



Vertical Farming and the Circular Economy

By Seppe Salari



ASTROPLANT



Association for
Vertical Farming

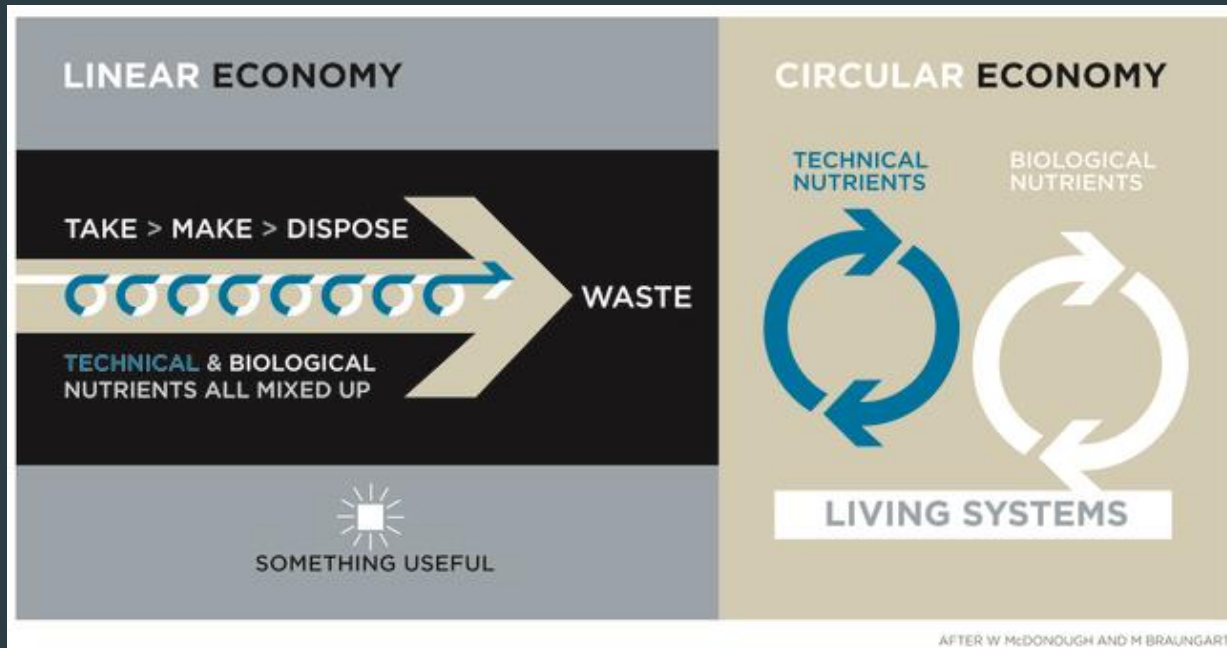


WAGENINGEN
UNIVERSITY & RESEARCH

Vertical Farming = Controlled Environment Agriculture (CEA)

- ▶ Any agricultural product can be grown with CEA
 - ▶ No pesticides/herbicides
- ▶ Can also mean fish, insects and mushrooms
- ▶ How can we make this more sustainable?

