# Solid Fibrous Digestate Pyrolysis

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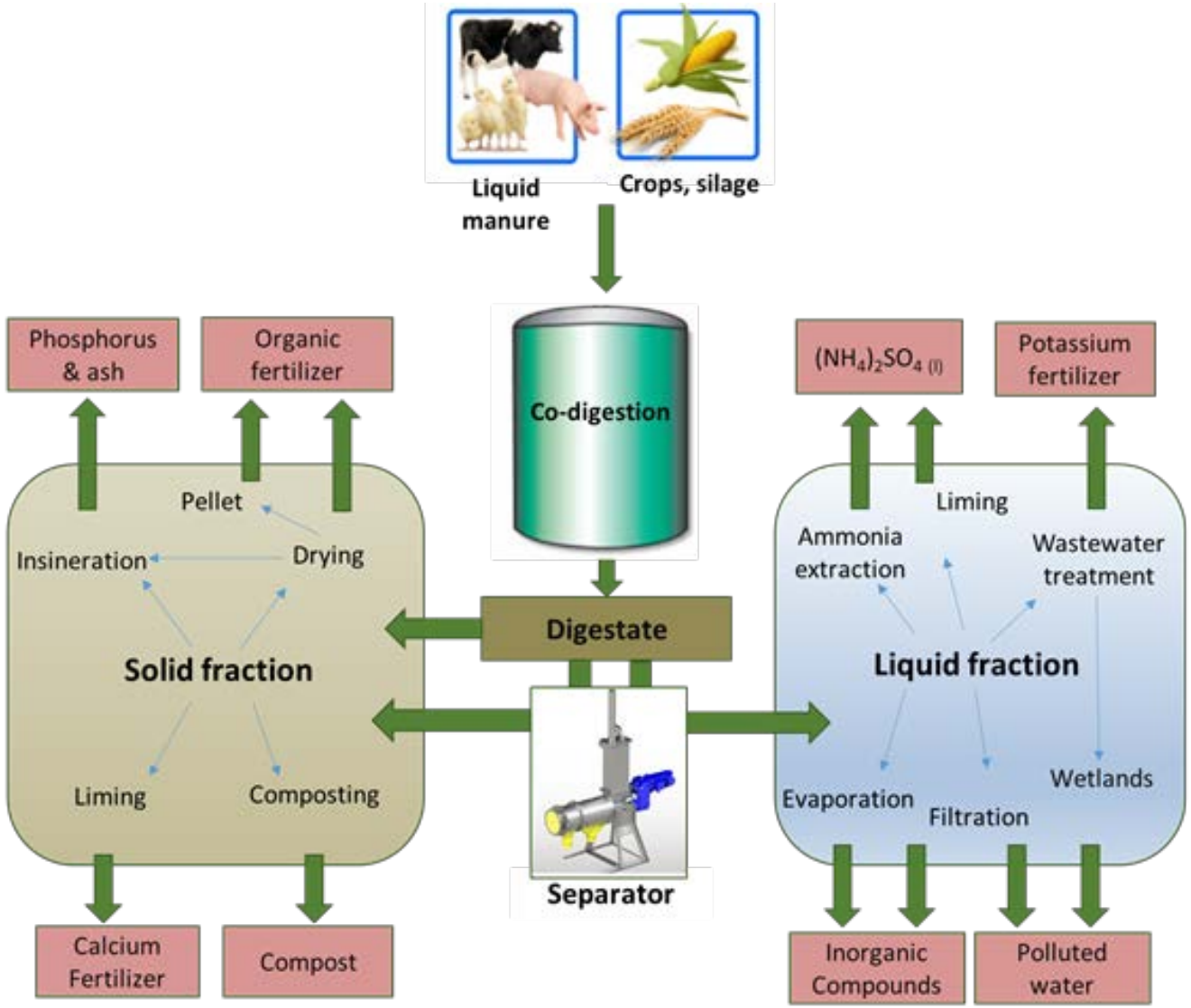
