Circular Urban Farming in Singapore

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SIAW 2023: Singapore International Agrifood Week

Rationale

- Singapore Food Story 2.0 policy:

  Food self sufficiency in 2030 should be 30%

- CEA is an appreciated candidate for Fruit & Veges production due to spatial and climate limitations

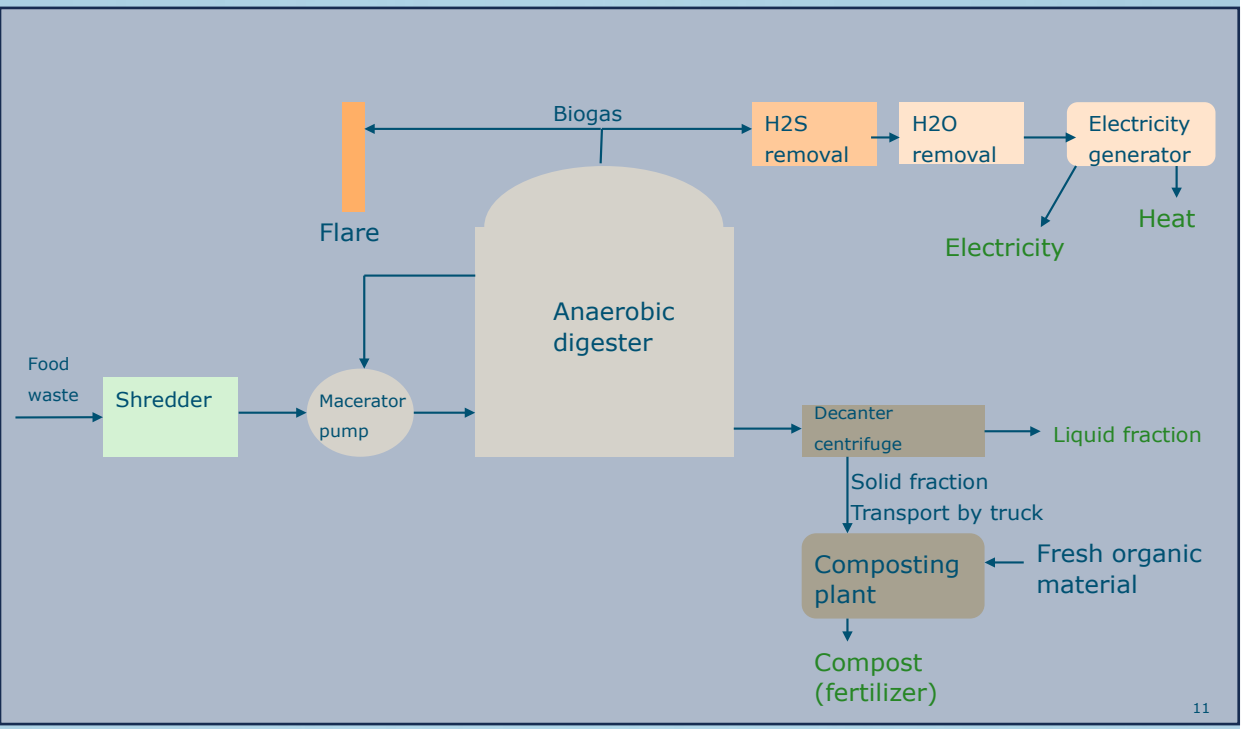
- Local institutions (NRF & SFA) require reduction of energy use in CEA: stimulate CEA farmers to reduce energy consumption from the local grid.

- Besides energy reduction, also need for circularity: produce energy from waste & reuse nutrients

- SMP aim: Develop a *1.* CEA **business case** to produce energy from food waste & *2.* **circular use** of nutrients.

- Deliverable: Setup of a *3.* **PPS Consortium** interested to implement & upscale the SMP rationale.

Results 1 – Business case



We have calculated a positive business case for connecting a digester to a CEA-farm to produce energy.