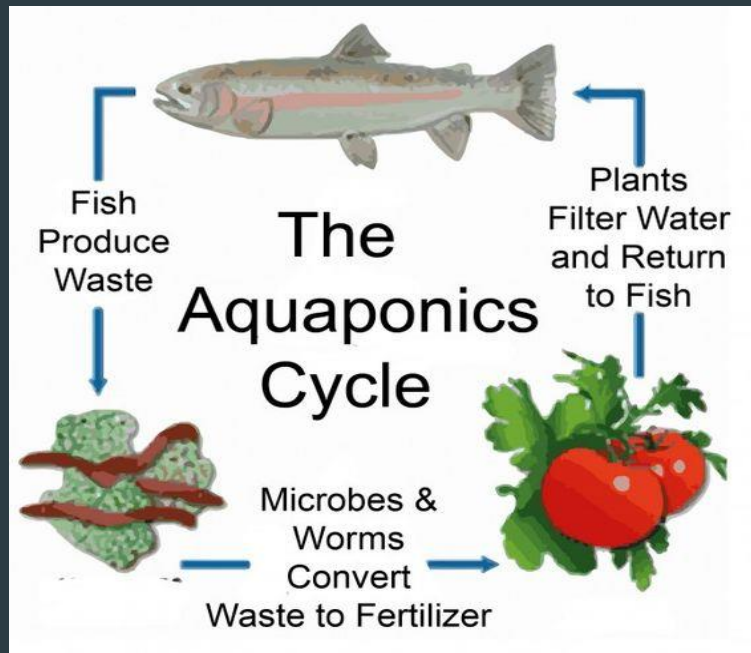
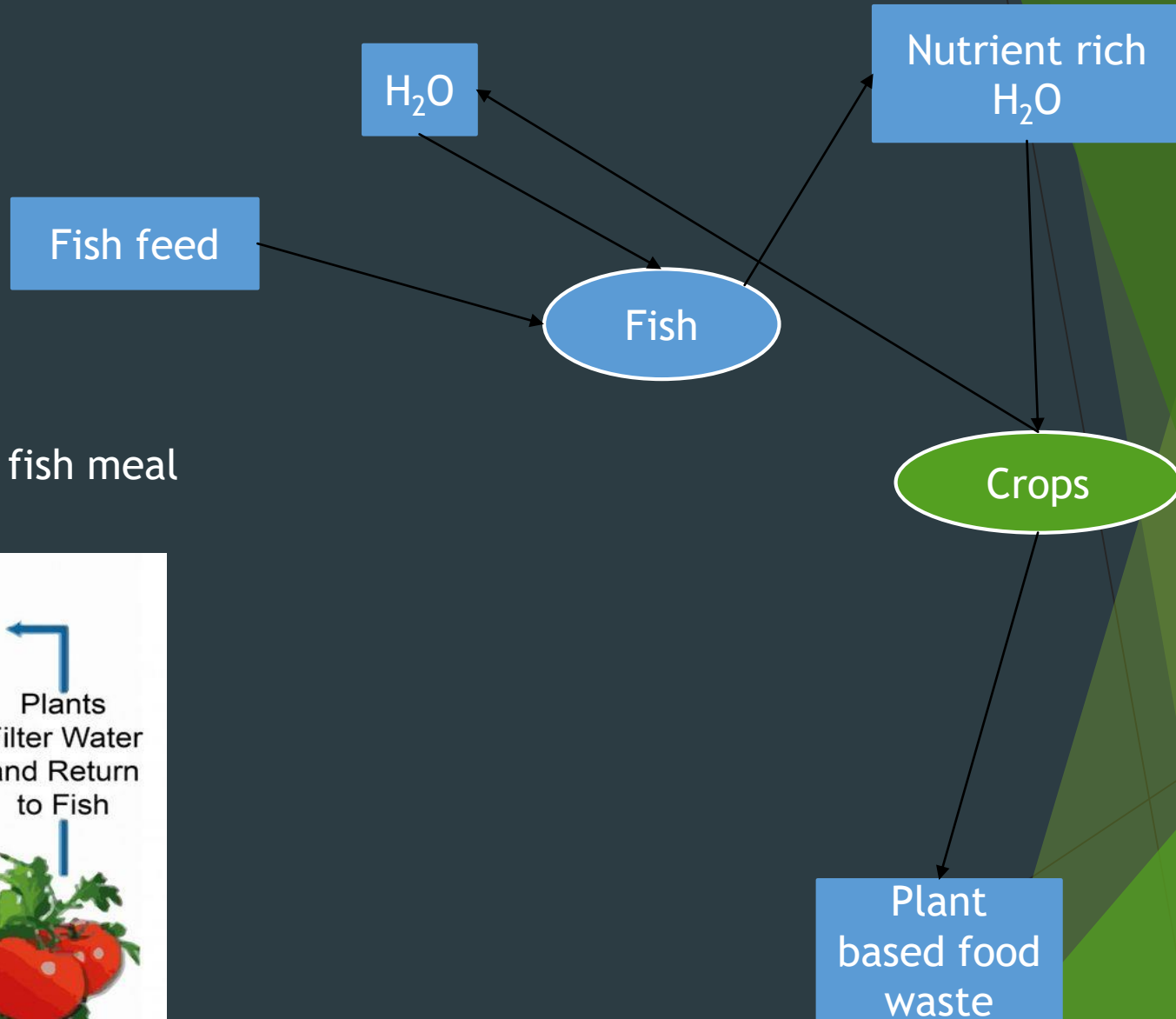
Circular Economy