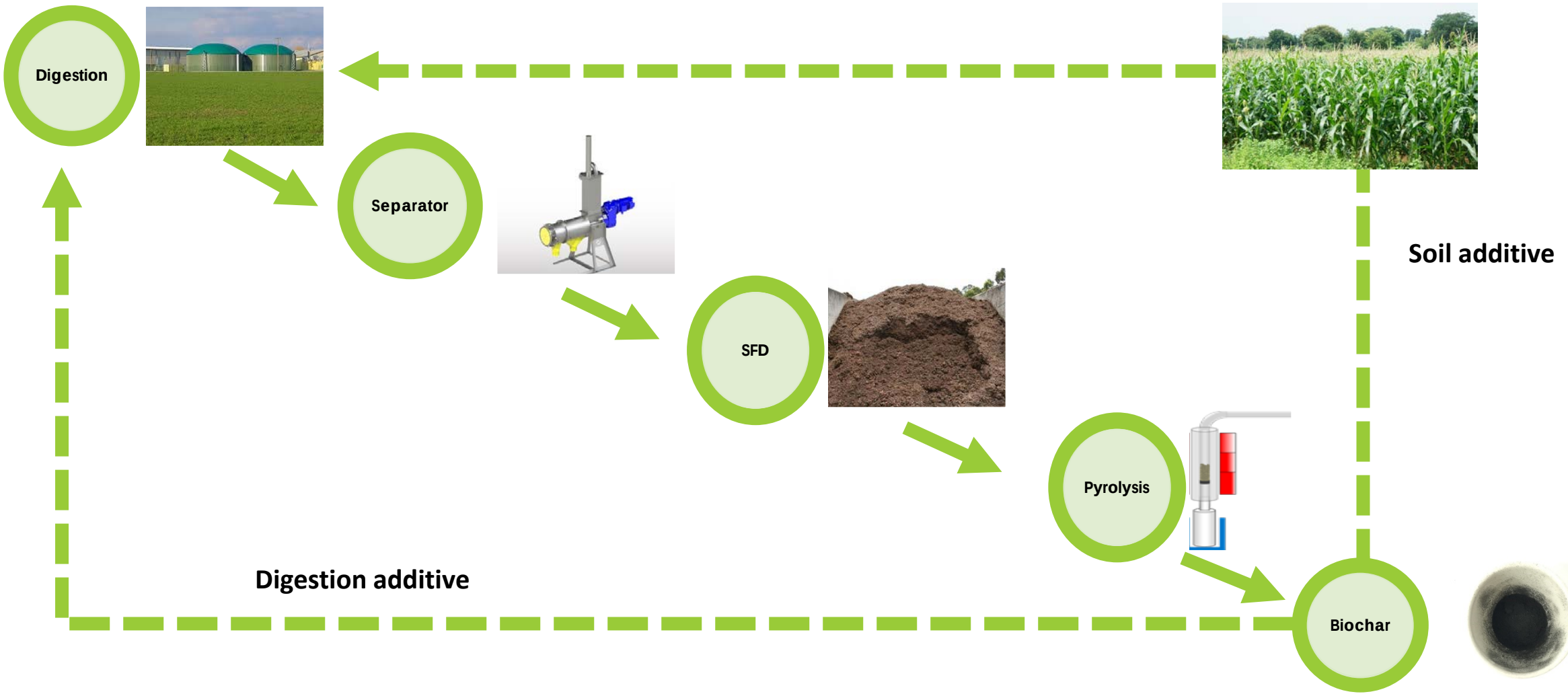
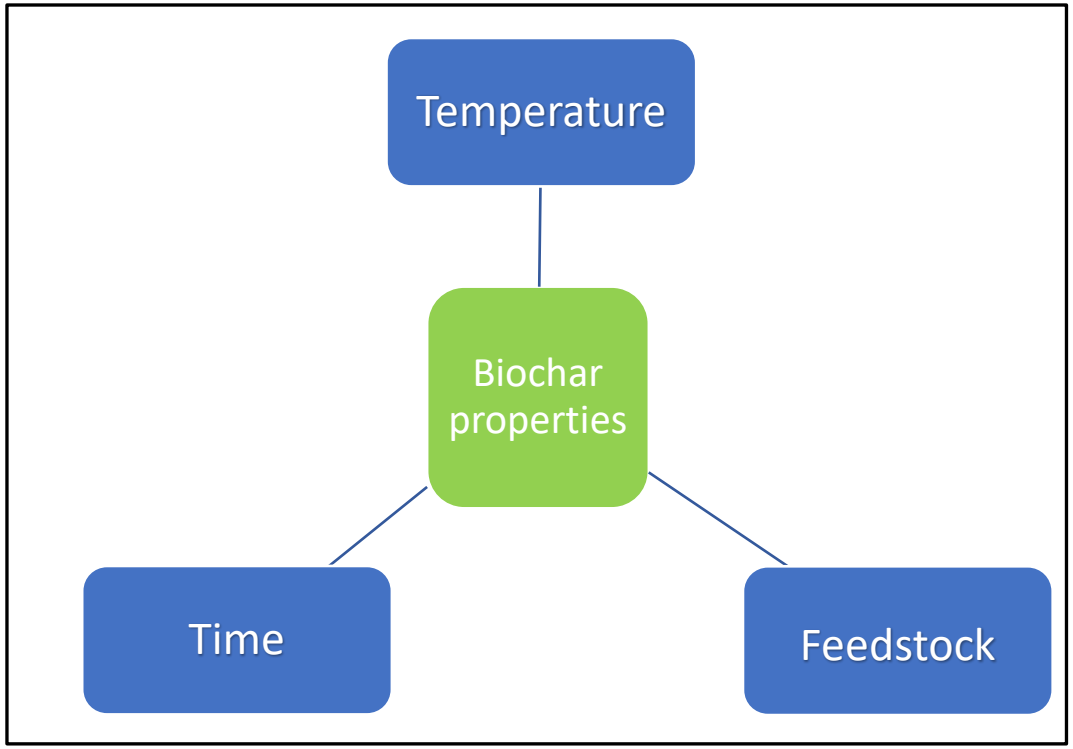
# Digestate Route



