#### **URBAN FARMING CENTRE** ARCHITECTURAL ENGINEERING



SCOTT SPOON 4675177







Hydroponics



Aquaculture



Community farm





Hydroponics

Aquaculture

Aeroponics



Community farm





Hydroponics





Community farm





Hydroponics

Aeroponics







Community farm

Mushroom farming



Vertical farming



Aquaculture



Vermiculture



Biomass from vertical farming Mushroom substrate Mushrooms – O2 & cooling from vertical farming CO2, heating – Energy Spores Water Spent mushroom substrate (SMS)

Lignocellulose

Coffee grounds from restaurants

#### Social settings



Housing



Restaurants & Shops

Vertical farming

Vermiculture

Mushroom farming



#### Vertical farming



#### Aquaculture



#### Vermiculture



#### CO2 & heating from mushroom farming Compost from vermiculture Nutrient rich fluids from aquaculture Energy Seeds Water

#### Social settings



#### Housing



Restaurants & Shops

Mushroom farming

Aquaculture

Aquaculture

Vermiculture

Mushroom farming



#### Vertical farming





#### Social settings



#### Housing



Restaurants & Shops

Vertical farming

Mushroom farming



Vertical farming



Aquaculture

Vermiculture



Social settings





Housing

Community supported agriculture

Shops

Vertical farming

Aquaculture

Mushroom farming



Vertical farming



Housing



#### Vermiculture

Mushroom substrate for mushroom farming

#### Mushroom farming



#### Vertical farming



#### Aquaculture Vermiculture Vermiculture Seeds Energy Healthy food Housing Housing Housing

#### Social settings



#### Housing







#### Flows combined



## Flows combined | simplified





#### Functions overview



## Campus analyses



Renovations

Sport functions

Vacant space

## Location analyses | Functions



Function clusters









Students



### Location analyses | Students



Student interaction

[1] The park forms the connection between the chosen design location and the rest of the

- place a larger emphasis

YZ (KIW) [2] You currently have to approach the chosen location from the side when coming from the

- Create a more prominent connection on the front going through the

[3] The botanical garden is free to enter for students and is often used as an outside study

- Continue this theme into the new location



100m

#### Location analyses | Local residents



Local residents interaction

#### Location analyses | Cityscape



Surrounding potential

[3] The botanical garden has a vast collection of plants and teaches and researches about the different aspects them. - This idea can be continued in the chosen location falling in line with the idea of allowing for tours and workshops to teach the people. - Could therefore create connection between the existing botanical garden and the new

[4] Nearby open spaces like parking lots can get a canopy that allows for public urban farming up

- This allows for both an increases in public social participation and lets cars stay cool in the shade during the