- ▶ Two main components in CEA:
 - ▶ Material flows: fertilizer, faeces, feed
 - ▶ Air flows: CO₂, O₂, humidity

Aquaponics

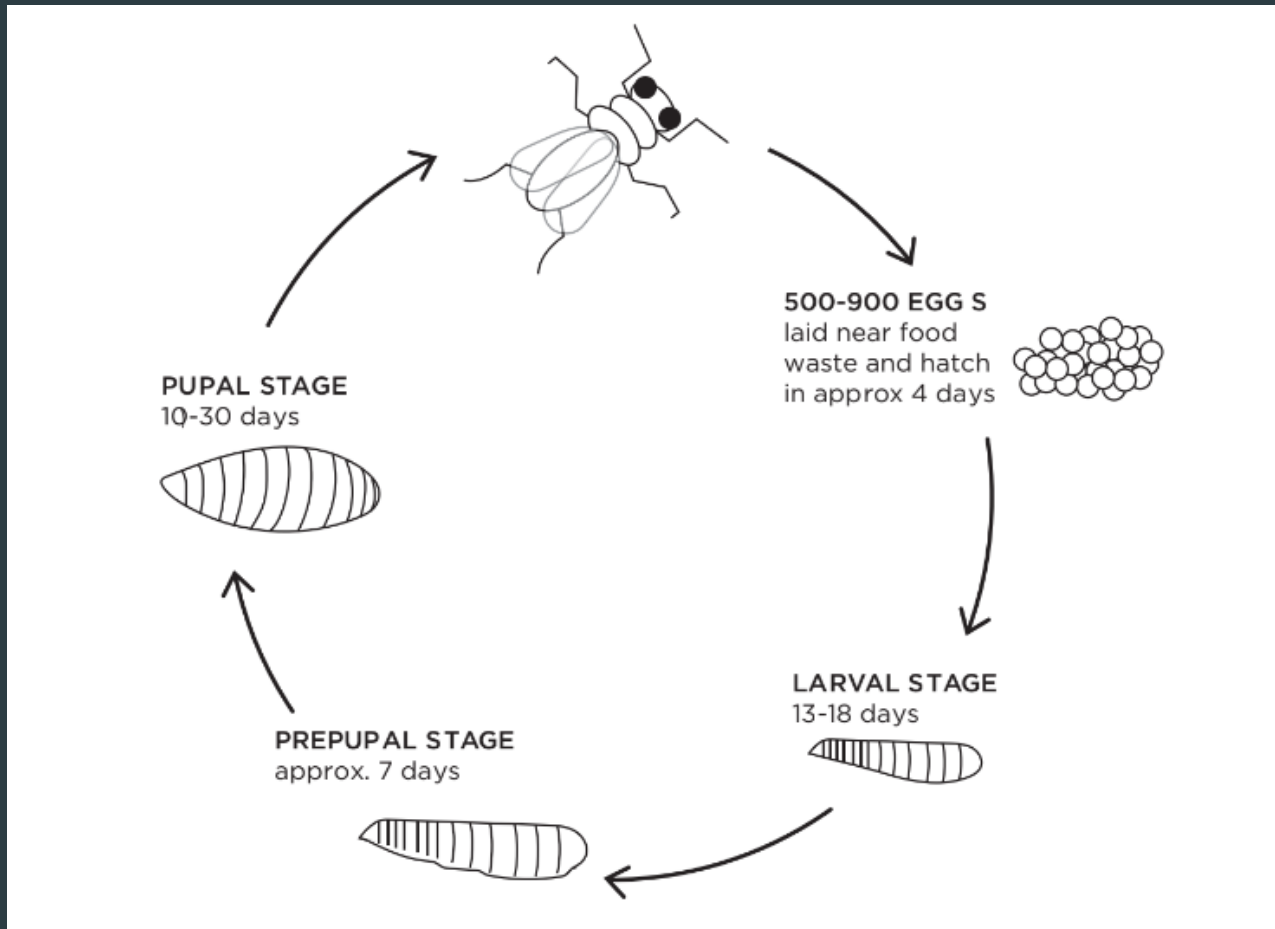
- ▶ No fertilizer
- ▶ Water use reduction
- ▶ Fish feed needed = loads of fish meal