# Biochar Production



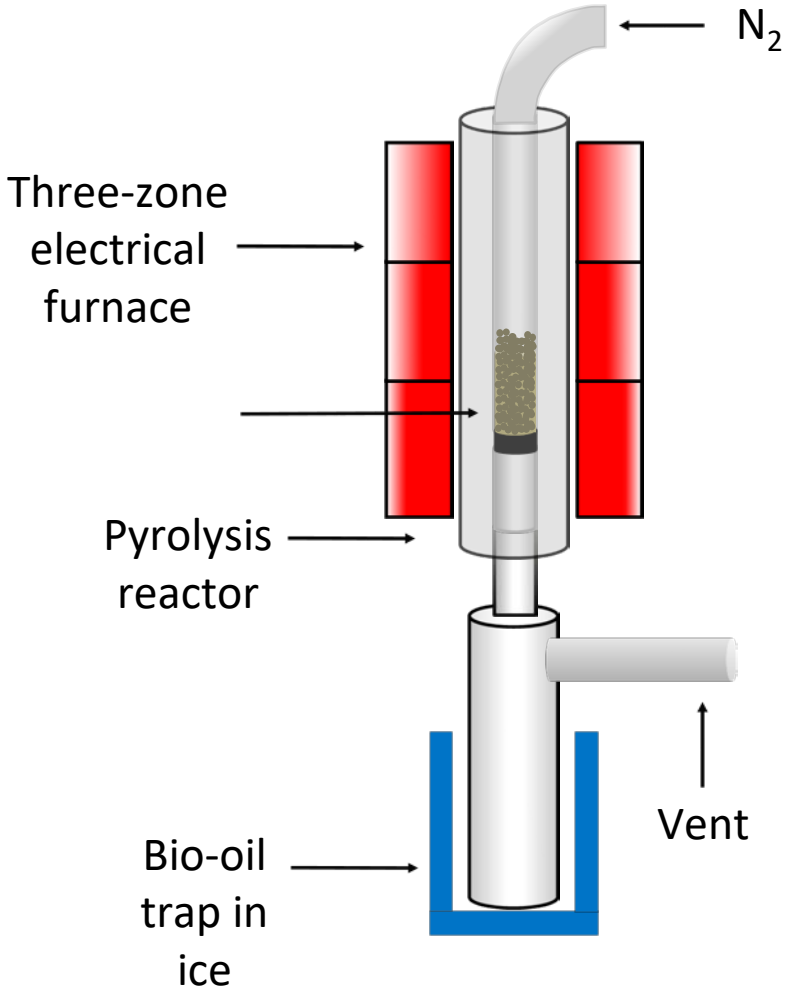
# Biochar Utilization

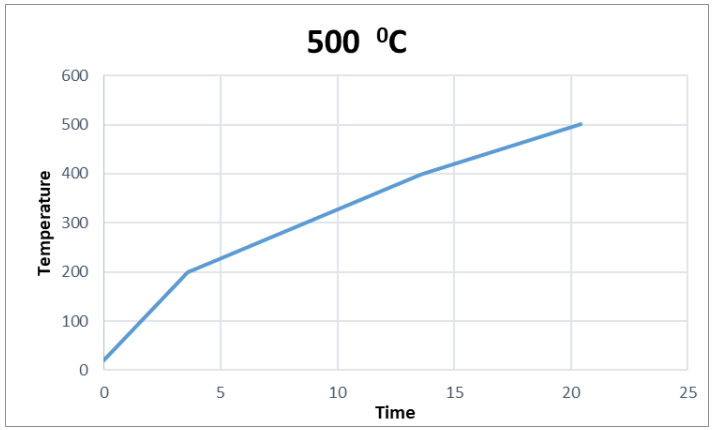


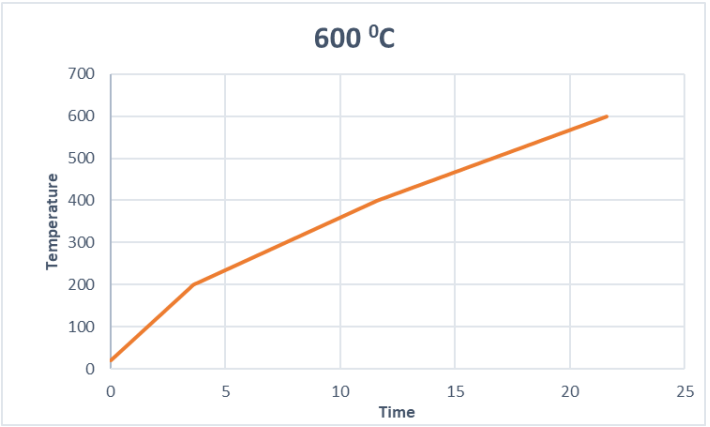

- Porous structure
- Increased SSA (Specfic Surface Area)
- Adsorptive

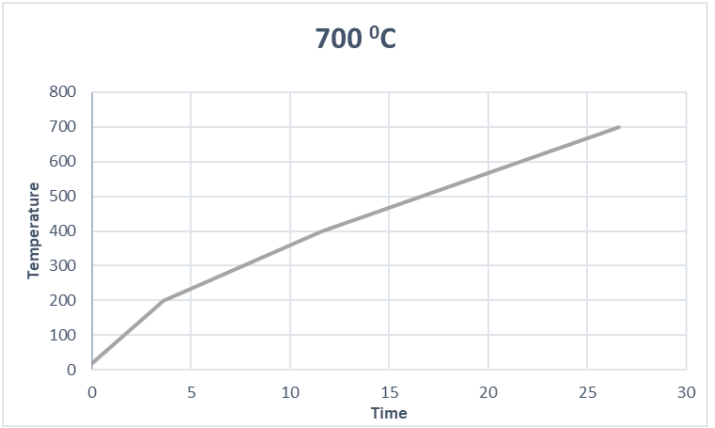
- Soil additive
- Anaerobic digestion additive
- Removal of organic pollutants and heavy metals

