

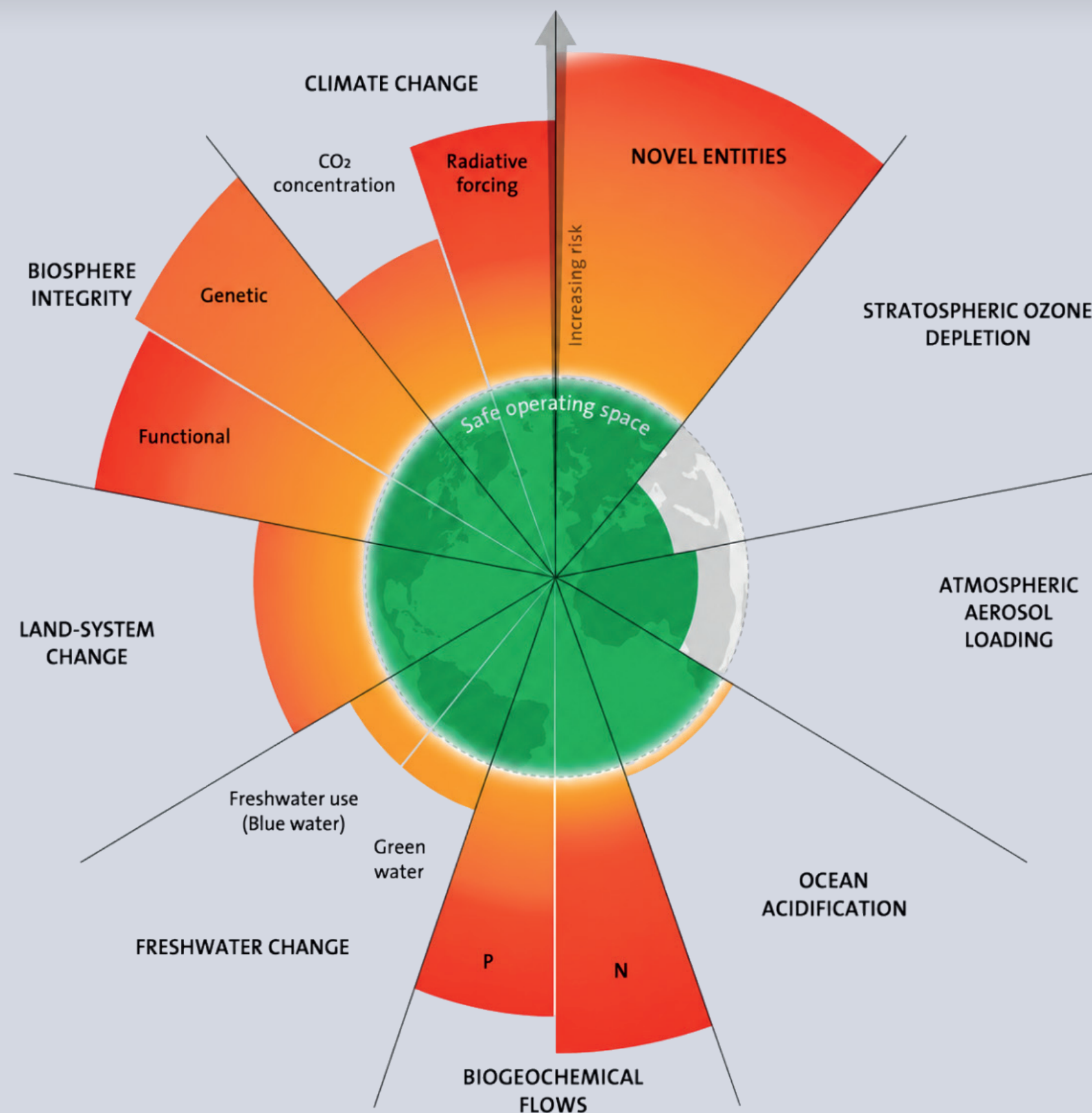


BIOBOOST-PRO: Demonstrating and Enabling Bioponics Using Manure-Based Organic Fertilizers in North-West Europe

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Contexte of manure management



29.7% agrifood systems in global GHGs (2)
6.7% EU share of global GHGs (2)
125 Mt N/year in livestock manure (2)
27 Mt N/year applied to soil (2)

Figure 1: evolution of the planetary boundaries framework

Soil-less Cultivation

Hydroponics is a **soilless cultivation system** in which plants grow in a **water-based nutrient solution**. Its main advantages are water efficiency, precise nutrient management, and high productivity, while its main drawbacks are technical complexity and dependence on external fertiliser inputs.