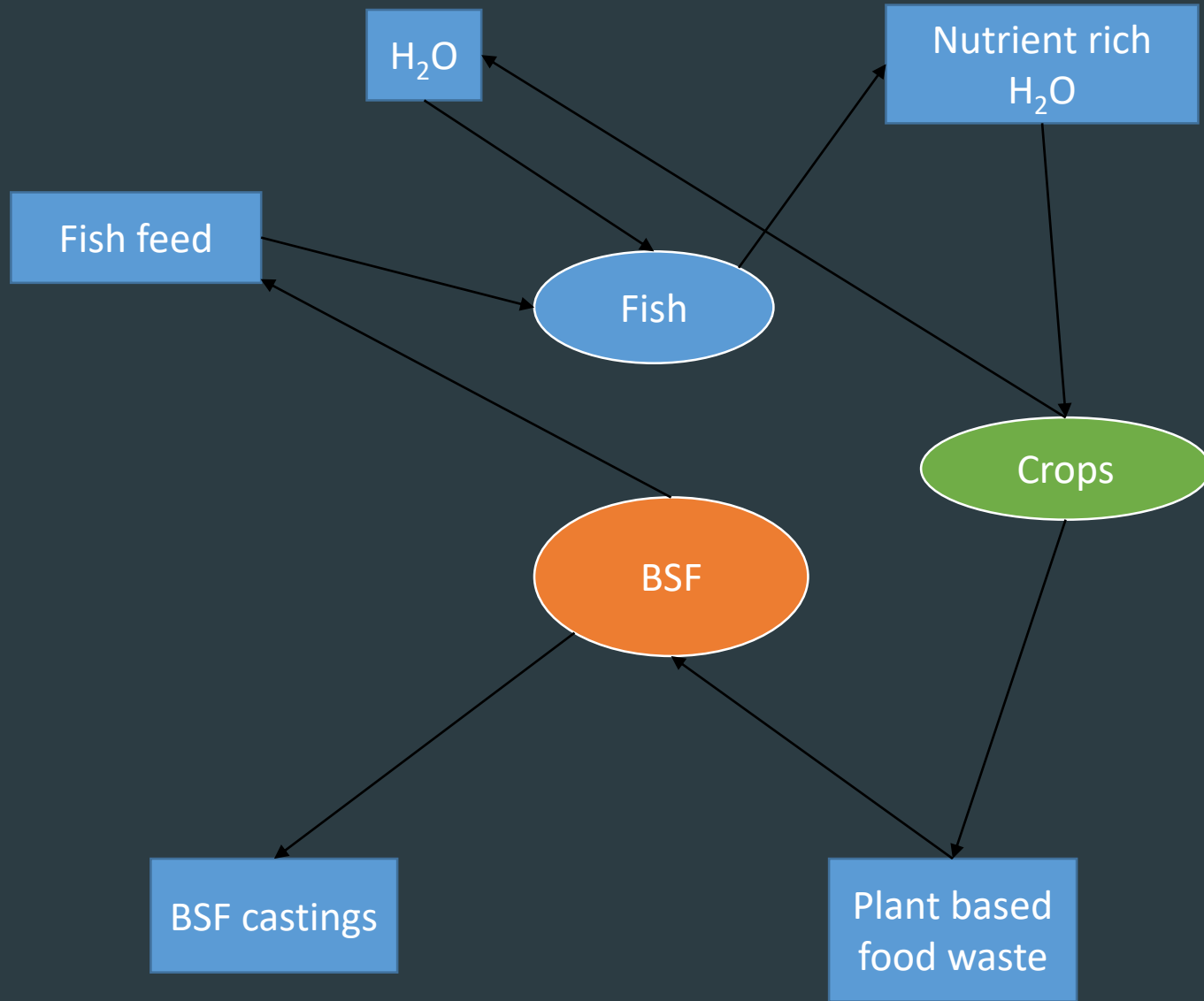


Aquaponics and Insects

- ▶ Replace fish feed with insects
- ▶ Black soldier flies (BSF), crickets, mealworms
- ▶ BSF can feed on virtually every organic waste product:
 - ▶ Potato peels
 - ▶ Coffee grounds
 - ▶ Manure
- ▶ Diet has lots of influence on speed of growth
- ▶ Yields up to a 40% protein product (DW)