1. Concept development for energy reuse
2. Development of a business case
3. Assumptions made, further details required e.g. waste composition & costs, permit procedure, digestate disposal, commercial negotiations

Yearly costs

Depreciation and interest 12% of investments	Euro 312,000
Maintenance 3% of investments	Euro 78,000
Energy 55 kWh x 24 x 365 x 0.197	Euro 94,915
Labour	Euro 40,000
	Euro 524,915

Yearly revenues

Electricity 500 kWh x 24 x 365 x 0.197	Euro 862,860
Waste processing fee 37 x 365 x 88 x 0.68	Euro 808,139
Saving water 9,125 x 1.58 x 0.68	Euro 9,804
	Euro 1,680,803

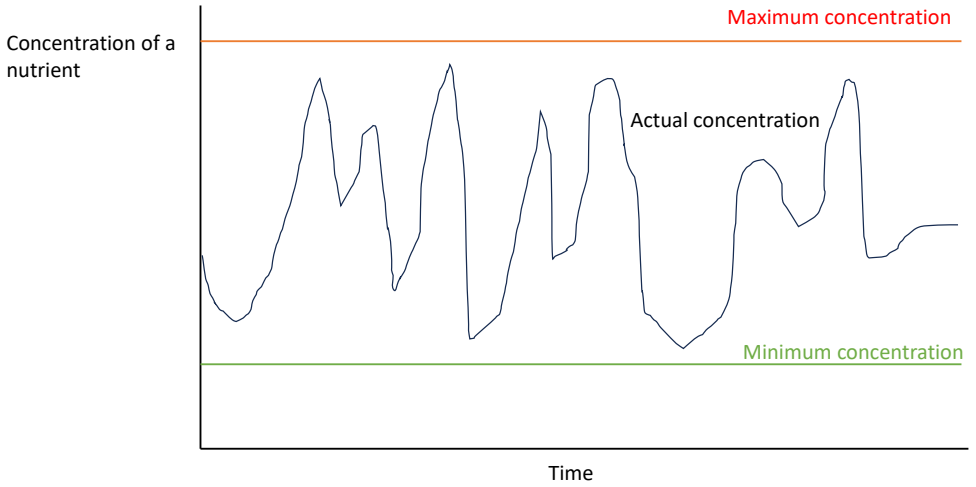
Results 2 – Circular use

Performed local discussions on existing situation:

1. Local Visits: NEA, Marina Bay Sands Hotel, Growy, NRF
2. Conference & Expo: SFA, Growy, NTU

Feedback resulted in a new concept for circular reuse of nutrients from digestate:

1. Reuse of liquid fraction.
2. Legal procedure to initiate implementation.



Results 3 – PPS Proposal

1. Submission of PPS proposal 2023

   Healthy food on demand: linking consumer acceptance – circular cultivation systems

   1. Consumer Preferences
   2. Control of Product quality characteristics
   3. Renewable use of energy by digestion
   4. Automated monitoring of crop growth
   5. Digital twin
   6. Validation “ proof of principle”

2. Consortium partners: Growy, WR, AMS, INFO, Chef’s Farm, Dordtech, Quick Plug.

3. Presentation of the idea at Expo Singapore.

Conclusions

Content:

- Business case for energy production from food waste looks promising. A follow-up initiative needed to fill in the used assumptions and make it a commercial business case.

- A concept has been developed for circular reuse of nutrients from digestate. Further tests are needed to determine the efficiency of the concept.

Process:

- Feedback PPS-rejection 2022: focus on a reduction of energy use and internationalization.

- Combi PPS – 2022 & SMP 2023 has led to PPS – 2023

- Rejected in November 2023

- New opportunities for rejected PPS 2023 in SFS 2.0 from SFA-Singapore.

Next Steps

1. Apply for SFA funding using the rejected PPS-proposal.

2. Extract feedback from Topsector & ministries on rejected NWO, PPS1, NGF and PPS2 to prevent disappointment in tenders to come.

Lessons Learned

- Practice of waste management and processing not yet so advanced as thought, but improvement is on the way due to large innovation investments.

- The consortium needs another approach to position vertical farming in the Netherlands.

- Singapore is very interested to invest in technology and expertise to realize urban food production.

THANK YOU

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