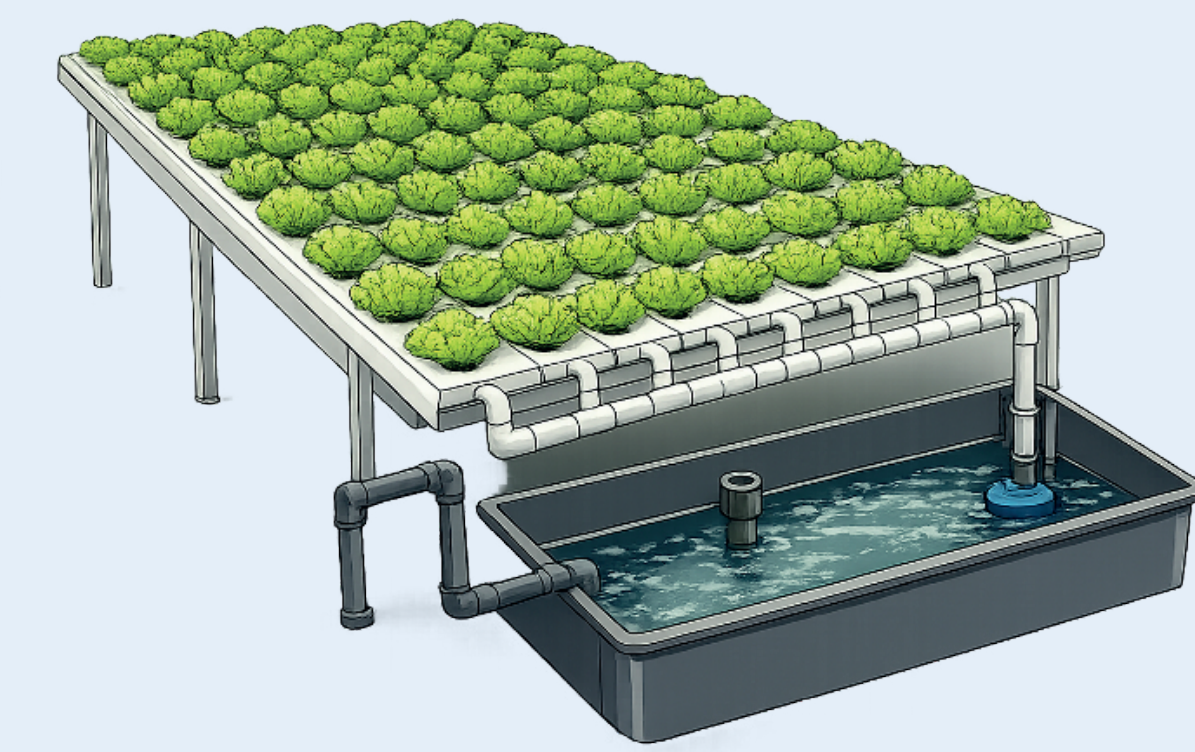


Figure 2: Hydroponic system with lettuce

Bioponic: a circular solution

Bioponics is a **soilless cultivation system using nutrient solutions derived from organic fertilisers**, such as processed animal manure. It makes hydroponic production more circular by **recycling nutrients** and reducing dependence on mineral fertilisers.

Structure :

WP1

- Demonstration
- Modelling
- Optimization

WP2

- Development of tools and strategies

WP3

- Stimulation of uptake and capacity building

5 countries



Figure 3: BIOBOOST-PRO partnership map



On-site and off-site pilots



Figure 4: On-site process chain

This on-site system converts animal manure into a local organic fertiliser for soilless cultivation, helping growers reduce mineral fertiliser use and create added value.



Figure 5: Off-site process chain

This off-site system combines digestion and nitrification to produce a nutrient solution for soilless cultivation. At large scale, it could supply multiple growers while reducing manure exports and nutrient losses.