# Pyrolysis Protocol



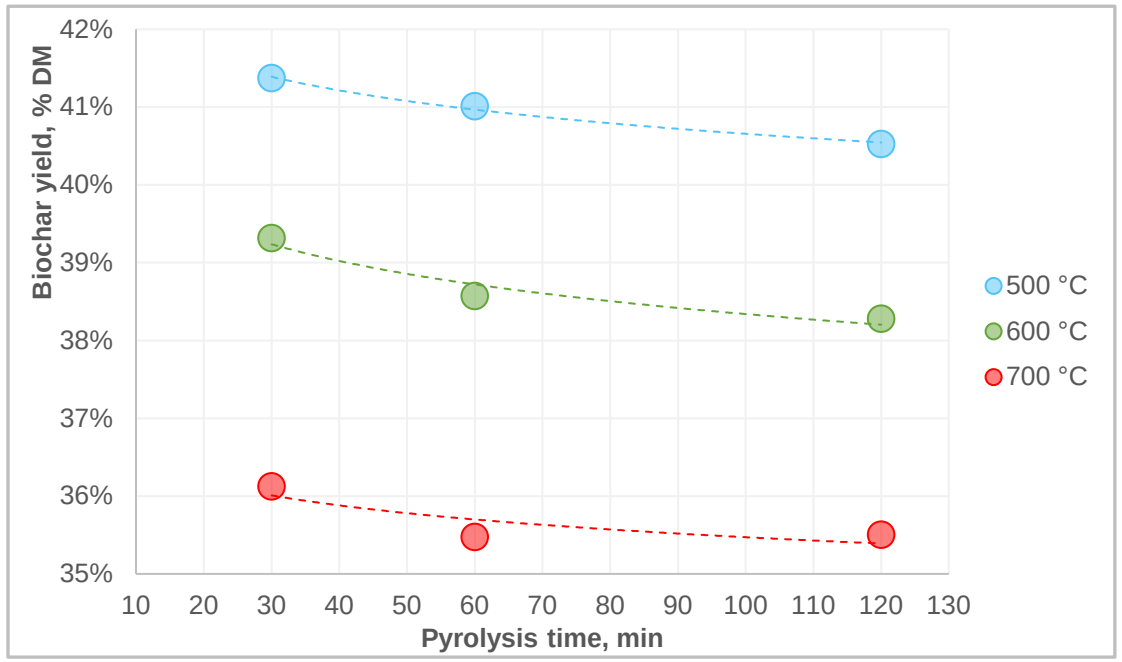

| | |
|---|---|
| **Sample mass** | 5g SFD |
| **Flow of inert gas** | 60 ml/min Nitrogen |
| **Run time** | 30, 60 & 120 min |

# Solid Fibrous Digestate Composition

| Parameters | SFD |
|---|---|
| Ash , % DM | 14.6 |
| Organic matter | 85.4 |
| C, % DM | 42.3 |
| H, % DM | 4.8 |
| O, % DM | 38.3 |

- Dried at 105 $^{0}$C, overnight.
- Ignition at 550 $^{0}$C, 3 hours.
- Proximate analysis