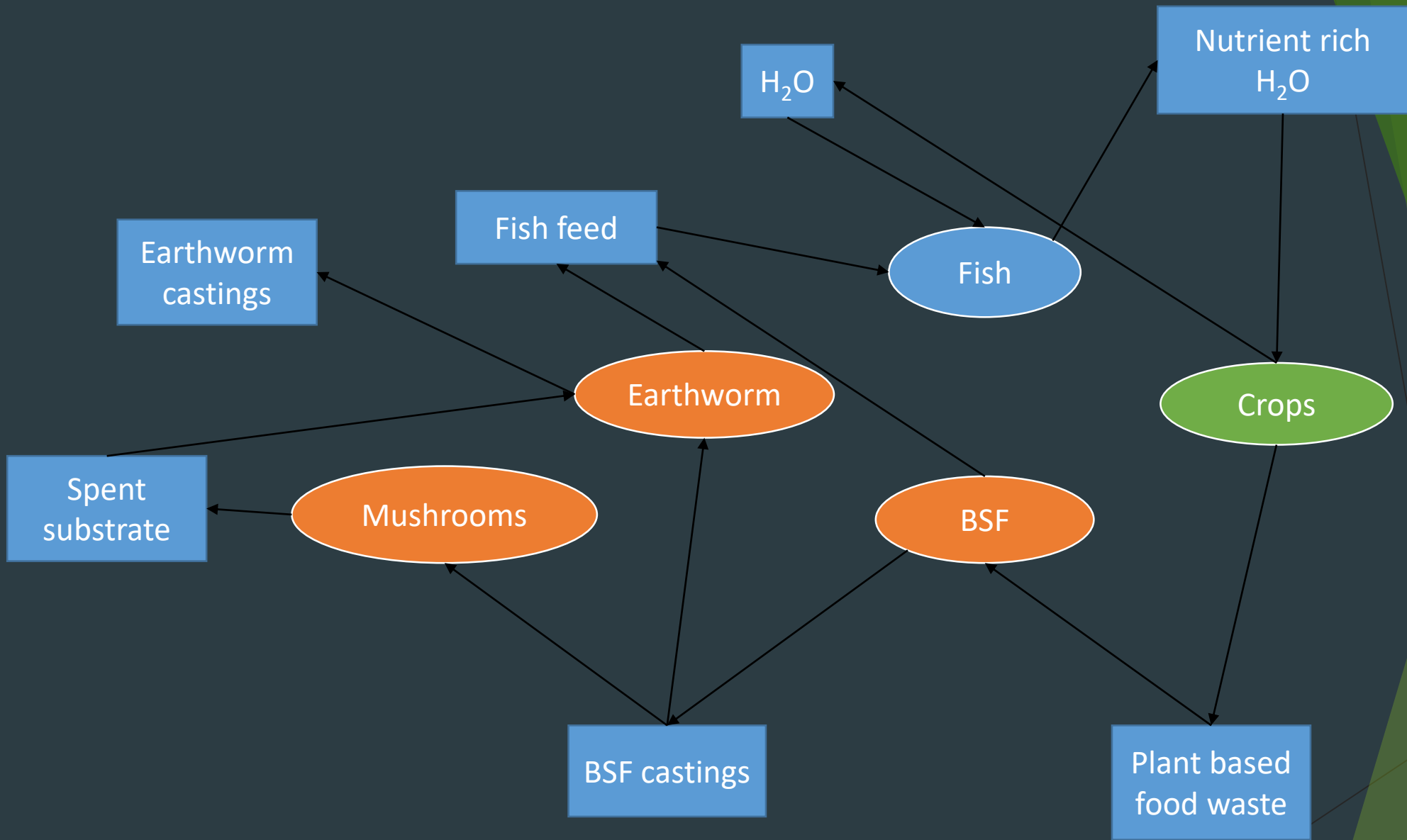
Black soldier flies





BSF waste

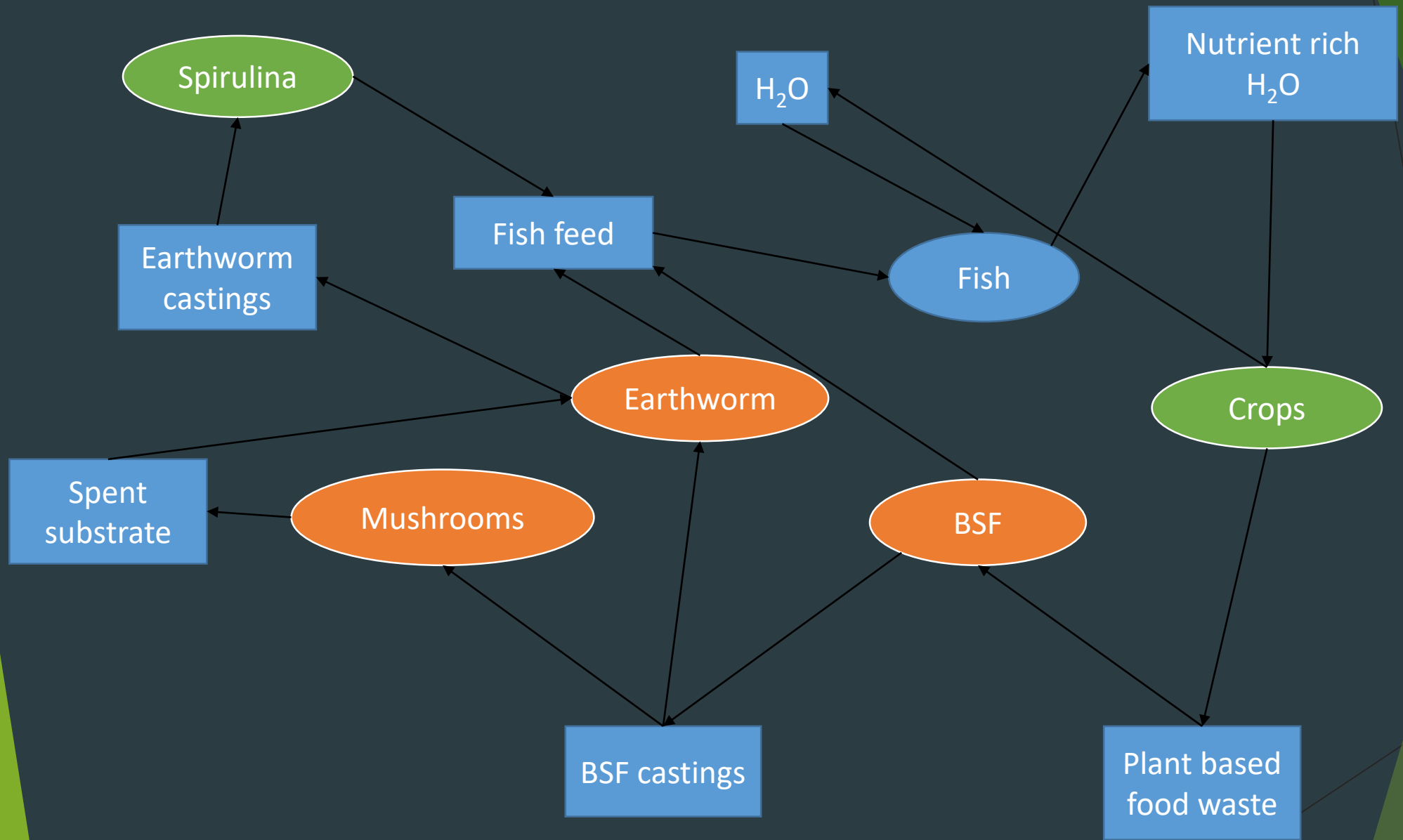
- ▶ Can be used for:
 - ▶ Mushroom substrate
 - ▶ Earthworm substrate
 - ▶ Plant fertilizer → improves after further breakdown by mushrooms/earthworms