Mushroom farming



Vertical farming



Housing



#### Vermiculture

Mushroom substrate for mushroom farming

### Urban farming flows | Extended

Mushroom farming





Housing

Compost



Vermiculture

Mushroom substrate for mushroom farming

## Render | Front side







# Render | Arrival







## Section | West to east



## Render | Courtyard













## Model | The back of the courtyard


### Floor plan | Ground floor



## Render | Courtyard



## Section | North to south



Section | North to south

### Floor plan | Ground floor



### Floor plan | Ground floor







\_\_\_\_\_10m



\_\_\_\_\_10m

# Floor plan | Ground floor





\_\_\_\_\_10m





\_\_\_\_\_10m

# Render | Living room



### Table | Urban farming production numbers

Hydroponics	Crops grown	Biomass production	Oxygen production	Compost reduction*	Water usage*	Energy usage**	Land use	٩
Water culture	1 kg	0.5 to 3 kg	0.21 kg	55% to 80%	21.4 to 13.3 L	38.8 to 60 kWh	0.15 to 0.06 m2	Т
Ebb & Flow technique	1 kg	0.5 to 3 kg	0.21 kg	55% to 80%	21.4 to 13.3 L	38.8 to 60 kWh	0.15 to 0.06 m2	Т
Aeroponics	1 kg	0.5 to 3 kg	0.21 kg	85%	2.6 L	60 to 180 kWh	0.06 to 0.03 m2	U
Nutrient film technique	1 kg	0.5 to 3 kg	0.21 kg	55% to 80%	21.4 to 13.3 L	38.8 to 60 kWh	0.15 to 0.06 m2	T
Drip	1 kg	0.5 to 3 kg	0.21 kg	68% to 85%	10.7 to 6.1 L	38.8 to 60 kWh	0.15 to 0.06 m2	A
Conventional farming	1 kg	0.5 to 3 kg	0.21 kg	0%	214 L	0.3 to 0.7 kWh	0.89 to 0.38 m2	С
Greenhouse farming	1 kg	0.5 to 3 kg	0.21 kg	0%	132 to 75 L	5.4 kWh	0.60 to 0.24 m2	C

\* The lower number is used when the water is recirculated

\*\* Most energy in urban farming is needed for LED lighting (55%), airconditioning (30%) and dehumidifiers (10%), meaning little variance between the different forms Average dutch household uses 2810 kwh per year

Conventional farming uses an average of 0.03 kg of fertilizer per kg of crop

	Mushrooms grown	SMS production	CO <sub>2</sub> production	Necessary substrate	Water usage	Energy usage	Land use	N
Mushroom farming	1 kg	2 kg	5 kg	5 kg	2.9 L	1.9 kWh	0.15 m2	M

	Fish grown	Can sustain how many crops	Necessary fish feed	(Rain) water usage	Energy usage	Land use	Notes
Aquaponics	1 kg	6.5 kg	1.3 kg	292 L	159 kWh*	8.41 m2	Amonia waste from the fish is turn

\* Most energy usage is for heating the water

	Worms grown	Compost production	Necessary leftover biomass	Water usage	Energy usage	Land use*	Notes
Vermiculture	1 kg	15 kg	30 kg	21 L	-	-	The worms turn waste organic ma

\* The land use of Vermicomposting is negligible compared to other functions

#### Notes

The roots are directly placed in the water

The plants are placed in a medium which floods and drains in intervalls

Uses mist to spray onto the plants instead of water

The nutrient solution flows along the plants and excess is recirculated

A tube drips exact measurements of nutrients solution onto the plants

Conventional outdoor farming on fields

Crops that are grown conventionally inside of greenhouses

#### Notes

Mushroom colonies can be grown on substrates from other leftovers

urned into nutrients for the plants

matter into compost



### Ground floor

Aeroponics: Wick system hydroponics:

151.3 m² | 2521 kg/y 258.7m<sup>2</sup> | 1725 kg/y



10m

151.3 m² | 2521 kg/y 258.7m<sup>2</sup> | 1725 kg/y

176.3 m² | 1175 kg/y



#### Ground floor

Aeroponics: Wick system hydroponics

#### **Basement**

Mushroom farming:

### <u>First floor</u>

Ebb and flow hydroponic Aeroponics :

	151.3 m²	2,521 kg/y
CS:	258.7m <sup>2</sup>	1,725 kg/y

176.3 m² | 1,175 kg/y

ics:	382.5 m <sup>2</sup>	2,550 kg/y
	205.8 m <sup>2</sup>	3,429 kg/y



#### Ground floor

Aeroponics: Wick system hydroponic

#### **Basement**

Mushroom farming:

### <u>First floor</u>

Ebb and flow hydroponic Aeroponics :

<u>Total:</u> People fed:

Conventional farming: People fed:

	151.3 m²	2,521 kg/y
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176.3 m² | 1,175 kg/y

ics:	382.5 m <sup>2</sup>	2,550 kg/y
	205.8 m <sup>2</sup>	3,429 kg/y

1,174.6 m² | 11,400 kg/y 94

1,174.6 m<sup>2</sup> | 1305 kg/y 11

### Section | Climate



## Details | Roof courtyard





## Construction method | Courtyard



## Construction method | Courtyard



## Construction method | Courtyard



### Section | Changes existing structure



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