# Biochar Yield



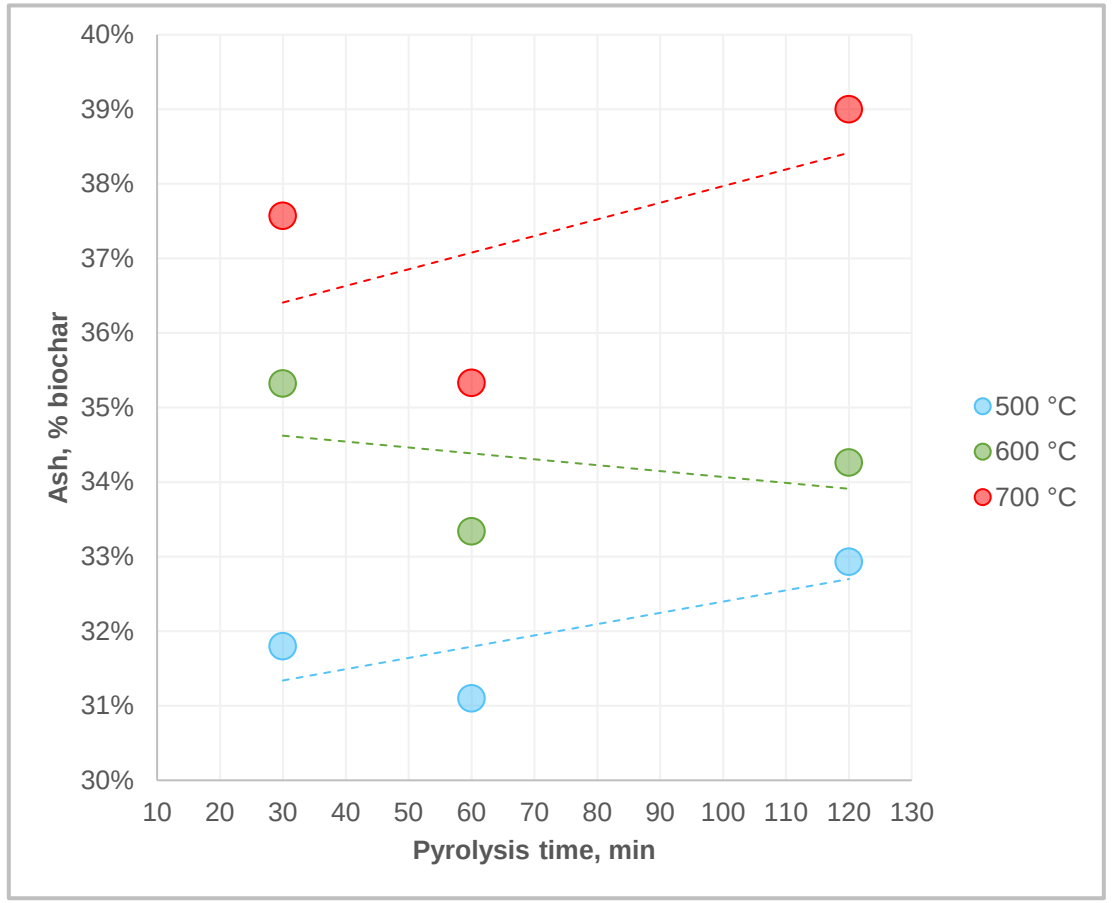

| 500 $^0$C | |
|---|---|
| 30 min | 41.4% |
| 60 min | 41.0% |
| 120 min | 40.5% |

| 600 $^0$C | |
|---|---|
| 30 min | 39.3% |
| 60 min | 38.6% |
| 120 min | 38.3% |

| 700 $^0$C | |
|---|---|
| 30 min | 36.1% |
| 60 min | 35.5% |
| 120 min | 35.5% |

- Lower pyrolysis temperature, higher biochar yield.
- Longer pyrolysis time, lower biochar yield.

