Recycling resources from coffee by-products via hydrothermal conversion for sustainable coffee farming in Vietnam

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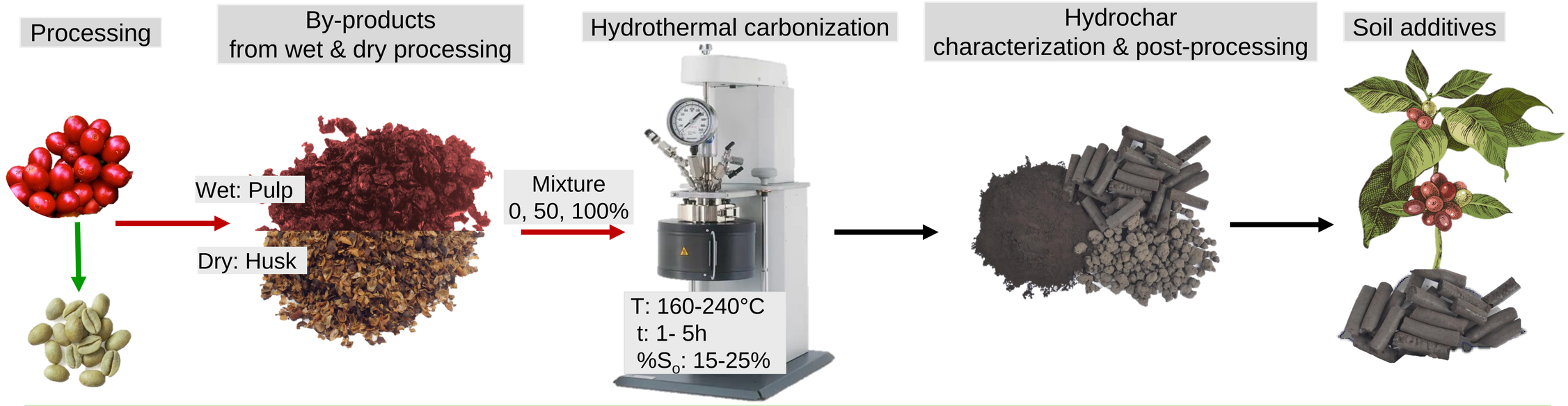
1. Problem statement

- Vietnam's coffee sector is facing challenges to remain competitive:
  1) world market pressure to improve product quality,
  2) climate change with threats of drought, pest, and disease attack,
  3) the need to promote product diversification.
- Measures to meet these challenges range from expanding the wet-processing capacity of coffee berries to improving the resilience of the growers through agro-ecological farming and ensuring that sustainable production standards are met throughout the value chain.

2. Main research questions

- Can the integration of a HTC system in coffee processing plants increase the sustainability in the coffee value chain?
- Can HTC be used to recover carbon and nutrients from coffee by-products for use as soil improvers for coffee plantations?
- Which HTC process parameters significantly influence the recovery efficiency for carbon and nutrients in the hydrochar?

3. Research methods



4. Results and discussion

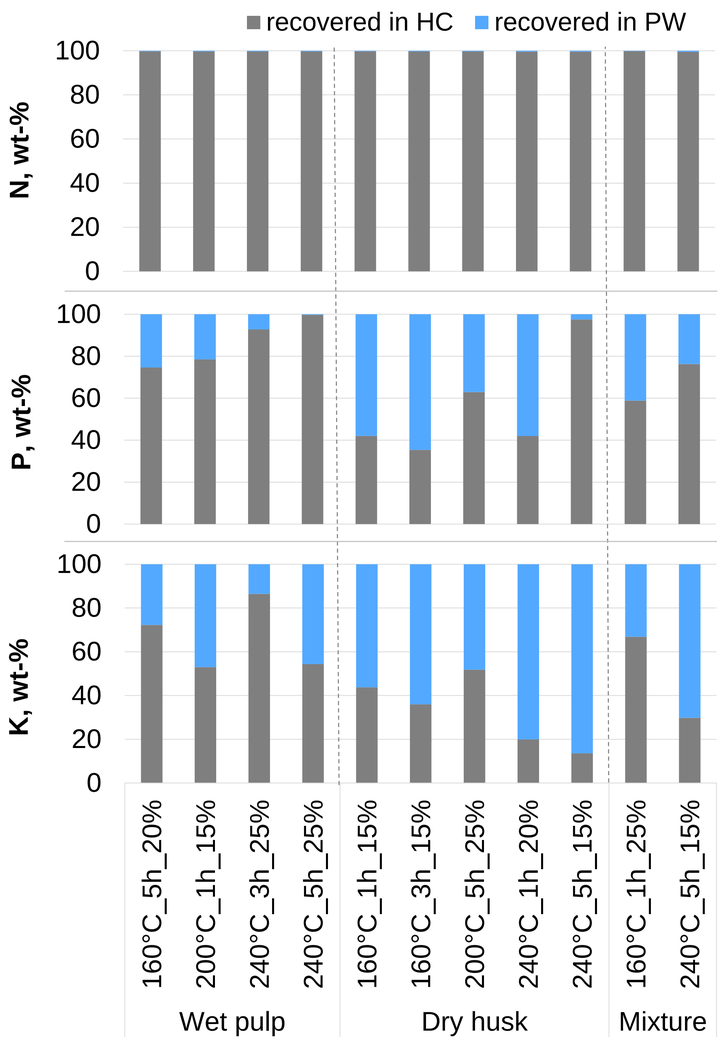
Recovery of nutrients (N, P, K)