First results and perspectives

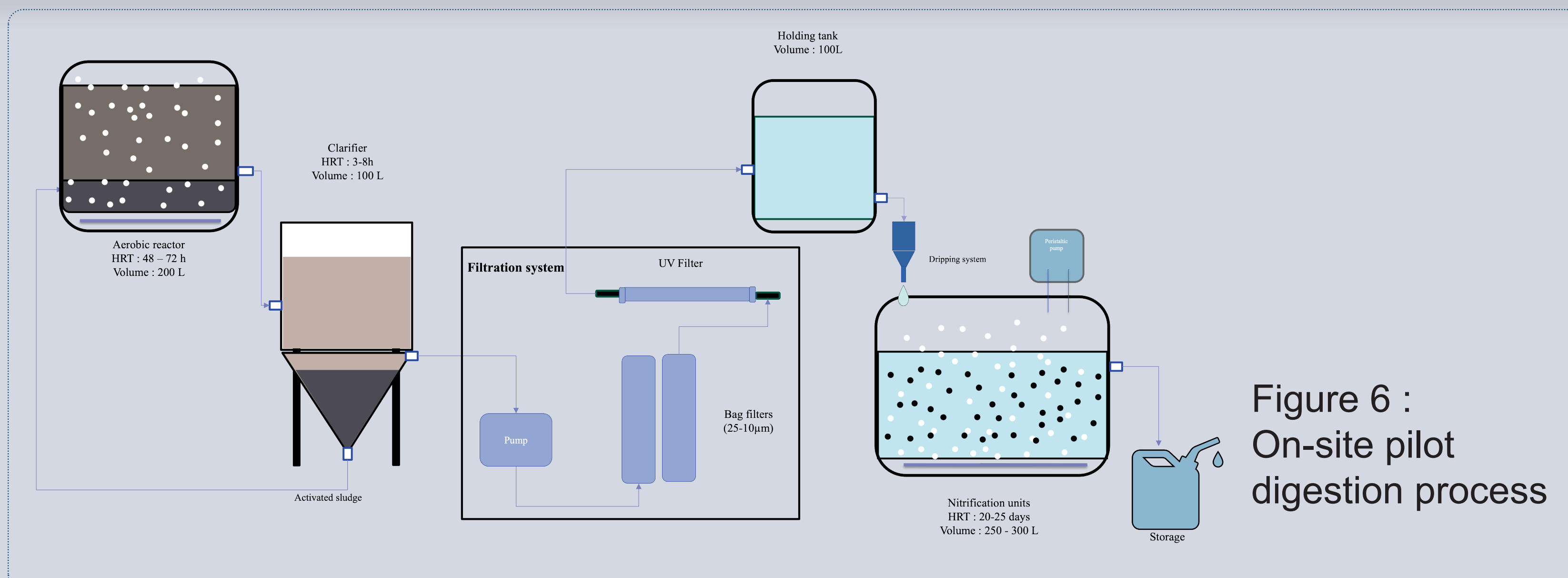


Figure 6 : On-site pilot digestion process

Table 1 : Composition of the fish and poultry manure

Parameters	Results on raw matter		Results on dry matter											Results on dry matter				
	Dry matter at 60°C (%)	Dry matter at 105°C (%)	Organic matter (%)	NTot (%)	NOrganique (%)	Nkjel (%)	NNH4+ (%)	NNO3- (%)	pH	P205 (%)	CaO (%)	MgO (%)	K2OT (%)	Na2O (%)	Carbon e (C %) (%)	Fer (Fe mg/kg) (%)	Mn (Mn mg/kg) (%)	C/N
Fish sludges	2,98	2,84	1,46	/	/	0,104	0,003	/	7,1	0,269	0,509	0,012	0,007	0,01	33,47	0,913	422	/
Poultry manure	38,98	36,89	30,66	1,766	1,704	/	0,061	<0,001	/	0,638	2,152	0,602	1,11	0,17	34,38	0,071	399	7,6

Poultry manure shows the greatest potential for nitrogen recovery because of its high organic matter content. Fish sludge can also supply nitrogen, but it needs to be concentrated to be used as an effective fertiliser.