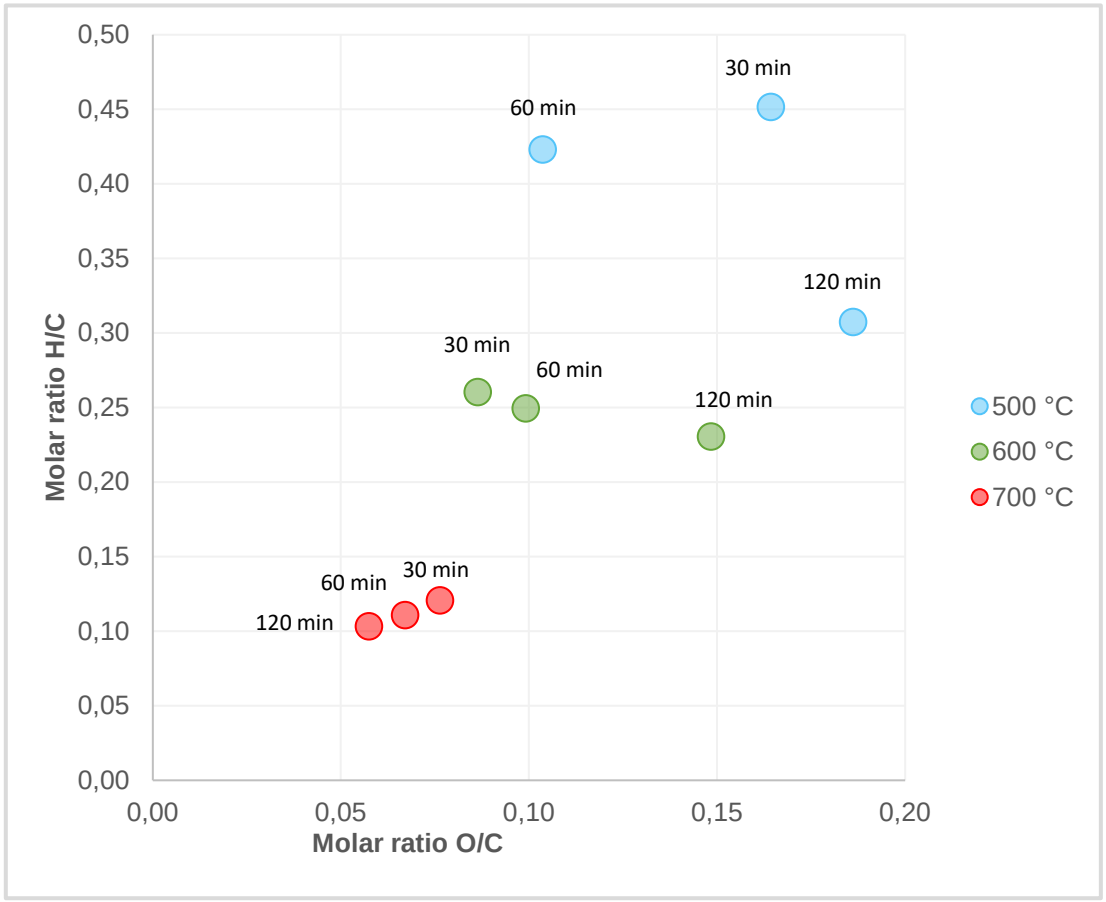
# Ash Content




Ash content increases at increased pyrolysis temperature.

No obvious correlation between ash content and pyrolysis time.

# Biochar Elemental Composition

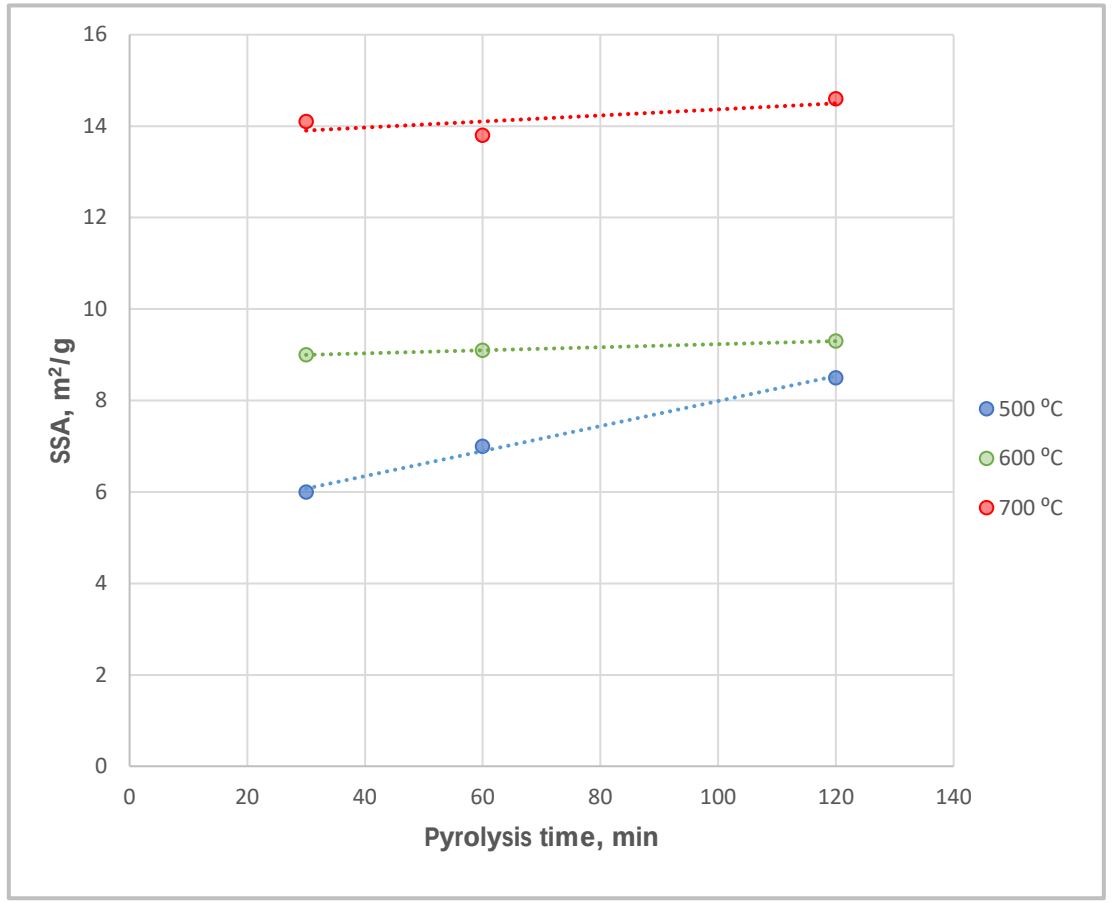



Increased pyrolysis temperature, reduced Hydrogen content.

Low H/C ratio indicates increased carbonization.

Decreased O/C ratio, decreased hydrophilicity.