- Nutrient recovery potential from wet pulp is much higher than dry husk.

nitrogen (N):
99% was recovered in HC at all conditions.

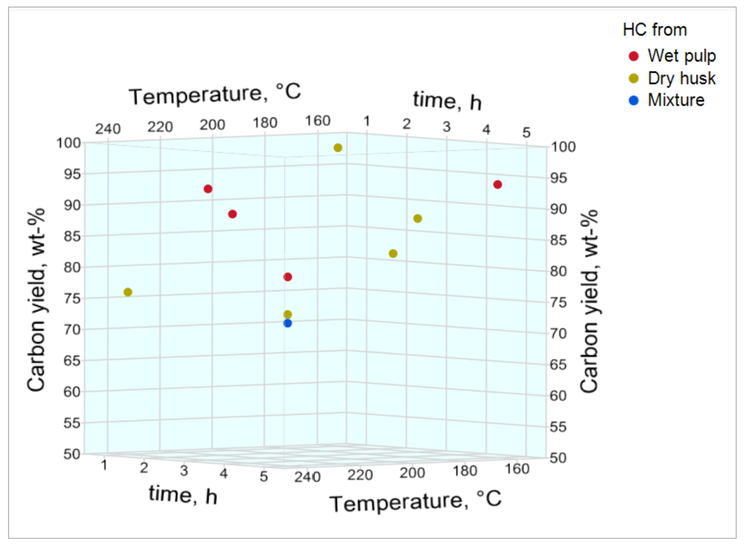
phosphorus (P):
Wet pulp: >75% recovery in HC at all conditions.
Dry husk: < 60% recovery in HC (except at 240°C, 5h).

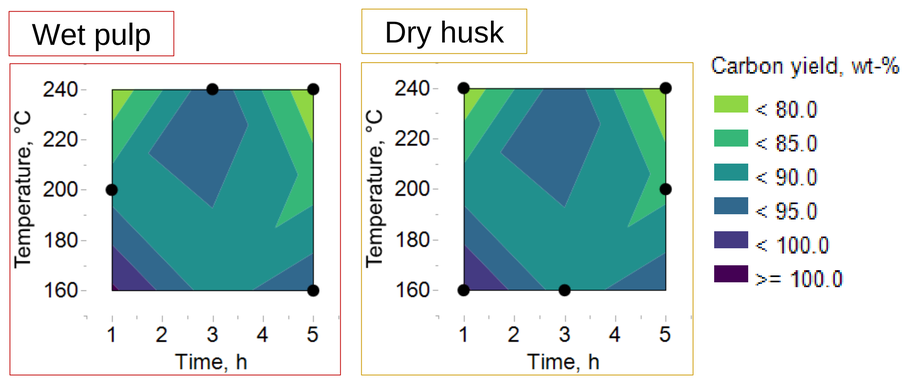
potassium (K):
Wet pulp: > 50% recovery in HC at all conditions.
Dry husk: < 50% recovery in HC at all conditions.



Effect of HTC parameters on carbon recovery

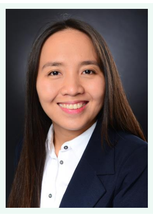
- HTC increased the carbon content of the solids, producing a stabilized product.
- Over 70% of carbon (C) mass can be recovered in HC at all conditions.





5. Conclusions and highlights

- Hydrochars derived from coffee processing by-products have high carbon and nutrient contents which can be utilized as a soil improver (physical and chemical properties) in the coffee plantation.
- The addition of a HTC-step to the wet-processing system to recover carbon and nutrients from the by-products can lead to large reductions in greenhouse gas emissions currently produced in the wastewater treatment plant .
- The outcome of this project will support farmers and producers to improve the sustainability of the coffee value chain in Vietnam, and also provide a basis for adapting on of HTC application to other coffee production regions.



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With support from
Federal Ministry of Food and Agriculture
by decision of the German Bundestag
Projektträger Bundesanstalt für Landwirtschaft und Ernährung