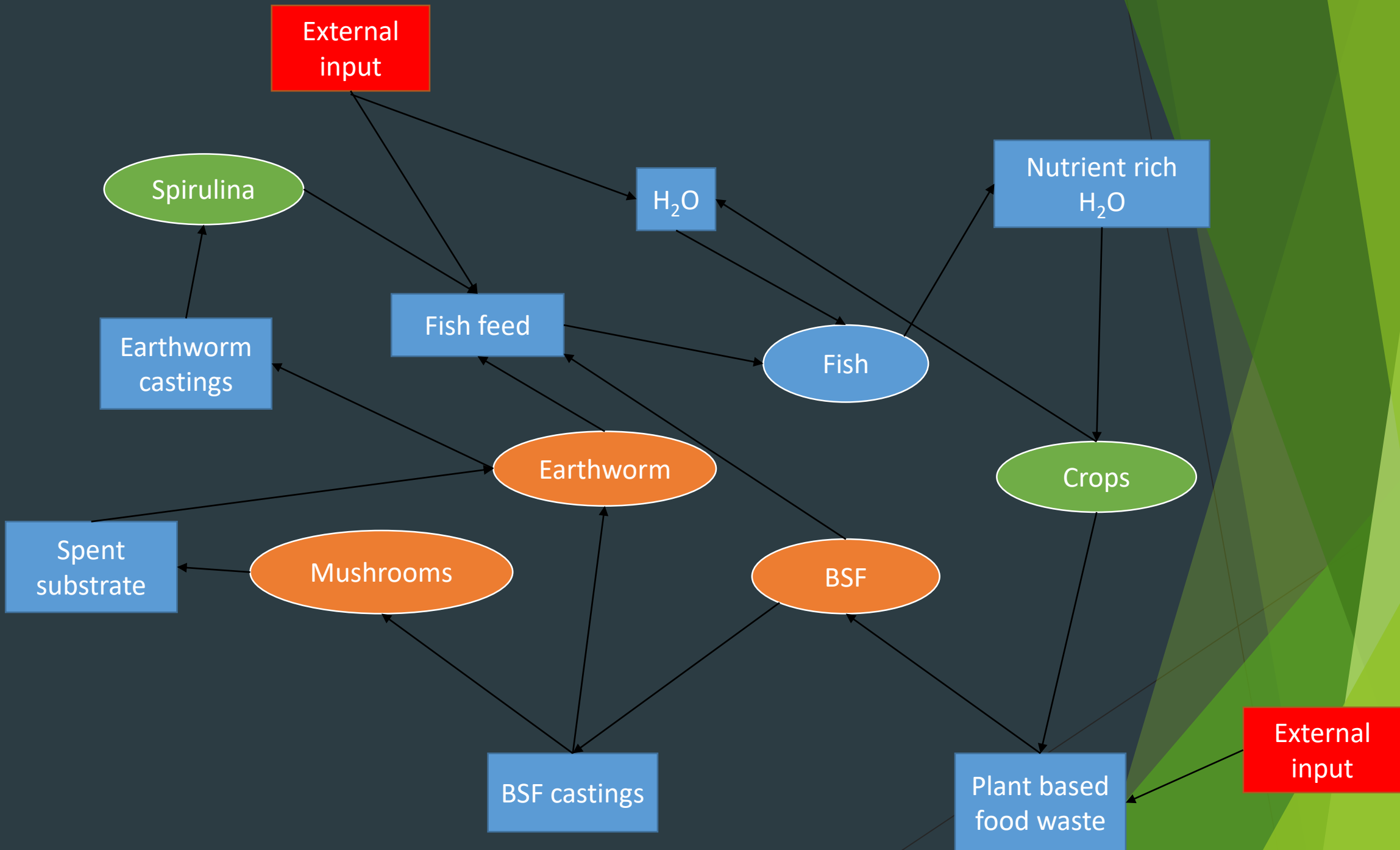


Earthworms

- ▶ Additional fish feed
- ▶ Earthworm faeces is fertilizer
- ▶ Algae fertilizer?