# Specific Surface Area (SSA)

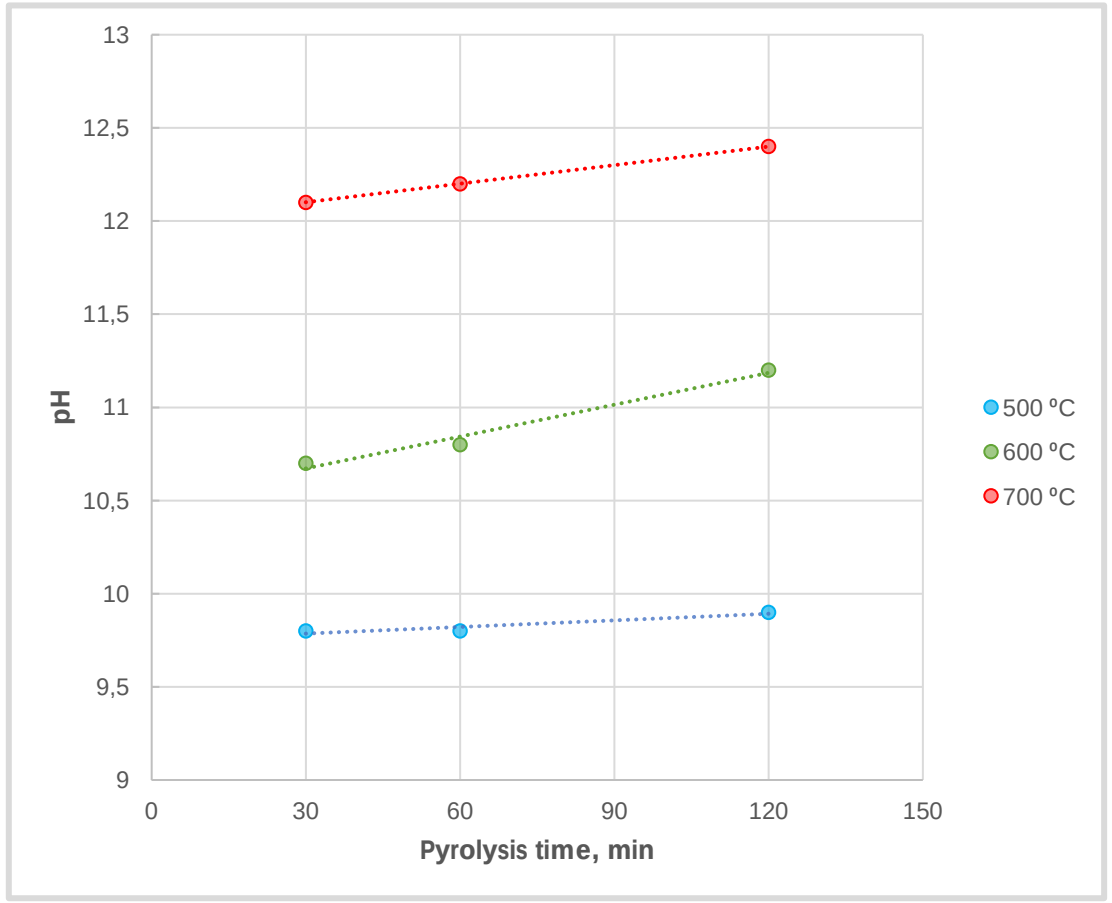



Higher pyrolysis temperature, increased SSA.

Pyrolysis time has negligible effect on SSA.

