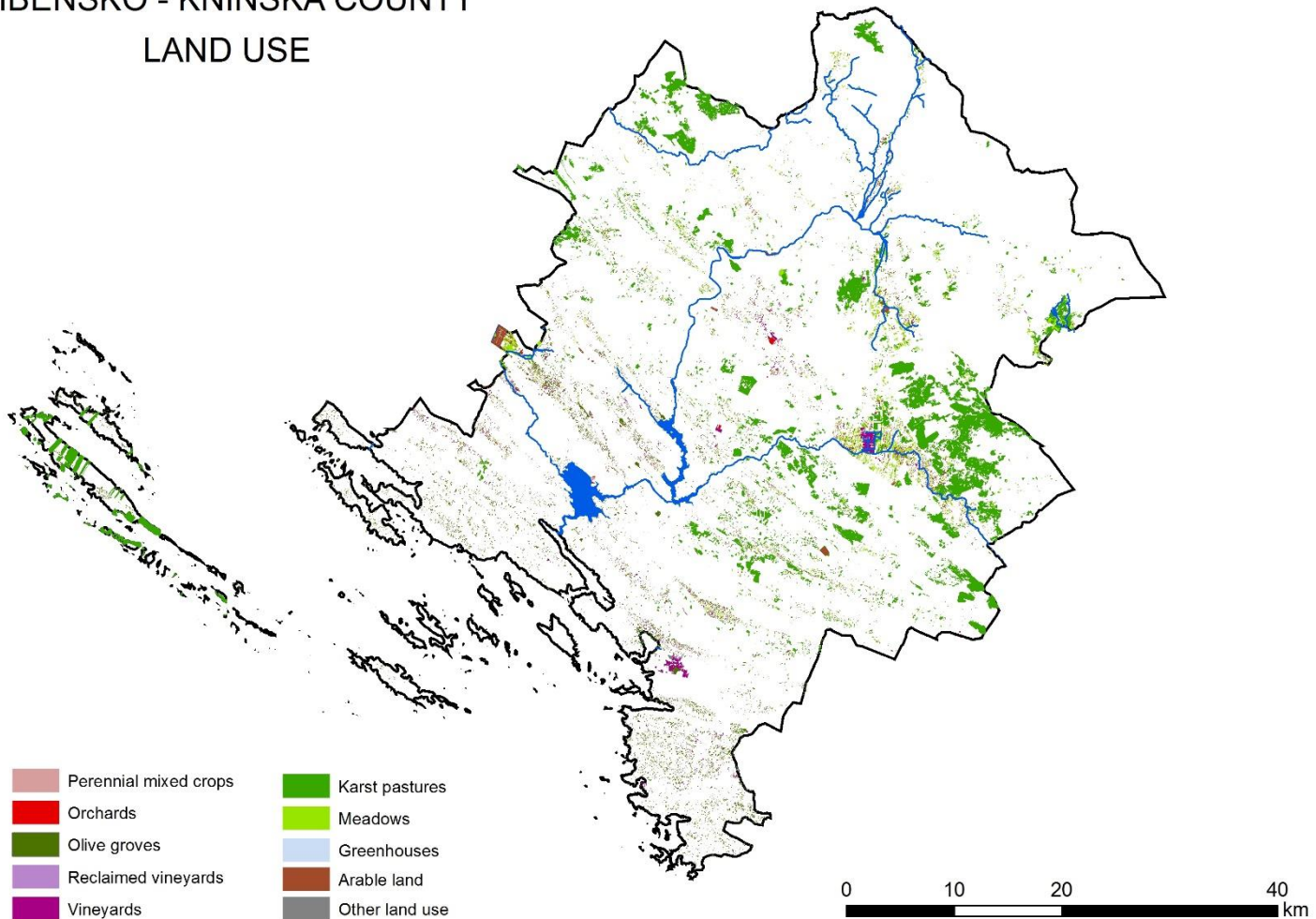
Mapping

- Karst land area
 - Organic matter scarcity
- Risk from well drained soils – percolation → leaching of **heavy metals**, pathogens, organic matter, etc...
- Preserve soil quality (physical and biological properties) and surface or groundwater quality



Mapping

ŠIBENSKO - KNINSKA COUNTY LAND USE



Mapping

- Šibensko-kninska county – land use
- REGULATIONS
- Forbidden:
 - Use on meadows and pastures used for grazing
 - Forage crops production fields (2 months before harvest)
 - Fruits and vegetables, 10 months before harvest if the edible part is in direct touch with soil

Legislation

- Goal is to prevent harmful consequences of usage for soil, plants, animals and humans besides fertilizing
- Safety process:
 - Biological, chemical and heat treatment (reduce fermentability)
 - Long period storage (6 months)
 - Proper implementation on field/in soil
 - Regular sludge analysis and annual soil analysis
- 1,66 tons dry matter of sewage sludge per hectare
- Idea – Sewage sludge + char production process
→ **Multiple times increased amount of allowed sludge use**



Thank you!