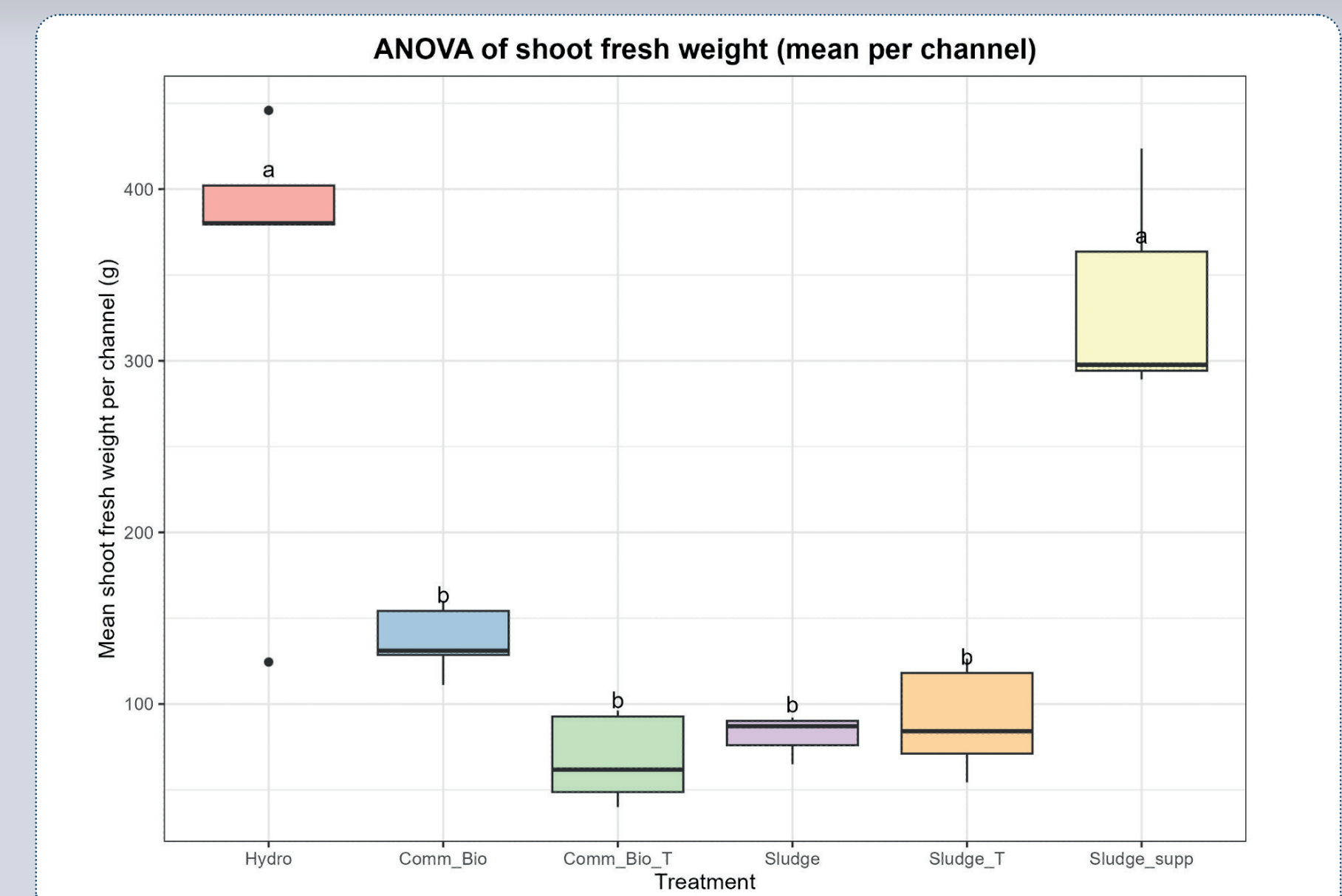


Figure 7 : Fresh shoot biomass of basil cultivation in hydroponic and bioponic condition with digested fish sludges

This preliminary test showed that fish sludge digestate did not provide enough nutrients to support plant growth throughout the full cultivation period. No significant differences were observed compared with the organic control fertiliser. All bioponic treatments showed clogging problems and root biofilm formation, indicating the need for finer filtration and higher nutrient concentrations.

(1) The evolution of the planetary boundaries framework. Licenced under CC BY-NC-ND 3.0 (Credit: Azote for Stockholm Resilience Centre, Stockholm University. Based on Sakschewski and Caesar et al. 2025, Richardson et al. 2023, Steffen et al. 2015, and Rockström et al. 2009).

(2) FAO. 2024. Greenhouse gas emissions from agrifood systems: Global, regional and country trends, 2000–2022. FAOSTAT Analytical Brief Series No. 99. Rome, FAO. <https://doi.org/10.4060/cd3167en>