Max SSA achieved was low, ~14 $m^2/g$

# pH of Biochar



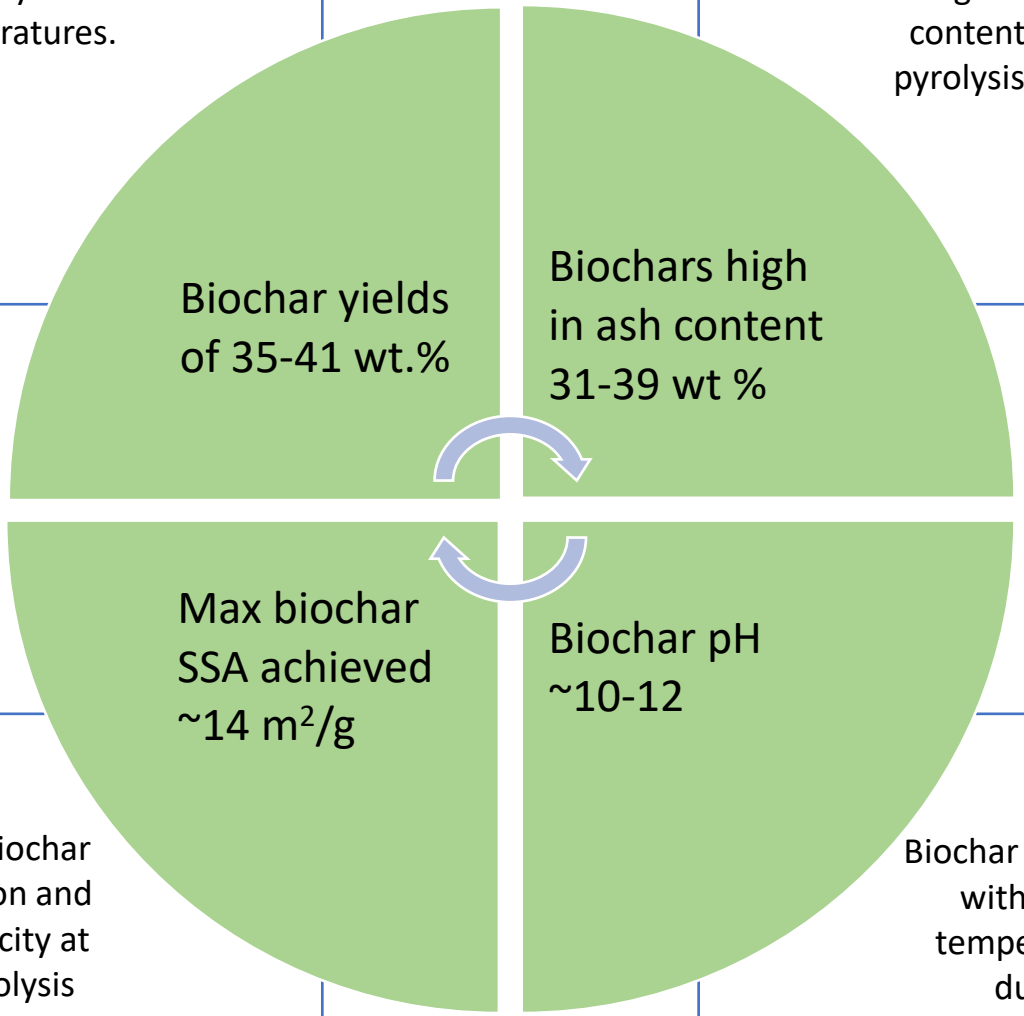

Higher pyrolysis temperature, increased pH due to inorganic compounds accumulation (ash).

Longer pyrolysis time, increased pH.

# Conclusions

Lower biochar yield at higher temperatures.

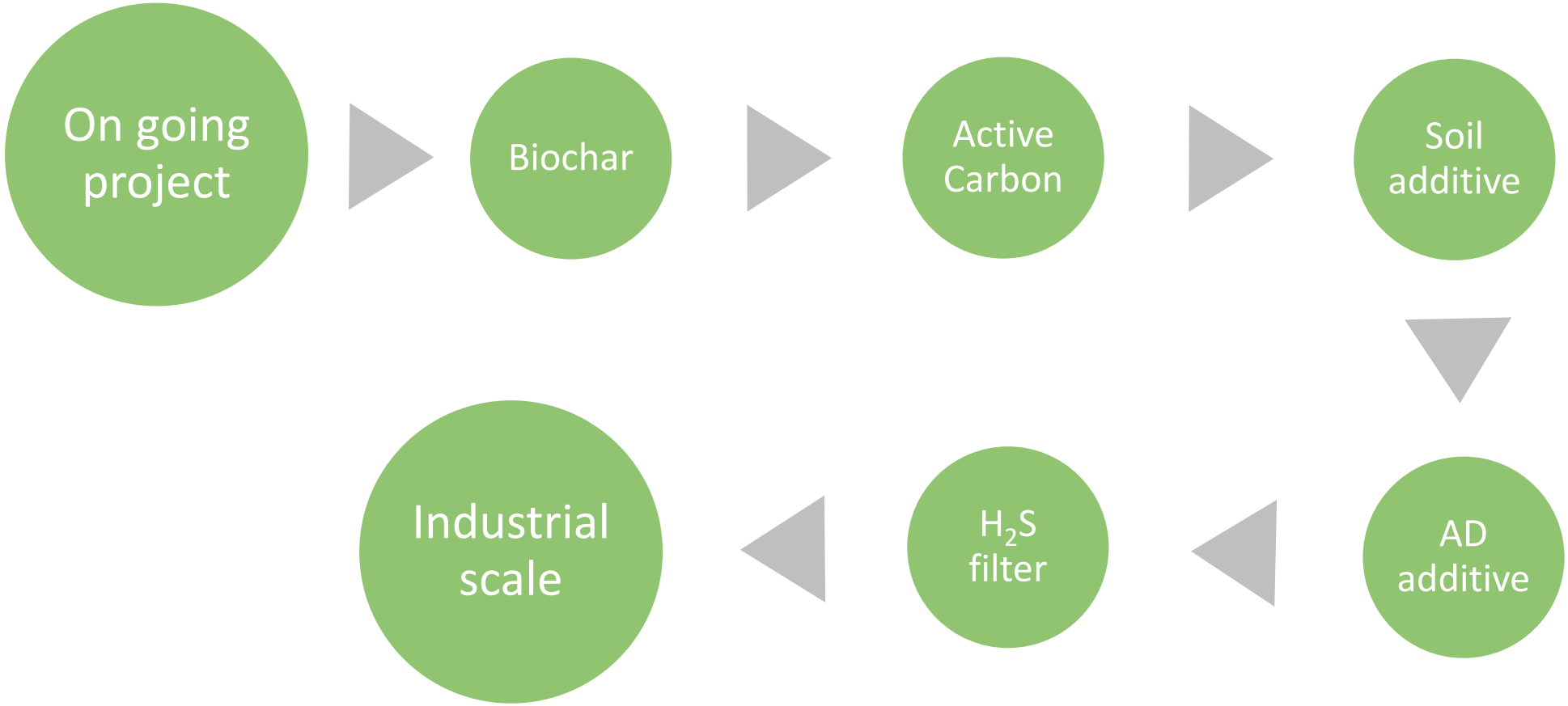
Higher biochar ash content at increased pyrolysis temperature.




Increased biochar carbonisation and hydrophobicity at higher pyrolysis temperature.

Biochar pH increased with pyrolysis temperature and duration.

# Future Aspects



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