

# Biochar and Bioslurry production using Water hyacinth from Lake Tana, Ethiopia

## Methodological issues and impact on crop yields

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### Introduction

- The proliferation of exotic water hyacinth (*Eichhornia crassipes*) in Lake Tana, Ethiopia, is a result of **nutrient input via soil erosion and municipal waste**, disrupts **ecosystems** and **fishery**.
- Multiple (inter-) national conflicts have tripled the **mineral fertilizer costs** in the Amhara region, and fundamentally limited access, emphasizing the project's role.
- Utilizing WH biomass as an **organic fertilizer / amendment** via **bioslurry (biogas)** and **biochar**, the endeavor merges ecological restoration and agricultural resilience as a scientific answer to intertwined environmental and geopolitical challenges, and finally to contribute to food security and human health.



### II. Interactions with the local community and experts

- 1. Information events:** Farmers introduce scientists into the WH challenges
- 2. Trainings:** Farmers are trained, employed for harvesting and preparing the WH for testing and field trials
- 3. Workshops:** farmers and experts discuss the WH challenges, experiences with bioslurry and biochar production, and future perspectives personal observation

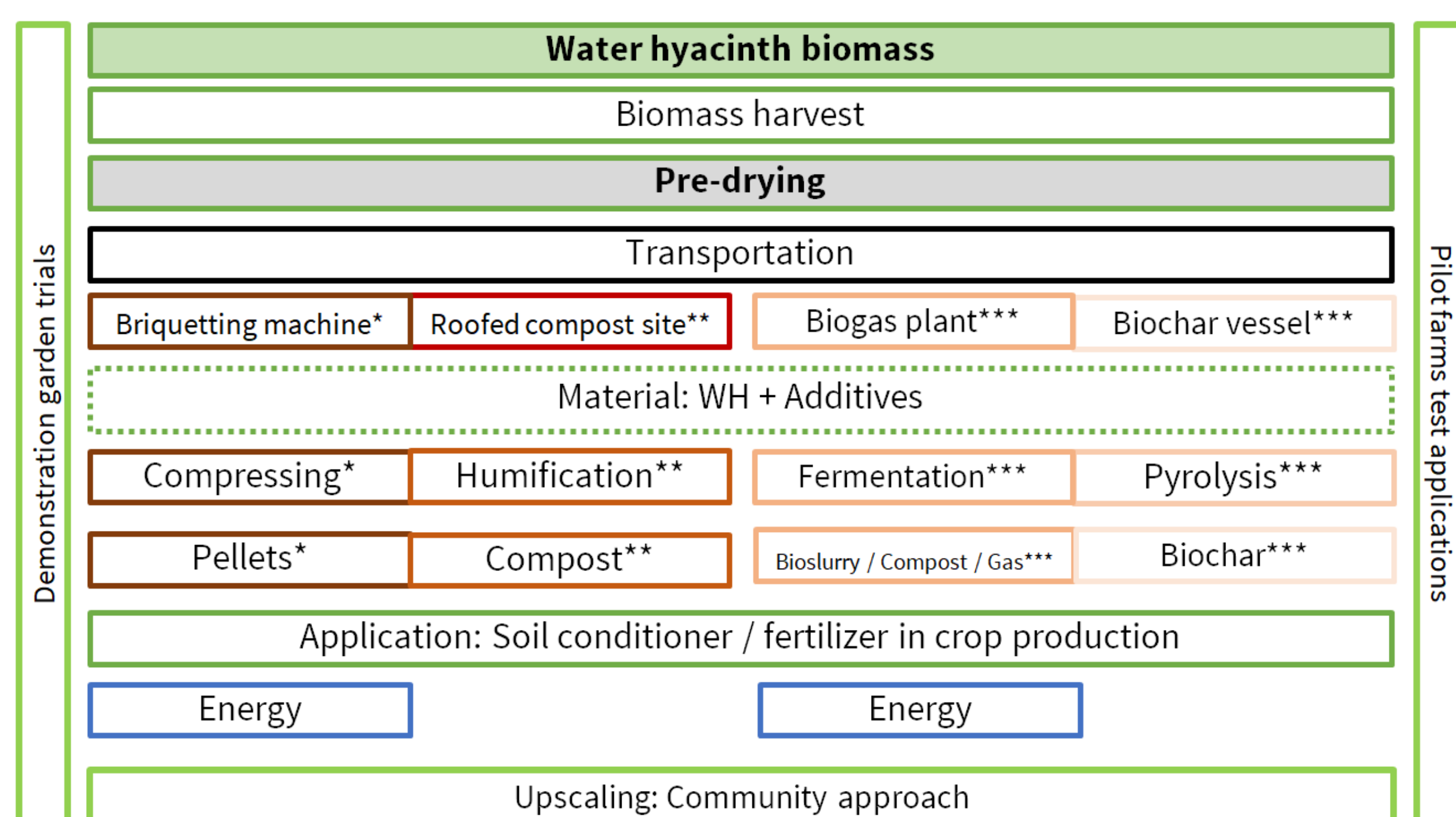
### Preliminary results

#### Preparation of WH:

- Supported by farmers the WH was prepared with local technology. Preparation is labor intense.

#### Lab scale and pilot scale test:

- **Biogas production:** Favorable C/N ration for gas production; Gas potential is generally high primarily from the WH stem; Methane from WH stem is 20,6 / 16,8 l kg FM-1 and qualifies for biogas production.
- **Biochar production from WH stem:** particularly from the stem high burnability; pH 11,2; extremely low heavy metal content.



\* Not part of the project Water for Life (possibility of development in the future); \*\*Being undertaken by the UoG; \*\*\*Part of the application; \*, \*\*, \*\*\* Part of the literature review



Farmer and expert workshops

### Outlook

1. Pilot scale tests will be added by **nutrient analysis**
2. Further tests to produce biochar and bioslurry / biogas of **all plant parts** are necessary
3. Impact on **teff yield** and **nutrient balance** will be analysed
4. Experiments under **farm conditions** will be established
5. Comparison with **WH compost** will be included
6. **Farmer and expert** feedback workshops and trainings incl. technology, economy and labour assessment will continue
7. **Policy briefs** including **upscaling** of practices will be summarized and used for **discussion** and **dissemination**

### Conclusions

Transforming WH into biogas, bioslurry and biochar helps to **sanitize Lake Tana, increases fish production**, and optimizes **soil fertility** and **crop yields**. There is **interest from the local farmers** to learn the techniques and use those fertilizers in their fields.



Teff trial



a) Dry Stem WH

b) Biochar from stem

c) powdered Biochar

### Materials and Methods

#### I. Analytical steps

- 1. Preparation of WH:** Collection from Lake Tana, sundried up to moisture content below 15%, and stem cut in pieces 2-3 cm for both lab and pilot scale; Physic-chemical analysis of the different parts of the plant.
- 2. Testing WH at lab scale:** For biochar, controlled pyrolysis using steel barrels with a surface area of 0.212 m<sup>2</sup>, temperature monitoring, and measurement of final biochar weight was evaluated. The lab-scale biogas experiments evaluated the methane potential of different WH parts using 0.5 l conical flasks.
- 3. Testing WH at pilot scale:** For biochar, steel barrels with a surface area of 0.212 m<sup>2</sup> have been applied, temperatures reached 200-500°C. For biogas, a stainless-steel barrel of 600 l was used.
- 4. Testing the impact of pilot scale products on crop yield of teff (ongoing):** Different variants of biochar, bioslurry and combinations incl. mineral fertilizers and their impact on teff yield.

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