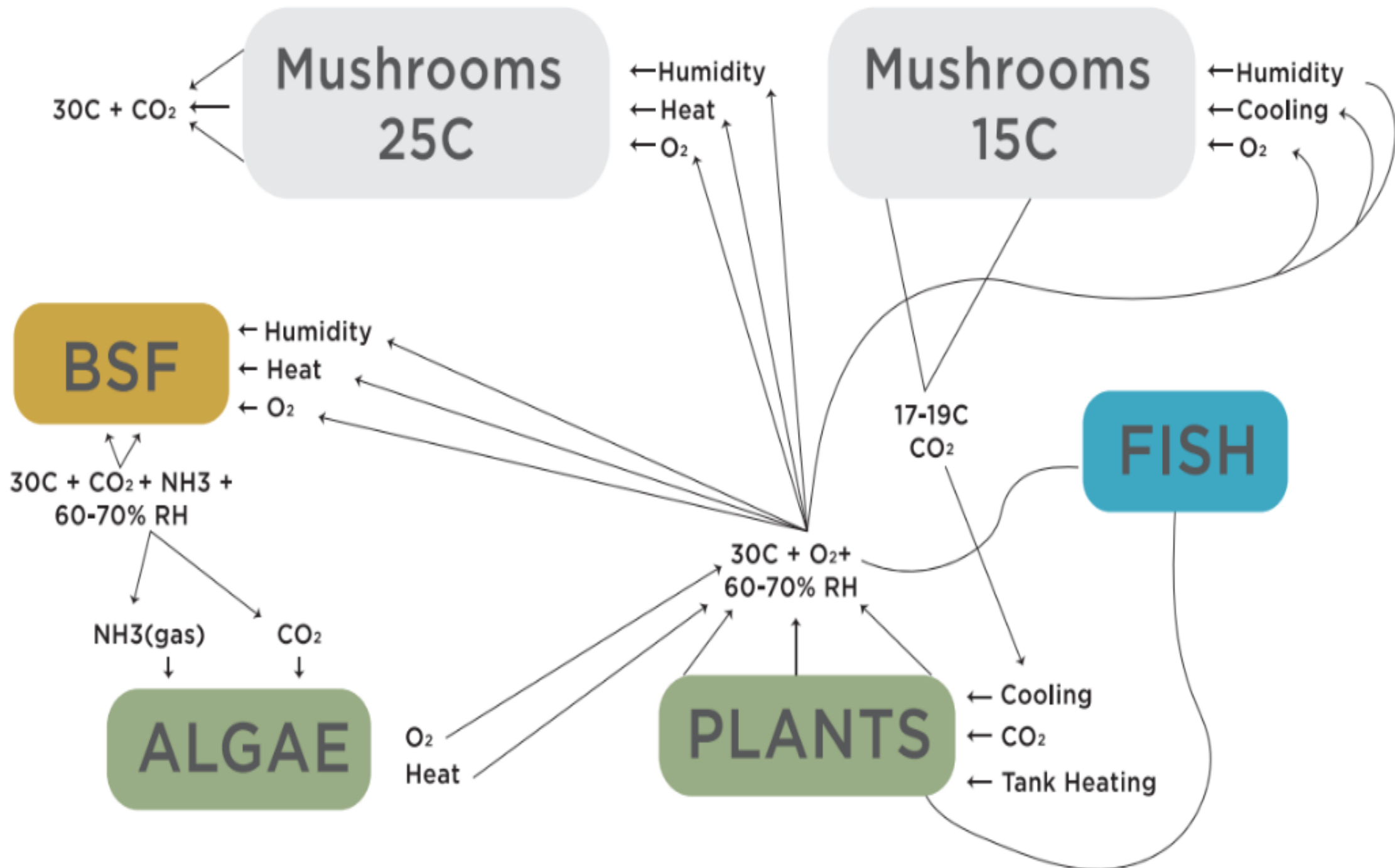
→ Algae to supplement fish feed (omega-3 fatty-acids)





Air flows

- ▶ In a VF air needs to be conditioned
 - ▶ Heating/cooling
 - ▶ (De)humidification
 - ▶ Sanitation
 - ▶ O_2/CO_2



Challenges

- ▶ Research is scarce
- ▶ Identifying potential overlap between organisms
- ▶ Production ratios (fish:plants)
- ▶ Legislation

Interested?

Contact me at seppe.salari@smartcrops.nl